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Determination of Soil Elements and Texture in two Cultivars of *Phoenix dactylifera* Dates in Bushehr Province

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In order to determination of soil elements and texture in two cultivars of *Phoenix dactylifera* dates in Bushehr province, an experiment was carried out in year 2016. In this research, soil characteristics such as texture and elements were investigated. Important soil elements (nitrogen, phosphorus and potassium) were studied, that nitrogen in soil in Kabakab, Sugar and Shahabi varieties (04, 1), phosphorus content (4.26, 4.4) and potassium (180.78.33) respectively. Soil texture in varieties Kabakab, Sugar and Shahabi are sandy-loamy, silt-loamy and silt in that order. The palm tree grows in drained, sandy-loamy, clay and other heavy soils. Soil elements cause fertility and require drainage and ventilation. The average amount of salinity for the plant is not harmful but more than that, decreases the growth and decline of the quality of the fruit [1,2].

Keywords: Kabakab, Sugar, Soil Elements and Soil Texture

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Identification of Nitrogen Containing Compounds of the Essential Oil of *Dorema ammoniacum* D. Don. (Apiaceae) and Their Grouping in Its Habitat Located in Isfahan Province, Iran

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The undeniable role on medicinal plants effectiveness particular in terms of community health has been specified for everyone since time immemorial. Several scientific studies have been conducted internationally to confirm their efficacy effectiveness and some of the results of them led to the herbal medicine production [1]. Nitrogen is a molecule in every major drug class in pharmacology and medicine. Also, nitrogen compounds play an important role in many aspects of life and commercial processes so that a vast number of nitrogen containing compounds have many applications in the fields of pharmaceutical research, agricultural sciences and drug discovery. In this regard, *Dorema ammoniacum* D. Don. was collected from its natural habitats in the western part of Isfahan province, Iran. After the plant collection, its target organs namely stem and leaf were separated, air dried, milled and in the certain quantity weighed. Following that, the essential oil of the plant was isolated by hydro-distillation method and analyzed by GC/MS. The results indicated that a wide range of nitrogen containing compounds were found in the essential oil of *Dorema ammoniacum* D. Don. Following that, there were three forms of the nitrogen containing compounds in the identified constituents so that the mentioned forms were classified to other subgroups namely amines (27 compounds), alkaloids (8 compounds) and amides (4 compounds). The percent of the mentioned compounds coupled with the highest abundance amount were amines (73.5 %), alkaloids (17.2 %) and amides (9.3 %) respectively. Finally, the major nitrogen containing compounds of each subgroups were 2-Hexanamine 4-methyl and 2-Methoxy amphetamine (0.63 %) for amines group jointly, Homarine (0.48 %) for alkaloids group and 1-(3,5-Dimethyl-1-adamantanoyl) semi carbazide (0.52 %) for amides group respectively.

Keywords: *Dorema ammoniacum* D. Don., Essential oil, Habitat

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Study of *Aloe vera* Extract on Growth Performance and Bacterial Flora of Intestine in Siberian Sturgeon (*Acipenser baerii*)

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Regarding the beneficial effects and benefits of the herb *Aloe vera* and its application in various industries such as pharmaceuticals and food industries, this study investigated the effects of *Aloe vera* extract on growth parameters and bacterial flora of the Siberian sturgeon (*Acipenser baerii*). In this study, a total of 360 numbers of Siberian sturgeon weighted average 10.95 ± 0.04 (g) randomly distributed in four treatments including a control group and three experimental groups (each with three replications) were used. So, *Aloe Vera* extract powder ratio of 0.5%, 1% and 1.5% were added to the food. After eight weeks of feeding in the fiberglass vans and physicochemical parameters of water daily registration, biometry carried out and necessary samples collected. In this study, growth indicators such as weight gain, initial body weight, condition factor, feed conversion ratio, specific growth rate, protein efficiency ratio, hepatosomatic index and survival rate were calculated. Results showed that all growth parameters (except hepatosomatic index) in the treatments compared to the control group showed statistically significant differences as a significant difference between the control group treated 1.5% extract were observed ($P < 0.05$). Each carcass composition parameters, no significant difference was observed between the treatment and control groups ($p > 0.05$). Meanwhile, total count of bacteria in intestine in the treatment and control groups did not show significant differences ($p > 0.05$), but significant increase in the count of anaerobic bacteria (lactic acid bacteria) were observed compared to the control group ($p < 0.05$). The result showed that *Aloe vera* extract can be effective in improving the growth performance of Siberian sturgeon.

Keywords: *Aloe vera* extract, Growth, Bacterial flora, *Acipenser baerii*

The Study on the Effect of Esabgol (Psyllium) on Constipation Angina Hospitalized Patients in the Cardiac Care Unit (2015)

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Constipation is among prevalent problems in patients. In heart-related special cares part of hospitals, lack of mobility, consumption of narcotics for pain relief, lack of appetite and limitation of food consumption are the reasons for constipation in more than 70 percent of occasions. Sand plantain, in traditional medicine, is used very much as a laxative drug. In the present study, effects of sand plantain and hydroxide magnesium syrup on constipation of Angina pectoris patients in heart-related special part are examined. The present study is a clinical trial with a semi-empirical method which was carried out on two groups of patients in special cares part of heart-related problems of Isabn-e-maryam hospital in Isfahan. One group was consisted of 48 and the other was consisted of 62 persons. Sampling method was targeted sampling in similar conditions. In each group before treatment and until 5 days after it, number of stool exertion and conditions during exertion were verified by questionnaire. Then results of using Sand plantain and magnesium hydroxide before and after treatment were compared between the two groups. statistical analysis before and after treatment showed that mean of stool excretion numbers increased in two groups and is higher in treatment group in comparison to control group. Significant findings in test group in comparison to control group was lack of complete discharge 2.5 percent and 16.7 percent, painful discharge 5.0 percent in comparison to 14.6 percent, pushing too much 25 percent and 43.8 percent and ball-shaped and hard stool 12.5 percent and 31.3 percent. Sand plantain in Angina pectoris patients hospitalized in special cares part of heart-related problems was effective in prevention and treatment of constipation of these patients with increasing numbers of discharge, reduction of incomplete discharge, pushing and painful discharge, and also reduction of hard and ball-shaped stool. It was significantly more effective in comparison to hydroxide magnesium syrup, so it is offered that in special parts of heart-related problems Sand plantain powder (Psyllium) is usable for prevention and treatment of constipation.

Keywords: Cardiac care unit, Constipation, Sand plantain, Hydroxide magnesium

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Effect of *Nigella Sativa* Oil as a Potential Treatment for Oral Mucositis in Animal Models

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Previous Studies have shown that nigella sativa oil can help oral ulcer healing. The purpose of this study was to investigate potential therapeutic utility of this medicinal plant against chemotherapy oral mucositis. 56 rats were divided into three experimental groups and subjected to the intraperitoneal injection of 100 and 65 mg/kg of 5-FU on days 1 and 3. Their buccal mucosa were scratched with a needle 18 gauge. The first group was used as control; the second and third groups were treated with 400 µlit/kg/day intraperitoneally placebo (group II) and nigella sativa oil (group III). Animals were sacrificed on the 4th, 8th day post 5-FU administration. The degree of inflammation was then evaluated on HE-stained slides. The results were analyzed using Kruskal-wallis and the Mann-Whitney U test. The severity of inflammation in the treated group of nigella sativa was significantly lower than the other groups. Systemic administration of nigella sativa oil can improve chemotherapy induced mucosal damage.

Keywords: *Nigella sativa*, Mucositis, Chemotherapy

Effects of Spraying with Salicylic Acid, Jasmine Acid and Proline on Morphological Traits of *Glycyrrhiza glabra* L.

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Glycyrrhiza glabra L (Licorice) as native and pasture medicinal plant has most important export rule [1]. Glycyrrhizic acid (GA) or Glycyrrhizin as a main active component of licorice root and rhizomes, is a triterpenoid saponin claimed to be up to 30-50 times sweeter than sucrose and to be used in pharmaceuticals, food and tobacco industry. Licorice root is a traditional medicine used mainly for the treatment of peptic ulcer [2]. In order to evaluate salicylic acid, methyl jasmonate and proline salinization on morphological traits of *G. glabra* L., a randomized complete block design with three replications was conducted in Mahabad city during 2017-2018. The treatments consisted of salicylic acid at three levels (0.3, 0.6, 1.2 mM), methyl jasmonate in two levels (0.2 and 0.4 mM) and proline in two levels (1 and 2 mM) and Distilled water was used as control. There was a significant difference in plant height, stem diameter, inflorescence length, leaf length, leaf number, leaf length, leaflet width, pod length, number of pods per plant and seed number per pod at 1% probability level with treatments. The highest plant height, stem diameter, inflorescence length, number of leaflets, pod length, number of pods per plant and number of seeds per pod in salicylic acid treatment at 0.3 mM concentration, leaf length, leaf length and leaflet width in treatment Proline was obtained at a concentration of 1 mM. The height of the plant with the number of leaflets, inflorescence length, pod length, number of seeds per pod, number of pods per plant, stem diameter had a positive and significant correlation with 1% level and leaflet length at 5% level, but with traits Leaf length and leaf width were not significantly correlated.

Keywords: Growth Regulators, Foliar application, Morphological traits, Licorice

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Effects of Spraying with Ascorbic Acid, Spermine and Chitosan on Morphological Traits of *Glycyrrhiza glabra* L. under Rainfed Condition

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Glycyrrhiza glabra roots and rhizomes which are extensively used in herbal medicines for their health effects containing more than 100 various useful compounds including phenolics and triterpene saponins (glycyrrizin) grow as a weedy plant in many different localities of Iran [1]. Licorice has been traditionally used as a medicinal plant in Iran for treatment of diseases such as gastric ulcer and relieve intestinal spasms [2]. To study the effect of foliar application of ascorbic acid, spermine and chitosan salinization on morphological traits of rainfed *Glycyrrhiza glabra* L., a randomized complete block design with three replications was conducted in Mahabad city during 2017-2018. The treatments consisted of ascorbic acid at three levels (0.5, 1, 2 mM), spermine in two levels (0.2 and 0.4 mM) and chitosan in two levels (50, 100 and 200 mg/L) and distilled water as control. There was a significant difference in plant height, stem diameter, inflorescence length, leaf length, leaf number, leaf length, leaflet width, pod length, number of pods per plant and seed number per pod at 1% probability level affected by the treatments. The results of current study showed that the applied treatments had a significant effect on all parameters measured at 1% probability level. Maximum leaf length, length of pod, number of pods per plant and seed number per pod were observed in ascorbic acid at 2 mM, plant height, stem diameter, leaflet length and leaflet width in chitosan at 50 mg/l. and number of leaflets in spermine at 0.2 mM. The plant height had a positive and significant correlation with leaf length, leaflet width, inflorescence length, pod length, number of seeds per pod, stem diameter and number of pods per plant at 1% level.

Keywords: Morphological traits, Foliar application, Growth regulators, Licorice

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Identification and Ecological Investigation of two Endemic Iranian Medicinal Plants

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The genus *Nepeta* L. from the Lamiaceae family, contains approximately 79 species distributed in Iran. The species of this genus have been used as sedative and analgesics, cough and asthma, and diarrhea in traditional medicine. [1,2] The aims of present study is to identify the ecological characteristics of the two endemic species *Nepeta crassifolia*, *Nepeta cephalotes*, for introducing their cultivation on farmland and use in the pharmaceutical industry, as well as preventing the destruction of the natural habitats of these two species. In order to implement this plan, the habitats of these species were identified. Then, by referring to natural habitats, the ecological characteristics of the species included the average annual rainfall, annual temperature, soil texture, evaporation, climatic type, slope percentage, geographic extent of coverage, best habitat in terms of abundance and density, dominant plant communities, type Habitat, elevation, sea level, distribution points, and associated plants were examined. The results showed that the species these species habitats are ultracold and cold. The habitat of these plants is often dispersed in mountainous areas. *Nepeta cephalotes* were found in mountainous regions and dry slopes in gradients of 30-60% and in sheltered blubber species and require high moisture content. The *Nepeta crassifolia* habitat in Iran is the central Alborz, northeastern and northwestern part of the country. This species predominates in the rocky lands of mountainous regions above 2500 m.

Keywords: *Nepeta crassifolia*, *Nepeta cephalotes*, Ecological investigation

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Monoterpene Hydrocarbons, Major Components of the Oleo-gum-resine Essential oils from three Species of *Ferula* Growing Wild in Fars, Iran

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Most of *Ferula* species possess strong aromatic smell that is due to the presence of essential oil or oleoresin in their different organs. Essential oils of the Oleo-gum-resin of *F. assa-foetida*, *F. gummosa* and *F. persica*, growing wild in Iran, were separately obtained by hydrodistillation and analyzed by GC and GC-MS. Forty compounds, representing 99.2% of the total oil, were identified in OGR EO of *F. assa-foetida*. The oil was characterized by a high concentration of hydrocarbon monoterpenes (53.0%) and sulfur containing compounds (27.3%), among them α -pinene (22.6%), (Z)-1-propenyl sec-butyl disulfide (20.4%), β -pinene (12.1%), (E)-1-propenyl sec-butyl disulfide (6.6%) were the most abundant components. Fifty nine compounds were identified in EO of *F. gummosa* OGR which included 96.7% of compounds. The results showed that the EO was dominated by the presence of monoterpene hydrocarbon (61.7%). EO analyses showed that β -pinene (34.2%), α -pinene (7.5%), limonene (4.9) were the main components from *F. gummosa*. Fifty compounds were characterized as a result analyses of *F. persica* essential oil, accounting for 99.6% of the total oil. The results showed that the essential oil was rich in hydrocarbon monoterpenes (53.0%) and sulfur containing compounds (23.7%) with α -pinene (24.4%), (Z)-1-propenyl sec-butyl disulfide (18.5%), β -pinene (12.5%) and (Z)-b-ocimene (6.5%) as the main compounds. As a result, the major components of all these oils are α -pinene, β -pinene, limonene, γ -terpinene and p-cymene. Therefore, the particularity of these oils is their monoterpene hydrocarbons major components [1,2].

Keywords: *Ferula*, Essential oil, GC, Monoterpene hydrocarbons

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Essential Oil Composition of Four Species of *Ferula* Growing Wild in Fars, Iran

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Ferula species are one of the main sources of aromatic and medicinal plants. This genus is well-known in folk medicine for the treatment of various organ disorders. A comparative study on the essential oils of four species of *Ferula*, *F. assa-foetida*, *F. gummosa*, *F. persica* and *F. ovina*, growing in Fars province, Iran, has been carried out. The essential oils of aerial parts of these plants were obtained using hydrodistillation and analysed by GC and GC-MS. Analysis of the essential oils from aerial parts of *F. assa-foetida*, *F. gummosa*, *F. persica* and *F. ovina* resulted in the identification of 53, 60, 61 and 61 constituents which they comprised 99.5, 98.6, 99.9 and 99.8% of the oils, respectively. A total of Essential oil from *F. gummosa* was constituted high levels of α -Pinene (16.0%), β -Pinene (13.5%) and δ -3-Carene (9.7%). Essential oil from *F. persica* was constituted high levels of α -Pinene (18.3%), myrcene (16.3%) and α -bisabolol (8.8%). Essential oil of *F. ovina* was constituted high levels of α -pinene (17.8%), camphene (11.3%) and bornyl acetate (6.4%). While 10-epi- γ -eudesmol (18.3%), α -eudesmol (11.0%), agarospirol (7.1%) and β -eudesmol (6.6%) were found in large amount only in the essential oil of *F. assa-foetida*. As a result, essential oils obtained from different *Ferula* have different composition and biological activity thus have different applications in food and health industry [1,2].

Keywords: *Ferula assa-foetida*, *F. gummosa*, *F. persica*, *F. ovina*, Essential oil

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Investigation of Antioxidant Activity, Phenolic Compounds and Total Phenolic Content of Three Species of *Ferula* and their Oleo-Gum-Resin

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Recent investigations have shown that plants have antioxidant properties and could decrease oxidative stress in different human diseases. The phenols are the secondary metabolites of the plants that can scavenge the free radicals. The present work was evaluated the antioxidative activities, phenolic and total phenolic contents (TPCs) from aerial parts (AP) of *Ferula assa-foetida*, *F. gummosa* and *F. persica* and their oleo-gum-resins (OGR). Phenolic compounds were examined by using HPLC analysis. The TPC was assessed by Folin-Ciocalteu method. While, radical scavenging activity of sample was assessed using diphenylpicrylhydrazyl (DPPH). HPLC/DAD chromatograms recorded at 280 and 320 nm confirmed of chatchin, caffeic acid, chlorogenic acid, quercetin, p-coumaric acid, coumarin, vanillin, trans-ferulic acid, hesperidin, eugenol and rosmarinic acid. Total phenolic content was determined in comparison with standard Gallic acid and the results expressed in terms of mg GAE g⁻¹ dry weight. Among the tested samples, the highest concentration of phenolic compounds, in terms of number and size, was found in *F. gummosa*. Furthermore, the result showed that *F. persica* and its OGR had the highest total phenolic (70.21±2.3 mg/g and 68.4±0.7mg/g), respectively. *F. assa-foetida* and *F. gummosa* had the highest free radical-scavenging activity in DPPH assay with the IC50 values of 980.20±27.2 and 667.8±21.3 µg ml⁻¹ respectively. Results implied that *Ferula assa-foetida*, *F. gummosa*, *F. persica* and their OGRs are valuable sources of natural antioxidants that may help to retard oxidative degradation and it can be used in food industry [1,2].

Keywords: *Ferula*, Total phenol, Polyphenol, Antioxidant activity, HPLC

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Effect of Exogenous Application of some Elicitors on Physiological Growth Indices of *Rosa damascena* Mill.

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In order to evaluate the effect of γ -aminobutyric acid, Spermine and Ascorbic acid on some physiological characteristics of Damask rose plant, a completely randomized design was conducted in three replications in Zanjan province. Treatments included three levels of γ -aminobutyric acid (1, 5, 10 mM), Spermine (0.5, 1, 1.5 mM) and Ascorbic acid (5, 10, 20 mM). The evaluated traits included physiological traits (total chlorophyll, chlorophyll a, chlorophyll b, carotenoids, leaf flavonoids and petals flavonoids). The results showed that all the traits were significant at 0.01 compared to the control. Based on the results of this study, the concentration of 1 mM γ -aminobutyric acid between different concentrations of this material had the highest effect on leaf carotenoids and petal flavonoids, concentration of 10 mM, had the most effect on chlorophyll b and leaf flavonoids. In addition, the concentration of 1 mM of Spermine among the various concentrations of this substance had the greatest effect on chlorophyll b and leaf flavonoids as well as the concentration of 1.5 mM of the same substance on the chlorophyll a, carotenoids and petal flavonoids. The concentration of 5 mM Ascorbic acid showed the greatest effect on chlorophyll a, total chlorophyll and leaf flavonoids, 10 mM on petal flavonoids and 20 mM on chlorophyll b and carotenoids.

Keywords: Free amino acid, Vitamin C, Polyamine, Yield, Pigment



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Changes in Growth Parameters, Phytochemical Profile, Antioxidant Activity, Bioactive Components and Antimicrobial Activity of the Essential Oil of *Ocimum basilicum* L. Supplied with Nanoparticle Fertilizers

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In this paper, the influences of iron-arginine n[Fe(Arg)₃], iron-glycine n[Fe(Gly)₃] and iron-histidine n[Fe(His)₃] nano-complexes were examined on growth parameters, essential oil yield, chemical composition, phenolics and flavonoids compounds, antioxidant activity and antibacterial and antifungal activities of sweet basil (*Ocimum basilicum* L.) in comparison with the Fe-EDDHA fertilizer. When various Fe nano-complexes were applied, higher growth of basil was observed compared to the control treatment. The highest increases in vegetative growth (319±4 mm plant height and 284±4 g plant weight) were monitored in response to n[Fe(His)₃] treatment. Various Fe nano-complex treatments showed higher essential oil yield than Fe-EDDHA and the control treatments. The n[Fe(His)₃] and n[Fe(Arg)₃] treatments showed the highest yield of essential oil, and the control treatment gave the least yield. While only fifty-six essential oil compounds were recognized from untreated basil, after iron nano-complexes application, seventy-two compounds were identified in the essential oil. In the control treatment, the major constituents of basil essential oil were specified by a great proportion of methyl chavicol (89.60%) followed by methyl eugenol (2.57%), n-decane (1.41%), 1,8-cineole (1.06%), (E)-caryophyllene (0.73%) and epi- α -cadinol (0.60%). Application of iron nano-complexes significantly increased sesquiterpenes yield. n[Fe(His)₃] treatment was more effective in decreasing the oxygenated monoterpenes content and in raising the proportion of the main sesquiterpenes in the sweet basil's essential oil. By using iron nano-complexes, the content of both polyphenols and flavonoids rose considerably in basil's extract compared to the control treatment. Among the polyphenols and flavonoids, rosmarinic acid and catechin were the prevailing compounds in basil's extract, respectively. The greatest amount of rosmarinic acid (5.87 mg g⁻¹) was found in n[Fe(His)₃] treatment followed by n[Fe(Arg)₃] treatment which increased the rosmarinic acid to 5.16 mg g⁻¹, provided the lowest amount (2.02 mg g⁻¹) realized in untreated plants. The lowest values of inhibitory concentrations (IC₅₀) for free radical scavenging were 1.02 ± 0.09 mg mL⁻¹ of essential oil got from n[Fe(His)₃] treatment. Foliar application of iron, especially in the form of nano-complex significantly increased antibacterial and antifungal activities of the essential oils. n[Fe(His)₃] treatment had the highest effect in this aspect. MIC for *Bacillus subtilis*, *Staphylococcus aureus*, *Escherichia coli*, and *Salmonella typhimurium*, were 0.033±0.009, 0.002±0.0007, 0.181±0.011 and 0.163±0.077 mg mL⁻¹ of essential oil derived from treated basil with n [Fe(His)₃] fertilizer, respectively. Also, MIC for *Candida albicans* and *Aspergillus niger* was 0.058±0.006 and 0.066±0.008 mg mL⁻¹ of essential oil derived from treated basil with n[Fe(His)₃] fertilizer, respectively.

Keywords: Chemical composition, Nanoparticle, Antibacterial activity, Flavonoids

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Biological and Biochemical Evaluation of Essential Oils of *Ocimum basilicum* L. in Response to Iron and Nitrogen Sources

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The objective of this research was to evaluate the influences Fe-EDDHA, urea and [Fe-Urea] nano complex on the vegetative growth, antioxidant activity, phenolics and flavonoids content, antibacterial and antifungal activities and biochemical features of essential oils of sweet basil. Results showed that the application of iron and urea sources significantly increased the essential oil yields and variables of vegetative growth compared to the control treatment ($p < 0.05$). The application of 0.2% Fe-urea nano-complex significantly increased the essential oil yields (by 69.69%), plant height (by 50.46%) and plant weight (by 82.94%) compared to the control. Foliar application of iron and urea sources considerably have changed chemical components of essential oil. The major phenylpropene compounds in essential oil after foliar spraying, were epi- α -Cadinol and trans- α -Bergamotene. Interestingly, the lowest number of phenylpropene compounds in essential oil realized in 0.2% Fe-urea nano-complexes treatment. Furthermore, the highest amount of epi- α -Cadinol (27.09±2.5%) and trans- α -Bergamotene (14.93±1.77%) in the essential oil of basil was achieved by the application of 0.2% n[Fe-Urea]. Also, the application of 0.2% n[Fe-Urea] in comparison with control treatment decreased the n-Decane quantity significantly (by 99.1%) from 13.399±1.92% to 0.12±0.01%. When various Fe-EDDHA, Fe-urea nano complexes and urea were applied, the content of both flavonoids and phenolic compounds rose considerably in basil's extract compared to the control treatment. In between the flavonoids and phenolic compounds, rosmarinic acid was the prevailing compounds in basil's extract. The highest amount of rosmarinic acid (5.81±0.18 mg g⁻¹) was found in 0.2% Fe-urea nano complex treatment followed by 0.1% Fe-urea nano complex treatment which increased the rosmarinic acid to 5.62±0.22 mg g⁻¹, provided the lowest amount (2.43±0.12 mg g⁻¹) obtained in untreated plants. The highest antioxidant activity (21.98±1.3 mg AAE g⁻¹) was displayed by the sweet basil treated with 0.2% [Fe-Urea] nano complex, whereas the lowest antioxidant activity (9.31±1 mg AAE g⁻¹) was found in the control treatment. Generally, the application of iron and urea sources significantly increased the antibacterial and antifungal activity of essential oils compared to the control treatment ($p < 0.05$). The lowest minimal inhibitory concentration for *Bacillus subtilis*, *Staphylococcus aureus*, *Escherichia coli*, *Salmonella typhimurium*, *Aspergillus niger*, and *Candida albicans* were 0.042±0.008, 0.016±0.003, 0.238±0.024, 0.166±0.025, 0.101±0.021 and 0.129±0.011 mg mL⁻¹ of essential oil derived from treated basil with 0.2% Fe-urea nano complex foliar spraying, respectively.

Keywords: Nanoparticle; Phenolic compounds; Antimicrobial potential; ROS

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How to Improve *Ocimum basilicum* L. Growth Parameters, Essential Oil Yield, Bioactive Components, Antioxidant Activity and Biological Potential by Zn-Salicylic Acid Nanocomplexes?

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A greenhouse study was conducted to investigate and compare the impact of different rates of application of Zn-EDTA, salicylic acid and n[Zn(SA)₂] nanocomplex on the growth parameters, essential oil yields, phytochemical profile, antioxidant potential, amount of phenylpropene compounds and antibacterial and antifungal activities of essential oil of sweet basil (*Ocimum basilicum* L.) in 2017. Results indicated that the application of zinc and salicylic acid sources have a significant effect on the vegetative parameters of sweet basil ($P \leq 0.05$). The highest plant height and plant weight were found in sweet basil treated with 0.2% and 0.1% n [Zn (SA)₂], respectively. The Zn-salicylic acid nanocomplex application significantly stimulated most of the essential oil production. The highest and lowest EO yields were achieved at 0.2% n [Zn (SA)₂] and control treatments, respectively. Thirty-eight compounds were identified in the essential oil of basil at control treatment, among them, the epi- α -Cadinol, Eugenol, Linalool, and trans- α -Bergamotene were the major components in the EOs with the value of 24.67, 12.7, 10.85 and 8.36%, respectively. Sixty-one compounds were detected in the EOs after Zn and SA sources were applied to the plants. GC-MS analysis showed that the main components of the EOs after treatment of different Zn and SA fertilizer sources were epi- α -Cadinol and trans- α -Bergamotene. The highest amount of epi- α -Cadinol (29.06 \pm 1.31%) and trans- α -Bergamotene (11.90 \pm 1.1%) were observed in the essential oil of 0.2% n[Zn(SA)₂] treatment and the lowest (24.67 \pm 1.7 and 8.36 \pm 0.86%, respectively) at control treatment. In general, the application of 0.2% n [Zn (SA)₂] fertilizer significantly increased percentages of phenolic and flavonoid compounds of extract. HPLC analysis showed that the predominant phenolic compound of the extract after treatment of different Zn and SA fertilizer sources were rosmarinic acid and quercetin, respectively. The highest antioxidant activity (22.94 \pm 1.7 milligrams ascorbic acid equivalents per gram of essential oil) was found in 0.2% n[Zn(SA)₂] nanocomplex treatment followed by 0.1% n[Zn(SA)₂] nanocomplex treatment which increased the antioxidant activity to 21.44 \pm 1.5 mg AAE g⁻¹, provided the lowest amount (8.82 \pm 1.2 mg AAE g⁻¹) obtained in untreated plants. The results showed that the application of zinc and salicylic acid sources significantly increased the antifungal and antibacterial activity of EO from sweet basil compared to the control treatment. The lowest MIC for *Candida albicans* and *Aspergillus niger* growth were 0.050 \pm 0.005 and 0.068 \pm 0.045 mg mL⁻¹ of EO derived from treated basil with 0.2% n[Zn(SA)₂] nanocomplex, respectively. Also, results showed that *Staphylococcus aureus* and *Bacillus subtilis* are more sensitive to Zn-salicylic acid nanoparticles than *Escherichia coli* bacteria.

Keywords: Nanomaterials; Epi- α -Cadinol; Trans- α -Bergamotene; *Escherichia coli*

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The Morphophysiological Responses of Saffron (*Crocus sativus* L.) to the Application of Vermicompost and Humic Acid

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In order to improve the vegetative characteristics of saffron (*Crocus sativus* L.), a experimental design was randomized complete blocks with factorial arrangement in four levels of vermicompost (0, 10, 20 and 30 ton ha⁻¹) and three levels of humic acid (0, 600 and 1200 g ha⁻¹) under field conditions. The measurement traits were: number of leaves, flowers and corms plant⁻¹, corm diameter, leaf area, fresh and dry weight for all the plant organs (aerial parts, flower, stigma and corm) and photosynthetic pigment concentrations. Results showed that humic acid and vermicompost improves saffron vegetative properties. The highest dry weight of stigma and fresh and dry weight of corm were achieved to by humic acid at 1200 g ha⁻¹ plus vermicompost at 20 ton ha⁻¹ in the second year. The highest of total chlorophyll content (3.03 mg g⁻¹ FW) was achieved in the 20 ton ha⁻¹ vermicompost plus 600 g ha⁻¹ humic acid treatment. Humic acid and vermicompost had no significant effect on carotenoid content in stigma. The maximum number of flowers (4.71 plant⁻¹) was obtained by application of 1200 g ha⁻¹ humic acid and vermicompost (20 ton ha⁻¹). Also, humic acid and vermicompost treatments significantly improves dry weight of aerial parts, corm diameter and leaf area index.

Keywords: Saffron, Humic acid, Vermicompost, Corm, Stigma

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Assessment of the Organic Fertilization Effect on Bioactive Compounds and Free Radical Scavenging Capacity of *Crocus sativus* L.

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This research was performed to evaluate the influence of vermicompost (0, 10, 20 and 30 ton ha⁻¹) and humic acid (0, 600 and 1200 g ha⁻¹) on photochemical characteristics of saffron (*Crocus sativus* L.) in 2016 and 2017. The measurement traits were: flavonoid content and total phenolic in petal, free radical scavenging capacity, crocin, picrocrocin and safranal content of stigma. The highest total phenolic content in the second year following the consumption of 20 and 30 ton ha⁻¹ vermicompost (by the means of 385.16 and 372.61 mg 100 g⁻¹ DW, respectively), or the use of 1200 g ha⁻¹ humic acid (with an average of 369.81 mg 100 g⁻¹ DW) each alone were achieved. Also, the highest increases in flavonoid content (306.2 mg 100 g⁻¹ DW) was monitored in response to 1200 g ha⁻¹ humic acid treatment. The highest free radical scavenging capacity (82.17%) was displayed by the saffron treated with 30 ton ha⁻¹ vermicompost, whereas the lowest free radical scavenging capacity (65.63%) was found in the control treatment. The results showed that the greatest amount of crocin, picrocrocin and safranal, were 181.13, 72.17 and 45.95 E^{1%}_{1cm} derived from treated saffrons with 10 ton ha⁻¹ vermicompost fertilizer, respectively.

Keywords: Organic fertilizers, Saffron, Stigma, Safranal, Flavonoid content

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Field Evaluation of New Botanical Insecticide Based on Date Oil Against Dominant Mulberry

Whitefly, *Aleuroclava jasmini* Senso Lato in Tehran

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Over the past few years, dominant mulberry whitefly, *Aleuroclava jasmini* senso lato (Hem: Aleyrodidae) has become a major pest of Tehran green space. The use of synthetic pesticides is the most common method for controlling this pest. Because of the high capacity of fecundity and daily increasing whitefly's populations, studies for toxicity of newer pesticides are necessary. In this research, contact toxicity of new botanical pesticide (Liko[®]) based on palm oil and biodegradable polymers was examined against the pest and compared with a conventional pesticide (APPLAUD 40%) in the field condition. Efficacy (%) was estimated by Henderson-Tilton formula. Using Liko, after seven days the population of *A. jasmini* (91.35%) were decreased more than APPLAUD (65.9). Therefore, it is time to focus green chemistry processes and commercialization of natural products as green pesticides on the way to the expansion and application of oils by highly developed formulation technologies.

Keywords: Botanical pesticide, Liko, White fly

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Introducing some new Herbal Insecticide Soaps in Washing Mulberry Trees in Order to Controlling Whiteflies

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Deu to low toxicity effect on creatures and fade in the environment, using the insecticide soaps in order to controlling whiteflies has significantly grown in the last three years in Tehran. In the summer of 1396, a comparison between some herbal insecticide soaps (Castor Oil "Phito", Soya Oil "Sayo", Date Oil "Capsy") and palisin soap has been conducted in District 17th. herbal insecticide soaps by concentration of 6000 ppm and palisin soap by concentration of 2000 ppm has been investigated on the ten of mulberry trees. The sampling has been done on one day before spraying and 3,7,14,21 days after that. the Corrected results by Henderson-Tilton formula show that using herbal insecticide soaps lead to more reduction of whiteflies population in compreaed to palisin soap. three days after spraying, the effect of "Phito" on egg, nymph and pupa of whitefly is respectively "64.47%, 43.68%, 53.45%", the effect of Sayo is respectively "58.04%, 41.27%,50.44%" and the effect of Capsy is respectively "58.90%, 38.79%, 53.45%". while the effect of palisin is respectively "42.58%, 6.03%, 21.34%". Although the mortality concentration of herbal insecticide soaps is higher than palisin soap but deu to more casualties and better durability, herbal soaps is an appropriate alternative to palisin soap in order to controlling whiteflies.

Keywords: Herbal soaps, Castor Oil, Soya Oil, Date Oil, Palisin, Whiteflies

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Analysis of Non-Polar Chemical Composition of *Rindera lanata* Extract and Evaluation of its Cell Cytotoxicity on Stomach Cancer Cell Line

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Rindera lanata is an important genus of Iranian flora and which no phytochemical investigation and Cytotoxic activity has been reported so far from this plant. The aim of this study is identifying naturally occurring compound from the aerial part and their cytotoxic activity of methanolic extract on human gastric carcinoma (AGS) cell line. At first, the hexane and methanolic extract of *R. lanata* was prepared by Maceration method. Its hexane and methanolic extract was used for GC/MS and cytotoxic analysis, respectively. The plant extract cytotoxicity was performed by using 3-(4,5-dimethyl thiazol-2yl)-2,5-diphenyl tetrazolium bromide (MTT) colorimetric assay. The number of 10000 cell/ml were incubated in the presence or absence of the different concentrations (1.56, 3.12, 6.25, 12.5, 25, 50 and 100 mg/ml) in 24, 48 and 72 hours and Inhibitory concentration at 50% (IC50) was determined. Analysis of GC/MS data show that the content of hexane extract was contain Decane, 5,6-bis(2,2-dimethylpropylidene) (30.29%), 5,6,65 Trimethyl-5-(3-oxobut-1-enyl)-1-oxaspiro octan-4-one (22.23%), 2--Dodecene-1-yl-succinic anhydride (12.64%) and Butylated Hydroxytoluene (24.6%). In addition to, the results of MTT assay reveal that the 100mg/ml concentration of the extract have highest cytotoxic effect in 72 hours. In addition to, the IC50 for AGS cell line at 24, 48 and 72 h were 8.5mg/ml, 6.25mg/ml and 1.96mg/m, respectively. The present study is the first research about cytotoxic effect of *Rindera lanata* extract and the results of this study show that whole extract from methanolic extract has a dose dependent cytotoxicity effect on AGS cell line. Moreover, the plant can be considered as a potential candidate for further studies on human gastric carcinoma treatment.

Keywords: *Rindera lanata*, Chemical composition, Extract, Cytotoxic activity, MTT



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***Peganum harmala* L.'s Anti-Tumour Effect on Breast Cancer Cell Line**

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Recent clinical findings suggest that over 60% of cancer patients use herbal medicines as a supplementary treatment. In this study, the in vitro effects of the alkaloid extract of *Peganum harmala* L. seeds containing harmine and harmaline, on growth rate and induction of apoptosis in two human breast cancer cell lines (MDA-MB-231 and MCF-7) has investigated. The Alkaloid portion of *Peganum harmala* L. was extracted and identified with HPLC and FT-IR techniques. Cell growth was monitored by methyl thiazolyl tetrazolium (MTT) technique and the induction of apoptosis was determined by identifying level of expression of Caspase 8, TRAIL, P21 and P53 genes through qualitative and quantitative assays, RT-PCR and Real-Time RT-PCR, respectively. An over-expression of TRAIL and Caspase 8 genes has observed in the treated cells when compared with un-treated ones. The over-expression of P21 and P53, suggests that both apoptosis induction and blocking cell cycle life occurs as a consequence of the used alkaloids. These results imply the benefits of using these alkaloids as the main treatment or a supplementary action in cancer treating.

Keywords: Apoptosis, Cancer, Harmaline, Harmine, *Peganum harmala* L.

Isolation and Purification of Essential Oil Derived from *Peganum harmala* L. Species with Industrial Usage

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In the past decade, the extraction of active principles of medicinal plants received a great attention from the researchers. *Peganum harmala* L. as a medicinal plant includes phyto-chemical molecules such as alkaloids and flavonoids presenting in different fractions of seed, root and stem extract. These components are responsible to provide antibacterial, antioxidant and antitumor properties. This study aims to extract and characterize the principal components of *P. harmala*'s seed as well as determining its antimicrobial and anti-cancer potential. Nanographene oxide (NGO), a new type of nanomaterial for anticancer drugs delivery. Covalent binding of folic acid (FA) molecules to the NGO, allowing it to specifically target MCF-7 cells, human breast cancer cells with FA receptors. Controlled loading of anticancer drug, harmine, onto the FA-conjugated NGO (FA-NGO) via π - π stacking and hydrophobic interactions is investigated. It is demonstrated that FA-NGO loaded with the Harmine shows specific targeting to MCF-7 cells, and remarkably high cytotoxicity compared to harmine as a free drug. The controlled loading and targeted delivery of harmine, using these graphene-based nanocarriers may find widespread application in biomedicine.

Keywords: Peganum harmala, Harmine, Harmaline, Targeting drug delivery



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Effects of *Aloe vera* Extract on Aquaculture of Siberian Sturgeon *Acipenser baerii* during Fingerling Stage

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Regarding the beneficial effects and benefits of the herb *Aloe vera* and its application in various industries such as pharmaceuticals and food industries, this study investigated the effects of *Aloe vera* extract on growth parameters and bacterial flora of the Siberian sturgeon (*Acipenser baerii*). In this study, a total of 360 numbers of Siberian sturgeon weighted average 10.95 ± 0.04 (g) randomly distributed in four treatments including a control group and three experimental groups (each with three replications) were used. So, *Aloe Vera* extract powder ratio of 0.5%, 1% and 1.5% were added to the food. After eight weeks of feeding in the fiberglass vans and physicochemical parameters of water daily registration, biometry carried out and necessary samples collected. In this study, growth indicators such as weight gain, initial body weight, condition factor, feed conversion ratio, specific growth rate, protein efficiency ratio, hepatosomatic index and survival rate were calculated. Results showed that all growth parameters (except hepatosomatic index) in the treatments compared to the control group showed statistically significant differences as a significant difference between the control group treated 1.5% extract were observed ($P < 0.05$). Each carcass composition parameters, no significant difference was observed between the treatment and control groups ($p > 0.05$). Meanwhile, total count of bacteria in intestine in the treatment and control groups did not show significant differences ($p > 0.05$), but significant increase in the count of anaerobic bacteria (lactic acid bacteria) were observed compared to the control group ($p < 0.05$). The result showed that *Aloe vera* extract can be effective in improving the growth performance of Siberian sturgeon.

Keywords: *Aloe vera* extract, Aquaculture, Fingerling stage, *Acipenser baerii*

Micromorphological Study of Medicinal Herb, *Paspalum* (Poaceae) in Iran

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Paspalum L. is a grass with 250-330 species in the world which shows its main distribution area in tropical and temperate regions, especially in the New World [1]. In Iran, there are 2 species of *Paspalum*: *P. dilatatum* Poir. and *P. distichum* L. Different species of this grass can be found in different habitats like sand beach, meadow, wetland and marsh [2]. Different parts of this plant showed anti-diabetic activity. Moreover, in ethnobotanical study, leaf and stem of *Paspalum* species are used for menstrual disorder. In India, ergot-infected *Paspalum* was used to relieve postpartum pain. In this study, 15 populations of *Paspalum* were studied using micromorphological characters of lemma and palea. Scanning Electron Microscope (SEM) and dino-Lite Digital Microscope were used to evaluate qualitative and quantitative features in this study. Results showed that characters as cell shape, shape and size of papilla and the substrate sculpture are of diagnostic importance in these two medicinal herbs.

Keywords: *Paspalum*, Poaceae, Micromorphology

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The Use of Herbal Plants in the Diabetic Patients

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Currently, the tendency toward using alternative and traditional medications for controlling and reducing blood sugar is increasing. The purpose of this study was to use of herbal plants used to control blood sugar in diabetic patients referred to ghaem hospital in Mashhad. The present study is a descriptive one. The research community included all the patients with Diabetes, referring to selected hospitals in Mashhad. Of these, 458 were selected using aimed sampling method. Data were collected using a structured questionnaire during the interview and were analyzed using SPSS software. The results of the study showed that 83% of patients with diabetes from use of herbal plants. 79.5 % of the patients had not consulted their doctors about the use of herbal plants. That is very important because there is a risk of drug interactions. Professional care not aware of the use of these methods can have different causes that including lack of belief that many of the doctors and nurses to the effectiveness of these methods are named. The results of the study highlights the importance of conducting regular and effective educational programs aimed at promoting the knowledge of patients and health workers. Such programs should be able to provide them with a knowledge of what to take, what not to take and the side effects and the possible interactions of the chemical drugs and herbal plants. The study also emphasizes the importance of recording the use of herbal plants in the patient's history.

Keywords: Diabetes, Herbal plants, Chemical drugs, Effectiveness

Effects of Aromatherapy with Lavender on Sleep Quality of Hemodialysis Patients

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Sleep disorders are common in hemodialysis patients, it can decrease the quality of life and increase the rate of death. Due to its sedative effects, lavender may be effective in promoting sleep quality of these patients. this research was conducted to examine the effects of aromatherapy with lavender essential oil on sleep quality of hemodialysis patients. This is a randomized clinical trial. 76 hemodialysis patients were selected by convenience sampling and were randomly divided into two groups: intervention and control. In the intervention groups, the patients were requested to inhale a piece of cloth smeared with lavender drops of the lavender essential oil during dialysis sessions. In the control groups, only the usual care was given. results showed no significant difference in the mean sleep quality score between the experimental (9.29 ± 2.60) and control groups (7.86 ± 2.12) at baseline ($p < 0.012$), but a significant difference was seen in mean sleep quality score between the experimental (3.89 ± 1.98) and control groups (8 ± 2.32) after the end of study ($p < 0.001$). Aromatherapy with lavender essential oil positive effect on improving sleep quality in hemodialysis patients and may be used as a noninvasive, easy and low-cost method for sleep disorders in these patients.

Keywords: Aromatherapy, Hemodialysis, Lavender, Sleep quality, End stage



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Autecology and Ethnopharmacological Studies of *Onosma dichroanthum* Boiss. an Important Medicinal Species of Iran

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Iran is one of the richest countries in Southwest Asia in terms of vegetation, which includes many rare and endemic medicinal species. The indiscriminate harvesting of medicinal herbs as well as the lack of awareness of the ecological conditions appropriate for plant growth has resulted in the disappearance of many important Iranian medicinal species. Autecology is one of the most important sciences that, by examining the ecological conditions and plant phenology, can be remedied by the restoration, protection and adaptation of medicinal plants in similar ecological areas. *Onosma dichroanthum* Boiss. is a highly endangered medicinal plant of Boraginaceae in Iran. This research was conducted to identify the ecological and ethno-pharmacological information of this species to order determining the strategies for *Ex situ* conservation as well as to predict the condition for cultivation in Iran. The fieldwork study was done in Mazandaran, Golestan and North Khorasan provinces during the years 2016-2018. Results showed that this species grows in mountain habitats with altitudes of 1200 to 3000 m and mean annual rainfall ranging from 251 to 450 mm and mean annual temperature of 10.7 to 18°C. The population of *O.dichroanthum* are more common in the clay loam and loam soils with PH of 6.4 to 8. Phenological studies showed that the flowering season of this plant is from June to August, and some populations of this plant have more secondary compounds and metabolites. Cold is the best treatment for seed germination of this taxon. The ethnopharmacological survey showed that the local people use the flower and mostly rhizome of this plant with local name 'Hakachoo' to treat the burns and wounds, digestive disorders, nervous disorders etc.

Keywords: Autecology, Boraginaceae, Ethno-pharmacology, Iran

Morphological and Ecological Investigation of the Genus *Onosma* L. to Understand the Variation of its Intraspecific and Interspecific Levels in Iran

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The genus *Onosma* L. (Boraginaceae) contains around 150 species in the mountainous habitats of the Irano-Turanian zones of Asia as well as the Mediterranean region, especially Iran. The species belongs *Onosma* are herbaceous biennial or perennial and many of them have several medicinal properties and contains alkaloids, shikonin and antioxidants (Kumar, 2013). Therefore, the species delimitation and determination of the correct scientific name of the source plants is critically important. The identification of these taxa is very complicated due to a huge diversity of the morphological characters and the ability for polyploidization and hybridization (Kolarčik et al. 2010). The main purpose of this study was to investigate the intraspecific and interspecific diversity levels of *Onosma* species using morphological and ecological parameters in Iran. Natural populations of different species of *Onosma* were collected across the country during 2009 to 2018. A total of, 600 accessions collected from this plant were analysed using 26 and 37 quantitative and qualitative morphological characters and ANOVA test. Ecological survey was carried out using topographic, climatic and soil factors and by CCA analysis. The results showed that there is a great variety of intra species variations in the several species of this genus, even within an individual. This variation is positively correlated with ecological conditions including soil and climate characteristics. Finally, the important morphological and key traits were identified for species delimitation of these taxa. The results of CCA analysis indicated that some environmental factors such as annual rainfall, altitude, the percentage of sand of soil have a most limiting role in categorizing the ecological groups of this genus.

Keywords: Ecology, Iran, Morphology, *Onosma*, Species delimitation

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The Macroscopic and Microscopic Evaluation of *Silybum marianum* Hydroalcoholic Extract on Surgery-Induced Intraperitoneal Adhesions in Rat

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Adhesions formation is the most unpleasant complication of abdominal surgery. *Silybum marianum* extract contains phenolic compounds which show anti-oxidant and anti-inflammatory activities and prevent collagen production and accumulation and, thus may reduce adhesion formation. The aim of the present study was to examine the amount of phenolic content and antioxidant capacity of *S. marianum* and to determine its effect on intra-abdominal adhesions. In this experimental study, 30 healthy male Wistar rats were randomly divided into three equal groups. Groups A and B received 1% and 5% concentrations of the *S. marianum* extract respectively and control group (C) received distilled water. After anesthesia, abdominal wall was opened and three shallow, longitudinal and transverse incisions (2 cm in length) were made on the right wall of the abdomen. A 2*2 piece was removed from peritoneal surface on the left side of abdominal wall. Then 3 ml of *S. marianum* extract or distilled water were administered into abdominal cavity of the rats. In macroscopic examination, adhesion degrees were determined according to the number of adhesion bands (Ahmet-Canbaz scale). Histopathological examination was also determined according to the severity of fibrosis and inflammation. Data analysis was performed through SPSS v.22 using Kruskal-Wallis and Mann-Whitney tests and P<0.05 was considered statistically significant. There was significant difference in adhesion formation between groups (P=0.023). Adhesion degree in group A and B were significantly lower than control (P<0.05). Mean adhesion scores in groups A, B and C were 1.1±1.197 and 1.1±0.994 and 2.2±0.919, respectively. In histopathological examination, significant difference were observed between control and extract treated groups in term of fibrosis and inflammation (P<0.05). *S. marianum* extract has preventive effects on post-laparotomy intra-abdominal adhesion. Therefore, by further clinical studies, *S. marianum* extract and its derived compounds might be used in humans for treatment of these complications.

Keywords: Intraperitoneal adhesion, *Silybum marianum*, Laparotomy, Rat

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Anticancer Effect of Mixtures of Hydroalcoholic Extract of *Chrysanthemum morifolium*, *Raphanus sativus* var. *Longipinnatus*, *Linum usitatissimum* on Epithelial Carcinoma Cells of the Cervix

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Cervical cancer is the second most common cancer in women. A mixture of hydroalcoholic extracts of *Chrysanthemum morifolium*, *Raphanus sativus* var. *Longipinnatus*, *Linum usitatissimum* are medicinal herbs and are one of the native products used to treat cancer in Iran. It has antibacterial, anticancer, antifungal, anti-ulcer properties. The aim of this study was to investigate the antinociceptive effect of *Chrysanthemum morifolium*, *Raphanus sativus* var. *Longipinnatus*, *Linum usitatissimum*. In this experimental study, after cultivation and proliferation of cells derived from human epithelial tissue of the cervix (HeLa), these cells were adjacent to various doses of *Chrysanthemum morifolium*, *Raphanus sativus* var. *Longipinnatus*, *Linum usitatissimum* (12.5, 25, 50 and g / ml 100) were incubated for 24, 48 and 72 hours. After the end of the incubation period, the modified MTT colorimetric method was used to determine the cytotoxicity of the extract. The results of MTT test showed that the extract had anticonvulsant effects depending on the dose and time on HeLa cells, so that with increasing extract concentration and incubation for 72 hours, the highest percentage of cell death was observed (P <0.001). Concentration of 50% cell growth (IC50) for cancer cells was 24.4 g / ml for 24 hours. A mixture of hydroalcoholic extract of *Chrysanthemum morifolium*, *Raphanus sativus* var. *Longipinnatus*, *Linum usitatissimum*, with a dose-dependent and time-dependent effect on HeLa cancers, can inhibit the growth of these cells; therefore, it seems that further research in the future can be used to treat cancer.

Keywords: Hydroalcoholic, *Chrysanthemum*, *Raphanus sativus* var. *Longipinnatus*, *Linum usitatissimum*



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Investigation of the Effects of *Chrysanthemum morifolium*, *Raphanus sativus* var. *Longipinnatus*, *Linum usitatissimum* on the Rate of Uterine Apoptosis in Rats Affected by Electromagnetic Fields
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Nowadays, with the industrialization of countries, most residents of urban areas are exposed to electromagnetic waves. Discussing whether these waves have side effects on body tissues. Objective: The aim of this study was to evaluate uterine tissue as an important and key organ in reproduction and study the effects of the above waves on this tissue. For this purpose, 40 female rats were used, 20 rats were exposed to 40 Hz (0.1 Tesla) radiation and one of these groups was mixed with *Chrysanthemum morifolium*, *Raphanus sativus* var. *Longipinnatus*, *Linum usitatissimum*, at a rate of 0.7 grams per kilogram. At the end of the experiment, the uterus was sampled to study the planned cell death using a Tunnel method. The results showed that electromagnetic waves increased the planned death of uterine tissue cells, but in the group receiving the mixture of hydroalcoholic extract of *Chrysanthemum morifolium*, *Raphanus sativus* var. *Longipinnatus*, *Linum usitatissimum*, the rate of planned death of uterine tissue cells was significantly reduced. In this study, electromagnetic waves cause cell damage and the use of a mixture of hydroalcoholic extract of *Chrysanthemum morifolium*, *Raphanus sativus* var. *Longipinnatus*, *Linum usitatissimum* (0.6 g/kg), has been shown to reduce cellular damage in the uterine tissue in mice exposed to radiation.

Keywords: Apoptosis, Electromagnetic waves, Uterus, *Chrysanthemum morifolium*

Chemical Composition and Hepatoprotective Activity of *Salix aegyptiaca* on Paracetamol-Induced Liver Toxicity in Rats

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The present day life style causing different illness including liver diseases and different health complications. So, there is a need to identify new chemical entities with more efficiency in the treatment of diseases and less side effects. There were many reports in recent times, about identifying new drugs from different medicinal plants and also precursors for synthesis new bioactive molecules for treating various diseases. The phytochemical analysis was carried out to know biological active compounds in different extracts of *Salix aegyptiaca* using standard procedures and quantified the total alkaloid and phenolic contents. Hepatoprotective activity of the *Salix aegyptiaca* extracts were carried out by using Paracetamol-induced hepatotoxicity in rats. The phytochemical analysis of *Salix aegyptiaca* roots⁷ extracts showed presence of sterols, terpenoids, glycosides, carbohydrates, proteins, flavanoids, alkaloids, phenols, tannins and absence of saponins and oils. The methanolic extract showed more phenolic and alkaloid contents on their quantification. The *Salix aegyptiaca* roots extracts are found to be safe at 2000 mg/kg b. w. in acute toxicity study and showed dose dependent percentage protection on liver toxicity. Methanol extract showed more activity at 500mg/kg b. w. and is comparable with standard drug Liv 52 on altered liver biomarker enzymes AST (SGOT), ALT (SGPT), ALP, total bilirubin and total protein with percentage protection 54.17%, 44.53%, 613.55% 58.29% and 41.66%. The present study results indicates that phytochemical constituent's diversity in *Salix aegyptiaca* and those extracts possess hepatoprotective activity. Further studies are needed and should involve the isolation of pure, biologically active compounds.

Keywords: Medicinal Plants, Paracetamol, Roots, *Salix aegyptiaca*, Toxicity



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Preparation and Characterization of Combined Wound Dressing Based on Chitosan/Cmc Including *Portulaca oleracea*

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The wound refers to any loss of integrity or fracture in the cohesion of skin layers or subcutaneous tissues. One of the most important reasons for using the wound is to protect the wound against contamination and prevent infection and accelerate the wound healing process. But in fact, the main purpose of using it is to accelerate the process of wound healing. In all today's biomedical applications, especially the wound coating, natural polymers play an important role. Chitosan is a biocompatible polymer that has strong anti-inflammatory and antimicrobial properties and has great application in wound dressing making. Also, carboxymethyl cellulose is a cellulose-derived polymer that plays an important role in accelerating the wound healing process, causing angiogenesis and repair of damaged tissue. Due to this, in the forthcoming project, we evaluated the chitosan-carboxymethyl cellulose composite film with the portulaca oleracea extract at various concentrations (0/5,2/5,5) and examined the biological and antimicrobial properties of the film. Then, we examined the water absorption and inflation and the biodegradability of the films. Also, by scanning electron microscopy (SEM) images, surface morphology was studied in different dimensions on different concentrations of the sample. In this study, we used two bacteria, gram positive (*Staphylococcus aureus*) and gram negative (*Escherichia coli*) to detect the antimicrobial activity of the film containing portulaca oleracea extract and chitosan-carboxymethyl cellulose. The results of the study showed that chitosan-carboxymethyl cellulose film with 5% portulaca oleracea extract had the highest resistance to gram-positive bacteria and also had the highest percentage of inflammation compared to other samples. Considering the results of biodegradation, which also increases the concentration of biodegradability extract. It can be concluded that increasing the concentration of the extract (as evidenced by the SEM results) on the polymer film eliminates the integrity and uniformity of the film surface and in this way increases its biodegradability.

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Alleviating Negative Effects of Cadmium Stress in Basil (*Ocimum basilicum* L. cv. Keshkeni Luvelou) by Using two Types of Mycorrhizal Fungi

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Cadmium is one of the heavy metals which has harmful effects on the quality of crop production. It is mobile element in environment and the plants can absorb cadmium easily and move it to their different organs (1). Mycorrhizal fungi cause to improve the growth of plants and decrease heavy metal uptake in plants (2). In order to study the effect of mycorrhizal fungi on some growth and physiological characteristics of sweet basil (*Ocimum basilicum* L. cv. Keshkeni Luvelou) grown in cadmium polluted soil, a pot factorial experiment based on completely randomized design with three replications was performed in greenhouse of Ferdowsi University of Mashhad, Iran in 2017. The treatments were comprised two types of mycorrhizal fungi (control, *Claroideoglomus etunicatum*, *Funniformis mosseae*) and three cadmium levels (0, 20 and 40 mg/kg). The results showed that at the highest cadmium concentration (40 mg/kg), using *C. etunicatum* mycorrhizal fungi caused to increase fresh and dry weight of aerial parts, plant height, stem diameter and decrease electrolyte leakage, protein, malondialdehyde (MDA) content and catalase (CAT) activity. Also, at 40 mg/kg cadmium treatment, *F. mosseae* application caused to increase photosynthetic pigments, whereas ascorbate peroxidase (APX), guaiacol peroxidase (GPX), superoxide dismutase (SOD) activities and proline content was reduced. In total, the findings of this experiment indicated that mycorrhizal fungi usage caused to increase the growth and tolerance of basil under cadmium pollution conditions.

Keywords: Sweet basil, Cadmium, Photosynthetic, Pigments, Physiological

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Studying the Effect of Salicylic Acid on Some Physiological and Biochemical Characteristics of *Lippia citroidora* under NaCl Stress

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Salinity stress cause to several chemical, physiological and morphological modifications in plants (2). Salicylic acid (SA) is one of the most important plant growth regulator substances that regulate physiological growth and development of plant and its application under stress condition cause to create tolerance in plants (1). In order to study the effect of SA on some physiological and biochemical characteristics of *Lippia citroidora* under NaCl stress, a pot factorial experiment based on completely randomized design with four levels of irrigation water (0, 50, 100, 150 mM NaCl) and four levels of SA (0, 150, 300, 450 mg/L) in three replications was performed. The results showed that interaction effects of salinity and SA on photosynthetic pigments, soluble carbohydrate, total phenol, protein amounts and catalase (CAT), peroxidase (POD) and superoxide dismutase (SOD) activities were significant. The mean comparison indicated that SA application caused to decrease glycine betaine, protein, CAT, POD and SOD activities and increase photosynthetic pigments, soluble carbohydrate, total phenol and proline content. Generally, the results of this study showed that foliar application of SA improved harmful effects of salinity partly. According to the findings of this experiment, SA usage at 300 and 450 mg/L cause to tolerate this plant to stress condition through regulation and improvement of physiological and biochemical characteristics.

Keywords: *Lippia citroidora*, Salinity stress, Photosynthetic pigments, Enzyme activity

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Study on Flora and Biodiversity of Sorond- Ferdos Area Southern Khorasan

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In September 1375, when Dr. Javanshir visiting Shotor Kooh mountain in east of Tabas, the wicket of one of the villagers attracted his attention, it was from a tree called Sano *Fraxinus rotundifolia* which never reported from this arid area. This species is exclusively located in the east of the country and only in this area. Therefore, in order to investigate the flora of this area in Sorond, located 20 km from Ferdows, this research was carried out. In this study, 15 plots were randomly selected at 10 × 10 m size and all species were identified. After the identification and exact counting of plant species, biological form, their functional value (pharmaceutical and industrial) were also recorded. Also, Shannon-Warner, Simpson, and Margalf's indices were calculated. The results showed that there were 8 families with 18 species, 7 medicinal species, and the largest families were Asteraceae, (8 species), Fabaceae (3 species), Chenopodiaceae (2 species). Chamaephytes with 50% was the dominant life form in the region. Shannon-Weiner index was 1.88, the evenness index was 0.8 and Margalef index was 2.33. Regarding this, the region has a moderate status in terms of biodiversity and over-utilization of plants by humans and livestock in this area has reduced the diversity of species.

Keywords: Sorond-Ferdos, Flora, Biodiversity

The Effect of Application of Organic and Chemical Fertilizers on Phenolic Compounds and Antioxidant

Activity of Peppermint (*Mentha piperita* L.) under Drought Stress Hamed Keshavarz^{1*}, Seyed Ali Mohammad Modares

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This study was laid out to evaluate the role of organic and chemical fertilizer management in different irrigation systems on phenolic compounds and antioxidant activity of peppermint. The experiment was conducted in a factorial arrangement in a randomized complete block design with six rates of fertilizer strategies (F1: control, F2: Urea, F3: 75% urea + 25% vermicompost, F4: 50% urea + 50% vermicompost, F5: 25% urea + 75% vermicompost and F6: vermicompost) and three irrigation regime [irrigation was suppressed until 75 (control), 60 (mild stress) and 45% (severe stress) soil moisture was reached] with three replication at Research Farm, Faculty of Agriculture, Tarbiat Modares University. The results showed that applied treatments had a significant effect on the studied traits. In severe drought stress, the highest levels of anthocyanin, peroxidase and superoxide dismutase were obtained. Fertilizer regimes also had a significant effect on the above traits, so that the highest levels of anthocyanins, hydrogen peroxide and superoxide dismutase were obtained in F4, F2 and F2 treatments, respectively. The interaction of fertilizer levels and irrigation systems was significant on total flavonoids, shoot dry weight, percentage and yield of essential oils, catalase and polyphenol oxidase, and total phenols. The highest total flavonoids and essential oil percent were obtained for medium stress and F6 treatment, the highest shoot dry weight and essential oil yield in complete irrigation and F6 treatment, the highest activity of catalase in severe drought stress and fertilizer F1 treatment, the highest activity of polyphenol oxidase enzyme in severe drought stress and F5 treatment and the highest total phenol content was obtained in drought stress and F4 treatments. In general, the combined use of organic fertilizers, in addition to the positive environmental effects [1], has a positive effect on the increase of phenolic compounds, which can be economically economical, and on the other hand, by improving the properties of the soil, leads to sustainable agriculture.

Keywords: Antioxidant capacity, Chemical fertilizer, Compost, Essential oil

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Effect of Berberine on liver Enzymes in Normal and Cholestatic Adult Male Wistar Rats

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Berberine, an Isoquinoline alkaloid isolated from *Berberis vulgaris* L., is commonly used to treat diarrhea. In recent years, its roles in cholesterol level reduction and anti-inflammation have been reported. The aim of this study was to investigate the effects of Berberine on Cholestasis-induced hepatic injury after bile duct ligation (BDL) in male Wistar rats. In the present study, the effects of 35-day oral administration of Berberine (at doses of 50, 100, 200 mg/kg body weight) were evaluated in normal and BDL-induced Cholestatic rats. The BDL group showed significant increases in serum levels of ALP, ALT, AST, GGT, and total Bilirubin. Administration of Berberine significantly attenuated these changes to nearly normal levels. Administrations of Berberine did not change these parameters in normal rats.

Keywords: Berberine, Bile-duct ligation, Rat, Liver Enzymes

Extracellular Radical Scavenging, Intracellular Antioxidant and Apoptotic Potential of *Zataria multiflora* Essential Oil

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Extracellular and intracellular antioxidant activities along with apoptotic potential of *Zataria multiflora* essential oil (ZEO) was examined. ZEO was obtained by hydro-distillation and chemical composition of ZEO determined by GC-MS. The extracellular antioxidant activity of ZEO, carvacrol and γ -terpinene against ABTS, DPPH, superoxide and nitric oxide was examined. The ability of ZEO on the inhibition of NADH oxidase (NOX) and nitric oxide synthase (NOS) expression and activity and superoxide radical and nitric oxide (NO) production in lipopolysaccharide (LPS)-stimulated macrophages were investigated. The in vitro anti-proliferative and cytotoxicity activities of ZEO in 2D and 3D in MDA-MB-231, MCF-7 and T47D Breast cancer cells was analyzed. The main components of the ZEO were carvacrol and γ -terpinene. ZEO sequestered superoxide anion and nitric oxide in in-vitro assay at low concentrations. ZEO at non-cytotoxic level (<10 μ g/mL) strongly reduced intracellular reactive oxygen species (ROS) and nitric oxide (NO) production in LPS-stimulated macrophages. NOX and NOS expression and activity in LPS-stimulated murine macrophages was declined by the ZEO. Molecular docking results indicated that carvacrol can inhibit NOS activity by blocking the arginine binding site. However, they did not show any evidences for NOX inhibition. ZEO increasingly suppressed viability in MDA-MB-231, MCF-7 and T47D Breast cancer cells while nontoxic to L929 normal cells in monolayer cell cultures (2D), whereas MDA-MB-231 multicellular spheroids (3D) were more resistant to inhibition. ZEO significantly induced cell apoptosis confirmed by fluorescent staining, flow cytometry analysis and DNA fragmentation in MDA-MB-231 2D and 3D cell cultures. ZEO increased ROS generation and subsequent loss of $\Delta\Psi_m$, caspase 3 activation and DNA damage which consequently caused G1 and G2/M cell cycle arrest in a dose- and time-dependent manner in 2D. S phase arrest occurred in cell spheroids therefore ZEO possible DNA interaction with DNA was investigated and revealed ZEO binds DNA via intercalation. Altogether these results confirmed in-vitro, in-vivo and in-silico antioxidant activity of ZEO by sequestration NO and superoxide scavenging and down-regulation of NOS and NOX expression activity. In addition, these data corroborate anticancer properties of ZEO and suggest that cell culture format plays a critical role in drug response and provides new insights into the mechanisms underlying ZEO cytotoxicity effect on Breast cancer cells.

Keywords: Essential oil, Nitric oxide, Reactive oxygen species, NOX, NOS, Apoptosis



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Applying the Cybernetics Model to Policy-Making and Managing the Field of Cultivation and Processing of Medicinal Plants

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Cybernetics has been instrumental in interdisciplinary science in advancing various fields of science, including sociology, psychology, philosophy and architecture. The breadth of this science has attracted the attention of many researchers in other sciences. The use of cybernetic laws, can by analysing the relationships between a phenomenon with other environmental factors, challenged the obstacles ahead and provide appropriate strategies, and methods of their control are carefully considered [1]. This knowledge is considered as an important tool by providing modelling, creating algorithms and "feedback and comeback" mechanisms. The purpose of this study is to investigate global research on the importance of Cybernetics in the field of cultivation and processing management of medicinal plants. This research was carried out using a science-metrics method in the field of medicinal plants. In order to access the articles and publications carried out in this area, the use of related keywords in the field of cybernetics, agriculture and medicinal plants was conducted in the sources of information in the databases "Emerald" and "Science Direct" during the period of 2016-2013. After data collection, they were analysed. The results showed that the highest number of articles published in the field of cybernetics during the time period of the present study, in "Emerald" and "Science direct" was on 2016. Compared to the entire research domains, most articles in the part of agricultural and medicinal plants in these two sites, at the base of the years 2014 and 2016, were 4.86% and 4.3%, respectively. The findings of this study showed that due to the widespread use of cybernetic science in different sciences, less study have been done in field. Considering the importance of the development and optimization of plant products, especially medicinal plants and removing obstacles facing this industry in Iran, with the application of cybernetics and its institutionalization in the field of management and policy-making in the production and processing of medicinal plants, has witnessed a huge developments in the sustainable development of this important sector will be in the country. Therefore, is necessary of planning to develop appropriate corrective mechanisms and feedback.

Keywords: Cybernetics; Sustainable Development; Field, Medicinal Plants

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The Effects of Various Concentrations of Costmary (*Tanacetum balsamita* L.) Extract on Frozen-thawed Ram Sperm Motility and Velocity Parameters

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The process of semen cryopreservation produces significant amounts of reactive oxygen species (ROS) which may lead to impairment of sperm morphology, function, and ultimately male fertility. There is increased interest among researchers in using plant products as natural antioxidants. The herb of Costmary (*Tanacetum balsamita* L.) contains phenolic compounds, such as flavonoids and phenolic acids, which have antioxidant properties. Therefore, this experiment was conducted to evaluate the effects of different levels of Costmary extract as an herbal antioxidant on frozen-thawed Moghani ram sperm motility and velocity parameters. After primary evaluation of collected ejaculates, only semen samples with motility of more than 70% and sperm concentration higher than 3×10^3 sperm/ml were used for cryopreservation. The selected Samples were then pooled and diluted with Tris based extender supplemented with different concentrations of *Tanacetum balsamita* (0, 2, 4, 8, 12 and 16 mL per dL diluent solutions). Sperm motility and velocity parameters were assessed after thawing by a Computer-Aided Semen Analysis (CASA). Our results showed that the 8 and 12 mL/dL extract groups resulted in higher ($p < 0.05$) percentage of total (42.31 ± 3.89 and 42.56 ± 4.02 , respectively) and progressive (34.61 ± 4.01 and 36.46 ± 3.40 , respectively) motility compared to the control group. Addition of 8 and 12 mL/dL extract of Costmary to the extender significantly ($P < 0.05$) improved VSL and VCL parameters compared to the control and 16 mL/dL extract groups. For parameter of VAP the highest performance ($P < 0.05$) was observed at 2, 4, 8 and 12 mL/dL of extract. The highest and lowest ($p < 0.05$) percentage of LIN (46.83 ± 3.82 and 40.52 ± 3.23 , respectively) was observed in 8 and 16 mL/dL groups respectively. The percentage of STR was higher ($P < 0.05$) in the extender containing 8 and 12 mL/dL extract (81.09 ± 7.56 and 80.27 ± 7.18 , respectively) compared to the other groups. The ALH were not affected ($p > 0.05$) by different levels of Costmary extract. In conclusion, addition of 8 and 12 mL/dL extract of *Tanacetum balsamita* L. to the semen extender improved the post-thawed ram sperm motility and velocity parameters in a dose dependent manner, which may be due to increasing in antioxidant enzyme activity and reduction in lipid peroxidation.

Keywords: Ram, Semen cryopreservation, Antioxidant effect, Costmary extract

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Inclusion of *Tanacetum balsamita* L. Extract to the Extender Improves the Viability and Plasma Membrane Integrity of Post-thawed Ram Sperm

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Physical and chemical damages during sperm cryopreservation are associated with significant production of reactive oxygen species (ROS) and peroxidation of lipids in the cells membrane. Several studies have shown that during the freeze-thaw process of semen, the use of herbal antioxidants had positive effects on sperm quality. Costmary (*Tanacetum balsamita* L.) extract as an herbal antioxidant contains phenolic compounds, which have antioxidant properties. No study has reported the effects of Costmary extract in semen extenders against cryo-damage to ram sperm. Therefore, within this study, an attempt was made to investigate the effects of different levels of Costmary extract on sperm viability and plasma membrane integrity. Semen samples were collected by an artificial vagina, twice a week from four matured ram (3-4 years old, mean live weight 70 kg) and ejaculates with same condition were pooled. Different levels of *Tanacetum balsamita* L. extract (0, 2, 4, 8, 12 and 16 ml/dL diluents solution) were added to Tris based diluents. The extender containing semen was frozen in liquid nitrogen and then was store until using for assessment. Semen was thawed at 37°C and then sperm viability and plasma membrane integrity were assessed. The obtained results showed that the addition of 8 and 12 mL/dL extract of Costmary significantly improved the viability of the spermatozoa following freezing-thawing process compared to the control group ($P < 0.05$). Also, Addition of 16 mL/dL extract significantly reduced the sperm viability (39.12 ± 3.28) compared to the 8 and 12 mL/dL (46.29 ± 4.26 and 49.71 ± 4.15) groups ($P < 0.05$). 8 and 12 mL/dL extender groups revealed a higher ($p < 0.05$) percentage of plasma membrane integrity (52.63 ± 4.62 and 54.14 ± 4.86 , respectively) compared to the control, 2, 4 and 16 ml/dl extender groups (41.18 ± 3.31 ; 44.38 ± 3.56 ; 47.34 ± 3.48 and 40.75 ± 3.34 , respectively). In conclusion, the study showed that supplementation of Tris based extender with *Tanacetum balsamita* L. extract in an appropriate level has a beneficial effect on post-thawed ram sperm viability and plasma membrane integrity parameters, probably due to polyphenolic compounds having antioxidant activity.

Keywords: Ram sperm, Freeze-thawing process, Antioxidant, *Tanacetum balsamita* L.

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Micromorphological Study of Medicinal Plant, *Cichorium* L. in Iran

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Cichorium L. in Persian language Kasni from Asteraceae has 10 species in the world and 2 species in Iran. While *C. intybus* L. occupies different habitats in different parts of country, *C. pumilum* Jacq. shows limited distribution pattern in South, West and South East of Iran [1, 2]. This plant has been traditionally used as diuretic and laxative [3]. Recent studies show tumour inhibitory, antidiabetic and antioxidant activities. Moreover, fresh leaves of Chicory are used raw as salad leaves. In this study, populations of *Cichorium* were gathered from different localities in Iran and cypsels and pollen grains of the genus were studied micromorphologically. Light Microscope (LM), Scanning Electron Microscope (SEM) and dino-Lite Digital Microscope were used to evaluate diagnostic features between two species studied. Although these species showed similarities, but characters as cypsela colour, length of cypsela groove, length and status of pappus, and shape and density of echinus sculpture in pollen grains can delimit species studied.

Keywords: *Cichorium*, Asteraceae, Micromorphology

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Synthesis, Characterization and Study of the Biological Potentials of Silver Nanoparticles Synthesized Using the Aqueous Extract of *Leontice leontopetalum* Plant after Ultrasonic Assisted Extraction

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In the present study, ultrasonic assisted extraction (USAE) was applied as an efficient, green and rapid approach to prepare the aqueous extract of *Leontice leontopetalum* (LL) plant. The aqueous extract was obtained at 45 °C, after 15 min ultrasonic process. In addition, the obtained synthesis of silver nanoparticles (Ag NPs) was performed in the presence of the extracts. The synthesized Ag NPs have been characterized via different techniques including UV-Vis absorption; fluorescence and Fourier transform infrared (FT-IR) spectroscopies, scanning electron microscopy (SEM), and X-ray diffraction (XRD). According to the results, the average size of the prepared Ag particles was estimated to be 50 nm. A broad absorption band around 400 nm in UV-Vis absorption spectrum and a maximum emission peak at 445 nm in fluorescence spectrum clarified the successful green synthesis of Ag NPs. Moreover, the biological properties of the extracts and as-biosynthesized Ag NPs were investigated by antimicrobial (i.e. Well-diffusion, minimum inhibitory concentration (MIC), minimum bactericidal concentration (MBC) tests) and antifungal tests [1].

Keywords: Ultrasonic, Ag nanoparticles, Biological activity, *Leontice leontopetalum*

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Cadmium Selenide Quantum Dots Biosynthesis Using *Leontice leontopetalum* Herbal Extract after Microwave Assisted Extraction and Evaluation of the Biological Activity

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The purpose of the study was the green synthesis of cadmium selenide (CdSe) quantum dots (QDs) by *Leontice leontopetalum* plant extract. Microwave assisted extraction (MAE) was performed as eco-friendly, effective, green and fast techniques for preparation of the plant extract. The prepared *Leontice leontopetalum* extracts (15 min; 90 w) were used as natural stabilizing precursors in the synthesis of CdSe QDs, in the presence of cadmium nitrate, selenium oxide, and sodium borohydride. The average particle size of the prepared CdSe QDs was estimated to be around 10 nm, from transmission electron microscopic images. UV-Vis absorption and fluorescence analyses indicate a wide absorption band (~390 nm) and an intense emission peak at 450 nm [1]. After synthesis and characterization, antimicrobial and antioxidant properties of the plant extracts as well as synthesized CdSe QDs were evaluated by different assays. Genotoxicity, toxicity and antifungal activities of the samples were investigated, too. The results indicate the significant antimicrobial activity of the extract samples as well as CdSe QDs with negligible toxicity and genotoxicity impacts.

Keywords: Cadmium selenide Quantum dots, *Leontice leontopetalum*, Genotoxicity

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Histopathological Study of the Healing Effects of Dermal Wound Dressing by Propolis Gum in Carps

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Propolis is a green resinous material made by bees from the gum of eucalyptus, poplar and cone-bearing trees. This compound has anti-inflammatory, antibacterial, antioxidant, and mucosal healing effects. Propolis will become a smooth, sticky and resistant gum against the water, after melting by a mild heat. In this study, we will investigate the healing effects on dermal wounds after dressing with the propolis, in carps. Fifty cyprinid fish, weighting 300 g, are anaesthetized by ketamine solution in water. Afterwards, a 5 mm full-thickness wound is created by a biopsy punch on the right side of the fish skin. Fish are divided into two equal groups. In the treatment group, the propolis gum is melted on a mild heat and completely coated the skin hole. No wound treatment is done in the control group. The wounds were examined clinically after 1, 3, 7, and 14 days and then the tissue was sampled for histological studies [2]. Clinically, the gum had maintained its stability, on the skin, however lost its resistance through 7 days and got detached. On the day 7, the wound had no infection and was completely healed by the day fourteen. In the control group, the wound was not healed during 14 days. From histopathological view, epidermis healing in the treatment group was significantly higher than the control group, along with mucosal and cubical cells, fibroblasts increase and regular collagen formation. Finally, it was shown that the propolis gum is capable of making a resistant dress against the water and accelerates the wound healing.

Keyword: Propolis, Wound bandage, Carp, Skin

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Clinical and Microscopic Comparison of the Healing Effects of Propolis and Zinc Oxide on the Full-Thickness Skin Wounds of Rabbit

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Propolis is a green resinous material made by bees from the gum of eucalyptus, poplar and cone-bearing trees. This compound has anti-inflammatory, antibacterial, antioxidant, and mucosal healing effects [1]. This research investigates the healing effects of propolis extract on skin wound repair in New Zealand white rabbit. The rabbits (n=24) were anesthetized with xylazine and ketamine. Then, two 8-mm full-thickness holes were created on the right and left skin of the spinal column using a sampling punch. The upper right, lower right, and upper left holes were then impregnated with propolis extract, zinc oxide ointment, and Vaseline, respectively. The left lower hole received no treatment. Finally, skin wounds were sampled on days 1, 3, 7, and 15, and examined histopathologically [2]. Results showed that new capillary buds, fibroblasts, and connective tissue in the wounds treated with propolis and zinc oxide were significantly greater than the other two groups. Also, migration of epithelial tissue and reduction of epithelial gap size were higher in propolis-treated rabbits than the other three groups on days 7 and 15. According to the results, propolis extract has a high potential in repairing and healing of full-thickness skin wounds compared to chemical drugs.

Keyword: Propolis, Wound healing, Rabbit, Skin

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Effect of Biosynthesized Graphene-Ag Nano composites Using *Melissa officianalis* Extract on Some Biochemical Characters

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Nanocomposites of graphene with metallic nanoparticles have promising applications as chemical sensors, energy storage, catalysis, and hydrogen storage. In order to reduce the aggregation reaction of the graphene nanosheets and to obtain graphene with good electrical conductivity and high individual dispersion, some inorganic nanoparticles such as metals or semiconductors have been intercalated into the interlayer of the graphene nanosheets. The adhesion of metal nanoparticles to the graphene helps in the inhibition of aggregation of the resulting graphene sheets in the dry state. The metal nanoparticles function as spacers and increase the distance between the graphene sheets, thereby making both faces of graphene accessible. In this study, we demonstrate a new, simple, low cost, environmentally safe process for the biosynthesis of graphene/silver (GN/Ag) nano-composites using *Melissa Officianalis* plant extract. After synthesis of Ag nanoparticles by treatment of an aqueous solution of AgNO₃ with *Melissa Officianalis* plant extract, graphite was added to the synthesized nanoparticle solution and sonicated in the ultra-sonication bath. The synthesized nano-composites were characterized by UV-visible spectroscopy, transmission electron microscopy and X-ray diffraction. Plant treated with GN/Ag nano-composites showed higher content of total carbohydrate (68%), flavonoid (80%), alkaloid (70%), and also, higher shoot/ root length (51%) and leaves area (53%), respectively, than individual nanoparticles, graphene alone, plant without treatment of nanoparticles. The present results show that the facile synthesis method using eco-friendly plant extracts can be applied to prepare other types of graphene/metal nanocomposites. The graphene/metal nanocomposites produced may be less-toxic, biocompatible, and useful for diverse applications including biomedical applications [1, 2].

Keywords: Graphene, Agnanoparticle, Nanocomposites, *Melissa officianalis*.

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Biosynthesis of Graphene-Ag Nano Composites Using *Stevia Rebaudiana* Extract and their Effect on Some Biochemical Characters

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Recently, numerous studies have utilized graphene/nanoparticle hybrid materials in bio-applications such as bio-sensing, bio-imaging, photothermal therapies, delivery of drugs and genes, and stem cell and tissue engineering applications. In this study, we demonstrate a new, simple, low cost, environmentally safe process for the biosynthesis of graphene/silver (GN/Ag) nano-composites using stevia plant extract. After synthesis of Ag nanoparticles by treatment of an aqueous solution of AgNO₃ with stevia plant extract, graphite was added to the synthesized nanoparticle solution and sonicated in the ultra-sonication bath. The synthesized nano-composites were characterized by UV-visible spectroscopy, transmission electron microscopy. Plant treated with GN/Ag nano-composites showed higher content of total phenol (60%), flavonoid (72%), protein (68%), and also, higher shoot length (59%) and leaves area (58%), respectively, than individual nanoparticles, graphene alone, plant without treatment of nanoparticles. The present results show that GN/Ag nano-composites can be eco-friendly synthesized using stevia leaf extract. The graphene/metal nano-composites produced may be less-toxic, biocompatible, and useful for bio-applications [1, 2].

Keywords: Graphene, Agnanoparticle, Nanocomposites, *Stevia Rebaudiana*

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Herbal Bio Enhancer in Iranian Traditional Medicine

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Bio enhancers are agents that increase the bio efficacy and bioavailability of active ingredients without having any activity in a dose combination are used. Presence of bio enhancer agent in drug formulations makes the formula safer and cheaper due to reducing dose and cost. First time, these agents explained by Indian researchers based on Ayurveda system. Several reports have demonstrated enhance of drug bioavailability by medicinal plants. In Iranian traditional medicine, medicine properties were expressed as medicine efunctions (*Afall*). The purpose of this study is to make a relationship between herbal bio enhancers which have been reported in previous studies and their properties (*Afall*) in Iranian Traditional Medicine [1]. For this purpose, initially electronic databases were searched for herbal bio enhancers then each of them characteristics investigated in the most famous Iranian Traditional medicine books. This study showed a close correlation between herbal bio enhancers and their properties in Iranian traditional medicine. Statistical analysis of this study demonstrated that most of the bio enhancers have warm and dry temperament (*Mizaj*). Opener (*Mofattih*) function is main properties of the bio enhancers in Iranian Traditional Medicine. Opener agent are medicine that mobilize materials stayed in tracts, orifices and inside of organs and evacuate materials outward to open obstruct. There are many plants with Opener (*Mofattih*) function in Iranian traditional medicine texts that it might be as sources of new bio enhancer. Regard to herbal properties in Iranian traditional medicine it might be achieve to new herbal bio enhancers [2].

Keywords: Bio enhancer, Iranian Traditional Medicine, Medicine functions, Opener

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Investigation of Changes in Morphological Traits of Hyssop *Hyssopus officinalis* L. with the Use of Chitosan at Different Growth Times and Different Irrigation Conditions

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Chitosan as a biotic elicitor is produced from chitin, an important component of crustacean shells, such as crab, shrimp and crawfish and is mainly made up of (1–4)-2-amino-2-deoxy-β-D-glucan [1]. In order to evaluation of application of chitosan on the morphological traits Hyssop (*Hyssopus officinalis* L.), a factorial split plot experiment was conducted in a randomized complete block design with three replications at the research field of Yazd agricultural and natural resources center in 2016-2017. The experimental treatments included irrigation at three levels 25, 50, 75 % of the available water discharge from the soil, so as control, middle stress, Intense stress as main treatments and foliar application treatments in two levels of distilled water (control) and chitosan (0.4 g/l) also time of foliar application (vegetative and flowering, just flowering) were considered as sub plots. The results showed that different irrigation treatments had a significant effect on morphological traits measured. So that intense water stress reduced the number of lateral branch (17.28%), the canopy area (14%), the fresh weight of flower (32.35%), the dry weight of flower (48.04%), the fresh weight of stem (42.1%), the dry weight of stem (44.60%), compared to the control. The highest amount of measured traits was obtained in vegetative and flowering time of foliar application treatment. Foliar application of chitosan increased the number of lateral branch (5.03%), the canopy area (0.63%), the fresh weight of flower (5.13%), the dry weight of flower (0.89%), the fresh weight of stem (0.35%), the dry weight of stem (5.80%) compared to the control. From the results of this study, can be concluded that the use of chitosan biotic elicitor plays an important role in increasing the physiological traits and modulating the harmful effects of water stress in the Hyssop.

Keywords: Growth, Biotic elicitor, Leaf foliar application, Medicinal plant

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Identification of Chemical Constituents in *Marrubium anisodon*, *M. astracanicum* and *M. crassidens* from Zagros Region, Iran

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The genus *Marrubium* L. is one of the important medicinal genera of Lamiaceae family and Lamioideae subfamily containing 40 species throughout the world [1] and 11 species in Iran. The aim of this research is to study the leaf flavonoid of three species including *M. anisodon* K. Koch, *M. astracanicum* Jacq. and *M. crassidens* Boiss. in the center and north-west of Zagros region. The total flavonoid was extracted using crude 95% MeOH and rotary evaporator. The purification of flavonoid was accomplished by thin layer chromatography and column chromatography, with silica gel 60 GF and sephadex LH₂₀. The purified flavonoid fractions were analyzed using liquid chromatography-mass spectrometry (LC-MS/MS). The negative mode electrospray ionization (ESI) with different collision energy (30-40 eV) were applied. In addition, total ion chromatogram (TIC) of mass spectra was studied. A total of 10 fractions were investigated in MS/MS data. In identification process, all mass spectra of this research and MS/MS data of standard references were assessed. Based on the results of this study, a total of 36 flavonoid compounds were identified in three *Marrubium* species. The product ions ranged from m/z 286-700. The highest frequency of flavonoid compounds was observed in *M. crassidens*. In addition, the flavonoid glycoside derivatives were mainly distributed in *M. anisodon*. It is noted that some lipids and phenolic acids were also recognized which were observed in low frequencies. Some of the important flavonoid compounds in three species include prunin, epicatechin-3-O-gallate, syringetin-3-O-galactoside, quercetin-3-O-glucuronide, fukugetin, pinobankasin-6-C-glucopyranosyl-8-C-ara binopyranoside, chrysoeriol-7-O-glucoside, baicalein-7-O-glucuronide, malvidin-3-O-galactoside, phloretin xyloglucoside and kaempferol-3-O-galactoside-7-O-rhamnoside. According to the results of this research, *Marrubium* species illustrate a rich source of flavonoid compounds which can be used for pharmaceutical and therapeutic purposes. In addition, LC-MS/MS is a powerful technique for separation and identification of chemical compounds in *Marrubium* species.

Keywords: Lamiaceae, *Marrubium*, Liquid chromatography, Flavonoid

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Studying the Problems of Raw Medicinal Plant Packaging in Iran

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The lack of appropriate packaging technology in the herbal industry has dramatically reduced Iran's economic income in this field. Various medicinal plants in Iran are cultivated and gathered due to sunny days and proper climatic condition of Iran. These plants form part of Iran's exports and can be more acceptable with a proper and artistic packaging for the domestic and foreign markets. Proper packaging can prevent plant material from the environmental contaminant and the fungi and guarantee the health of the herbal medicine [1]. By the way, the use of appropriate materials in packaging while preserving aesthetic aspects can result in sustainable development and the protection of the fragile nature of the world. Visual elements and information elements are two major components that can play role in packaging of medicinal materials. The present study addresses the problems of unprocessed (raw) medicinal plant packaging, which is a collection of plant material that is cultivated from nature or farm, and is unaffected by changes in workshops and pharmaceutical plants for consumers. The inappropriate size and type of packaging material are some of worth mentioning problems encountered in the packaging of these medicinal herbs. The lack of necessary information on the packaging and the lack of fundamental aspects of graphic designs are other important problems of many packages of herbal material in market. It is recommended to use biodegradable materials in order to improve packaging of unprocessed herbs in Iran, so that steps have been taken to preserve nature and sustainable development [1, 2].

Keywords: Medicinal plants, Iran, Packaging, Graphics

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Evaluation of *Chenopodium botrys* Resistance to Salinity Stress during Early Growth Stage

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Salinity is a major abiotic stress that affected nearly 20% of the world's cultivated lands. Germination is a critical phase during plant growth, because seedling establishment affects the plant vigor during other growth phases and so plant density. Choosing plants that have more resistant to salinity (such as *Chenopodiaceae*) is an appropriate strategy for crop production in areas affected by salt stress. *Chenopodium botrys* (synonyms: *Botrydium botrys*, *Dysphania botrys* and *Teloxys botrys*) is a strongly aromatic annual plant in *Chenopodiaceae* with an incense like fragrance. To the best of our knowledge, so far the response of this plant to salinity stress has not been evaluated during germination stage. Therefore, we monitored the effects of different levels of salinity stress (0, 50, 100, 150, 200, 250, 300 and 350 mMol induced by NaCl) on germination indices of *Chenopodium botrys*. Seeds were germinated at room temperature (~ 25 °C), in 9 cm diameter Petri-dishes with one Whatman No. 1 filter paper moistened with 5 ml of distilled water or the appropriate solutions. Germinated seeds (radicle length ~2 mm) were counted daily for 10 days and finally the germination percentage and seedling length were determined. Then seedlings were dried in oven at 75°C for 48 hours to determine their dry weight. The germination percentage ascertained for 0, 50, 100, 150, 200, 250, 300 and 350 mM of NaCl was 100, 76, 65, 52, 25, 14, 0 and 0%, respectively. The seedling length varied from 4.90 to 4.01, 2.20, 1.52, 0.35, 0, 0.51 and 0 cm for 0, 50, 100, 150, 200, 250, 300 and 350 mM of NaCl respectively. Similarly, seedling dry weight was significantly reduced when salt severity increased above 150 mM. Overall, results revealed that *Chenopodium botrys* has a considerable tolerance to salinity up to 150 mM salt concentration during early growth stage. Salinity affects seeds germination and seedling growth either by creating an osmotic potential external to the seed preventing water uptake, or through the toxicity of Na⁺ and Cl⁻ ions for germinating seed. Reduction of storage substrates decomposition and disturbance in synthesis of storage proteins are two other main deterrent impacts of salinity on seed germination.

Keywords: Chenopodiaceae, Wild species, Salt stress, Fragrance, Incense

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Foliar Application of Nutrients Improves Saffron (*Crocus sativus* L.) Flowering

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Saffron, a member of Iridaceae, has many medicinal applications and it is well known as precious food ingredient. Its oil has more than 150 volatile and aromatic compounds. Saffron yield and quality is influenced by agronomic practice like fertilization. So far the effects of soil application of chemical and organic fertilizers have been studied on saffron growth and flowering, and it has been concluded that saffron responses positively to nutrients availability. However, the influence of foliar nutrition has not been fully investigated and, moreover, the results of previous studies are different or sometimes even contradictory. Therefore, this experiment aimed to evaluate the impact of foliar spraying of nutrients on saffron flowering criteria. The study was carried out during 2016-18 based on a randomized complete block design, with three replications in a two-years-old field, in Sarayan faculty of agriculture, (University of Birjand), Iran. For plant foliar nutrition was used chemical fertilizer, containing 12% N, 8% P₂O₅, 4% K₂O, 2000 ppm Fe, 1000 ppm Zn, 1000 ppm Mn and 500 ppm Cu, provided by ©Dalfard Company. Corm planting was done in October 2016 and nutritional spraying was done two times during March 2018, when field was two-years-old, in order to evaluate its effects on flower yield of the next foreseen fall harvesting time (November 2018). Effects of foliar application of nutrients were significant and positive on reproductive growth parameters of saffron. Nutrient spraying increased number of flower and flower weight by 17 and 8%, respectively, compared to the control. Flower yield (130 and 105 kg ha⁻¹) and dry style one (1.50 vs 1.27 kg ha⁻¹) in plants nutried foliarly also was higher than non-treated ones. These results are similar to those reported previously by Rezvani-Moghaddam et al. Accordingly to the latter Authors we ascertained the foliar nutrient application is considered as an appropriate strategy for restoring corm growth before the spring dormancy and for increasing its reserves for the next flowering time. Improving replacement corms growth will result in better flowering in the coming flowering season.

Keywords: Fertilizer, Flower yield, Medicinal plant, Reproductive growth, Stigma

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Effect of Different Organic Production Systems on Saffron Flowering

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Saffron, as a member of Iridaceae is an economically important crop, and currently has more than 330-ton annual stigma production in Iran, which includes near 90% of its world production. Saffron stigma has many household and industrial applications like as a colorant and flavoring agent in cooking as well as use in medical and perfumery industries. Nowadays, more attention is paid globally on saffron as a medicinal plant. Hence, to ensure a safe, residue-free and reliable material for use in herbal drug industry, there is an urgent need to adopt strategies for its cultivation that are consistent with principles of good agricultural practices. It has been reported that organic cultivation is an appropriate strategy for cultivation of medicinal plants to improve their quality and quantity [1]. Therefore, the aim of this study was to investigate the effect of three organic production system (OPS) on saffron reproductive growth criteria during two growth seasons. For this purpose an experiment was conducted at research field of University of Birjand, during 2015-2018. Treatments were included low (LI), medium (MI) and high input (HI) organic production systems. In LI, MI and HI-OPS, respectively, 15, 30 and 45 ton ha⁻¹ cow manure in the first year (fall 2015, just before corm planting) and 5, 10 and 15 ton ha⁻¹ in the second and third years (fall 2016 and 2017) was used. In addition, during each growing season 1, 2 and 3 times hand-weeding was used for LI, MI and HI-OPS, respectively. Corm planting was done in October, 2015 and flowering parameters were measured in autumn 2017 and 2018, when field was two and three-years old, respectively. Flower yield for the LI, MI and HI treatments was 114, 172 and 294 kg ha⁻¹ in the second growing season and 120, 204 and 260 kg ha⁻¹ during the third growing seasons, respectively. These values for stigma yield were 1.40, 1.97 and 3.78 kg ha⁻¹ in the second flowering season and 1.86, 3.97 and 2.29 kg ha⁻¹ in the third flowering season, for LI, MI and HI production systems, respectively. Overall, OPS especially HI-OPS improved saffron yield during both flowering seasons. It should be considered that organic manure application in soils with low organic carbon has high positive impact on saffron growth and flowering, but had no considerable effect in a soil with 1.0% O.C. Totally, a fertile soil is the basis for good saffron production, but organic manure represents the best support for saffron, especially under drought conditions, supplying nutrients, but above all, improving soil moisture and soil structure.

Keywords: Cow manure, Flower yield; Iridaceae, Organic matter, Stigma

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A Proposed Protocol for DNA Extraction from the Dried Leaves of *Zataria multiflora* L.

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The quality and quantity of deoxyribonucleic acid (DNA) extraction from the fresh leaves of medicinal plants is effectively affected and limited by the presence of phenolic compounds and polysaccharides and the other secondary metabolites. In addition, the accessibility to fresh leaves of these plants is not always available. Therefore, the DNA extraction from the dried leaves is motivated and encouraged. *Zataria multiflora* Boiss. is a thyme-like shrub belonging to the Lamiaceae family with the vernacular name of Avishan-e-Shirazi (Shirazi thyme) in Iran. The aerial parts of this plant are used in traditional medicine, pharmaceutical and food industries. In this research a protocol to extract the DNA from the dried leaves of *Z. multiflora* plants with high quality is proposed. According to the other researchers papers the DNA extracted with cetyl trimethylammonium bromide (CTAB) method produces the best results compared to the other methods such as sodium dodecyl sulfate (SDS), and cesium chloride (CsCl). In our study the CTAB with some minor changes was modified. The DNA extracted from the *Z. multiflora* dried leaves were compared with the fresh leaves outputs by polymerase chain reaction (PCR) analysis in terms of quantity and quality. The best quality genomic DNA has been obtained by dried leaves ranged 2.1 ng/μl against the fresh leaves equal to 1.8 ng/μl which showed about 17% improvement compared to the fresh leaves. The extracted DNA by the modified CTAB had the potential and compatibility to be used by different markers analyses such as inter simple sequence repeat (ISSR), which was successfully done for the *Z. multiflora* in this study [1,2].

Keywords: *Zataria multiflora*, DNA extraction, Dried leaves, ISSR markers

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Essential Oil Variability of *Zataria multiflora* Boiss. Ecotypes Growing Wild in Hormozgan Province

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Zataria multiflora Boiss. is a thyme-like shrub belonging to the Lamiaceae family where grows wild in the south provinces of Iran. This plant with the vernacular name of Avishan-e-Shirazi (Shirazi thyme) in Iran is a valuable medicinal and condimental plant. Chemical polymorphism of essential oils is the characteristic of species of *Zataria*. It is supposed that environmental abiotic factors (temperature, moisture, chemical composition of soil) influence chemical polymorphism of *Zataria* species and chemical composition of cenopopulations through the course of time. The aerial parts of *Z. multiflora*, collected at the flowering stage from 6 natural habitats in Hormozgan province including Roodkhane, Lavar-Sheikh, Faryab, Tang-e-Zagh, Bashagard and Bandar-e-Khamir, were dried at room temperature and stored inside paper bags in a dark place until analysis. The essential oils of air-dried samples (100 g) were extracted by hydro-distillation for 3 h for each sample, using a Clevenger-type apparatus according to the method recommended in the British Pharmacopoeia. The essential oil yields were measured on the basis of the volume of dried essential oil/primary dried material weight $\times 100$ for each sample. The essential oil yields ranged from 3.9 to 6.5% (w/w). The essential oils were analyzed by a combination of GC-FID and GC-MS techniques, to check for chemical variability. According to ecotypes, twenty-nine components, representing 96.1 – 99.5% of the total components, were identified. A maximum difference of essential oil yield was about 2.6% (w/w) which observed between the Roodkhane and Bandar-e-Khamir ecotypes. Three ecotypes, Roodkhane (6.5% w/w), Lavar-e-Sheikh (6.2% w/w) and Faryab (4.7% w/w), possessed the maximum essential oil yields. Twenty-three volatile compounds were identified by GC-FID and GC-MS analysis. The main essential oil components were thymol (5.6 – 61.8%), linalool (0.33 – 56.4%), carvacrol (1.7 – 46.1%), *p*-cymene (4.9 – 24.4%), α -terpinene (1.7 – 10.7%), α -pinene (1.1 – 9.8%) and carvacrol methyl ether (0.14 – 2.4%). Three chemotypes were identified: thymol, linalool and carvacrol. The knowledge of the *Z. multiflora* chemotype variability, showed in the current study, will allow an improvement of the homogeneity of the plant material for the production of different types of essential oils, depending on the demands of the pharmaceutical and food industries for specific uses.

Keywords: *Zataria multiflora*, Essential oil, Chemotype, Hormozgan province

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Evaluation of Total Phenolic, Flavonoid and Antioxidant Activity of Different Ecotypes of *Zataria multiflora* Boiss. in Fars Province

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Zataria multiflora Boiss. is an aromatic shrub belonging to the Lamiaceae family that grows wild only in Iran, Pakistan and Afghanistan countries. The phenolic compounds and flavonoids as well as antioxidant contents are secondary metabolites which have important functions in plants. Furthermore, phenolic compounds exhibit a series of medicinal properties. The several biological properties of phenols result in antioxidant activity related to the free radicals scavenging. In this study, the total phenolic, flavonoid and antioxidant contents of some wild populations of *Z. multiflora* were assessed. The aerial parts of *Z. multiflora* were collected in the following locations of Fars province: Jahrom, Pasargad, Abade, Darab, Khonj, Jouyom, Tashk, Fasa. The samples were air-dried at room temperature and then were powdered and macerated with aqueous pure methanol in a ratio 10:1 (v/w) by 48 h, resulting liquids were filtered and concentrated under vacuum evaporator to get the crude hydroalcoholic extracts of *Z. multiflora*. Subsequently, flavonoid and antioxidant content were determined. The total phenol content (TPC) was measured according to Folin-Ciocalteu method. Total flavonoid content (TFC) was quantified using the colorimetric method with aluminum chloride and TFC amounts in extract were expressed as quercetin equivalent per gram of dry weight. Anti-oxidative activity of *Z. multiflora* leaves was evaluated using the method of DPPH free-radical scavenging activity. The maximum difference phenol was 3345.2 eq/g which observed between Pasargad and Abadeh ecotypes. The maximum amount of phenol was 3994.2 eq/g, which observed in Pasargad ecotype. The minimum amount of phenol was 649 eq/g which observed in Abade ecotype. The maximum difference antioxidant was 0.492 eq/g which observed between Pasargad and Tashk ecotypes. The maximum amount of antioxidant was 0.560 eq/g which observed in Pasargad ecotype. The minimum amount of antioxidant was 0.068 eq/g which observed in Tashk ecotype. The maximum difference flavonoid was 561.7 eq/g which observed between Tashk and Pasargad ecotypes. The maximum amount of flavonoid was 848.8 eq/g which observed in Tashk ecotype. The minimum amount of flavonoid was 287.05 eq/g which observed in Pasargad ecotype. These results indicated that different *Z. multiflora* ecotypes could be used for treatment of oxidative diseases as new anti-oxidative agents. Therefore, *Z. multiflora* showed antioxidant effects and high phenolic and flavonoid contents which could be used for treatment of inflammatory and immune dysregulation diseases or disorders associated with increased oxidative stress.

Keywords: *Zataria multiflora*, Phenolic compounds, Ecotypes, Fars province

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Selection of the Best Cultivar and Region to Increase the Quantity and Quality of *Cannabis sativa* Oil in Iran

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Hemp has numerous benefits in seed production, fiber, oil and pharmaceutical uses. The hemp oil has some advantages to human health, such as decreasing cholesterol and high blood pressure, because of two essential fatty acids. Gluten-free hemp oil is an important source of plant protein for those suffering from coeliac disease. The aim of this study was selection of the best cultivar and region to increase the quantity and quality of *cannabis sativa* oil in Iran. Therefore, the seeds of two native populations from Iran (Fars and Yazd origin) and one foreign variety from France with its progenies cultivated in the research fields of three locations (Gilan, Golestan and Alborz province) in Iran. The mature seeds of cultivated plants were collected and their oils were extracted by Soxhlet apparatus and analyzed by GC and GC/MS. Based on the results, the highest seed yield, weight of 1000 seeds and oil yield belonged to native populations. It was also determined that Karaj was significantly higher in terms of oil production, weight of 1000 seeds, seed and oil yield per hectare compared to the other two regions. The predominant fatty acids in the samples were linoleic acid, α -linolenic and oleic acid, with an average of 89.8% which classified as unsaturated fatty acids. The most abundant fatty acid in the samples was linoleic acid with an average of 60.4% that was almost identical in all cultivars and areas studied. The ratio of linoleic acid to α -linolenic acid has been reported to be desirable in indigenous populations especially Fars, in all three regions. In all three locations, the palmitic acid content of foreign cultivars was higher than the native populations.

Keywords: Fatty acids, Cannabis, Seed, Oil, 1000 Seed weight

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Selection of the Best Cultivar and Region to Increase the Quantity and Quality of *Cannabis sativa* oil in Iran

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Keywords: Fatty acids, Cannabis, Seed, Oil, 1000 seed weight

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Green Synthesis of Silver Nanoparticles Using Extract of *Lonicera japonica*

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The phytochemical synthesis of silver nanoparticles (AgNPs) using plants or fruit extracts plays an important role in the field of nanotechnology and nanomedicine as it offers alternative therapeutic options which are safe, free of side effects and effective for a wide variety of diseases. Several studies demonstrated that AgNPs possess remarkable inhibitory effect against microorganisms [1,2]. In our work, we have chosen flower of *Lonicera japonica* for the Green synthesis of Ag nanoparticles (Ag Nps). The formation of nanoparticles was observed by visualizing color changes and it was confirmed by Scanning Electron Microscope (SEM), UV-Vis spectrophotometer and Fourier Transform Infra-Red (FT-IR) spectrophotometer. The results of various techniques confirmed the presence of Ag nanoparticles. The TEM results showed the obtaining of AgNPs with sizes varying within the range 40-80nm, having almost spherical shapes. *Lonicera* extract synthesized silver nanoparticles showed antibacterial activity against *E.coli* and *Bacillus subtilis* with a zone of inhibition 11 and 16 mm, respectively. This improved antibacterial activity was found to be comparable with the standard drug

Keywords: Antibacterial activity, Green synthesis, *Lonicera japonica*, Silver

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Genetic Diversity and Morphological Variability in *Cousinia calocephala* Jaub. and Spach Complex (Asteraceae) of Iran

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Cousinia with about 700 species in SW Asia has the most concentration in the Flora Iranica area, out of which 379 are endemic, distributed in mountainous regions of Iran, Afghanistan and Turkmenistan. *Cousinia* is not only of the largest genus of Asteraceae but also the largest in the *Arctium* group of the tribe Cardueae subtribe Carduinae. Section *Cynaroideae* Bung with 89 species is the largest section of the genus. All species belong to the section are Irano-Turkistanian elements [1]. Phytochemical studies on some *Cousinia* species provide some information about their chemical constituents including: acetylenes, triterpenes, steroids, sesquiterpene lactones (SLs), and flavonoids. In a previous study, the cytotoxic activity against Fibrosarcoma WEHI 164 cancer cells, as well as antibacterial and Matrix metalloproteinase protein (MMP) inhibitory effects of seven total ethanol extracts of *C. shulabadensis* sect. *Cynaroideae* were tested. *Cousinia calocephala* Jaub. & Spach is the only endemic species of the section that distributed in 14 provinces of Iran from Alborz and Zagros ranges. In this study, 65 plant specimens of 13 geographical populations of *C. calocephala* Jaub. and Spach were investigated based on genetic (ISSR) and morphological data. ANOVA test showed significant morphological difference among the studied populations. Similarly, AMOVA test produced significant genetic difference among the studied populations, which indicates that the studied populations are morphologically and genetically differentiated. Inter simple sequence repeats (ISSR) molecular markers showed a high degree of among population genetic variability (94%) in *C. calocephala* and studied populations are genetically differentiated. Mantel test revealed significant positive correlation between genetic and morphological distance and geographical distance of the studied populations. The populations relationship illustrated by WARD dendrograms based on morphological features and molecular data were congruent. This was also illustrated in the consensus tree of these dendrograms. This tree revealed that in most cases the studied populations show the same relationship. Therefore we have three different taxonomic group below the species level for *C. calocephala* based on morphological and genetic data.

Keywords: *Cousinia calocephala*, *Cynaroideae*, Asteraceae, ISSR, diversity

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Population Evaluation of *Cousinia calocephala* Jaub. and Spach (Asteraceae) Based on Morphological Characters and Habitat Features in Iran

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Evaluation distribution pattern of taxa is one of the basic measures of species conservation program. *Cousinia* with about 700 species in SW Asia has the most concentration in the Flora Iranica area, out of which 379 are endemic, distributed in mountainous regions of Iran, Afghanistan and Turkmenistan. Section *Cynaroideae* Bung with 89 species is the largest section of the genus. All species belong to the section are Irano-Turkestanian elements [1]. Phytochemical studies on some *Cousinia* species provide some information about their chemical constituents including: acetylenes, triterpenes, steroids, sesquiterpene lactones (SLs), and flavonoids. In a previous study, the cytotoxic activity against Fibrosarcoma WEHI 164 cancer cells, as well as antibacterial and Matrix metalloproteinase protein (MMP) inhibitory effects of seven total ethanol extracts of *C. shulabadensis* sect. *Cynaroideae* were tested. *Cousinia calocephala* Jaub. and Spach is the only endemic species of the section that distributed in 14 provinces of Iran from Alborz and Zagros ranges. In this study, interspecific relationships in 13 populations of *Cousinia calocephala* Jaub. & Spach of the 11 provinces of Iran, using morphological characters were examined. Since the morphological characters under the influence of ecological factors and climatic conditions are variable. So the study of the interaction between environmental factors and morphological characters, in divergence of populations of *Cousinia calocephala* seems to be very necessary. Grouping of CCA to determine the relationship between ecological factors and populations distribution and the most important factors in the separation and distribution of populations Shows that longitude, latitude and altitude influence on the separation of morphological characters of populations based on ecological factors and climatic conditions. By understanding the relationship between ecological factors and populations distribution, application of obtained results may be in the management and conservation of *Cousinia calocephala* populations in suitable ecological and climatic conditions.

Keywords: *Cousinia calocephala*, Distribution pattern, Conservation, CCA

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Effect of Organic and Conventional Management Systems on Phenolic Compounds Content of White Grape Berry cv. Thomson Seedless

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This study was conducted to evaluate the efficacy of organic and conventional agriculture systems on the bioactive compounds content of grape berries during storage. Organic farming, as an alternative agricultural system to protect human and environment health, may improve crop quality and shelf life. Flavonoids and other phenolic metabolites have important biological activities related to their antioxidant properties and, especially, to their free-radical scavenging capacity. Grape berry contain a high concentration of phenolics and flavonoids that are produce through the phenylpropanoid pathway. Results showed that the organic grape berries had higher total phenolic and total flavonoide compounds than conventional berries at each period of storage. Phenylalanine ammonia-lyase (PAL) and tyrosine ammonia-lyase (TAL) are two key enzymes in the phenylpropanoid pathway. Difference in PAL and TAL activities of organic and conventional berries at harvest time and during storage was significant. The content of phytochemical compounds in plant foods is a topic of great interest in food science because of nutritional importance [1]. In addition, they are also beneficial for the plant itself as physiological active compounds, stress protecting agents, attractants or feeding deterrents and, in general, by their significant role in plant resistance [2], specially protect the tissue against damages when grown in the absence of synthetic pesticides and fungicides.

Keywords: Antioxidant activity, Flavonoids, Grape berry, Phenolics

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Apoptotic Effects of Crocin and Safranal in Oral Squamous Cell Carcinoma (KB Cell Line)

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A wide variety of natural substances present in medicinal plants, fruits, and vegetables have been recognized to have the ability to induce apoptosis in various human tumor cells and therefore might be potentially applied in cancer therapy and prevention. Crocin and safranal are active ingredients in the saffron. Some studies have demonstrated antitumor activities of saffron ingredients [1]. The aim of this study was to evaluate cytotoxic effects of crocin and safranal in oral squamous cell carcinoma (KB cells) and NIH 3T3 cell line as non-malignant cells. The cells were incubated with crocin and safranal at 37°C for 24, 48, and 72 h, and cell viability was quantitated by MTT assay. Apoptotic cells, cell cycle distribution, and sub-G1 fraction were determined using propidium iodide staining of DNA fragmentation by flow cytometry. Crocin (0.05–4 mM) and safranal (0.2–3.2 mM) significantly inhibited the growth of KB cells (the inhibitory growth effects of all concentrations for both were >50% after 72 h), while they had less inhibitory effects on NIH 3T3 cells viability. The IC₅₀ values of crocin and safranal against NIH 3T3 cells after 72 h were determined as 2.8 and 0.3 mM, respectively. Crocin and safranal induced a sub-G1 peak in the flow cytometry histogram of treated cells compared to control cells indicating that apoptotic cell death is involved in the toxicity of crocin and safranal. Apoptotic effects of crocin and safranal in tumor cells were more than normal cells. Neither crocin nor safranal affected the cell cycle progression.

Keywords: Crocin, Safranal, Squamous Cell Carcinoma, Cytotoxicity

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Antileishmanial Activity of Carum Copticum Essence Against Leishmania (L) Major

[MRHO/IR/75/ER]: an *In Vitro* Study

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Leishmaniasis is regarded as a major public health problem. Because of the toxicity and side effects of the synthetic drugs, there is growing interest on biomedical plants. The aim of the study was to The Antileishmanial activity of Carum copticum Essence against Leishmania (L) major [MRHO/IR/75/ER]: An in vitro study. A total 19 experimental groups were designed to determine effect of Carum copticum Essence and Glocantime against Leishmania (L) major. Group 1 kept as control and 200 µl of RPMI1640 + 4×10⁶ cells/ml promastigotes. In group 2, 200µl of RPMI1640 + 2×10⁵ cells/ml promastigotes + 10µl Carum copticum Essence (0.01%). In groups' 3-10 levels of the 0.02, 0.05, 0.1, 0.2, 0.5, 1, 2 and 3 µl of Carum copticum Essence were used. The experiments 11-19 were similar to experiments 2-10 but different levels of the Glocantime (0.01, 0.02, 0.05, 0.1, 0.2, 0.5, 1, 2 and 3 µl) were used instead of Carum copticum Essence. Then 8 h after, the Antileishmanial bioassay were determined by MTT detecting kit using Chemiluminescent assay. The levels of 0.05, 0.02, 0.01, 0.5, 0.2, and 0.1 µl of Carum copticum Essence and Glocantime had no effect on Leishmaniasis load in stationary phase compared to control group (P>0.05). The levels of 1 and 2 µl of the Glocantime had no effect on Leishmaniasis load compared to control group (P>0.05) while levels of 1 and 2 µl of the Carum copticum Essence significantly decreased Leishmaniasis load in comparison to control group (P<0.05). Also, Carum copticum Essence and Glocantime (3 µl) significantly decreased Leishmaniasis load in comparison to control group (P<0.05), however, Carum copticum Essence had significantly better Antileishmanial activity compared to the Glocantime (P<0.05). These results suggested Carum copticum Essence had better Antileishmanial activity than Glocantime (1, 2).



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Green Synthesis of Manganese Nanoparticles Using Aqueous Extract of *Artemisia Annu*

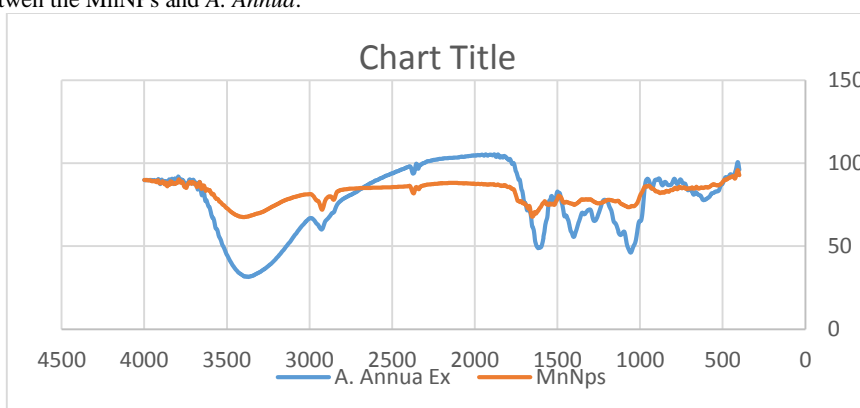
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Artemisia Annu is known as a new antimalarial agent in tropical areas.

A. annua is also used to cure of parasitic disease and viral infections. In this research the synthesis of manganese nanoparticles (MnNPs) using *A. annua* water extract is reported. For this propose, A 10 mL aqueous solution of manganese sulfate (1mM) was added to 10 mL of water extract of *A. Annu* (20 w/w%) . The reaction mixture was stirred at 50-60 °C for 1 hour until the solution colour was changed from yellow to reddish brown colour. Then, the mixture was centrifuged at 4000 rpm for 20 minute at room temperature. The supernatant was discarded and dried. The FT-IR spectra of MnNPs and the plant extract are shown in the figure [1,2,3]. According to the spectra a similarity is observed between the MnNPs and *A. Annu*.



Keywords: Artemisia Annu, Green synthesis, Nanoparticles, Aqueous Extract, Sulfate

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Essential Oil Content And Composition of *Dracocephalum moldavica* Under Irrigation Treatments

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A pot experiment was carried out to determine the effect of irrigation treatment on essential oil content and composition of *Dracocephalum moldavica* L. in a completely randomized design with four replications. *Dracocephalum moldavica* from the Lamiaceae family is a medicinal and aromatic plant and its essential oil is being used widely in medicinal, food, cosmetic and health industries [1]. The treatments were 100%, 85%, 75% and 55% of field capacity. Essential oil components were analyzed and identified by GC and GC/MS. The results indicated that 53 essential oil components were identified in different irrigation treatments. Thirty six, twenty one, twenty and thirty components identified from 100%, 85%, 75% and 55% of field capacity respectively. Sum of identified components were 99.5%, 83.9%, 97.8% and 99.8% from essential oil at 100%, 85%, 75% and 55% of field capacity treatments respectively. The highest of main components were geranyl acetate and geraniol in all of treatments. Sum of oxygene-containing monoterpenes components of essential oil were 81.6%, 81.7%, 91.7% and 92.0% in 100%, 85%, 75% and 55% of field capacity treatments, respectively. Results indicated that with drought level increment, essential oil content, sum of identified components and oxygene-containing monoterpenes (OM) of *D. moldavicum* increased but oxygene-containing sesquiterpenes (OS) decreased. It appears that essential oil content and composition of medicinal plants is varied, influenced greatly by plant origin, culture conditions and environment [2].

Keywords: *Dracocephalum moldavica* L., Field capacity, Oil composition

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Layered Double Hydroxide on Nanoporous Anodic Aluminum Oxide/Aluminum Wire as a Solid Phase Microextraction Fiber for Facile Extraction of *Artemisia absinthium* L. Essential Oil

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The objective of this study was the determination of the essential oil components from *Artemisia absinthium* L. growing wild in Heyran Defile region, Astara city of Guilan province, using of Layered Double Hydroxide on nanoporous anodic aluminum oxide/aluminum wire as a solid phase microextraction (SPME) fiber. SPME is a fast, simple, efficient, solvent free extraction and easy to automation method. Headspace SPME (HS-SPME) in combination with capillary GC-MS was utilized as a monitoring technique for the collection and detection of essential oils of *A. absinthium*. Experimental parameters, including the desorption temperature and time, extraction temperature and time, sample weight and humidity effect were examined and optimized. The method was compared with traditional hydrodistillation (HD). The analysis of the oils resulted in the identification of 37 compounds. α -phellandrene (18.03 and 12.64%), trans-thujone (15.62 and 14.21%), sabinene (11.32 and 9.54%), linalool acetate (4.47 and 3.26%), paracycymene (4.26 and 3.27) and 1,8-cineole (4.15 and 2.74%) were found to be the major components in HD and HS-SPME methods, respectively. Developed method offers the advantage of being simple to use, with lower cost of equipment, shorter analysis time, thermal stability of fiber and high relative recovery in comparison to conventional methods of analysis [1,2].

Keywords: Wormwood, HS-SPME, Essential oil, Nanoporous anodic aluminum oxid

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Effect of Different Salinity Levels on Flower Appearance, Morphological and Physiological Characteristics of *Dracocephalum moldavica*.

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In order to study the effect of salinity on growth and yield of (*Dracocephalum moldavica*) moldavian balm, a pot experiment was carried out in a completely randomized design with 5 treatments and 4 replications in green house. The treatments were included different levels of salinity (0, 10, 25, 40 and 50 mM) NaCl. According to the results of statistical analysis, salinity treatments had significant effects on growth, yield and water relations. Results indicated that with increasing salinity level, the plant height, leaf area, leaf number, leaf chlorophyll, fresh and dry weight of shoot and root, root length, branch number, leaf relative water content (RWC) and yield per pot decreased, but root to shoot ratio, and day number after sowing to first bloom, first flower and first fruit increased. The studies of water deficit on balm (*Melissa officinalis* L.) in agreement with our results showed that the effect of drought stress on shoot yield, leaf and stem yield, stem height was significant at 1% probability level, but on number of lateral stem was not significant [1]. Also Khorsandi *et al* [2] found that in different levels of salinity, biomass yield and amount of essential oil in each plant and composition of essential oil changed and decreased by stress increment.

Keywords: *Dracocephalum moldavica*, Growth, yield, Salinity Stress

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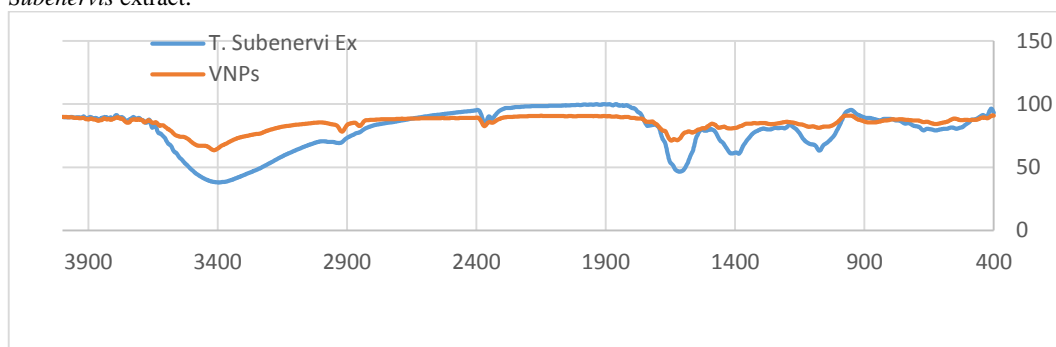
Green Synthesis of Vanadium Nanoparticles Using Aqueous Extract of *Trigonella Subenervis*

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Many foods and medicinal plants are known for their antioxidant properties. Fenugreek (*Trigonella Foenum-Graecum*) is used as a spice in India, Africa and other Asian countries. Seeds and leaves of Fenugreek have been showed antidiabetic effects. The plant parts are useful to treat digestive disorders such as flatulence, diarrhea, dyspepsia. The plant is also used to treat hypocholesterolemia and hypoglycemia. Due to chemical and physical properties, different application of vanadium nanoparticles (VNPs) have been reported. VNPs are used as catalysis, sensors, and electrochromic and optical switching devices. In this paper, we have reported the green synthesis of VNPs using of Aqueous Extract of *Trigonella Subenervis*. For this purpose, a 190 mL of aqueous solution of 1mM Vanadium oxide was slowly added to 10 mL of aqueous leaf extract of *T. Subenervis*, the mixture was stirred vigorously for 2 hours at room temperature until the yellow colour was changed to green. Then, the mixture was centrifuged at 3000 rpm for 40 minute at room temperature. The supernatant was discarded and dried. The FT-IR spectrum of VNPs and the plant extract are shown in the figure [1,2]. According to the spectra a similarity is observed between the VNPs and *T. Subenervis* extract.



Keywords: Green Synthesis, *Trigonella Subenervis*, Vanadium Nanoparticle, Aqueous

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Determination of Several Active Substances and Antioxidant Activities of Frozen and Dried *Vitis vinifera* L. “Red Seedless” Fruits

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The several active substances content and antioxidant activity of selected *Vitis vinifera* L. “Red Seedless” from Maragheh region, East Azerbaijan (Iran) was investigated with a view to their exploitation as a potential source of natural antioxidants. Antioxidant activities of the samples were determined by three testing systems namely DPPH, β -carotene/linoleic acid, and reducing power assays. In the DPPH system, the highest radical scavenging activity was seen by the polar subfraction of the methanol extract in frozen fruits ($IC_{50} = 26.34 \pm 6.5 \mu\text{g/ml}$). In order to evaluate the efficiency of different methods for the extraction of the main polyphenols in grape, two methods were tested and compared. Results showed that the maceration method is better than the ultrasonic. These advantages are visible on extracting of the flavonoids, anthocyanins, total phenolic, ascorbic acid contents and antioxidant capacity [1,2].

Keywords: Grape; Flavonoids, Anthocyanin, Ascorbic acid, Antioxidant

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Bioinformatical Study of Inhibition Effect of *Olea Europaea* Extract on Tyrosin Kinase Receptor HER2 for Breast Cancer Treatment

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Recently, it is suggested that the use of olive leaf polyphenols like oleuropein (OLP), and others could decrease breast cancer cells viability significantly. The human epidermal growth factor receptor Her 2 (ERBB2) can be altered by somatic mutations (with/without ERBB2 amplification) that likely drive tumorigenesis. HER2 is an important factor in breast cancer. the aim of present research is the pharmacodynamics study of olive leaf (*Olea europaea*) extract including some common phenolic compounds, namely, verbascoside, rutin, luteolin-7-glucoside, oleuropein and hydroxytyrosol on her2 for inhibition of the tumorigenesis with docking technique. The structure of mentioned compounds were drawn by chemsketch software. crystallography structure of her2 was prepared from protein data bank (pdb id 3pp0 resolution 2.25 angstrom). after energy minimization with spdbv software, gridding parameter file and docking parameter file was acquired from autodocktools 4 software. gpf file and dpf file was ruined with cygwin software. according to output of present research, dlG files were analyzed for finding best affinity between compounds and proteins. conformational analysis was performed by chimera software. According to acquired rmsd tables from dlG file, verbascoside, rutin, luteolin-7-glucoside, oleuropein and hydroxytyrosol binds to receptor with energy binding -7.43 kcal/mol, -10.28 kcal/mol, -9.69kcal/mol, -9.87kcal/mol, -5.54 kcal/mol, respectively. rutin and hydroxytyrosol have highest and lowest affinity with her2. Rutin, a phenolic compound found in the olive leaf (*Olea europaea*), has been shown to have biological activities including the anticancer. among mentioned 5 compounds, rutin is better than other compounds for inhibition of her2. conformational analysis indicates rutin covers binding site of 3pp0 of her2 appropriately. we suggest to perform molecular dynamics and pharmacokinetics studies on rutin.

Keywords: *Olea europaea* L, 3pp0, Breast cancer, Rutin, Bioinformatics

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Phytochemical Contents of *Euphorbia granulata*

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Euphorbia granulata belongs to Euphorbiaceae family. Iran is the second richest country for *Euphorbia* in Asia with about 90 species [1]. Different medicinal uses such as treatment of fever, intestinal disorders, wound, bacterial and fungal infection have been reported for extracts of different species of *Euphorbia* [2]. Since there is no report on phytochemical contents of *E. granulata* in literature, in this we have evaluated the presence of different secondary metabolites including phenolic, flavonoids, alkaloids, and anthraquinones compounds. The aerial parts of the plant were collected from the beside of Sabzevar north road. The plant parts were dried and extracted using methanol for 72h at room temperature. Different reagents were prepared and sprayed on TLC profile of the methanolic extract to identify the presence of the mentioned compounds. The reagent were: aqueous FeCl₃ 5% for phenolic compounds (change to blue or green color); methanolic AlCl₃ 5% for flavonoid compounds (change to yellow color); ethanolic KOH 5% for anthraquinone compounds (change to orange or red color); Wagner reagent for alkaloids compounds (formed brown precipitate). The result are tabulated in the following Table. The presences of Alkaloids and terpenes in *E. granulata* from Algeria have reported previously.

	Phenolics	Flavonoids	Alkaloids	Anthraquinones
<i>E. granulata</i> extract	+	+	+	+

Keywords: *Euphorbia granulata*, Euphorbiaceae, Methanolic extract, Phytochemical

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Radical Scavenging Activity of *Euphorbia granulata* Hexane Extract

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Euphorbia granulata is widely used in African traditional medicine herb to treatment of skin diseases, gonorrhoea, migraines, and warts [1]. Mosquera et al. have reported that Euphorbiaceae family exhibited the highest antioxidant activity among five botanical families including Asteraceae, Euphorbiaceae, Melastomataceae, Rubiaceae and Solanaceae. Antioxidant are vital compounds for health as they have the potential to prevent and cure many degenerative disorders. Radical scavenging activity (RSA) assay is well known as the most important test to evaluate the antioxidant activity of plants extracts. In this study, we have analysed the RSA of *E. granulata*. For this purpose, the collected plant parts were dried and macerated in n-hexane; after 72h the extract was filtered and concentrated. Then, a 1.5 mL aliquot of each extract in methanol at 100, 200, 300, 400 µg/mL was added to 1 mL of 0.1 mM DPPH in methanol. The reaction mixtures were shaken vigorously and then kept in the dark for 90 min. The absorbance of the resulting solutions was read at 517 nm against the blank (without DPPH radical). All tests were run in triplicate. According to the results *E. granulata* extract scavenged DPPH radical with IC₅₀ of 274.20 ± 1.19 µg/mL. The plant RSA was less than of BHT and α-tocopherol (35.64 ± 0.56 and 17.42 ± 0.50 µg/mL).

Keywords: Antioxidant; Radical Scavenging Activity, *Euphorbia granulata*, DPPH

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Interactions Between Some Medicinal Plants and Common Antibiotics Against *S. aureus*: Studying the Synergism and Antagonism

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Antimicrobial resistance is an increasingly serious threat to global public health which requires action across all government sectors and society. In Iranian traditional medicine, there are some herbs prescribed as anti-infective agents. The aim of this study was to investigate the probable synergistic interactions between these herbs with each other as well as with some common antibiotics. Methanolic extracts of *Myrtus communis* (MC) (leaf & fruit), *Teucrium pollium* (TP) (aerial part), and *Vitis vinifera* (VV) (dried fruit as Maviz) were extracted via maceration and dried through rotary evaporator. The Muller Hinton agar plate surfaces were inoculated by spreading ten microliter of the suspension of *S. aureus* (ATCC 25923) (0.5 × 10⁶ bacteria/mL) over the entire agar surface. Then, holes with a diameter 8 mm were punched aseptically with a sterile cork borer and a volume of 40 µL (20mg) of the extracts was introduced into each well. For antibiotics, the standard discs of gentamicin (Gen), vancomycin (Van), tetracycline (Tet), and cloxacillin (Clx) (Padtan Teb) were placed on the inoculated plates. After incubation at 37°C overnight, plates were examined for any zone of growth inhibition. The synergistic and/or antagonistic effects of the plants were investigated through comparing the inhibition zone of the mixture of extract-extract (20mg of each) or extract-antibiotic (20mg on antibiotic disc) with the inhibition zone of each of them alone. Diameters of inhibition zone of the extracts and antibiotics were 36.5 (Gen), 18.5 (Van), 14 (Tet), 15 (Clx), 33 (TP), 37 (MC leaf), 28.5 (MC fruit), and 8 mm (VV). Inhibition zones of the dual combinations of Van with TP, MC leaf, MC fruit, and VV were 23, 24.5, 20, and 18; Gen with TP, MC leaf, MC fruit, and VV were 31, 26.5, 27, and 35.5; Tet and TP, MC leaf, MC fruit, and VV were 24.5, 26.5, 21, and 20.5; and Clx with TP, MC leaf, MC fruit, and VV were 23, 26.5, 19, and 13.5 mm, respectively. VV+Tet revealed synergistic effect against *S. aureus*. Almost all of the other combinations were antagonistic.

Keywords: Medicinal plants, Well diffusion method, Synergistic effect

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Genetic Diversity of the Medicinal Herb *Plantago ovata* Forssk. with Using ISSR Markers

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Plantago ovata (Plantaginaceae) is an annual or a perennial subscaulescent herb, up to 14 cm tall, sparsely or thickly covered with soft hairs, with rosette and linear-lanceolate leaves, and it is now as a medicinal herb cultivated widely in West Asia for seed husk known as Isabgol or blonde Psyllium [1]. Isabgol have highly valuable in the nutraceutical, pharmaceutical and cosmetic industries Because of mucilage extraction from the seed husk. Mucilaginous product contains polysaccharides. Polysaccharides are very useful in pharmaceutical, cosmetics and food formulations. And also polysaccharides can improve intestinal performance, obesity, high cholesterol, colon cancer, constipation and diabetes. We used ISSR molecular markers to investigate the population genetic structure and genetic divergence within *P. ovata* populations. We identified *P. ovata* variety as var. *decumbens* based on the morphological data in Iran. WARD tree and PCoA plot produced similar results on morphological data. AMOVA revealed a significant genetic differentiation among the studied populations. STRUCTURE analyses showed some degree of gene flow among the studied populations. NJ tree and PCoA plot of ISSR data revealed that there are at least three genetic groups within the studied populations. Though the studied populations in *P. ovata* are genetically differentiated, there are not qualitative morphological features for differentiating among theirs. Therefore, we consider them as ecotypes within *P. ovata*.

Keywords: *Plantago ovate*, Ecotype, ISSR, Structure analysis

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Heracleum persicum Beneficial Effects on Blood Glucose, Insulin and Antioxidant Enzymes in Alloxan-Induced Diabetic Rats

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Heracleum persicum is an Iranian traditional medicine consumed as a liver and kidney tonic and as an anti-toxic herb [1,2]. This study was aimed to investigate the antioxidant, anti-diabetic effects of the hydroalcoholic extract *H. persicum*, in rats with alloxan-induced diabetes. This is an experimental study on a total of 30 male rats which were assigned to five groups; a normal and a diabetic control, three diabetic groups treated orally with 200 and 400 mg/kg/d of the extract and 5 mg/kg of glibenclamide for two weeks. Blood glucose and body weight were measured at the end of each week. At 15 days, blood samples were collected to estimate the insulin, insulin growth factor-I (IGF-I), antioxidant markers for malondialdehyde (MDA), glutathione peroxidase (GP_x), superoxide dismutase (SOD) and total antioxidant activity (TAS) by using commercial kits. Daily treatment with 400 mg/kg of the extract significantly reduced the blood glucose level ($p < 0.001$) and improved body weight ($p < 0.001$), insulin ($p < 0.001$), IGF-I ($p < 0.05$), SOD ($p < 0.05$), MDA ($p < 0.001$), TAS ($p < 0.05$) compared to the diabetic control rats. The present study confirms potential role of hydroalcoholic extract of *H. persicum* fruits for the treatment of diabetes.

Keywords: Antioxidant effect, Blood glucose, Diabetes Mellitus, *Heracleum*, Insulin

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Myrtle, Felty Germander, and Zoufa Have Considerable Antibacterial Activity

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Antimicrobial resistance is globally one of the major concerns of healthcare systems. In Iranian traditional medicine, there are some herbs prescribed as anti-infective agents [1]. The aim of this study was to investigate the probable synergistic interactions between these herbs with each other as well as with some common antibiotics. Methanolic extracts of *Vitis vinifera* (Maviz), *Myrtus communis* (fruit and leaf), *Teucrium polium* (aerial part), *Glycyrrhiza glabra* (rhizom), *Adiantum capillus-veneris* (aerial part), *Nepeta bracteata* (aerial part), *Iris spp.* (root), and *Vitex agnus castus* (fruit) were taken through maceration and dried by rotary evaporator. The Muller Hinton agar plate surfaces were inoculated by spreading ten microliter of the suspension of *S. aureus* (ATCC 25923) and *E. coli* (ATCC 25922) (0.5×10^6 bacteria/mL) over the entire agar surface. Then, holes with a diameter 8 mm were punched aseptically with a sterile cork borer and a volume of 40 μ L (20mg) of the extracts was introduced into each well. For antibiotics, the standard discs of gentamicin, vancomycin, tetracycline, and cloxacillin (Padtan Teb) were placed on the inoculated plates. After incubation at 37°C overnight, plates were examined for any zone of growth inhibition. The growth inhibition zone for each plant was as below: Against *S. aureus*: *Myrtus communis* (fruit=28.5, leaf=37), *Teucrium polium*=33, *Vitis vinifera*=8, *Glycyrrhiza glabra*=16, *Adiantum capillus-veneris*=17, *Nepeta bracteata*=20, *Vitex agnus-castus*=16.5, *Iris spp.*=8 mm. Against *E.coli*: *Myrtus commonis* [fruit=24, leaf=25], *Teucrium polium*=16.5, *Vitis vinifera*=8, *Glycyrrhiza glabra*=16, *Adiantum capillus-veneris*=11, *Nepeta bracteata*=10, *Vitex agnus-castus*=14, *Iris spp.*=12.2 For antibiotics against *S. aureus*: Tetracycline=14, Gentamicin=36.5, vancomycin=18.5, cloxacilin=15 mm; against *E. coli*: Tetracycline=15, Gentamicin=27, vancomycin= --, cloxacilin= --. The result of this study indicates that the extracts of *Myrtus communis*, *Teucrium polium*, and *Nepeta bracteata* have a considerable effect of gram-positive bacteria. On the other hand, only the leaf and fruit of *Myrtus communis* have good antibacterial activity against gram-negative bacteria. Since plant extracts have fewer side effects than synthetic antibiotics, their use in treating wounds and bacterial diseases can be beneficial.

Keywords: Iranian traditional medicine, Well diffusion method, *S. aureus*, *E. coli*.

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Antimicrobial and Antioxidant Activity and Chemical Constituents of the Smoke of *Costus arabicus* L. Root

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Costus arabicus L. (Qust-e Shirin) is a perennial plant with a long history of use in traditional medicine for respiratory ailments, malaria, and leishmaniasis [1]. The smoke of costus root is mentioned in Iranian Traditional Medicine for rhinorrhea and catarrh especially with infectious origin. The aim of this study was to investigate chemical constituents and antimicrobial and antioxidant activities of *C. arabicus* root smoke. To prepare smoke extract, 200 g of dried plant was powdered and filled up in a Round-bottom flask. This flask was heated through a heating mantle to burn the powdered plant. The raised smoke was collected via a distillation set to another flask which filled up with methanol. To find the most potent components, fractionation via solvent partitioning was done. MICs and MLCs of total extract and its fractions were determined as well as antioxidant activities. The chemical compositions of the most potent fraction were also introduced via gas chromatography coupled with mass spectroscopy (GC-MS). The results showed that total extract of *C. arabicus* smoke has a considerable antimicrobial activity against gram-positive and gram-negative bacteria and fungi. The best antimicrobial and antioxidant activity belonged to dichloromethane fraction. This fraction was consisted of citronellal (14.33%), p-cresol (11.26%), 2-ethylphenol (6.1%), 2,4-dimethylphenol (4.03%), phenol (3.89%), syringol (3.23%), (E)-2-methoxy-4-(1-propenyl)phenol (3.22%), and di-n-octyl phthalate (3.05%). The results support traditional indications of *C. arabicus* L. against infections. Further antimicrobial studies on resistant microbial strains would be favorable.

Keywords: 2,2-diphenyl-1-picrylhydrazyl (DPPH), Gas chromatography

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Antimicrobial and Antioxidant Activities of some Medicinal Smokes Prescribed in Iranian Traditional Medicine for Catarrh

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Microbial resistance has been recently become one of the major healthcare problems worldwide. Finding new sources of chemical active antimicrobial compounds, alongside what has been produced by fungi, is now a common approach to solve this problem [1]. On the other hand, inflammation is recently considered as an underlying factor of many diseases and working on anti-inflammatory drugs is also interesting. To find herbs with antimicrobial and antioxidant activity, information given through Iranian traditional medicine (ITM) can be used as a source of inspiration. The aim of this study was to examine antimicrobial and antioxidant activities of 6 medicinal smokes prescribe in ITM for catarrh. *Staphylococcus aureus* ATCC 25923, *Escherichia coli* ATCC 8739, *Pseudomonas aeruginosa* ATCC 9027, *Bacillus subtilis* ATCC 6051, *Candida albicans* ATCC 10231, and *Aspergillus niger* ATCC 16404 were used in this study. Preliminary antimicrobial activity of *Commiphora myrrha*, *Cinnamomum cassia*, *Costus arabicus*, *Nigella sativa*, *Pimpinella anisum*, *Tetraclinis articulata* was done by disc diffusion method. Minimum inhibitory concentration (MIC) and minimum lethal concentration (MLC) were also determined via microdilution method. Antioxidant activity was evaluated via measuring the reduction of DPPH solution. The results showed that *C. arabicus*, *C. cassia*, and *P. anisum* have considerable antimicrobial activities. Antioxidant evaluation of herbal smokes showed the lowest IC50 for *C. cassia* (10.44 µg/ml), *C. myrrha* (13 µg/ml), and *C. arabicus* (15.16 µg/ml). Herbal medicinal smokes have interesting antimicrobial and antioxidant activities. More investigation on these smokes would be fruitful.

Keywords: Medicinal smokes, Iranian traditional medicine, Minimum inhibitory concentration

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Comparative Study of the Essential Oils of two *Nepeta* Species from Iran

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Nepeta species are used in the traditional medicine of many countries as diuretic, diaphoretic, antitussive, anti-asthmatic, tonic, febrifuge, and sedative agents [1]. *Nepeta gloeocephala* Rech.f. and *Nepeta haussknechtii* Bornm are distributed in Iran. The purpose of this study was identifying the comparison of essential oil composition from these two species. Flowers of *N. gloeocephala* were gathered from kashan habitat in Ghamsar and *Nepeta haussknechtii* flowers were collected from the Girandeh, in Gilan province. The dried parts of the plants were subjected to a Clevenger-Type hydro distillation apparatus for 3 hours and then analyzed by GC and GC-MS. In *N. gloeocephala* 29 compounds were identified, which 1,8-cineoles (36.5%) and β - pinene (22.1%) had the highest percentage. In *N. haussknechtii* the flower oil contained 25 compounds. The main components were germacrene D (41.5%) and E-caryophyllene (20.2%). The presence of nepetalactones in several *Nepeta* species in relatively high concentrations has been reported, although no nepetalactones were found in this two species of *Nepeta* oils.

Keywords: *Nepeta haussknechtii*, *N. gloeocephala*, Essential Oils

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Medicinal and Aromatic Plants in Iranian Herbal Centres. A Field Study

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Iran with about 8,000 plant species that 2,000 of them have medicinal properties, has an important position in the world. In this research, medicinal plants being sold in the central market of medicinal plants were studied and their Persian, local and scientific names have been determined. The results showed that 286 items are sold in the markets of Tehran, 22% of them are imported, 35% of them were agricultural products and 43% of them were collected from nature. According to these results, it can be concluded that the Iranian medicinal plants markets has no stable and reliable sources of supply and should take steps to produce medicinal plants in farms by scientific methods. It was also found that flowers, roots, seeds, leaves, fruits and gums were allocated 10%, 15.4%, 28.5%, 22.3%, 16.8% and 7% of the market, respectively. The most important medicinal and aromatic plants used in Iranian markets were Avishan Shirazi (*Zattaria multiflora*) and Gol Gavzaban (*Echium amoenum*). Plants such as Saffron (*Crocus sativus*) had the highest prices and plants such as Espand (*Peganum harmala*) had the lowest prices.

Keywords: Medicinal plants, Herbal markets, Herbalists, Traditional medicine

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Morphological Diversity among Some Species of *Teucrium* L. (Lamiaceae) in Zagros, Iran

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The genus *Teucrium* L. is one of the medicinal genera belonging to Lamiaceae family and Ajugoideae subfamily. It has 250 species throughout the world of which 19 species are mainly distributed in west, north-west, south and center of Iran. The presence of phenotypic variability, variation of ploidy levels, morphological similarity and natural hybridization results the complexity of this genus [1]. Consequently, the aims of this study are to investigate interspecific and intraspecific morphological diversity among 42 accessions of three *Teucrium* species in center, north-west and west of Zagros region. The studied species include *T. polium* L., *T. capitatum* L. and *T. orientale* L.; with three subspecies namely *T. orientale* subsp. *taylori*, *T. orientale* subsp. *goleotrichum* and *T. orientale* subsp. *glabrescens*. A total of 23 quantitative and 25 qualitative morphological characters were applied and analyzed with UPGMA method using PAST 3.17 software. Based on the results of cluster analysis, there were nine groups of *T. polium*, six groups of *T. capitatum*, eight groups of *T. orientale* subsp. *glabrescens*, four groups of *T. orientale* subsp. *taylori* and three groups of *T. orientale* subsp. *goleotrichum*. It is noted that *T. polium* and *T. orientale* subsp. *glabrescens* illustrate the greatest morphological diversity. Some accessions of *T. capitatum* exhibit high similarity with *T. polium* accessions. Moreover, *T. orientale* subsp. *goleotrichum* was closely grouped with *T. orientale* subsp. *glabrescens*. The presence of hybridization and polymorphism among these species causes morphological variations. It should be noted that the morphological characters such as indumentum of corolla, calyx, bract, stamen and calyx teeth, form of calyx teeth, leaf margin and length of calyx teeth display the high variations in intraspecific and interspecific levels. The results of this research clarify the presence of morphological adaptation in *Teucrium* species.

Keywords: Morphology, Medicinal, Diversity, Lamiaceae, *Teucrium*

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In Vitro* Study on Alpha-Glucosidase Inhibitory Activity of *Salvia multicaulis

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Salvias, among several species of lamiaceae family, could be considered as a source of natural agents for the preparation of new pharmaceuticals and functional foods, in particular for controlling diabetes mellitus. In this category biological activity of *Salvia Multicaulis*, which is a native species that grows in the northwestern, west and central regions of Iran, is investigated. At the present study, the enzyme inhibitory activity is tested against α -glucosidase based on spectrophotometric method, which necessitate concentration-dependent manner of acetone extract and six different fractions of aerial parts of *Salvia Multicalis*. The α -glucosidase inhibition potential of the extract and the isolated compounds are checked against their IC₅₀ values which are the concentrations that produce 50% inhibition under the researchers' specific set of assay conditions (Table 1). These activities are ranged from 35 to 95 (μ M) in α -glucosidase assay. Ursolic acid exhibit the strongest α -glucosidase inhibitory effects among all fractions. The inhibitory effect towards α -glucosidase of salviol is reported here for the first time.

Table 1: IC₅₀ of α -glucosidase inhibitory activity tests for 7 samples

Sample	α -glucosidase (μ M)
Daucosterol	75
Salviol	58
Corsolic acid	95
Beta sitosterol	39
Ursolic acid	35
Lupeol	45
AC extract	78 ppm

Keywords: *Salvia Multicaulis*, Alpha-Glucosidase, Inhibitory Activity

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Essential Oils Compositions of *Pycnocycla flabellifolia* Boiss. and *P. spinosa* Decne.

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The genus *Pycnocycla* L. belongs to family Umbelliferae, comprises of 8 native permanent plant species in Iran that distributed in the relatively tropical regions of Tehran, Kermanshahan, Khuzestan, Fars, Kerman, Hormozgan and Baluchestan. *Pycnocycla flabellifolia* and *P. spinosa* are used as medicinal plant in south and central region of Iran [1]. *P. flabellifolia* and *P. spinosa* were collected from Mehran in Ilam Province and Mahan in kerman Province respectively in 2017 at Flowering stage. Different parts of plant (stem plus the leaf, shoot and inflorescence) were extracted by distillation with water. The essential oils were identified by GC and GC/MS to identification of chemical compounds. The oil components were identified by comparing their mass spectra with the Wiley library as well as with authentic compounds. The yield of *P. flabellifolia* essential oil for stem plus the leaf, shoot and inflorescence were 0.66, 0.65 and 0.76% respectively. The yield of *P. spinosa* essential oil for stem plus the leaf and inflorescence were 0.16 and 0.38% respectively. In *P. flabellifolia* essential oil of stem plus the leaf, shoot and inflorescence were identified 16, 22 and 22 compounds respectively. The major constituents of stem plus the leaf, shoot and inflorescence essential oils were (E- β)-ocimene (39.6, 28.1 and 28.0%), (z- β)-ocimene (33.8, 19.9 and 31.0%), terpinolene (12.9, 17.3 and 12.6%) and α -pinene (4.1, 14.4 and 9.9%) respectively. The results of this study showed that different parts of plant such as stem plus the leaf, shoot and inflorescence have similar essential oil content and major compounds. Therefore the full plant is impoatant for the essential oil. 33 and 28 compounds were identified in *P. spinosa* essential oil of stem plus the leaf and inflorescence essential oils respectively. The major constituents of stem plus the leaf and inflorescence essential oils were respectively Z-isoelemicin (19.3 and 33.3%), bulnesol (8.5 and 8.8%), E-caryophyllene (9.0 and 4.4%), α -pinene (4.5 and 4.4%), myrcene (3.2 and 10.0%), p-cymene (6.8 and 0.5%), sylvestrene (1.5 and 4.9%), caryophyllene oxide (1.6 and 7.8%). The results of this study showed that stem plus the leaf and shoot have similar essential oil content and major compounds. Therefore the full plant is impoatant for the essential oil.

Keywords: *Pycnocycla flabellifolia*, *Pycnocycla spinosa*, Umbelliferae, Medicinal

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Determination of the Effect of Hydro-Alcoholic Extract of *Lavandula dentata* on Nitrite Oxide, Catalase Activity And Mortality in the Temporal Lobe Epilepsy Induced by Injection of Kainic Acid in Rat

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Temporal lobe epilepsy (TLE) is widespread drug-resistance focal epilepsy, and treatment options remain unsatisfactory. Kainic acid is analog of glutamate and agonist of AMPA, NMDA receptors. It also result in activates the glutamate ionotropic receptors similar to those occurring in human temporal lobe epilepsy. There is no report about antiepileptic effects of *Lavandula dentata* on kainic acid induced status epilepticus (SE), So this study evaluates the behavioral and biochemical effects of *Lavandula dentata* extract on kainic acid induced temporal lobe epilepsy in regard to oxidative stress role. The role of the NO molecule in epilepsy has been proven by multiple tests by systemic infusion (NOS) of NO synthetase. NO has complex effects on neurotransmitters, so that NO may increase cGMP with NMDA receptor activation but simultaneously blocks the increase of intracellular Ca²⁺ and NOS activity and NMDA receptor. The catalase enzyme is one of the active agents in protecting the structure of cells in the body of aerobic organisms, which plays a role mainly by disabling hydrogen peroxide and reducing the production of reactive and destructive oxygen species. 75 male rats weighing 200-250 grams were selected and were divided in to 5 fifteen groups include: 1. Sham 2. sham extract 3. kainic acid induced epileptic (1µg/rat) 4. pretreated epilepsy with single dose *lavandula dentata* (200mg/kg one hour before surgery) 5. pretreated epilepsy with frequent doses (injection one day at a time for 2 weeks 200mg/kg). The induction of epilepsy was accomplished in all of three groups with 1µg/rat kainic acid intraCA3 hypocamp and surgical help. All extract injections were i.p with volume of 0.3 ml. Hippocampal oxidative stress markers were measured 24h, 2 and 4 weeks after kainic acid administration. extract frequent doses Pretreatment, as the same as kainic acid group, nitrite levels and catalase activity enhanced time dependently. Nitrite elevation was more than kainic acid group Extract frequent doses Pretreatment while speeding up SE onset, also enhanced total duration and occurrence of SE. But, it reduced mortality rate. in spite of SE intensification, it seems that extract could reduced mortality by activation of catalase time dependently as antioxidant neutralizing syste.

Keywords: Kainic acid, Temporal lobe epilepsy, Rat, Oxidative stress

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Comparison of Chemical Composition of the Essential Oils of Different *Thymus* Species collected from two Provinces of Iran

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Regarding the importance of different species of *Thymus*, as an edible and vegetables used in various food, pharmaceutical, sanitary and cosmetic industries, [1,2] a variety of essential oils have been studied in Khorasan Razavi and Lorestan provinces. 8 species of thyme, *Th. kotschyanus*, *Th. daenensis*, *Th. eriocalyx*, *Th. Pubescens*, *Th. transcaspicus*, *Th. Fallax*, *Th. fedtschenkoi*, *Th. Transcaucasicus* were compared quantitatively and qualitatively. After identification of different habitats of *Thymus*, they were accumulated and dried on shadow. Essential oil extraction from all of the extracts was done by water distillation and was performed by Clevengere for three hours. The essential oils were analyzed using gas chromatography (GC) and gas chromatography and GC/MS mass spectrometry and their chemical compounds were identified. The results of this research showed that the highest yield of essential oil belonged to *Th. Transcaspicus* in the Khorasan Razavi population 2.23% and *Th. daenensis* in the Lorestan population 2.74%. Among the major compounds identified, phenolic compounds of Thymol and Carvacrol can be mentioned. The highest amount of thymol is in *Th. Transcaspicus* from the Khorasan Razavi province with 82/40 percent and the highest carvacrol compound belonging to *Thymus daenensis* in Lorestan province with 55.9 percent. By comparing the percentage of thymol and carvacrol in two provinces, it can be concluded that in the provinces of Khorasan Razavi the amount of thymol is higher than carvacrol.

Keywords: *Thymus*, Essential oil, Khorasan Razavi, Lorestan province

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Ultra-High Diluted Medicinal Plants Homeopathic Remedy Usage for *Rudbeckia hirta* Growth Improvement

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Homeopathy is effective for human, animals and plants and is the therapy based on the principle of "like-cures like." Given the fact that justifying the mechanism of homeopathic remedy action or a different therapeutic approach is different from its effectiveness, many studies have compared the effects of homeopathic medicines and their effectiveness in the human and animal. Such studies are very rare and new in plants. The purpose of this study was to evaluate the effects of homeopathic remedies (Belladonna C30 and Arnica C200) on reducing the damage caused by atmospheric changes and temperature on ornamental and medicinal plant (*Rudbeckia hirta*) germination. Therefore, the effects of homeopathic drugs on increasing the rate of germination, seedling quality and improving the ability to grow and resistance to environmental temperature can provide a new horizon for improving the quality and quantity of planting and also in confirming the effect and the value of this science will help. Using the Design expert trial 26 experiments were designed in 5 levels. The results indicate that the most important affecting parameters are temperature change ≤ 6 °C and ≥ 30 °C. Reducing moisture content $\leq 10\%$ or increasing it to $\geq 80\%$ prevents germination. Also, damaged sample treatment with homeopathic remedies (Belladonna C30 in the case of temperature increase and Aconite C200 in the case of temperature decrease) resulted in more than 90% germination in acute conditions of conditional stress correction and seed re-germination ability.



Keywords: Homeopathy, Belladonna, Arnica, *Rudbeckia hirta*, Germination

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The Chronic Dietary Effects of *Prangos Ferulacea* Hydroalcoholic Extracts On L-NAME Induced Hypertension in Rats

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Various studies show the medicinal properties of *Prangos Ferulacea*. Our previous study also revealed its hypotensive effect on normal blood pressure through muscarinic receptors. In this study, the chronic dietary effects of *Prangos Ferulacea* on hypertension induced by L-NAME were studied in rats. Twenty-four male Wistar rats (220-250 gr) were randomly divided into 4 experimental groups including normtension, hypertension and their controls. Hypertension was induced by administering L-NAME at a dose of 40 mg/kg daily to the drinking water of animals for 4 weeks. During this time, the *Prangos Ferulacea* hydro alcoholic extract (500 mg / kg / day) or its vehicle (water) was prescribed by oral gavages. At the end of the fourth week, animals were anesthetized with sodium thiopental (80 mg / kg, ip) and their femoral arteries cannulated and mean arterial blood pressure and heart rate were recorded. The induction of hypertension increased the mean arterial blood pressure significantly from 103 mmHg in the control group to 149 mmHg in the hypertension group (p <0.01). Oral administration of *Prangos Ferulacea* hydroalcoholic extract in the hypertension group significantly reduced the mean arterial blood pressure to 119 mmHg (p <0.01). Prescribing *Prangos Ferulacea* extract in the normotensive group did not have any effect on blood pressure. Also, the administration of L-NAME and *Prangos Ferulacea* did not affect the heart rate of the rats. In Conclusion *Prangos Ferulacea* extract prescription prevents high blood pressure in hypertensive rat. *Prangos Ferulacea* seems to be beneficial in preventing hypertension.

Keywords: *Prangos Ferulaceae*, L-NAME, Hypertension, Dietary, Rat

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Study on Essential Oil Productivity of some *Salvia mirzayanii* Populations in Iran

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Salvia species are distributed throughout Eurasia and the Americas and are especially diverse in Central America and in the Mediterranean region Eastern of Mediterranean region to the Southwest of Asia. Their species mainly contain two major types of biologically active compounds: lipid-soluble abietane-type diterpenoid tanshinones and carnosic acid and water-soluble phenolic acids. *Salvia* species are known for their several therapeutic properties in folk medicine to treat tuberculosis, bronchitis, pyretic, rheumatoid arthritis, colds, wounds and skin infections, headache, cerebral ischemia and memory disorders, as well as hepatitis. The genus *Salvia* L. consists of about 900 plant species and represents one of the most important and the largest genera of the Lamiaceae family. Iran with 58 species, of which 17 are endemic, is one of the best countries for growing *Salvia* species in the world. The natural populations of this genus i.e. *S. mirzayanii* Rech. f. & Esfand, an endemic species, is distributed throughout the drier parts of subtropical areas, ranging from the Southeast to the Southwest of Iran. This species has been traditionally used as herbal tea for the treatment of digestive and circulation disturbances, bronchitis, cough, asthma, angina, mouth and throat inflammations, depression, excessive sweating and skin ailments. In the present study, variation of the essential oil productivity among six populations of the plants collected from different natural habitats including Fars (Lar) and Hormozgan provinces (Tang-e-Zagh, Sarchahan, Dagh-e-Fino, Bastak and Sirmand) was investigated. The aerial parts collected at the flowering stage from 6 natural habitats during winter and spring of 2018. They were dried at room temperature and stored inside paper bags in a dark place until analysis. The essential oils of air-dried samples (100 g) were extracted by hydro-distillation for 3 h for each sample, using a Clevenger-type apparatus according to the method recommended in the British Pharmacopoeia. The essential oil yields were measured on the basis of the volume of dried essential oil/primary dried material weight $\times 100$ for each sample. The essential oil yields ranged from 1.2 to 3.2% (w/w). The maximum essential oil yield belonged to Lar ecotype (3.2% w/w) and three ecotypes, Sirmand (1.2% w/w), Sarchahan (1.2% w/w) and Bastak (1.2% w/w), possessed the minimum essential oil yields. Differences among these populations may be from different climates in their habitats and adaptation of them to their different environmental factors.

Keywords: *Salvia mirzayanii*, Essential oil, Productivity, Natural habitat

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Chemical Composition, Cytotoxicity and Antioxidant Activities of the Essential Oil from the Leaves of *Citrus aurantium* L.

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The species of the genus *Citrus* (Rutaceae) have been widely used in traditional medicine. In this study, the essential oil was extracted from the leaves of *Citrus aurantium* and its cytotoxicity effect on six tumor cell lines and a normal cell line was studied. Furthermore, antioxidant potential of the oil was tested by 2, 2-diphenyl-1-picrylhydrazyl (DPPH) assay, hydrogen peroxide scavenging and reducing antioxidant power methods. The composition of the essential oil was also analyzed by GC-MS. Results indicate 41 components that represented 97.81% of the total oil. The major components were limonene, linalool and trans-beta-ocimene. In addition, the essential oil also exhibited strong antioxidant activity. The IC₅₀ of the oil in DPPH assay, H₂O₂ scavenging and reducing antioxidant power were 1040 \pm 0.9, 140 \pm 1.5 and 1580 \pm 1.03 μ g/ml, respectively. The essential oil also had marked cytotoxicity against the all tumor cell lines, with the highest activity on Jurkat and HL60.

Keywords: *Citrus aurantium*, Essential oil, Chemical composition, Cytotoxicity

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Impact of Salt Stress on Contents of Rosmarinic Acid, Total Phenolics and Total Flavonoids and Antioxidant Activity in Leaves of *Dracocephalum kotschyi* Boiss.

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Dracocephalum kotschyi Boiss. (Lamiaceae) is an aromatic and perennial herb endemic to Iran with interesting pharmacological and biological properties. In order to evaluate the effects of various concentration of salinity (0, 2.5, 5, 7.5, 10 and 15 dS/m) on *D. kotschyi*, a pot experiment based on randomized complete block design with 3 replications was conducted in greenhouse. Salt treatments were started when the plants were 40 d old and salinity was applied for three weeks. In this study, the effects of various concentrations of salt on total phenolics, total flavonoids and rosmarinic acid contents and antioxidant activity of aerial parts of *D. kotschyi* was studied. Total phenolics contents of different extracts were determined by Folin-Ciocalteu method and the aluminum chloride method was used to measure of total flavonoids. The antioxidant activity of methanol extract was evaluated by 1, 1-diphenyl-2-picrylhydrazyl (DPPH), free radical scavenging method. The results of this study showed that salinity stress had significant effect on total phenolics, total flavonoids and rosmarinic acid content and DPPH activity. The highest content of total phenolics, flavonoids and rosmarinic acid and DPPH activity was observed at 7.5 ds/m. However, further increase of salt concentration to 10 ds/m, decreased the contents of total phenolics, total flavonoids and rosmarinic acid and DPPH activity. The lowest DPPH activity was observed in salt concentration of 10 ds/m. Also the results showed that at 15 dS/m salinity, plants died after 3 weeks after application of NaCl.

Keywords: Phenol, Flavonoids, Rosmarinic acid, Antioxidant, DPPH

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Effect of Salinity Stress on Growth and Photosynthesis of *Dracocephalum kotschyi* Boiss.

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Dracocephalum kotschyi Boiss. is a medicinal plant belonging to Lamiaceae family. In order to evaluate the effects of various concentration of salinity (0, 2.5, 5, 7.5, 10 and 15 dS/m) on *D. kotschyi*, a pot experiment with randomized complete block design with 3 replications was conducted in greenhouse. Salt treatments were started when the plants were 40 d old and salinity was applied for three weeks. In this study, the effects of various concentrations of salt on plant growth, chlorophyll (Chl) and carotenoid (Car) contents, total leaf area, stomatal conductance, Chl fluorescence parameters, including maximum (F_m) and minimum (F₀) fluorescence along with the maximum efficiency of photosystem (PS) II (F_v/F_m) of *D. kotschyi* were studied. The results showed that salt stress induced the decreases in plant fresh and dry mass, plant height, Chl *a*, Chl *b*, total Chl, and Car contents, total leaf area, stomatal conductance and maximum quantum efficiency of photosystem II. Also the results showed that in 15 dS/m salinity, plants died at 3 weeks after application of NaCl.

Keywords: Salinity, Plant Growth, Photosynthesis

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Effect of Acetosyringone Concentration on Hairy Root Induction in *Perovskia Abrotanoides* Karel.

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Hairy roots have several features, including their fast growth in hormone free media and capacity to synthesize bioactive chemical compounds. As, concentration of acetosyringone in co-culture media has a major role in hairy root induction, the main purpose of this study was to investigate the effect of this phenolic compound on hairy root induction in *Perovskia abrotanoides* Karel. Mmature seeds were cultured on hormone-free MS medium with 30 g/L sucrose and 6.5 g/L agar and kept in the culture room at 25±1°C under cool white fluorescent light at 40 µmol/ m²s under 16/8 h light/dark photoperiods. Three *Agrobacterium rhizogenes* strains (A4, A7, and ATCC15834) were used to infect the wounded nodes of one-month plantlets of *P. arbotanoides*. Infected plantlets were cultured with different concentrations (0, 100, 150, 200 µM) of acetosyringone. After 2 days, the explants were transferred to a fresh MS medium containing 400 mg/L cefotaxime and the percentages of hairy root formation were reported after 20 days of cultivation. Transgenic identity of hairy roots was confirmed by PCR using *rolC* specific primers. According to the results, all of the three types of *A. rhizogenes* strains could induce hairy roots on the nodes and their Ri plasmids were integrated into the genome of host cells. Also, the effects of acetosyringone concentration on hairy root induction, *A. rhizogenes* strain and their interaction were significant ($p<0.05$). The highest percentage (81.22%) of hairy root induction was obtained with the ATCC15834 strain at 150µM concentration of acetosyringone. With the application of acetosyringone at this concentration, a drastic increase (28.46%) was achieved in hairy root induction efficiency, as compared to the control. Further increase in the concentration of acetosyringone reduced the frequency of hairy root induction. In conclusion, the results suggest that acetosyringone as a phenol secreted by wounded plant tissues, influences on hairy root induction and transformation rate of the infected explants in *P. arbotanoides*.

Keywords: *Perovskia abrotanoides* Karel., *Agrobacterium rhizogenese*

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Studying the Physiological Effects of some Growth Promoting on Micropropagation Factors of *Rubus Loganobaccus*

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The *Rubus loganobaccus* variety is a hybrid produced by *Rubus idaeus* and *Rubus ursinus*. The Rosaceae genus in Iran has 8 herbaceous and shrub often acanaceous species common known as raspberries and often it is growing in the forest and non-forest shaded areas. The fruits of this plant in European regions are known as health snacks. [1] Its fruit is red and contains vitamins, fibers and antioxidant compounds and antimicrobial agents. Species of Raspberry in Iran are *R. raddeanus*, *R. ochthodes*, *R. hyrcanus*, and *R. persicus* which in addition to Iran also grow in Russia, Talesh and the Caucasus [2]. Micropropagation is the best way to propagate some plants. In this method, apical or axillary buds are cultivated in a suitable culture medium Plant buds were placed into plates containing disinfection Liquid. 6 treatments were provided for rooting. After the rooting stage and the time required for plant growth, they were transferred to soil-containing pots in the greenhouse. The highest rooting percentage (96.66) and the lowest rooting percentage (60) were observed. The maximum average roots length was (2-3 cm) and the minimum average root length was (1 cm).). In the acclimatization stage of the plant root, the maximum percentage of survived and fresh pots (96/43) were observed. Various factors can influence the response of explants culture including: the maternal genotypes, its growth conditions, and the time of choice of the explants, the culture medium and culture conditions.

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Evaluation Effects of *Allium noeanum* Reut Powder on some Parameters of Blood and Growth Factors of Common Carp

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The use of fish immune stimulant in aquaculture is common. On the other hand, the use of medicinal herbs stimulating the growth and immune system in traditional medicine has clinical significance. The aim of this study was to investigate the effects of allium noeanum reut powder on growth and blood indices of common carp for 8 weeks [1]. A diet containing allium noeanum reut powder in concentrations of 100 and 50 mg / kg of food, In 3 groups 50 pieces of common carp were weighed $10 \pm 2 \text{ g} / \text{m}^2$ (treatment and control). After a specified period, hematological parameters (RBC, white, hemoglobin, hematocrit, MCHC, MCH, and growth parameters (weight gain and survival) were evaluated [2]. The results showed that the diet of powdered plant had a positive and significant effect on growth parameters ($P < 0.05$). However, there was no significant effect on hematocrit, hemoglobin and red blood cells, white MCHC, MCH. Conclusion: Fish fed with Powdered Powder had survival and weight gain more than that of the control group ($P < 0.05$).

Keywords: Allium noeanum reut, Blood parameters, Growth index, Common carp

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Evaluation Blood and Survival Parameters to Response Temperature Stress in Rainbow Trout under the Treatment of Hydroalcoholic Extract of *Astragalus verus* Olivier

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The use of medicinal herbs in traditional medicine of growth stimulus and immune system in preventing the occurrence of aquatic diseases is of economic and clinical importance. The aim of this study was to investigate the effect of hydroalcoholic extract of Astragalus Verus Olivier on growth and blood parameters of rainbow trout in response to temperature stress for 6 weeks [1]. A diet containing hydroalcoholic extract of Astragalus viruses Olivier with 200 and 100 mg / kg of food Includes, in 3 groups of 50 pieces (150 Rainbow trout weighing $10 \pm 2 \text{ g} / \text{m}^2$) was considered. At the end of the experiment, each treatment was 60, 40 and 30 minutes, under stress conditions of 22, 24 and 28°C respectively. After a specified period, hematological parameters (hemoglobin, hematocrit, red blood cells and white blood cells) and growth indices including weight gain and survival were evaluated. The results showed that the diet containing the herbal extracts tested against temperature stress had a significant effect on the growth index and loss reduction ($P < 0.05$). Herbal extracts had a significant positive effect on hematocrit, hemoglobin, and red and white blood cell count ($P < 0.05$), but did not have a significant effect on other factors. Temperature stress in fish fed with plant extract was less effective and fish in this group had survival and weight gain more than that of control group ($P < 0.05$).

Keywords: Temperature Stress, Astragalus, Rainbow trout fish

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Evaluation of *Scrophularia striata* Powder on some Blood Parameters and Growth of Rainbow Trout in Terms of Temperature Stress

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Improving fish immunity is one of the methods of disease prevention and growth promotion. Zn is one of the most important nutrients that stimulates the immune system and aquaculture. Also, the use of medicinal herbs stimulating the growth and immune system is of clinical and economic importance. The aim of this study was to investigate the effect of *Scrophularia striata* powder on some blood indices and growth of rainbow trout in conditions of temperature stress for 6 weeks. The supplementation *scrophularia striata* powder in concentrations of 30 and 15 mg / kg of food, Includes 3 groups of 50 pieces (150 Rainbow trout weighing $10 \pm 2 \text{ g} / m^2$) and control was considered. At the end of the experiment, each treatment was 60, 40 and 30 minutes, under stress conditions of 22, 24 and 28 °C respectively. The results showed that diet containing plant powder had a significant effect on growth and mortality rates ($P < 0.05$). Also, in the number of white blood cells, there was a significant positive effect ($P < 0.05$). Although there was no significant effect on hematocrit, hemoglobin and MCHC, MCH. Temperature stress in fishes fed with plant powder was less effective, and fishes of this group had survival and weight gain more than that of control group ($P < 0.05$).

Keywords: *Scrophularia striata*, Temperature stress, Blood parameters, Growth

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Camelina Sativa Lines Response to Water Deficiency Stress under *in vitro* Conditions

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Camelina sativa L. as an oilseed crop is a member of the family of Brassicace has many properties and uses. In nutrition and health, its oil has high levels of omega-3 that prevents cancer and obesity. In the industry as biofuels, the production of resins, waxes and also for the production of sanitary supplies and pharmaceuticals are used [1]. *Camelina sativa* L. is an herb that is best adapted to cool temperature semi-arid climate zones on steppes and it is found in hot regions, and can tolerate water deficiency as a stress in the early growing season [2]. In this experiment, the Soheil cultivar along with the five lines of the plant will be evaluated to assess the response to dehydration through induction of calves. In order to simulate water stress from polyethylene glycol 6000 in four levels, after the growth of the extracts from the cultivation of whole seeds and induction of callus, they are transferred to a medium containing different concentrations of polyethylene glycol and the traits of the callus are measured and the data are Software will be analyzed.

Keywords: Callus, *Camelina Sativa* L., Water deficiency stress

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Ethenobotanical Study of Medicinal Plants In Darbe Anar Region (Kohpayeh) Kerman, Iran Sayed Mohammad Ali Vakili Shahrabaki*

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Iran has a long history in ethno botany and ethno pharmacology [1]. Darbe anar area, is located in the conserved area of kohpayeh of kerman province The endogenous people in. Darbe anar area, are used many plants and natural material for treatment their diseases. Darbeanar area is an Important part of kohpayeh area which there are many plants species in this area which have medicinal uses .the aim of this research was ethno botanical study on medicinal Herbs of Darbe anar area in order to recognize custom, tradition, and application way of plants by the people. in current study [2] plant species were collected at several times .plant identities were confirmed by botanist and references .and analyze was made of the species used in total, 81 medicinal plant species collected and identified in darbeanar area Results indicated some of medicinal plants are used commonly by the indigenous people many of medicinal plants are used for eliminating different pains. Generally, some of uses were found to be new when compared with published literature on ethno medicine of Iran.

Keywords: Ethenobotany, Darbeanar, Kerman Medicinal plants

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Determination of Mineral and Trace Element Concentrations in the Soil of Natural Habitats of *Salvia mirzayanii* by ICP-OES

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Iran is rich in terms of *Salvia* (Lamiaceae) diversity and is home to 58 species of which 17 are endemic. *Salvia* species are those plants that are as economically important as they are medically. One of the *Salvia*'s endemic species is *S. mirzayanii* Rech. f. and Esfand which is distributed throughout the drier parts of subtropical areas, ranging from the Southeast to the Southwest of Iran. This species has been traditionally used as herbal tea for the treatment of digestive and circulation disturbances, bronchitis, cough, asthma, angina, mouth and throat inflammations, depression, excessive sweating and skin ailments. The current study was conducted in a completely randomized design with three replications in five habitats of Hormozgan province, including Tang-e-Zagh, Sarchahan, Dagh-e-Fino, Bastak and Sirmand, to investigate mineral and trace element concentrations in the soil of *S. mirzayanii* and also for comparing the accumulation of heavy metals in some natural habitats of the province. The soil mineral elements of different natural habitats of this medicinal plant including micronutrients and a number of essential and high-consumption elements such as iron, zinc, manganese, molybdenum, copper, magnesium, calcium, potassium, phosphorus and a number of metals such as chromium, cobalt, sodium, dysprosium, erbium, europium, uranium, gallium, gadolinium, hafnium, holmium, lanthanum, lithium, lead, barium, beryllium, cerium, lutetium, manganese, aluminum, niobium, neodymium, prosteodium, rubidium, scandium, strontium, tantalum, nickel, cesium, cadmium, terbium, tellurium, mercury, thorium, titanium, thulium, tungsten, zirconium, cobalt, plumbum, arsenic, palladium, radium, vanadium, totally 53 elements, were measured by using an inductively coupled plasma measuring apparatus (ICP-OES). The results of analysis of variance demonstrated a significant difference among habitats for all elements except arsenic, cadmium, radium, palladium and mercury ($P < 0.01$). Also, the results indicated that the minimum and maximum essential and high-consumption elements in soil of the five natural habitats of *S. mirzayanii* were determined as following: iron (0.72 – 3.36 ppm), zinc (23.64 – 72.28 ppm), manganese (64.37–712.36 ppm), molybdenum (0.48 – 2.50 ppm), copper (0.001 – 0.002 ppm), magnesium (1.14 – 5.29 ppm), calcium (16.89 – 37.98 ppm), potassium (0.16 – 1.94 ppm), phosphorus (0.01 – 0.06 ppm). ICP-OES technology, there are a lot of merits of time-saving, saving efforts, reducing environmental pollution, fast and accurate determination result in determining major and trace elements.

Keywords: *Salvia mirzayanii*, ICP-OES, Soil analysis, Hormozgan province

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Evaluation of Antioxidant Activity and Total Phenolic Compounds of *Allium hirtifolium* Boiss Cultivated in Comparison to Its Wild Population

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Allium genus or Alliaceae consists of about 120 species, of which more than 30, including moosir (*Allium hirtifolium*), are exclusively native to Iran. Antioxidant compounds are considered as exerting oxidative damage-lowering and inhibiting properties, through which they contribute significantly to lowering free radicals. Given that natural antioxidants mainly found in medicinal plants, fruits, and vegetables are largely welcome by consumers. Then use of the plants rich in antioxidant compounds could protect the body's cells against oxidative damage. This study was conducted to investigate and compare the phytochemical characteristics of leaves and bulbs of cultivated and wild *Allium hirtifolium* Boiss [1, 2]. In this study, the plants were extracted by maceration, and the amounts of Flavonoids, Flavonols and Total phenolic compounds were measured by Folin-Ciocalteu reagent and aluminum chloride. Then the antioxidant activity was determined and compared with that of butylated hydroxytoluene (BHT) Data analysis was done by one-way ANOVA and Pearson's correlation coefficient. ANOVA and comparison of means among different treatments indicated a significant difference in antioxidant property between leaves and bulb of *A. hirtifolium* ($P < 0.01$) so that the highest antioxidant activity (the lowest IC_{50}) was seen in *A. hirtifolium* leaves and the lower antioxidant activity was seen in *A. hirtifolium* bulb. different treatments indicated a significant difference among different organs of wild and cultivated *A. hirtifolium*, and the optimal phenolic and flavonoid compounds were obtained for cultivated *A. hirtifolium* bulb indicates a significant difference in flavonol rate among different organs of *A. hirtifolium* ($P < 0.05$).

Keywords: *Allium hirtifolium*, Antioxidant activity, Total Phenolic compounds, Cultivated

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Effect of Different Culture Media and Different Concentrations of Indole Butyric Acid (IBA) and Naphthalene Acetic Acid (NAA) on Rooting of Cuttings of *Rosa damascena*

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Rosa damascena is one of the most popular medicinal plants in the world that is grown around the world as a medicinal or ornamental plant. This experiment was carried out in a field experiment in khoy city, in order to effect of different culture and different concentrations of Indole Butyric Acid (IBA) and Naphthalene Acetic Acid (NAA) on rooting of cuttings of *R. damascena*. The experiment was based on randomized complete block design with 40 treatments and 3 replications with 360 cutting. The factors consisted of 6 levels of Indole Butyric Acid (IBA) (0, 1000, 2000, 3000, 4000, 5000 mg/l) and 6 levels Naphthalene Acetic Acid (NAA) (0, 1000, 2000, 3000, 4000, 5000 mg/l) and 4 culture media such as sand, perlite, cocopeat and rice bran. Statistical analysis of data with SAS software was done using GLM generalized linear method and comparison of meanings with minimum difference of 5% probability level. The results of analysis of variance showed that the treatment of indole butyric acid (IBA) had a significant effect on rooting percentage, but other treatments did not have a significant effect on rooting percent. The effects of treatment on the number of root roots were significant at 1% level, but not significant for the interaction effects of naphthalene acetic acid (NAA) and culture media. Indole Butyric Acid (IBA) and Naphthalene Acetic Acid (NAA) treatments, culture media and double and triple effects of treatments on the number of secondary roots were significant at 1% probability level. There was a significant difference in root diameter between treatments and the effect of treatments on root diameter was significant at 1% probability level. The results showed that the highest percentage of rooting of cuttings was obtained in treatment of 5000 mg / l of indolebuteric acid (IBA) with a mean of 65.79% and the lowest with mean of 22.55% in control treatment, While the effects of naphthalene acetic acid treatment (NAA) and different culture media were not significant on rooting percentage. The double interaction effects of naphthalenic acid treatment (NAA) and culture media were not significant on root traits. The highest secondary root number in cuttings and root diameter in the perlite and 1000 mg/l concentrations of NAA and 5000 mg/l IBA, and the lowest number of roots and root diameter was related to the sand culture bed without application of the auxin hormone.

Keywords: Rooting media, Indole Butyric Acid, Naphthalene acetic acid, Damask rose

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The Effect of Biofertilizer and Magnesium Sulfate on the Components of Essential Oil of *Dracocephalum moldavica*

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This research in order to study the effects of the effect of biofertilizer and magnesium sulfate on the components of essential oil of *Dracocephalum moldavica*, was performed. The experiment was based on randomized complete block design with 6 treatments and 3 replications. The factors consisted of 2 levels of inoculation with fertilizer barvar 2 and non-inoculation) and 3 levels spraying of magnesium sulfate (0, 2 and 4 g). The traits were plant height, number of stems, stem diameter, dry weight, yield, essential oil percentage and essential oil yield. The results of analysis of variance showed that the highest shoot yield was obtained by inoculation with barvar 2 and magnesium sulfate 4 g/lit with an average 6447 kg/ha and the lowest aerial yield without inoculation with barvar 2 and control treatment with a mean was 2318 kg/ha. The results showed that the highest essential oil yield was obtained by inoculation with barvar 2 with a mean of 6.780 kg/ha and the lowest essential oil yield was obtained with a mean of 972.3 for control treatment. There was a significant correlation between aerial yield and essential oil yield. In general, the results of this experiment showed that in order to produce more essential oil and to have more dry yield, it seems appropriate to inoculate with barvar 2 fertilizer and magnesium sulfate [1,2].

Keywords: Barvar 2; *Dracocephalum moldavica*; Mg; spray

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The Effect of Biofertilizer and Magnesium Sulfate on the Components of Essential Oil of *Satureja hortensis* L.

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This experiment was carried out in a field experiment in the bakhchejik, Salmas city, in order to effect the biofertilizer of phosphorus barvar 2 and magnesium sulfate on the amount and components of essential oil of *Satureja hortensis* L. The experiment was based on randomized complete block design with 6 treatments and 3 replications. The factors consisted of 2 levels of inoculation with fertilizer barvar 2 and non-inoculation) and 3 levels spraying of magnesium sulfate (0, 2 and 4 g). The traits were plant height, number of stems, stem diameter, dry weight, yield, essential oil percentage and essential oil yield. The results of analysis of variance showed that the fertilizer barvar 2 had a significant effect on all morphological and morphological traits in 1% level. Magnesium sulfate had a significant effect on all traits except stem diameter at 1% level and only significant effect on dry weight trait at 5% level. Also, the interaction of fertilizer barvar 2 and magnesium sulfate on the traits of dry matter, fresh weight, height, percentage and yield of essential oil had a significant effect and the traits of number of stems and stem diameter were not affected and not significant. Comparison of the means showed that the highest yield was obtained by inoculation with fertilizer barvar 2 and 4 g magnesium sulfate, with a mean of 80/50 kg ha⁻¹, and the lowest yield in non-fertilized treatment with fertilizer barvar 2 and the non-application of magnesium sulfate with a mean of 23 kg ha⁻¹ was obtained. The results showed that the highest percentage of essential oil was obtained by inoculation with barvar 2 and 4 g magnesium sulfate with an average of 1.02 kg ha⁻¹ and the lowest percentage of essential oil without Fertilizer barvar 2 and non-application of magnesium sulfate with the average was 46.4 kg ha⁻¹. There was a significant correlation between essential oil yield and plant height and number of stems. In general, the results of this experiment showed that in order to produce more essential oil and to have more dry yield, it seems appropriate to inoculate with barvar 2 and magnesium sulfate [1,2].

Keywords: Bio-fertilizer, Barvar 2, Magnesium Sulphate, (*Satureja hortensis* L.)

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***In vitro* Shoot Multiplication of *Haplophyllum virgatum* var. *Virgatum* Axillary Bud Explants**

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Plants belong to the genus *Haplophyllum* A. Juss. (Rutaceae), with 70 species, exist in warm, temperate and subtropical zones of earth including Eurasia and the tropical zone of northeast Africa. So far, the phytochemistry and medicinal properties of some of these species have been examined by analysing the contents of their essential oils, alkaloids, lignanes, glycosides and flavonoids, etc. [1]. For plant *in vitro* propagation, shoot multiplication through axillary bud culture would be the most suitable choice for obtaining vigorous shoots. *Haplophyllum virgatum* var. *virgatum* is one of the endemic varieties of the species which have limited to Geno region-Hormozgan province-Iran, so likely can categorized as an endangered species, its micropropagation has not yet been studied. Here, the effects of different concentrations of BAP (6-Benzylaminopurine), a plant cytokinin, employed *in vitro* on axillary bud explants for shoot multiplication. The seeds were surface sterilized and cultured on B5 medium for explants preparation. Axillary bud explants obtained from weakly produced plantlets and were cultured in MS medium supplemented with BAP in total concentrations of 0.25, 0.5 and 0.75 mg/L, and incubated in a growth chamber with 25 °C temperature, 16 h photoperiod and a photon flux density of 400 $\mu\text{mol m}^{-2} \text{S}^{-1}$. The most shoot multiplication observed in 0.75 mg/L BAP. The study on more BAP concentrations and the other kinds of plant kinetins are continued in our Lab.

Keywords: Axillary bud culture, *Haplophyllum virgatum*, Micropropagation, Shoot

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An Investigation of the Flora of Faryab Region of Kahnug City in Kerman Province

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In this study, the flora of the Faryab region, in 76 Km of the Kahnug city in South of Kerman province investigated. This region is a mountainous area with some small plains and short hills that cover a surface of ca. 16000 hectares. The annual precipitation in the region is about 180mm and its elevation varies from 636 to 1196 meter above of the sea level (mean is 916 m). The results showed that there were 186 plant species belonging to 135 genera and 43 families of higher vascular plants (40 families were dicotyledones, 3 families were monocotyledons, The family Asteraceae with 25 genera and 31 species was the largest family and the genus *Astragalus* (Fabaceae) with 6 species was the largest genus in the region, respectively. The genera *Tamarix* with 5 species, *Convolvulus* and *Nepeta* each with 5 species, and *Echinops*, *Eragrostis* and *Salvia* each with 3 species are the other large genera in the flora of Faryab region. {2} Survey of the life form of the plants showed that 12/22% of the species were phanerophytes, 16/84% were chamaephytes, 30/64% were hemicryptophytes, 8/06% were geophytes and 32/24% were therophytes. The dominance of hemicryptophytes and therophytes (totally 62/88,) indicates the severe conditions of the area which is characteristics of the mountainous regions. Phytogeographically, 41/4% of the species belonged to the Irano-Turanian region, 15/62% were Sahra Sandy and 34/4% belonged to the Irano-Turanian and Sahra Sandy regions. and 8/58% belonged to the other regions. Also, 18 species were endemic for the flora of Iran, and, 9 species were rare.

Keywords: Flora, Faryab, Kerman, Life forms

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Evaluation of Hepatoprotective Effects of Hydroalcoholic Extract of *Rosmarinus officinalis* and E Vitamin on Carbon Tetrachloride-Induced Hepatotoxicity in Rats

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Production of reactive oxygen species (ROS) and induction of oxidative stress are the main mechanisms of xenobiotics-induced liver injury. In this study, the effect of hydro-alcoholic extract *Rosmarinus officinalis* on hepatic enzymes and oxidative activities in carbon tetrachloride (CCl₄) induced liver toxicity in male rats was investigated. For doing research, 56 male Wistar-albino rats (200-250 g) were divided into eight experimental groups; Group I was treated with distilled water via gavage daily, followed by Normal saline 0.9%, 1ml/kg B.W, intraperitoneal injection (i.p) on day 16. Group II received distilled water via gavage daily, followed by olive oil, i.p on day 16. Group III treated with distilled water via gavage daily, followed by single dose of CCl₄ with olive oil 50%, i.p on day 16. Group IV and V received extract at doses of 100 and 200 mg/kg via gavage daily, Group VI received E vitamin at dose of 200 mg/kg BW, Group VII E vitamin at dose of 200 mg/kg BW and extract at dose of 100 mg/kg BW and Group VIII received vitamin E at dose of 200 mg/kg BW and extract at dose of 200 mg/kg BW followed by single dose of CCl₄ with olive oil 50%, i.p on day 16. Then serum levels of biochemical liver parameters such as, aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP), total protein (TP) and total bilirubin (TB) and serum level of oxidative enzymes, superoxide dismutase (SOD), glutathione peroxidase (GPX) and catalase (CAT) were performed. The results of our research showed that CCl₄ in hepatotoxic group caused a significant increase in the serum levels of AST, ALT, ALP and TB as well as decreased TP, SOD, GPX and CAT serum levels (p<0.05). Treatment with the extract at dose 200 mg/kg/d along with E vitamin significantly normalized the CCl₄-elevated serum levels of ALT, AST and ALP (p<0.001). The extract (200mg/kg) along with E vitamin also increased levels of SOD and GPX (p<0.05). Results of present study indicated that the extract along with E vitamin had hepatoprotective and antioxidant activities that could reduce the toxic effects of carbon tetrachloride in the liver.

Keywords: *Rosmarinus officinalis*, Extract, Tetrachloride, Hepatotoxicity

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The Optimization of *in vitro* Germination of *Smirnovia iranica*

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Smirnovia iranica of *Fabaceae* family is considered a valuable shrub species as being indigenous and adapted to the sandy lands of the Iranian central regions. This plant has gained its significance due to the capacity of forage production, soil protection, creating beautiful land landscape scenery and as well as its great medicinal values. Considering the fact that seed germination of this plant due to its hard and solid seed coat cannot easily happen in a natural way, in this study, we intended to implement for the first time, the method of tissue culturing in order to surmount the obstacles laid ahead of *Smirnovia iranica* seeds germination. To do so, 3 types of explants (scratched seed, unscratched seed and seed embryo) were placed in two culture media (MS, MS with free amino acids complex) exposed to 2 photoperiod treatments (16 hours of lightness and 8 hours of darkness as well as absolute darkness). In this study, a factorial statistic format designed upon complete random plots with 3 replications was implemented. The results collected indicated that the investigated treatment conducted over *in vitro* germination plates (the percentage of germination and the length of stem) were satisfactory significant. Therefore, it was clearly evident that the plantation of seed embryo in MS culture media along with free amino acids complex in the photo period of (16 hours lightness and 8 hours darkness) could be considered as the best *in vitro* germination method to be employed for the seeds of this very valuable plant. Having said that, we may suggest the potentiality of *in vitro* culturing can be an appropriate practice in order to accelerate the production of seed bases of this shrub species.

Keywords: Tissue culture, *In vitro* germination, Seed embryo, *Smirnovia iranica*



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Response of Germination and Seedling Growth of *Ferula assa-foetida* to Salinity and Drought Stress

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Seed germination is first critical and the most sensitive step in the life cycle of plants [1]. Germination of medicinal plant has an important role in its establishment in an agricultural and seed germination and seedling establishment are critical and important stages in plant life cycle caused by environmental factors. In order to study the effects of salt and drought stress on germination characteristics and early seedling growth of *Ferula assa-foetida* two completely randomized designs with 4 replications were conducted in Karaj in 2018. Treatments were salt and drought stress at six levels (zero, -2, -4, -6, -8 and -10 bar). Characteristic germinations and seedling length were measured after 14th day of germination in all the germinated seedlings. The percentage of germination in different concentrations of drought and salinity was studied using a three-parameter sigmoid model. Maximum reduction was noted at highest NaCl concentration and PEG 6000 (-10 Bar). With the increasing intensity of drought and salinity from 0 to -10 Bar *F. assa-foetida* germination percentage of 93.87 and 95.91 percent respectively compared to control was reduced. Germination speed is one of the indicators for assessing drought tolerance, plants with high germination rate under stress conditions have a higher opportunity of emergence. Results showed that seedling growth parameters were reduced due to NaCl and PEG induced osmotic stress. Redicle and plumule length *F. assa-foetida* in both conditions of drought and salinity stresses decreased with increasing potential, so that the *F. assa-foetida* Redicle and plumule length decreased from 0 to -10 Bar, 100.00 percent. Fitting of three-parameter logistic model, provided a successful estimation of the relationship between salt and drought stress levels and germination percentage of *F. assa-foetida*. This model showed that salinity and drought stress at -3.63 and -5.85 bar, respectively caused 50% reduction in maximum germination percentage of *F. assa-foetida*. This research revealed that *F. assa-foetida* differed significantly in its response to salt and drought stress. *F. assa-foetida* is more sensitive to salinity stress at germination stage. However, at early growth stage both salt induced osmotic stress and Na toxicity reduced growth.

Keywords: Germination, Osmotic potential, Medicinal plant, Seedling

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Comparison of Antimicrobial Activities of Essential Oil of *Thymus vulgaris* from two Iranian Localities (Gazvin and Central Provinces)

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It has been demonstrated that the content of essential oil of medicinal plants and their biological activities may change based on the differences in cultivation, origin, vegetative stage and growing seasons of the plants. This study was conceived to evaluate the difference in the Antimicrobial Activities of *Thymus vulgaris* from two ecotypes (Gazvin and Central provinces). The antibacterial activity against 5 human pathogenic microorganisms was determined by disk diffusion method and minimal inhibition concentration (MIC) values were estimated according to the micro dilution method and compared with Ciprofloxacin and Ceftriaxone antibiotics. The experiment was conducted in a factorial based on randomized complete block design with two main factor including microorganisms (five levels) and essential oil concentration (three levels) with four replication. The statistical analysis showed the significant effect ($p < 0.01$) of microorganisms, essential oil concentration and their interaction on antimicrobial activity in both locations. Mean comparison of inhibition zone indicated *Pseudomonas aeruginosa* and *Candida albicans* as the most and least resistant bacteria in both locations, respectively. Essential oil which diluted 1:5 had the highest activity even more than Ceftriaxone antibiotics. The interaction effect between microorganisms and essential oil concentration in both locations made the most sensitive be *Candida albicans* which treated with 1:5 concentration of essential oils. According to MIC results, there is less concentration of essential oil collected from Gazvin to inhibit *Escherichia coli*, *Candida albicans* and *Staphylococcus aureus* in compared to essential oil collected from Central province. But more concentration of essential oil collected from Gazvin to inhibit growth of *Pseudomonas aeruginosa* and *Bacillus subtilis* essential oil collected from Central provinces. In conclusion, the study revealed significant antimicrobial activity of *Thymus vulgaris* essential oils. Indeed, the agar diffusion method indicated a strong activity of *Thymus vulgaris* essential oils against pathogenic microorganisms. These data suggest that *T. vulgaris* collected from different location may be used as a source antimicrobial agents against different microorganisms.

Keywords: Antimicrobial, Essential oil, Locality, *Thymus vulgaris*

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The Effect of Plant Growth Regulators and Elicitors on Callogenesis and Taxol Production of *Taxus baccata* L.-an Important Medicinal Plant

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Taxol as a highly effective anticancer drug is mainly extracted from the bark and needles of *Taxus baccata* which is a longed-lived tree species from Taxaceae family. Because of increasing demand for this specific secondary metabolite (taxol) and regarding limited resources of this medicinal plant, biotechnological approaches specially callus suspension culture can be promising solution method. At the present study, the effect of different combinations and concentrations of plant growth regulators on callogenesis and at the next step, the effect of different kinds and concentrations of elicitors on taxol production from cell suspension culture were investigated. The results indicated that MS medium supplemented with 2, 4-D at 2 mg^l⁻¹ and NAA at 1mg^l⁻¹ proved to be the best treatment in terms of callus induction (100%), fresh weight (495mg) and dry weight (272mg) of calli. Also, HPLC analysis confirmed the maximum production of taxol (1.96 mg/g) in MS medium having 2 ml/l amino acids complex with 10 mg/l chitosan.

Keywords: *Taxus baccata*, Callus induction, Taxol, Plant growth regulators, Chitosan

Study of Germination Characteristics and Determination Cardinal Temperature of *Momordica charantina*

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Seed germination is one of the most important stages that ensure seedling establishment along with a prosperous growth. The temperature has a significant effect on the germination characteristics and the most critical agent determining the establishment of the plant. The base, lower optimum, upper optimum and ceiling temperature are called cardinal temperatures. In order to study the evaluated the cardinal temperatures of *Momordica charantina*, under growth chamber condition was carried. Experiment was conducted based on completely randomized design with six replications. Treatment was constant temperature (10, 15, 20, 25, 30, 35 and 40°C). The experimental unit consisted of 25 seeds in diameter Petri dish. The number of germinated seeds were recorded daily and seed with a 1 mm root was considered as a germinated seed. At the end of experiment, rate of germination and germination percentage, and cardinal temperatures of *M.charantina* were measured. Cardinal temperatures of seed germination were estimated by using three regression models including dent-like, segmented and beta models. Significant difference in seed germination was observed in response to various temperatures in *M.charantina*. No seed germination was observed at 10°C. at the temperature 25 °C about 85% seed germination was observed and increasing temperature, rate in germination and germination percentage reduced. In 40° C germination stopped. The dent-like, segmented and beta models were used to describe the germination responses of the *M.charantina* to different temperatures. According to the value of RMSE, and R². The regression coefficient values for beta models (0.86), segment (0.95) and dent-like (0.93) were observed. According to the value of RMSE and R² in segmented model, this model was more suitable for rate of *M.charantina* seed germination than temperature. Based on this model, base, optimum and maximum temperature were 15.59, 26.03 and 40.76°C respectively. According to the results of this experiment, the optimum temperature for germination seeds of is 26.03° C, and the maximum rate of germination that plays an important role in germination of seeds is obtained at this temperature.

Keywords: Cardinal Temperature, Germination rate, Beta model, Segmented model

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Genetic Diversity of *Lactuca undulata* Population by Using ISSR Molecular Markers

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Lactuca undulata is a medicinal plant belongs to Asteraceae family [1]. Cichoric acid is the most prominent component of *Lactuca undulata* which is important in dietary and medical industry. The goal of current research was to investigate genetic variation between different populations of this plant. For this purpose, plants were collected from Mirzabiloo (M) in north Khorasan and Firoozkooh (F) regions. Then DNA was extracted by Gross et al method. The extracted DNA was then amplified by using PCR. Primers used in this experiment were ISSR6 (5'-ACACACACACACACG-3') and ISSR7 (5'-TCTCTCTCTCTCTT-3'). PCR products were run on electrophoresis gel to isolate obtained bands. The presence or absence of PCR bands in each population were recorded as 0 and 1 in Excel software. Genetic variation percent and PCOA was analyzed by GenAIEx 6.51b2 software. The current data revealed that there is high percentage of genetic variation between two studied populations (F and M). The results of analysis variance showed that the variation within the populations of *L. undulata* (86%) is greater than the diversity among populations (14%). The molecular documents (based on ISSR experiment) divided F and M into two distinct groups. On the other hand, PCOA analysis showed that there is significant genetic variation among F and M populations and we can classify them into two distinct groups. But some individuals of F population can be classified into M population.

Keywords: *Lactuca undulata*, ISSR Markers, Genetic Diversity

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Effect of Kadilay Cream on Anti-Aging, Antioxidant, Anti-Wrinkle Agent and UV Radiation-Induced Inflammation in Human Skin

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Skin Wrinkles occur due to the various reasons, predominantly to the skin malfunction resulted from aging. Other factors including skin dryness, ultraviolet radiation, and allergy (e.g. atopic dermatitis) decrease collagen and elastin fibers resulting in wrinkles. Oxidative stress, known as a source of reactive oxygen species, plays a crucial role in the aging process such as wrinkle formation. Societies throughout history have employed different forms of cosmetics and toiletries to improve appearance, scent and health. In this study, first we prepared a new-formulated ointment named Kadilay Cream (KC). KC comprises of honey, royal jelly, olive oil, and propolis extract. Promoting of the skin healing, KC reduces and even eliminates the skin wrinkle. KC as a barrier cream diminishes or even disappears the wrinkling response by keeping stimulant out of the action site in dermis. Sunscreen application, generally used for skin protection against the adverse effects of UV radiation, results in inflammation, oxidative stress, and DNA damage. Olive oil has a protective impact on the different disorders associated with aging. Olive oil, honey, and propolis have strong antioxidant properties. Olive oil also enhances beneficial effect of KC such as anti-aging, anti-cancer, and anti-wrinkle characteristics. Although many cosmetics formulations have claimed to contain collagen, honey and propolis will actually help the skin with generating more natural collagen. According to these results, we conclude that the positive effects of KC on wrinkle elimination of human skin might be related to its anti-inflammatory, anti-oxidant and anti-wrinkle agent.

Keywords: Wrinkles, Collagen, Honey, Olive oil, Propolis

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Evaluation of Effect of Sesame Butter (Ardeh) and Honey on Blood Glucose and Lipid Profile of Streptozocin- Induced Diabetic Rats

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Despite the availability of a large number of antidiabetic drugs, diabetes mellitus remains a burden worldwide. Studies have shown that nutritional therapy plays a pivotal role in the controlling and postponing the complication of this disease. Sesame butter (ardeh) contains substantial quantities of polyunsaturated fatty acids, monounsaturated fatty acids, and vitamin E and various lignans including sesamin, sesamol, episesamin, and sesamol. The aim of this study was to evaluate the combination of Ardeh and honey on blood glucose and lipid profile of streptozocin- induced diabetic mice and to compare with metformin. This experimental study was conducted on 40 male rats with 6- 8 weeks of age and 200± 20 gm weight. Rats were kept in the standard cage at 22±3°C with 55% humidity and 12 hour light/dark cycle. They were supplied with standard diet. Diabetes was induced by injection of 55 mg/Kg of streptozocin. They were divided into five groups of control, honey (1mg/kg/day), ardeh (25 mg/Kg/ day), metformin (100 mg/Kg/day), and both honey and ardeh. Biochemical analysis of blood glucose, triglyceride, cholesterol, and LDL was performed before and after 6 weeks of treatment. Only rats receiving metformin had a significant decrease in blood glucose and no considerable changes were observed in other groups. Cholesterol in the group receiving honey was higher than the control group (219.17±20.38 vs 180.67±24.10 mg/dl, respectively), while it decreased in the group receiving both ardeh and honey (161.43±15.38 mg/dl). Also, LDL was significantly higher in the honey group (P<0.05) and addition of ardeh could counteract some of the effect of honey. Even though both ardeh and honey were capable of increasing HDL but best results were obtained with the group receiving ardeh only (63.75 ±37.16 mg/dl vs 34.16±16.19 mg/dl in the control group). No significant changes in the triglyceride were observed in either group. Overall, this study showed that honey, ardeh or their combination could not change blood glucose or triglyceride in diabetic rats. However, this study showed that adding ardeh to diet could counteract some undesirable effect of honey on cholesterol and LDL. Further studies are needed to determine the exact effect of this combination.

Keywords: Diabetes, Sesame, Honey, Lipid profile

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Seed Germination of Six *Thymus* Species of *Thymus* in Response to Temperature and Humidity

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Temperature and humidity are two determining factor in species dispersion in geographical areas. Therefore the effect of pre temperature and humidity was studied on seed germination of six *Thymus* species in laboratory condition. Experimental design was a completely randomized with factorial arrangement with three replications. The treatments included 28 temperature levels (The temperature ranges were 12 °C to 98 °C with a temperature of 4 °C between two temperatures), six *thymus* species (*Th. daenensis*, *Th. pubescens*, *Th. Kotschyanus*, *Th. fallax*, *Th. fedtschhenkoi* and *Th. vulgaris*) and drought or humidity conditions. Results showed that temperature and humidity had significant effects on percentage and germination rate of different species. Optimum germination of *thymus* seed occurred at -4, 0 and 4 °C under drought condition before planting. With regard to results, in all temperatures, *Th. daenensis*, was superior compared with other species.

Keywords: *Thymus*, Germination, Temperature, Humidity



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Germination and Initial Growth of 51 *Thymus* Accessions in Iran

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In order to study of genetic variation for seed germination and initial growth among 51 accessions of eight *Thymus* species, a completely randomized design with three replications was conducted. Measured characteristics were: germination percentage, radicle and plumule length of seedlings, mean germination time, germination rate, seedling dry weight, seed vigor index in laboratory and plant dry weight in field. The results showed significant differences between accessions for all traits. The results displayed that radicle and plumule length of seedlings, seedling dry weight and seed vigor index produced from different altitudes seeds, were significantly different, where as these terms were higher in lower elevations. According to results germination percentage was superior in higher elevations. Results showed that 1000 seed weight, germination and initial growth have no effects on plant dry weight in field.

Keywords: *Thymus*, Seed vigor index, Germination

***In Vitro* Release of Cuminum Essential Oil Encapsulated from Nanostructure Lipid Carriers**

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According to progressive trend of herbal application in modern medicine. *Cuminum cyminum* is a herbaceous annual plant belonging to the family Umbelliferae and has been long used commercially as a traditional flavoring in a number of ethnic cuisines and also in food industries. Moreover, cumin oils possess high antifungal and antibacterial activities against various pathogenic population, and hence, has also been used for preserving spicy foods and other food products (1). A number of investigations revealed that some major active components contained in cumin oils e.g., cuminal and cuminic alcohol are of very strong antimicrobial and antioxidative properties. Despite all unique advantage, they are sensitive materials which can easily suffer degradation in the presence of oxygen, light and moderate temperatures. Therefore, the major goals in stabilizing essential oils formulations are (a) to protect them from degradation and (b) to achieve a controlled release. Essential oils exist in liquid form at room temperature; thus, the simplest encapsulation strategy would be emulsifying/dispersing the formulation in an aqueous solution of carrier material (2). Recently, nanoscale materials such as nanostructure lipid carriers have attracted a deal of attention for drugs preservation and controlled release. Owing to benefits of nanostructure lipid carriers increased solubility, enhanced performance and increased stability of its content, the main objective of this study was to design nanostructure lipid carriers containing *Cuminum* essential oils to achieve more efficacy. The produced nanocarriers using a high mechanical shear with sonication method were subjected to size, PDI, Encapsulation efficiency and release analysis. The mean size of nanostructure lipid carriers containing essential oils of *cuminum* was lower than 100 nm and poly dispersity index was lower than 0.3. Encapsulation efficiency was higher than 90 %. Release of nanostructure lipid carriers showed that Higuchi model fit *in vitro* release of *cuminum* essential oil from NLC the best. This finding could be of great significance in medicinal plant remedies in order to achieve improved performance of herbal essential oils at lower concentrations and during longer time frames.

Keywords: *Cuminum* essential oil, Controlled release, Nanostructure lipid carriers

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Autecological and Conservation Studies of *Polygonatum orientale* Desf (Asparagaceae) in Iran

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Flora of Iran comprised of about 2300 taxa of medicinal plant that have been used for treatment a wide range of illness from ancient times. During the last decade, indiscriminate harvesting of medicinal species caused serious damage to the natural population of these species, and some of them are threatened with extinction. Identifying the features habitats of medicinal plants and their environmental factors is a key step to determining the conservation strategies. *Polygonatum orientale* Desf is one of the most important medicinal plants in Iran, which showing a limited range of geographical distribution faced to several threatened factors (e.g. land use change, uncontrolled harvesting and etc.) led to severely decline in its population size and geographical distribution. The autecological study of this taxon was conducted in its natural habitats to priorities for conservation during 2018-2019. Our results showing the *P. orientale* grows in the 250 to 1000 m a.s.l. of the forest and rangelands habitats. Its habitats extended in a mean annual range of 10 to 13 ° C. Besides, the mean annual rainfall of its habitats is 250 to 450 mm. Moreover it grows in acidic soils (pH: 6.5 to 7.5) with clay content The flowering time of this plant is the spring season and the autumn is the season of fruit production. Our results showing that it mainly distributed in northern gradient of Alborz Mountain from Sari to Talesh as the most priority zones for conservation. Therefore, harvesting of this plant at mentioned times causes the seed to not be distributed and the faster extinction of this valuable species. Because of extreme pressures resulted by overharvest as well inappropriate harvesting has been threatened, so quickly management measures are absolutely essential.

Keywords: Autecology, Alborz Mountain, Polygonatum, Conservation strategies, Iran

Evaluation of Antiproliferative Activity of Fractions of the Most Potent *Eryngium billardieri* Extract on Cancerous and Non- Cancerous Cells.

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Apiaceae family as one of the largest family, comprises approximately 450 genera and 3700 species in the worldwide. Some pharmacological activities of this family such as anti-cancer, anti-vitiligo, cardioprotective, etc have been attributed to the presence of important secondary metabolites such as coumarins, flavonoids. *Eryngium billardieri* is one of the apiaceae plant with species through the world. The current study was assigned to evaluate cytotoxic properties of fractions of the most potent extract from the aerial parts of *Eryngium billardieri* (*E. billardieri*). In this study, n-hexane (n-hex), Dichloromethane (DCM) and methanol (MeOH) extracts were prepared by Soxhlet apparatus of the aerial parts. Subsequently n-hex and DCM VLC fractions were subjected to MTT method for evaluating cytotoxic effect on MCF7 (human breast cancer cell line) and B16 (human melanoma cell line) along with non-cancerous cell. Among the all fractions, 80% and 100% VLC fractions of n-hex and DCM extract demonstrated considerable cytotoxic activity against B16 and MCF7 cell lines with the IC₅₀ 148.3(24h) and 48.39(48h), 251.4(24h) and 27.21(48h), 185.5(24h) and 92.94(48h), 203.1(24h) and 107.4(48h), respectively. It is worth to mention that these fractions inhibit the growth of cancerous cells via apoptotic pathway.

Keywords: *Eryngium billardieri*, Apiaceae, Cytotoxic activity, MCF7, B16



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Efficacy of Marshmallow 1% Ointment in the Treatment of Atopic Dermatitis: a Randomized, Pilot, Placebo Controlled Clinical Trial

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Atopic dermatitis (AD) known as atopic eczema is a chronic inflammatory skin disease, primarily affects infants and young children. The common drug used for AD treatment carries the risk of side effects. Then development of a safe therapeutic strategies is need [1]. The objective of this study was to evaluate the efficacy of topical Marshmallow 1% ointment in the treatment of AD. A randomized, pilot, clinical trial, was conducted to investigate the efficacy of marshmallow 1% ointment in 50 children with mild to moderate AD at the Mofid Children Hospital of Shahid Beheshti University of Medical Sciences, Tehran, Iran. The diagnosis of AD was made according to the criteria of Hanifin and Rajka by physicians. The inclusion criteria were children aged 3 months to 12 years, Atopic Dermatitis SCORAD score between 25-50, participant with no history of acute local infections and no history of contact dermatitis. Participants were excluded if they had skin sensitivity during treatment period and participants suffering from immunodeficiency diseases. Children with AD were randomly allocated in two groups and treated with either Marshmallow 1% ointment or Hydrocortisone 1% (Sina Daroo Co., Iran) as placebo, twice a day for 7 days and after that 3 times a week for a period of 21 days. The Atopic Dermatitis SCORAD index between the experimental and placebo groups were detected pre-treatment, at first week and after one month post treatment. Eleven patients in treatment group and 11 in placebo group completed the trial. According to the trial results, the severity of disease was not significant at the pre-treatment, end of first week and in first month of trial. Although there was no considerable relationship between both groups and SCORAD index at the end of the first week ($p=0.807$), but it was significant at the end of first month ($p=0.008$). A decreasing trend of SCORAD index was observed in treatment group. *Marshmallow* 1% ointment indicated more efficacy in decrease of disease severity compare to Hydrocortisone 1%. The result indicated that Marshmallow 1% ointment is appropriate remedy for children suffering from AD.

Keywords: Marshmallow, *Althaea officinalis*, Atopic dermatitis

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Investigating Lighting Properties of Extracted Fucoïdan from *Sargassum Cristaeifolium*

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Brown algae have the second largest batch of algae. Polysaccharides are the most extensive compounds including fucoïdians that belong to group of sulfated polysaccharides. Different biological functions have been reported from this polysaccharide, including anti-inflammatory and antioxidant properties. In this study, the main purpose was to extract the fucoïdan content of *Sargassum Cristaeifolium* and to investigate its whitening properties by testing tyrosinase inhibitory propertise. Distilled water with 65°C was used for extracting total extract in the following curd fucoïdan was isolated. Characterization was included FT-IR and UV/VIS Spectroscopy. FT-IR spectra showed a peak in the range of 1200 and 1600 cm^{-1} which indicates the presence of sulfate and carboxyl groups, respectively. Phenol-sulfuric acid method was used to determine the fucoïdan using UV/VIS Spectroscopy (1). The effect of tyrosinase inhibition by fucoïdan in five concentrations of 100, 125, 250, 500 and 1000 mg/ml was investigated (2). The results showed that fucoïdan has the higher inhibitory ability at concentrations of 100, 125 and 250 and approximately the same ability at 500 and 1000 mg/ml compared to Kojic acid as a positive control in concentration of 100 mg/ml.

Keywords: Fucoïdan, Polysaccharide, Brown algae, Whitening, Tyrosinase inhibitory

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Reformulation of a Traditional Combination to a Modern Pharmaceutical Dosage Form

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Traditional Medicines derived from medicinal plants are used by about 60% of the world's population. In the last few years there has been an exponential growth in the field of herbal medicines and these drugs are gaining popularity because of their natural origin and possible fewer side effects. Iranian traditional medicine or Persian medicine has used in diagnosis, prevention and treatment of diseases for thousands of years. The traditional formulations should be converted to modern dosage forms to better acceptance and easier consumption by patients. In the current study, a polyherbal medicine "monzej-e-soda" according to ITM has been formulated and quality assessments have been performed. For this purpose *Lavandula* spp. and *Melissa officinalis* L. aerial parts, *Echium amoenum* L. petals, whole parts of *Adiantum capillus-veneris* L., *Foeniculum vulgare* Mill., *Ziziphus jujuba* Lam and *Cordia myxa* L. fruits, *Glycyrrhiza glabra* L. rhizomes, *Fumaria parviflora* L. leaves, and *Alhagi* spp. manna were powdered and extracted with water. Aqueous extract was spray-dried and then used for preparing tablets by direct compression method. Several tablet formulations with various excipients were prepared and among them the formulation containing carboxymethyl cellulose (CMC) as disintegrant was selected. The quality of prepared formulation was assessed as well. The results of pre- formulation demonstrated good powder flowability and all physicochemical characteristics of tablets were in agreement with requirements. They had acceptable appearance, disintegration time, friability, hardness, dissolution behavior and weight variation. This formulation can be produced in large scale after clinical trial studies [1,2].

Keywords: Spray-dried, *monzej-e-soda*, Iranian traditional medicine, Persian medicine

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Formulation of a Polyherbal Antidepressant Syrup

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Depression is a chronic and debilitating illness. Initial antidepressant therapy may not provide adequate relief for the patient and caused many adverse reactions. So, novel agents with more favorable safety profile and efficacy are needed. Plants may provide an alternative to synthetic antidepressants. Depression has been considered in Iranian traditional medicine (ITM) or Persian medicine as well. The aim of this investigation was to formulation and evaluation the quality of an antidepressant syrup based on ITM references. A decoction containing *Lavandula* spp., *Melissa officinalis*, *Echium amoenum*, *Cordia myxa*, *Glycyrrhiza glabra*, *Ziziphus jujuba*, *Foeniculum vulgare*, *Fumaria parviflora*, *Adiantum capillus-veneris* and *Alhagi* spp. manna was prepared. Several experimental formulations using different ingredients containing carbomer, carboxy methyl cellulose, poly vinyl pyrrolidone, propylene glycol and glycerin were examined to improve the quality of syrup. Also sodium benzoate and potassium sorbate were used as preservatives. The results demonstrated that syrup was a semitransparent dark brown liquid and physicochemical characteristics including pH, density, viscosity, rheological properties and total phenolics content of the syrup were acceptable. No significant changes were found in the measured parameters along six months in accelerated stability test. Therefore the formulated syrup can be a suitable candidate as an herbal origin antidepressant agent with respect to its traditional use and conventional records about the effects of its ingredients to treat depression but clinical trials are necessary to evaluate the effect [1,2].

Keywords: Syrup, Depression, Quality control; Iranian traditional medicine

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Anticancer Effect of Ethanolic Extract of *Lavandula austigofolia*

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Cancer is the second leading cause of death worldwide. Although great advancements have been made in the treatment and control of cancer progression, significant deficiencies for improvement still remain. This study investigates the cytotoxicity of different concentration of ethanolic extract of Lavender (*Lavandula austigofolia*) against the human hepatocarcinoma (HepG2) cell line compared to normal cells. The mortality was measured in period of 24 and 48 hours using XTT assay technique, in three concentrations of 1, 10, 100 and 1000 µg/ml. The concentration of 1000 µg/ml showed the highest selectivity (selectivity index = 9.6) and potent cytotoxicity in the HepG2 cell line, with an IC50 value of 80.0 ± 5.8 µg/ml (mean ± standard deviation). It seems that the extracts of lavender induced apoptosis. It means that this plant can be evaluated for potential promising anticancer activity [1].

Keywords: Hepatocarcinoma (HepG2), Cytotoxicity, *lavandula austigofolia*

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The Effect of *Nigella sativa* Extract on Renal Fibrosis in Rats with Unilateral Ureteral Obstruction

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Unilateral ureteral obstruction (UUO) is a well-established experimental model to evaluate renal interstitial fibrosis [1]. *Nigella sativa* (NS) is a widely used medicinal plant with many pharmacologic properties [2]. Current study is aimed to investigate the effects of NS extract against kidney fibrosis following UUO in rats. In this study the rats received intraperitoneal injection of two doses of NS extract (200&400 mg/kg) for 18 consecutive days. At the 4th day of the experiment, laparotomy was performed and the left ureter was ligated. Sham-operated animals received saline as vehicle and laparotomy without ureteral ligation was done. Masson's trichrome staining was used to visualize localization of extracellular matrix (ECM) components. UUO was associated with significant increase in ECM deposition in kidney which associated with fibrosis. However, administration of NS extract at doses of 200 & 400 mg/kg significantly attenuated the nephrosclerosis scores when compared to UUO group. Thus, NS extract, a potent antioxidant and anti-inflammatory herb, could be a therapeutic agent to treat the UUO-induced kidney fibrosis.

Keywords: Unilateral Ureteral Obstruction, *Nigella sativa*, Fibrosis

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Recombinant Construct Harboring cDNA of Salutaridinol 7-o-Acetyltransferase (*SalAT*) Gene from *Papaver bracteatum*

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P.bracteatum is a medicinal plant that naturally is scattered and distributes in 1500 up to 2500 m of the skirts of Alborz Mountains, Iranian Kurdistan and northern slope of the Caucasus. Thebaine developed and enhanced in *P.bracteatum* is could be considered as a major alkaloid and Because of the low activity of enzymes involved in demethylation to codeine and morphine, could be employed as a non-addictive substitute for morphine as a medical painkiller. Genetic engineering through over expression of key genes in biosynthetic pathway is a promising approach to increase Thebaine production. In this research, the cDNA of Acetyltransferase (*SalAT*) Salutaridinol 7-O- gene of Persian poppy origin which is considered as one of the key genes in the pathway of Thebaine biosynthesis, has been constructed by using reverse transcriptase polymerase chain reaction (RT-PCR) method with specific gene primers. Both pBI121 plasmid expression vector and RT-PCR product were being digested with *Bam*H1 and *Sac*I restriction enzymes. Later, the digested RT-PCR product and The bone structure of pb1121 plasmid without *GUS* gene were recovered from agarose gel (1%) and then were ligated to each other and transformed to *E.coli* DH5 α . Finally, the recombinant construct has been proved by PCR and enzymatic digestion.

Keywords: *Papaver bracteatum*, Thebaine, Biosynthetic pathway, cDNA, *SalAT*

Comparison of Phenolic Compounds in Different Organs of *Scrophularia striata*

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Scrophularia striata (with common name of tashne dari) is a native medicinal plant of Iran that contains variety of flavonoids and phenylethanoid glycosides (PhGs) such as acteoside and echinacoside. PhGs are a large group of secondary metabolites with a wide variety of biological activities including antioxidant, anti-inflammatory, painkilling and anti-tumor. The seeds of *S. striata* were collected from northern of Ilam province in Iran. The seeds after antiseptic placed in a pot containing water-saturated perlite and the 45-day-old plants were subjected to the Hoagland's nutrient for four weeks. The nutrient solution was renewed once a week to prevent nutrient depletion. The plants were grown in a growth chamber under a 16/8 h (light/dark) photoperiod (220 $\mu\text{mol photons m}^{-2} \text{s}^{-1}$) with a 30/25°C day/night temperature and 50-70% air humidity. Then, the shoots and roots were separated, frozen with liquid N₂, and stored at -80°C for further analysis. PhGs and flavonoids were extracted with Khanpour-Ardestani and Keinänen methods respectively [1, 2]. Finally, content of PhGs and flavonoids in shoots and roots were determined by HPLC. Flavonoids (such as myricetin, genestin and resveratrol) and PhGs (such as acteoside and echinacoside) were determined in roots. In return in shoot, genistein, myricetin, Catechin, luteolin, kampferol, diosmin, daidzein, Naringenin and PhGs (acteoside and echinacoside) were determined. Compared to the roots and shoots, flavonoids (such as myricetin, genestin, resveratrol) acteoside and echinacoside were significantly greater in shoots and some of flavonoids weren't detected in root. In general, from the above results, it can be concluded that the use of the air department is more suitable for the manufacture of pharmaceutical compounds.

Keywords: Acteoside, Echinacoside, Flavonoids, *Scrophularia striata*

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Effects of Supplementation with the Betalain-/Betacyanin-Rich Extracts on Some of the Atherogenic Risk Factors in Patients with Coronary Artery Disease: A Pilot Clinical Trial

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It appears that betalains, the nature-inspired pigments, can improve some of the atherosclerotic risk factors and quality of life in patients with coronary artery disease (CAD). In this pilot randomized crossover trial, participants were allocated to 2-week interventions (a betacyanins-rich supplement of *Opuntia stricta* and a betalains-rich supplement of red beetroot) with a 2-week washout period. The study included 24 obese/overweight male patients (50 ± 5 y; BMI = 30 ± 5 kg/m²) with CAD. The concentration of homocysteine and glucose, lipid profile, and blood pressure were measured at the beginning and end of each intervention. Additionally, quality of life was assessed. The present trial was registered at Iranian Registry of Clinical Trials website as IRCT2017092836469N1. Relative to baseline, both supplementations significantly decreased plasma concentration of homocysteine, FBG, total cholesterol, triglyceride and LDL. Although HDL concentration showed a tendency for elevation, its increase was not significant. Furthermore, betalains-rich supplement significantly lowered both systolic and diastolic blood pressure. In contrast, betacyanins-rich supplement had no notable effect on diastolic blood pressure. Moreover, emotional and physical items of quality of life considerably improved after both interventions. It seems that the betalains/betacyanins-rich extracts of red beetroot and prickly pear fruits can be introduced as therapeutic and functional supplements. In this study, supplementation with these powdered extracts improved lipid profile and reduced homocysteine and glucose levels and blood pressure to some extent in patients with atherosclerotic CVD.

Keywords: Red Beetroot, Prickly Pear; *Opuntia stricta*; Homocysteine; Lipid Profile

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Evaluation of Anti-proliferative Activity of Fractions of the Most Potent *Eryngium billardieri* Extract on Cancerous Cells.

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Apiaceae as one of the largest family, comprises approximately 450 genera and 3700 species in the worldwide. Some pharmacological activities of this family such as anti-cancer, anti-vitiligo, cardioprotective, etc, have been attributed to the presence of important secondary metabolites such as coumarins, flavonoids. *Eryngium* is one of the apiaceae plant with 9 species in Iran. *E. billardieri* is one of the most important species. The current study was assigned to evaluate cytotoxic properties of fractions of the most potent extract from the aerial parts of *Eryngium billardieri* (*E. billardieri*). In this study, n-hexane (n-hex), Dichloromethane (DCM) and methanol (MeOH) extracts were prepared by Soxhlet apparatus of the aerial parts. Subsequently n-hex and DCM VLC fractions were subjected to MTT method for evaluating cytotoxic activity on MCF7 (human breast cancer) and B16 (human melanoma) cell lines. Among the all fractions, 80% and 100% VLC fractions of n-hex and DCM extracts demonstrated considerable cytotoxic activity against B16 (IC₅₀ = 48.39, 27.21 μg/ml) and MCF7 (IC₅₀ = 92.94, 107.4 μg/ml) cell lines, respectively. Furthermore, it is worth to mention that these fractions inhibit the growth of cancerous cells via apoptotic pathway.

Keywords: *Eryngium billardieri*, Apiaceae, Cytotoxic activity, MCF7, B16

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Histological Study of Testis Following Rosemary Hydroalcoholic Extract Administration in the Mice under Chemotherapy

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One of the consequences of chemotherapeutic agents in the male is fertility decrease or infertility. Cyclophosphamide is a common anticancer drug which its side effects on male fertility has been reported. Natural antioxidants consumption is a benefit approach for facing toxic effects of this category of drugs. The aim of this study was evaluation of rosemary extract on testis tissue structure following chemotherapy with cyclophosphamide. 15 adult mice were divided into 3 groups: Negative control (normal saline), positive control (cyclophosphamide) and treatment (cyclophosphamide + rosemary extract). The experiment period was 14 days. Tissue sections of testis samples were prepared and studied by light microscopy. Cyclophosphamide lead to reduction of the tubular epithelial thickness and spermatogenic cells numbers ($P < 0.05$), while extract administration prevented these changes so that histological indices of testis were similar to control group ($P > 0.05$). Hydroalcoholic extract of rosemary could relieve toxic effects of cyclophosphamide on testis and prevent its devastating effects.

Keywords: Testis, Rosemary, Cyclophosphamide, Histology

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Tamarix Aphylla Hydroalcoholic Extract Reduces Glioblastoma Cancer Cell Viability

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Glioblastoma is the most common tumor of central nervous system. Tamarix aphylla is a wild native plant of Iran which has various health features in traditional medicine and contains antioxidant compounds. The aim of the present study was evaluating the effect of Tamarix aphylla extract on cellular viability of cancer and mesenchymal cells. Glioblastoma cancer cells line U98 and mesenchymal stem cells (MSCs) were cultured. They were treated with different concentrations of Tamarix aphylla hydro alcoholic extract for 24 and 72 hours. Cell viability rate was assayed by MTT method. U98 had killing effect on cancer cells in all concentrations and both of times which was more than mesenchymal cells significantly ($P < 0.05$). The most deadly effect of Tamarix aphylla on cancer cells was in concentration of 800 $\mu\text{g/ml}$ on the 72 hours. Tamarix aphylla can decrease cancer cells viability more than mesenchymal cells in a dose and time dependent manner.

Keywords: *Tamarix aphylla*, MTT, Glioblastoma

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Histometrical Evaluation of Adrenal Gland Cortex in the Rats Suffering from Experimental Poly Cystic Ovarian Syndrome Following Treatment with Terminalia Chebula Extract

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Poly cystic ovarian syndrome (PCOS) changes adrenal gland function and body metabolism subsequently. Terminalia chebula (TC) is a medicinal plant which has various health effects including anti oxidative effect. This study aim was evaluating of histometrical changes of adrenal gland cortex following TC extract treatment in the rats suffering from experimental poly cystic ovarian syndrome. The rats divided into 5 groups as control, sham, PCOS, PCOS + Metformin and PCOS + TC. The experimental period was 15 days. Finally, adrenal gland sampling was done and tissue sections were prepared and studied by light microscope. TC extract reduced the gland mean volume ($P<0.05$). The extract could also reduce the thickness of Glomerulosa, fasciculata and reticularis regions of the gland ($P<0.05$) while their thickness was increased in PCOS in comparison with other groups. TC extract could ameliorate PCOS induced adrenal cortex histometrical changes in rats.

Keywords: Adrenal Gland, PCOS, Terminalia chebula, Histometry

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Ecophysiological Effect of Azospirillum and Azotobacter on Intercropping of Basil and Sorghum

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In order to evaluate different types of nitrogen fertilizers on yield and yield components of sorghum (*Sorghum bicolor* (L.) Moench) and basil (*Ocimum basilicum* L.), an experiment was conducted in Research Farm of Faculty Agriculture, University of Tehran. The treatments were arranged in split plots based on Randomized Complete Block Design with four replications. Four levels of fertilizer (chemical fertilizer (150 kg/ha urea), biofertilizer (*Azospirillum/Azotobacter*), combinations of biofertilizer and 50% chemical fertilizer and control) were assigned to the sub plots including (S0: sole cropping of sorghum with weed control, SW: sole cropping of sorghum without weed control, S100: sorghum 100% + basil 100%, S75: sorghum 100% + basil 75%, S50: sorghum 100% + basil 50%, S25: sorghum 100% + basil 25%, B0: sole cropping of sorghum with weed control, BW: sole cropping of sorghum without weed control). A additive system was used for the intercropping pattern. The highest dry yield in first and second harvest of sorghum and basil observed in chemical fertilizer and combinations of biofertilizer and 50% chemical fertilizer. In all fertilizer treatments, sole cropping of sorghum and basil with weed control and combination of 100% sorghum + 25% basil were the superior treatments, because of the highest dry yield in first and second harvest of sorghum and basil. Results showed highest highest dry yield in sorghum and basil detected in sole cropping of sorghum and basil with weed control and chemical fertilizer. Total land equivalent ratio (LER) in all treatments was more than one and combination of 100% sorghum + 100% basil in combinations of biofertilizer and 50% chemical fertilizer was the superior treatment, because of the highest Land Equivalent Ratio. Generally, it is concluded that sorghum and basil make a more efficient use from agricultural inputs in intercropping compared to their sole cropping and it seems that using of biofertilizers could improve basil and sorghum performance in addition to reduction of environmental pollution.

Keywords: Biofertilizer, Intercropping, *Ocimum basilicum* L., *Sorghum bicolor* L.

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Effect of Seed Biopriming and Hydropriming on Germination Indices and Yield of *Ocimum Basilicum* L.

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In order to investigate the effects of seed biopriming with plant growth promoting bacteria on germination and growth of *basil* (*Ocimum basilicum* L.), a randomized complete block design with four replications was conducted at the seed technology laboratory and research farm of faculty agriculture, university of Tehran. Treatments were: no priming (control), seed biopriming with plant growth promoting bacteria (combination of *Azetobacter chorchorum* and *Azosprilium lipoferum*) and hydropriming. The results showed that Seed hydropriming and biopriming with combination of *Azetobacter chorchorum* and *Azosprilium lipoferum* had considerable effect on growth seedling, uniformity of germination, radicle and plumule dry weight, germination percentage and seed vigour index in laboratory. Seed hydropriming and biopriming with combination of *Azetobacter chorchorum* and *Azosprilium lipoferum* increased biomass, dry yield, height and number of branch in first harvest at farm. Germination and yield indices in biopriming were better than hydropriming. Thus, in order to increasing of germination indices and yield, hydropriming and biopriming of seed can be suggested.

Keywords: Biopriming, Hydropriming, *Ocimum basilicum* L.

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Improvement in Germination and Seedling Growth of *Dracocephalum Kotschy* Boiss

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This work aimed to examine dormancy breaking of *Dracocephalum kotschy* Boiss (Labiatae). Seeds collected from Chaharmahal and Bakhtiari Province in Iran were subjected to different treatments including concentrated sulphuric acid for 10, 15 and 20 minutes, hot water at 70°C and 90°C for five and 10 minutes, leaching for 24, 48 and 72 hours, scarification with sand paper, scarification and leaching for 24, 48 and 72 hours, gibberellic acid soaking (500 and 1000 ppm), scarification and gibberellic acid soaking (500 and 1000 ppm). The highest germination indices (uniformity of germination, radicle and plumule length, germination percentage and seed vigour index) were observed in the case of scarification with sand paper and leaching for 48 hours and scarification and gibberellic acid soaking (500 and 1000 ppm) but concentrated sulphuric acid for 10, 15 and 20 minutes resulted in abnormal seedlings with reduced growth.

Keywords: *Dracocephalum kotschy* Boiss., Dormancy, Seed vigour index

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Optimization of *Myrtus communis* L. Essential Oil Nanoemulsion Formation by Isothermal Low-Energy Method Using Mixture Experimental Design

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Essential oils (EOs) are water-insoluble compounds, which are unstable in the presence of oxygen, light and temperature. Entrapment methods are used to overcome the essential oils problems. A number of different processing methods, such as high- or low-energy methods was used for fabrication of nanoemulsions. In the current study, we applied an isothermal low-energy method (spontaneous emulsification) for producing transparent *Myrtus communis* L nanoemulsions suitable for utilization in medicine. The purpose of this study was to produce and optimize nanoemulsion of *Myrtus communis* L. This spontaneous emulsification was formed by titration of an organic phase (containing spearmint oil (5%), $1.5 \leq \text{Eumulgin} \leq 2$, $2 \leq \text{Tween 20} \leq 3$ and $2 \leq \text{Tween 80} \leq 3$) into an aqueous phase ($0.5 \leq \text{PG} \leq 1$, $20 \leq \text{PEG 25} \leq 20$, $6 \leq \text{Glycerine} \leq 8$ and $53 \leq \text{water} \leq 63$) with continuous stirring. In this study, mixture experimental design was applied to investigate the main and interactive impact of independent variables on the turbidity of *Myrtus communis* L nanoemulsion, as a response. The obtained model was validated by correlation of determination (R^2 , adjusted R^2 and predicted R^2), and analysis of variance (ANOVA) was used to verify the adequacy of the regression model in terms of a lack of fit (LOF). ANOVA results are based on the confidence level of $\alpha=0.05$, and influence of each variable should be obtained according to its probability value (P-value). Therefore, the terms with P-value ≥ 0.05 assume significance. The high coefficients of correlations (R^2 : 0.9999, adjusted R^2 : 0.9992 and predicted R^2 : 0.9485), low coefficient of variation and standard deviation show the goodness of the model. The mathematical model showed that the optimum formulation for preparation of nanoemulsion *Myrtus communis* L 5.00% has the desirable criteria with 1.5.00% of emulgin, 2.66 % of Tween 20, 2.61% of Tween 80, 24.99% of PEG 400, 0.78% of PG, 7.98% of Glycerine and 54.47% of water. Under optimum formulation, droplet size and zeta potential of the nanoemulsion were 114.632 nm and -0.891 mV, respectively. The droplet size of optimized nanoemulsion remained stable after one month of storage. These results have important implications for the design and utilization of nanoemulsions as delivery systems in the pharmaceutical industries.

Keywords: Nanoemulsion, *Myrtus communis* L, Essential oil, Isothermal low-energy

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Genetic Diversity of Saffron *Crocus sativus* L. Analysed by SRAP Markers

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Saffron (*Crocus sativus* L.) belonging to the family Iridaceae comprises the dried red stigma and is widely cultivated in Iran and other countries such as India and Greece. Saffron contains more than 150 volatiles and aroma-yielding compounds mainly terpenes, terpene alcohol, and their esters. The bitter taste and an iodoform or hay-like fragrance are caused by chemicals picrocrocin and safranal. *C. sativus* possesses a number of medicinally important activities such as antihypertensive, anticonvulsant, antitussive, antigenotoxic and cytotoxic effects, anxiolytic aphrodisiac, antioxidant, antidepressant, antinociceptive, anti-inflammatory, and relaxant activity. It also improves memory and learning skills, and increases blood flow in retina and choroid. We used sequence-related amplified polymorphism (SRAP) molecular markers to investigate the population genetic structure and genetic divergence within *C. sativus* populations. NJ tree, UPGMA tree and PCoA plot produced similar results on morphological data. AMOVA revealed a significant genetic differentiation among the studied populations. NJ tree and PCoA plot of SRAP data revealed that there are at least four genetic groups within the studied populations. The results show that the SRAP markers are effective molecular marker for evaluation of genetic diversity among saffron accessions.

Keywords: *Crocus sativus* L., Genetic Diversity, SRAP, AMOVA

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The Yield and Growth Characteristics of *Thymus Thymus daenensis* L. Treated by Defoliation Intensity and Different Nutritional Systems

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To study the effect of defoliation intensity and different nutritional systems (chemical, Zeonix and integrated) on the quantitative and qualitative performance of *Thymus daenensis* L. in Mahidasht Agricultural Training Center, Kermanshah/Iran, in 2017, an experiment was conducted in split plot design based on a randomized complete block with four replications. The first variable was non defoliation and 50 percent defoliation in May 5th and June 5th (main factor), and the subsidiary factor was four different nutritional systems including (chemical, Zeonix and integrated). The obtained results showed that integrated nutrition treatment without defoliation had the maximum height of the bush (31.8 cm), the most number of secondary subshrubs (12.17), the most volume of aerial limbs (12/6 cubic cm), the maximum root (7.52 cm), the maximum root length (22.21 cm), wet and dry weight of the root (6.7 gr, 4.5 gr), the maximum aerial organs (10.82 gr), chlorophyll b (0.025 milligrams per liter) and the essence about (200) micromole per liter. The chemical nutrition treatment had the maximum stem length (21.27 cm), and the most wet weight (6.7 gr) and dry weight of root (4.5 gr). The treatment of 50% defoliation in June was led to increase in root length and wet weight of aerial limbs. It seems that the applicability of integrated nutrition system can be effective on reducing the use of chemical fertilizers widely along protecting the environment and stable agriculture and declining the production costs and making the agricultural activities more economic.

Key words: Thymus, Defoliation intensity, Different nutritional systems

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Drought Stress Modulates Polyphenols Accumulation in *Melissa officinalis* L.

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Melissa officinalis L., commonly known as lemon balm is a famous medicinal plant in the Lamiaceae family that grows in Africa, Europe and Western Asia [1]. It has now been confirmed that the most medicinal properties of this plant are due to the presence of polyphenolic compounds, the most important of which is rosmarinic acid (RA). Drought is a major abiotic stress which affects morphological, physiological and biochemical aspects of plant growth. Also, drought stress can affect metabolic pathways and subsequent production of valuable secondary metabolites like phenolic compounds. The purpose of this study was to examine the effects of drought stress on growth and content of some nutritional/pharmaceutical phenolic compounds in lemon balm. Experiments were carried out using a randomized complete block design in three replications. Drought stress was applied to 130-day-old plants with four water regimes: 90% pot capacity (PC), control; 75% PC, mild stress; 50% PC, moderate stress and 25% PC, severe stress. Plants were harvested 20 days after drought treatment and fresh and dry weight of their shoots were measured. Extraction of phenolic compounds was performed by methanol (80%) in an ultrasonic bath. Total contents of phenols (TP), flavonoids (TF), anthocyanins (TAC) and phenolic acids (TPA) in the extracts were measured using a spectrophotometric method. Concentration of RA in the extracts was determined by HPLC method. Fresh and dry weights of shoot were decreased under moderate and severe drought stress (50% and 25% PC, respectively). The minimum values of shoot fresh weight (7.264 g/plant) and shoot dry weight (1.453 g/plant) were observed in 25% PC treatment. The levels of all examined phenolic compounds were increased under 75% and 50% PC treatments. The highest amount of TP (42.311 mg GAE/g Dw), TF (12.107 mg QE/g Dw), TAC (17.283 µM/g Fw) and TPA (0.04407 mg RAE/g Dw) as well as RA (4.493 mg RA/g Dw) were found in 75% PC treatment. In conclusion, enhancement of polyphenols in mild drought stress could improve the nutritional and pharmaceutical properties of *M. officinalis* with no negative impact on plant growth.

Keywords: Drought stress, Lemon balm, Polyphenols, Rosmarinic acid

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Response of Different Groups of Saffron Corm Weight to for Type of Nutrition Management

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This research was conducted to study the response of different weight groups of saffron corm to four types of nutritional management during two growing seasons 2015-2017 at Torbat-e Heydarieh University as split plots based on a randomized complete block design with three replications. The experimental treatments consisted of four types of nutritional programs: control (without fertilizer), second treatment (manure, humic acid, micronutrients, Thiobacillus bacteria), third treatment (blood fertilizer, mono potassium phosphate, iron chelate, humic acid, Delfard fertilizer) and fourth treatment (chicken manure, ammonium nitrate, granular humic acid, urea, NPK 20-20-20 fertilizer, Marmarin fertilizer, Decapa fertilizer, Cotamix fertilizer) as main plot and mother corm weight (include less than 8 gr, between 8 and 12 gr And more than 12 grams) as a subplot. The results showed that in the first year of experiment (2015), the effect of different levels of fertilizer on all measured traits was significant, so that the maximum fresh and dry weights of stigma, fresh weight of flowers and number of flowers were obtained in the fourth treatment of the nutrient program and then The third treatment followed by the second treatment of the nutrient program. The most corm weights and diameter corm in the first year (2015) were obtained in the fourth treatment of the nutrient program. The effect of mother corm weight on the measured traits in the first year was significant and its maximum amount was obtained in mother corm with a weight greater than 12 grams. The effect study of nutrient program on measured traits in the second year (2016) showed that the most corm weights, fresh and dry weights of stigma, fresh weight of flowers and number of flowers were obtained in the fourth treatment, the most amount of these traits was obtained in the treatment of mother corm with a weight greater than 12 grams. The interaction of two factors in the second year showed that the maximum fresh and dry weights of stigma were (38.6 kg/Ha) and (7.8 kg/Ha), respectively and the weight corm (1710.88 g/m²) in the fourth treatment of the program nutrition and mother corm with a weight greater than 12 grams was obtained. According to the nutritional program was conducted in the fourth treatment, it can be concluded that the application of chicken manure, humic acid, macro elements, as well as micronutrients such as iron, zinc, manganese, etc., have a significant role in increasing the yield of saffron.

Keywords: Humic Acid, Micronutrients, Corm Weight, Dry Weight, Stigma, Fertilizers

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Investigation of Application of Anthocyanin Pigments of Saffron Petals on Functional Drinks Production

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Saffron is the most expensive medicinal plants of Iran and most important medicinal of the world. Saffron petals as residual have anthocyanin pigment, flavonoid and glycosides Compounds. In this study for extraction and anthocyanins isolated from saffron petals and its application in the production of functional drinks was done in Saffron Institute of Torbat University, Iran, in 2016. The experiment was conducted in Split factorial in completely randomized design with three replications. Treatments included two kineds levels of acid (acetic acid and citric acid), anthocyanins concentration levels (2, 2.7 and 3.4 mg per 100 ml drink) and storage conditions at three levels (refrigerator temperature 4° C, darkness and light at 20° C) and holding time in six levels (zero, 20, 40, 60, 80 and 100 days). The results showed that with increasing concentrations of anthocyanins in refrigerated storage conditions and the lack of light, lasting anthocyanins were more pragmatic in soft functional drinks. Application of acetic acid at a concentration of 3.4 mg per 100 ml in refrigerated storage at during the 20 days treatment produced the highest amount of anthocyanins after zero days. In addition, results showed that increasing of storage time, reduced anthocyanin in the functional drink, and the extraction method with acetic acid had more anthocyanin than other treatments. Extraction with citric acid had less decreasing in compare with acetic acid, especially at a concentration of 2 mg per 100 ml at the time was 100 days.

Keywords: Anthocyanins, Saffron petals, Drink

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Analysis of Genes Expression Pattern Involved in Biosynthesis of Secondary Metabolites of *Hypericum perforatum* L. in Response to Ultraviolet Radiation Stress

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St. John's wort (*Hypericum perforatum* L.) is an important medicinal plant with active biological components such as hypericin, hyperforin and pseudohypericin; these compounds are reported to have antiviral, antidepressant and anticancer activities. However, the content of these compounds in plants is low. Treating plants with UV lights (especially UV-B) is a technique suggested to increase the content of secondary metabolites in medicinal plants. So, to test the effect of this technique on Saint John's wort, this experiment was conducted in the greenhouses of Shiraz University College of Agriculture, Shiraz, Iran, in 2016 and 2017. The experiment was conducted in factorial in the form of a completely randomized design (CRD) with three replications. Plants were treated with UV-B light (20 w/m²) for 10, 20, 40 and 80 minutes and then hypericin content was measured in different times after treatment (12, 24, 48 and 96 h after treatment). Results indicated that hypericin content was significantly increased when plants were treated with UV-B light for 10 min, and the best time to harvest was 12 h after the treatment. Moreover, gene networks were drawn for the genes affecting the biosynthesis pathway of secondary metabolites in Saint John's wort. Among these genes, *PAL* and *4CL* genes from shikimic acid pathway, *PKS* and *HYP-1* genes from the biosynthesis pathway of hypericin and also *MYB75* transcription factor gene were selected to study gene expression under UV treatment. Studying the genes with Real-time qPCR indicated that gene expression was significantly reduced; showing the effect of UV treatment on DNA molecules destruction [1,2].

Keywords: Gene network, Hypericin, *HYP-1*, *PKS*, *PAL*.

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Antiprotozoal Germacranolide Sesquiterpene Lactones from *Tanacetum sonbolii* Mozaff.

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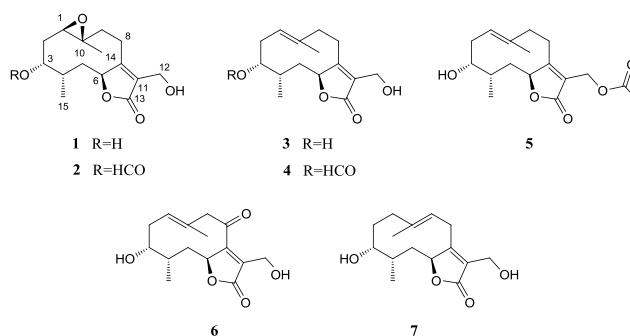
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Protozoan parasites cause serious public health problems in many parts of the world. No vaccines are currently available for protozoan diseases. Given the successful track record of natural product leads such as quinine and artemisinin [1], a continued search for new antiprotozoal compounds from higher plants is warranted. The genus *Tanacetum* (Asteraceae) comprises approximately 200 species that occur in the northern hemisphere. Of the 36 *Tanacetum* species growing in Iran, a total of 16 are endemic. *Tanacetum sonbolii* Mozaff. is an endemic species which non-volatile constituents of the species have not been studied so far. In a continued effort to discover new bioactive secondary metabolites from endemic Iranian plants [2], we here report on the isolation, structure elucidation and *in vitro* antitrypanosomal activity of seven new germacranolide sesquiterpene lactones from the aerial parts and flowers of *T. sonbolii*.



Keywords: *Tanacetum sonbolii*, Asteraceae, Sesquiterpene lactone, Antiprotozoal

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Anti-hemolytic Activity of *Atriplex Hortensis* L. Extract In Rats

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Hemolytic anemia is a hematological disorder that occurs because of excess destruction of red blood cells (hemolysis). Traditionally the *Atriplex hortensis* L. (*A. hortensis*) leaves decoction were used for anemia disorders [1, 2]. This study is evaluating the pretreatment effects of *A. hortensis*, leaves extract on hemolytic anemia that is induced by phenyl-hydrazine in rat. Thirty six male Wistar rats were randomly categorized in 6 groups (N=6) consist of normal saline treated control group, phenyl-hydrazine treated group (PHZ), and four *A. hortensis* extract (AH), and phenyl-hydrazine treated groups (PHZ+AH). AH+PHZ groups were given *A. hortensis* extract orally at daily doses of 50, 100, 200 and 300 mg/kg. *A. hortensis* extract at daily doses of 50, 100, 200 and 300 mg/kg were gavaged to four groups and saline were gavaged to other two groups for 31 days. After 31 days one of the saline treated groups considered as control and the hemolytic anemia is induced by 40 mg/kg phenyl-hydrazine IP injection to other five groups. Phenyl-hydrazine 40 mg/kg IP injection is also repeated on day 33. Hematological indices were evaluated at day 34 by flow cytometry method [3]. Results showed a significant difference between groups. Results showed that HCT, HGB, RBC are significantly lower on PHZ compared to control group. In 100,200 and 300 mg/kg *A. hortensis* groups HCT, HGB, RBC are significantly increased in comparison PHZ and 50 mg/kg groups. (P value<0.001). The hydro-alcoholic extract of *A. hortensis* at the doses of 100, 200 and 300 mg/kg/day prevents phenyl-hydrazine induced hemolytic anemia in rat.

Keywords: Hemolytic anemia, *Atriplex hortensis*, Anti-oxidant

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Developmental Stages of Ovule and Embryo Sac in *Salvia verticillata* L. Collected from Different Regions of Iran

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In this research, developmental stages of ovule and embryo sac were studied in *Salvia verticillata* L of Lamiaceae family. The flower and buds in different developmental stages were removed, fixed in FAA, stored in 70% ethanol, embedded in paraffin and sliced with a microtome. Staining was done with Hematoxylin and Eosin. The prepared slides from different developmental stages were studied using a light microscope (Germany) Zeiss Axiostar plus. On the basis of this research results, In the studied species, The ovary was found to be four chambered with four ovule, ovule was anatropous, bitegmic and tenuinucellate. The development of the embryo sac followed the monosporic, polygonum type. After the meiosis, megaspore tetrads had linear arrangement. First, embryosac was very small, so that its nuclei were compressed linearly but in maturation progress, embryo sac sustained longitude growth considerably.

Keywords: Ovule, Embryo sac, Macrosporogenesis, *Salvia verticillata* L.



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Evaluation of Antibacterial Effect of Propolis Nanoemulsion, Ethanolic Extract of Propolis, Ciprofloxacin and Usage of their Combination Against *Pseudomonas aeruginosa* PAOI

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Pseudomonas aeruginosa is one of the most important opportunistic pathogens and is considered as one of the main causes of nosocomial infections. Due to the increasing antibiotic resistant and the risk of antibiotic resistance, studies on the identification of natural antibacterial compounds have increased. Propolis, the sticky substance derived from a resin-like substance found in the beehive, is particularly effective in treating infection. It contains more than 300 essential substances such as polyphenols, phenolic aldehydes, sesquiterpene quinones, coumarins, amino acids, steroids and inorganic compounds that exerts a considerable antiviral, antifungal, antioxidant, anti-inflammatory immunomodulator, wound healing, hepatoprotective anti-ulcer, and anti-tumor activities effect. Few studies investigated the synergistic effects between propolis and antibiotics and no studies regarding the synergistic effect of Iranian propolis with other drugs have been done. Therefore, taking into consideration the importance of new scientific research relating Iranian propolis. We developed a Nanoemulsions propolis for the first time in Iran. In this study, high-energy propellant nanoemulsion were prepared using ultrasound waves. Antibacterial effect of ethanolic extract of propolis, propolis nano emulsion, Ciprofloxacin alone and their combination (EEP+Ciprofloxacin and propolis nanoemulsion + ciprofloxacin), were determined. For determination of MIC, MBC and FIC of each substance, Broth microdilution test were used (2). Data Statistical analysis was performed using SPSS software and one way ANOVA test. The results show that the Minimum inhibitory concentration of alcoholic extract of propolis and propolis nanoemulsion against *pseudomonas aeruginosa* is 1000 and 468.8 µg / ml, respectively. Also, the evaluation of the combined effect of Ethanolic Extract of propolis and propolis nano emulsion with Ciprofloxacin were 9.76/2.44, 7.3/1.22 µg /ml respectively. It seems that propolis nanoemulsion accompanied with ciprofloxacin have a synergistic antimicrobial effect on *Pseudomonas aeruginosa* in vitro. Therefore by using of propolis nanoemulsion, the dose of ciprofloxacin can be decreased and resistance to drugs can be reduced. Propolis nanoemulsion also be used as an antimicrobial compound in various industries.

Keywords: Propolis, Nanoemulsion, Ciprofloxacin, *Pseudomonas aeruginosa*

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Organogenesis from Callus Culture of *Haplophyllum virgatum* var. *virgatum*

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Haplophyllum virgatum var. *virgatum* (Rutaceae) is an Iranian endemic plant which grows naturally only in Geno region of Hormozgan Province-Iran. Many species of *Haplophyllum* A. Juss. genus used in traditional medicine for the treatment of herpes, warts, stomachache, erysipelas, toothache, skin diseases [1] and in the treatment of testicular cancer [2]. The presence of essential oils, alkaloids, fixed oils, coumarins, sterols, flavonoids and lignans have been reported from different species of the genus [1, 3]. Plant tissue culture is a useful technique for plant regeneration. In the present study callus induced in leaf, shoot and root explants using B5 medium supplemented with kinetin (0.1, 0.2 and 0.5 mg/L) in combination with NAA and IAA (1, 2 and 5 mg/L) incubated in darkness at 25°C. The most callus fresh weight obtained when shoot explants cultured on B5 medium supplemented with 0.1, 0.2 mg/L Kin and 5 mg/L NAA after two months. Shoots regenerated on callus cultures in B5 medium containing 1 and 2 mg/L BA and Kin. Different shoot regeneration percentages were observed in employed PGR treatments in cultured explants after two months. This is the first report of *in vitro* shoot regeneration of *H. virgatum* var. *virgatum* as an Iranian endemic plant.

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Phenolic and Flavonoids Contents and Antioxidant Activity of Different Extracts of Aerial parts of Feverfew *Tanacetum parthenium* L.

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Feverfew (*Tanacetum parthenium* L.) is a shrub from Asteraceae family that spread all over Iran, which have several therapeutic properties like as anti-septic, antimicrobial and antioxidant properties. The main objective of this study was to evaluate the antioxidant activity of shoot extract of feverfew. After preparation of different extracts such as hexane, ethyl acetate and methanol of feverfew, their antioxidant properties were measured by two methods, DPPH and FRAP. BHT and vitamin C were used as positive control for comparison. In this study, the amount of phenols and flavonoids were also measured. The results showed that the total phenol and flavonoid content of the methanolic extract was higher than other extracts. However, it was a direct relationship between flavonoid and phenolic content and antioxidant activity. Antioxidant activity was dependent on concentration and the highest antioxidant activity was observed in methanolic extract and the lowest activity in the ethyl acetate extract. The more antioxidant activity of extracts was obtained in the higher concentration, Furthermore the results showed that flavonoids and phenolic compounds had a major role in the antioxidant activity and more studies are needed for the isolation and purification of specific active components of this plant.

Keywords: *Tanacetum parthenium* L., Antioxidant activity, Phenols, Flavonoids

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Ligand-based Virtual Screening and ADME-tox Guided Approach to Identify Alkaloids Based Quinoline Derivatives as Topoisomerase I Inhibitors

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Topoisomerase (Top) is known as a class of enzymes that are essential to DNA transcription and replication. There are two types of Top and well-established antitumor drug targets. In this study, we used of 100000 natural ligands based quinoline structure like topotecan and identified 20 ligands with highest docking score as nearest to topotecan. Then, in order to investigate the possible interactions of the candidate compounds with topoisomerase receptors, the docking studies were performed using Schroedinger software. Our results revealed that alkaloids based quinoline derivatives have a -12.018 docking score. Besides, the score of Topotecan 's drug was -11.713. accordingly, these studied agents could be use as good candidates for the evaluation of drug effects in the treatment of ovarian cancer 's disease [1].

Keywords: Virtual screening, Topoisomerase1, Docking score, Ovarian cancer

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Micronization of Withaferin Extracted from *Withania somnifera* by Expansion of Supercritical Fluid Solution

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Withania somnifera L. belonging to the Solanaceae family is a pharmaceutical plant that is extensively applied in traditional systems of medicine for centuries and is also being used for treatment of diseases. Withaferin A is one of the main compounds of *Withania somnifera* (L.) which has shown anti-inflammatory, antistress and antitumor activity. Nowadays, attention to herbal medicines has increased due to the side effects of synthetic drugs and because of increase the absorption power, solubility and bioavailability of drugs, nanomedicine, a nanotechnology application in medicine, is being used more than ever. In the pharmaceutical industry, no/poor water insolubility is one of the main drawbacks to the optimal performance of active pharmaceutical ingredients (API) and improvement of dissolution rate and solubility. In this study, the first step entailed an extraction withaferin A from *Withania somnifera* using methanol as co-solvent for CO₂. Then, the withaferin A extracted from *Withania somnifera* was micronized by a powerful method, in accordance with the expansion of supercritical solution using CO₂ as a solvent (SC-CO₂) [1,2] and the effect parameters in this method is optimized with the response surface methodology using Statgraphics. The liquid chromatography-mass spectrometry (LC-MS) demonstrated that the sample which was extracted contained withaferin A. The investigation of the diameter of the particles was determined by field emission scanning electron microscopy (FESEM). Based on the obtained results, the optimum point was observed at a pressure drop of 220 atm., equilibration time of 20 min, collection time of 30 and temperature of 50 °C. Results showed the collected particles diameter were mainly within 5-200 nm.

Keywords: Nanoparticle, Supercritical fluid expansion, *Withania somnifera*, withaferin

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Supercritical Fluid Extraction of Hesperidin and Preparation of Extract Nanoparticles from *Mentha piperita* L. Leaves

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In this study, herbal extraction from the leaves of *Mentha piperita* L. using Supercritical fluid CO₂ is described. The extract samples were analyzed using LC-MS and hesperidine was identified. Micronization of the collected extract has been performed using the expansion of carbon dioxide supercritical solvent [1, 2] and obtained precipitate was characterized by Field Emission Scanning Electron Microscopy (FESEM). The effect of the different parameters such as the volume of extract, the pressure of precipitation and temperature on the particle size and morphology of resulted precipitate were investigated and the optimum conditions were determined as follows: volume of extract 50 µl, precipitation temperature 50 °C, equilibrium and precipitation pressure 350 and 100 bar and equilibration and precipitation time 10 and 30min respectively. Under optimum conditions, micronized particles with a particle size of 6 to 50 nm were obtained.

Keywords: Nanoparticle, Supercritical fluid expansion, *Mentha piperita* L.

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Optimization of Ultrasound-Assisted Extraction of Bioactive Compounds from *Artemisia Vulgaris* Leaf

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Mugwort (Artemisia Vulgaris) is widely used in traditional medicine because of its antimicrobial, anti-inflammatory, antitumor and its important role in anti-oxidation due to high level of phenolic compounds. The purpose of this study is to optimize the extraction parameters such as solvent volume, solvent concentration, temperature and time to investigate maximum extraction yield, antioxidant activities and total phenols (TP) of *Mugwort's* Aerial part extract obtained by ultrasonic assisted extraction (UAE) that is analyzed by LC-MS, using response surface methodology [1,2]. Results of central composite design (CCD) shows that highest extraction yield was 29.58%, Total phenols 24.27 mg gallic acid per 1gr dry plant, and IC₅₀ 0.06 µg per mL at optimum condition. Major components extracted from *Mugwort* were Coffeic acid, Kaempferol, Luteolin, Quercetin, Quercitrin and Rutin

Keywords: *Mugwort*; Ultrasound-assisted extraction, Phenolic compounds, Antioxidant activity

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Needing to Moisture Content Control in Market *Elaeagnus angustifolia* L. Powder in Ardabil

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Elaeagnus angustifolia L. (Oleaster, Russian olive, Wild olive) have high nutritional values and contain proteins, carbohydrates, vitamins and minerals. Some recent reports have indicated the anti-oxidant, anti-inflammatory, antimicrobial, anticancer and some other properties of this plant [1]. In Iranian folk medicine *E. angustifolia* L. have been used for the relief of pain and inflammation in patients with rheumatoid arthritis and for accelerating the wound healing process in an injured area [2]. Today, the consumers are exhibiting increasing interest in *Elaeagnus angustifolia* L., principally due to its functional properties. Hence, this study was conducted to evaluate the health of this nutrient. In this descriptive study, 20 samples of 100 grams of *Elaeagnus angustifolia* L. powder were selected randomly based on the distribution of sales areas from different districts of Ardabil. Measurement of moisture content was done using national standards of Iran (Iranian National Standardization Organization, number 2705). The range and mean of moisture content was 8.2-16.7 (%) and 12.5±2.2 (%), respectively. The mean moisture content was significantly higher than the allowed value (7.10%) (p<0.001). It has been confirmed that the mycotoxin contamination is a generally climate-dependent, plant and storage-associated problem, associated with many factors (for example: storage and processing conditions, moisture content). Therefore, the moisture content control is essential in *Elaeagnus angustifolia* L. powder. Further examination of the impact of moisture content in mycotoxin production should be widely and deeply carried out.

Keywords: *Elaeagnus angustifolia* L. Powder, Moisture content

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Determination of Total Phenolic and Flavonoid Contents of *Zyziphus jujuba* from two Regions of Iran
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Phenolic compounds are specific group of important plant compounds that, due to the presence of hydroxyl group, have the ability to remove free radicals, and are known as antioxidants [1, 2]. These compounds contain some elements such as flavonoids, catechins, anthocyanins and isoflavones, and there are in vegetables, fruits and beverages such as tea, cocoa, which make up the most important human food sources [3]. Considering the importance of storing amount of these materials in plants, this study investigated the amounts of total phenolic and flavonoids compounds in jujube (*Zyziphus jujuba*) in two regions of Iran included: Birjand and Dehaqan from Southern Khorasan and Isfahan provinces. For preparation of total extract by percolation method, 500 g of powdered plant was macerated in acetone at 50% (V / V). The solvent was removed by evaporation in vacuum. The total phenol content was determined using Folin-Siocalteu reagent. The amount of flavonoids was determined based on optical absorption of flavonoids-aluminium complex. The absorbance of total phenols and flavonoids were measured at wavelengths of 765 and 430 nm, respectively, with UV / Vis spectrophotometer. The total amount of phenolic compounds was expressed based on the standard Gallic acid, and the content of flavonoids in terms of Quercetin equivalent (QE). The mean obtained of total phenol in jujube collected from regions of Birjand and Dehaqan, were 8.26 ± 0.03 and 8.18 ± 0.04 mg GAE/g of DW respectively, which did not show significant differences ($p > 0.05$). However, there was a significant difference in total flavonoid content ($p < 0.05$), so that in these regions from provinces of Southern Khorasan and Isfahan, mean obtained were 18.27 ± 0.05 and 16.61 ± 0.04 mg QUE/g of DW, respectively. The findings of the study showed that the geographical conditions of the sampling areas did not affect the total phenolic content of jujube, but affected the amount of total flavonoid production in this plant.

Keywords: *Zyziphus jujuba*, Total Phenolic, Flavonoids, Isfahan, Southern Khorasan

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Isolation and Expression Analysis of a Chalcone Synthase Gene from Lemon Balm *Melissa officinalis* L.

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Flavonoids constitute an important class of plant secondary metabolites and are involved in many biological processes. Chalcone synthase (CHS) is a key component of phenylpropanoid route and directs the pathway into production of flavonoid compounds. In the present study, a partial fragment of a lemon balm (*Melissa officinalis* L.) gene encoding CHS was cloned and its expression was analyzed in plants subjected to salt stress and exogenous protectants including GSH, proline and salicylic acid. A high degree of similarity was found between the sequence of isolated fragment and sequences of CHS genes from other plant species notably *Agastache rugosa* and *Perilla frutescens* as two members of Labiatae. Exposure of plants to salt stress and exogenous protectants enhanced the transcript levels of CHS gene and the highest expression level was observed in stressed plants subjected to salicylic acid.

Keywords: *Melissa officinalis* L., Chalcone synthase, Salt stress, Gene expression

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Study on Adjustment of the Effects of Salt Stress by Azomite Application on Mexican marigold *Tagetes minuta* L.

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Post-drought salinity is one of the most significant and shared environmental stresses in the world and is one of the important factors in reducing the growth and yield of many crops and medicinal plants [1]. Azomite is an inorganic mineral that contains more than 60 forms of nutrients (macro and micro elements). This material modifies and improves the soil, and the high ionic exchange capacity of this substance has resulted in some of it being used to reduce the effects of salinity stress [2]. In order to investigate the effect of Azomite on reducing the effect of salinity stress in Mexican marigold, a pot experiment as a factorial based on a completely randomized design was conducted in research greenhouse of Ferdowsi University of Mashhad in 2017. The experimental treatments included the first factor of salinity stress at three levels (0, 30 and 60 mM NaCl as salinity of irrigation water) and the second factor was the application of Azomite at 4 levels (0, 4, 8 and 12 g/kg soil) and in three replications. The results revealed that the interaction between salinity and Azomite was significant on all studied traits. Also, the results of mean comparison of data indicated that by increasing salinity level, height of plant, photosynthetic pigments and protein content decreased and in opposite electrolyte leakage, proline, MDA and soluble carbohydrate increased. So that the highest height of plant, photosynthetic pigments and protein content, and in opposite the lowest electrolyte leakage, proline, and MDA was observed at the treatment without salinity and application of 12 g/kg soil Azomite. At the highest salinity level, the height of plant, photosynthetic pigments and protein content decreased and application of Azomite specially at the level 12 g/kg soil could improved these characteristics significantly. Therefore, use of this material in salinity stress could be recommended.

Keywords: Azomite, Salinity stress, Malondialdehyde, Photosynthetic pigments

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Effect of Different Dozes of Gamma Irradiation on Antimicrobial Properties of Turmeric Volatile Oil

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Turmeric (*Curcuma longa* L.) is a spice derived from Zingiberaceae family which is known for its anti-inflammatory properties. Several therapeutic effects including antifungal, antibacterial, antidiabetic, anti-Alzheimer's, anti-venomous, anti-viral, anti-inflammatory, anti-HIV, antioxidant and antibiotic properties attributed to the plant [1]. The effect of gamma irradiation under various packaging atmospheres on chemical constituents and antibacterial properties of turmeric's rhizome volatile oil has been studied. The turmeric rhizome powder was packaged under different atmospheres (air, NO₂ and vacuum) by high-barrier multilayered film (Pet/EVOH-PA/LDPE) and they were gamma irradiated at dose of 5, 10, and 15 kGy. The antibacterial activity of samples volatile oil was screened by disc-diffusion method according to National Community for Clinical Laboratory Standards method on five common pathogenic microorganisms including two gram-positive bacteria: *Staphylococcus aureus* (PTCC 1112), *Bacillus subtilis* (PTCC 1023) and three gram-negative bacteria: *Salmonella enterica* (PTCC 1639), *Escherichia coli* (PTCC 1338), *Pseudomonas aeruginosa* (PTCC 1707). MIC was assessed by two fold microdilution method in 96 well microplates according to ISO guideline 20776-1 (ISO, 2006). According to the results, gamma irradiation under different atmospheres of packaging did not change antibacterial properties of the volatile oil. The best effect was on *basillus subtilis*.

Keywords: Turmeric volatile oil, Antibacterial, Gamma irradiation

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Effect of Water Deficit Stress on Yield, Essential Oil and Antioxidant Activity of Two Milk Thistle *Silybum marianum* L. Ecotypes

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Milk Thistle (*Silybum marianum* L.) is one of the important ancient medicinal plants that have been used to treat liver disease, bile-related diseases and poisoned individuals by poisonous mushrooms. As an important medicinal plant in some industries such as pharmaceutical industry, the antioxidant capacity of milk thistle in conferring drought stress, as well as physiological and yield-related traits were studied. The experiment was a split plot based on randomized complete block design with three replications. The main plots included different irrigation levels (including 80, 60, 40 and 20 percent of the available soil water content) and ecotypes of Tehran and Hamedan were considered as sub-plots. Results indicated that the grain yield of Tehran ecotype was reduced 3.3%, 19.5% and 52.3% under mild, moderate and severe stress compared to optimum conditions, respectively. The grain yield of Hamedan ecotype was reduced 7.8%, 42.3% and 73.2%, respectively. Essential oil yield of Tehran and Hamedan ecotypes decreased by 22.1% and 63% in severe drought stress conditions, respectively. Tehran ecotype had higher levels of carbohydrate and proline than those of Hamedan under stress conditions. This property caused the Tehran ecotype to have more relative water content and lower slope change of grain yield and essential oil yield as compared with Hamedan. Drought stress increased the percentage of essential oil in both ecotypes and the essential oil of Tehran contained more antioxidant. In general, under mild stress conditions, the highest essential oil yield was obtained due to an increase in essential oil content and no significant reduction in grain yield. Thus, it seems that the application of mild controlled stress improves the quality of milk thistle without affecting its quantitative performance.

Keywords: *Silybum marianum* L., Water Deficit Stress, Yield, Antioxidant activity

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Effect of Gamma Irradiation on Cytotoxic Activities of Turmeric Essential Oil on *Mcf 7* Cancer Cell Line

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Many traditional medicines have considerable biological activities with potential therapeutic usage. *Curcuma longa* L. (Turmeric), which belongs to the Zingiberaceae family, is considered to have anticancer, anti-inflammatory, antioxidant, antibiotic and cytotoxic properties [1]. The various doses of gamma irradiation used in food packaging for specific purposes could be classified in three groups (i) low dose levels (<1 kGy) for inhibiting sprouting, (ii) medium dose levels (1–10 kGy) for microbial decontamination of foods which sometimes called “radicidation” and also because of extending the shelf life of foods; and (iii) high dose levels (>10 kGy) for commercial radiation sterilization which is sometimes called “radappertization” [2]. In the cold-pasteurization method, ionization radiation is the most effective way for reducing microbial contamination of spices. Gamma irradiation caused microbial destruction by breaking down the microorganism DNA (direct effect) or by producing free radicals such as H, OH originating from the radiolysis of the cellular water (indirect effect). The effect of four different dose of gamma irradiation on cytotoxic activities of turmeric volatile oil were tested for their possible antitumor activity and cytotoxicity by using the 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assay on *Mcf 7* cancer cell line with ATCC number of HTB-22. This cell line is epithelial breast cell cancer with 135 NCBI code. Turmeric volatile oil showed inhibition of cell proliferation. But IC₅₀ values of different dose of gamma irradiation were decrease by increased irradiation dose levels.

Keywords: Turmeric volatile oil, Cytotoxic effect, Mcf7 cell line, Gamma irradiation

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Identification and Determination of Various Impurities and Common Frauds in Essential Oils Used in Food, Pharmaceutical and Cosmetic Industries

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Essential oils have been widely used all over the world and their use is constantly increasing because of the strong demand for pure natural ingredients in many fields. Authentication is thus a matter of critical importance for both consumers and chemical companies. This research covers known adulterations in essential oils, and some analytical methodologies adopted for their detection. The purpose of the fraud in the essential oils is to achieve greater profit by adding an odourless substance to the essential oils. These substances can include other essential oils or a fraction of essential oils that are added to the essential oil or aromatic compounds that may be similar to oils. Odourless or odorous compounds include ethanol, mineral oils, isopropyl myristate, glycols, phthalates and fixed oils, such as grape seed oil and flaxseed oil. Due to the trade of thousands of millions of essential oils, dishonest peoples and many factories who seek more profit, made various types of fraud in the industry, including the following fraudulent practices: 1- Adding carbon compounds and Oils of various types of oilseeds to natural essential oils. 2- Adding synthetic organic compounds to natural essential oils that contain low active ingredients. 3. Add synthetic organic compounds to low-value essential oils and sell them instead of essential oils. The most obvious reason for fraud can be attributed to the high value and high cost of essential oils. There are no analytical method to guarantee the purity of the essential oils. However, the methods used to dissolve the essential oil in different percentages of ethanol, refractive index; density, analysis with the GC-MS, etc. are used for this purpose[1]. In this work, any type of essential oils was analysed by the Gas chromatography with mass spectrometry detector (GC-MS). The results of analysis of imported essential oils of Eucalyptus, Fennel, Zinger, Marjoram, Clove, Case and Basil showed that the various impurities such as isopropyl myristate isopropyl, glyceryl linoleate, hexadecanoic acid, methyl ester, dipalmitin, penta-decanoic acid, 14-methyl, methyl ester, hexadecanoic acid, methyl ester is used in essential oils at different levels.

Keywords: Essential oil, Fraud, Purity, Gas chromatography

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The Palynological Data Bank on Shrub Cultivated Herbaceous Plant Taxa as well Medicinal Plants in the Megalopolis of Tehran

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Palynology as a multidisciplinary science can be provided data base for a wide range of sciences such as the Petroleum exploration, prediction and simulation of past climatic events, Quality control of honey (Melissopalynology), phylogeny, aerobiology and etc. Tehran has an area of about 600 km² due to its location on the southern slopes of the Alborz Mountainous Region, widely extended along to north to south and east to west zones, so showing a variety of climatic conditions that include diverse species (e.g. ornamental, medicinal and etc.). Because of several cultivated and ornamental species are classified as allergenic plants, so identification, classification, and preparation of their database has particular importance. So far, no comprehensive study has been carried out on palynology in Iran. Therefore, it seems that carrying out a palynological study and preparing its database in Tehran is the first step in allergy studies. The objectives of this study are to investigate the morphological and micro-morphological characteristics, classification, preparing of identification key and palynological database in Tehran. So, review the published flora and present information on green space data bases in area, target taxa were selected. The plant samples were collected by field samplings and were deposited on the basis of standard methods. Finally, the pollen grains were coated with gold material. Then, they were scanned with Scanning Electron Microscopy (SEM). Afterward, they identified by diverse pollen references on palynology outer results showing that Asteraceae, Amaryllidaceae, Liliaceae, Portulacaceae, Poaceae, Berberidaceae, and Lauraceae are the most important families in study area. The achievements of this study will serve as a pilot for the study of palynological study, especially in asthma and allergy in the country.

Keywords: Aeropalynology, Biological Database, Asthma and Allergy, Medicinal



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Phytochemical Analysis and *in vitro* Antioxidant Potential Studies of *Matteuccia struthiopteris*

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Ferns belong to a group of non-flowering plants known as Pteridophytes. Although there is a wide application of these species in the traditional treatment of illnesses, but their phytochemical and biological properties are comparatively unexplored. *Matteuccia struthiopteris*, commonly called ostrich fern, is a clump-forming, upright to arching, rhizomatous, deciduous fern. This study aimed to evaluate the phytochemical contents as well as antioxidant activities of various solvent extracts of *M. struthiopteris*. The free radical scavenging activity of the samples were determined using 2, 2-diphenyl-1-picrylhydrazyl (DPPH) and total antioxidant capacity in phosphomolybdenum assay. The extracts showed noteworthy activities in both antioxidant assays which compared to the reference antioxidant in a dose dependent manner. In the DPPH test, methanol extract showed the highest radical scavenging activity with an IC₅₀ value of 43.38±1.79 µg/mL, higher antiradical capacity than BHA as positive control (IC₅₀=58.72±0.93 µg/mL). Ethanol extract had the highest total antioxidant capacity (545.64±8.35 mg BHA equivalent/1 g extract). Phytochemical constituents were determined using spectrophotometric methods. Among the extracts, methanol extract was containing the highest amount of phenolic compounds (114.62±2.05 mg gallic acid /g dry extract). Large differences in the amount of flavonoids and flavonols of *M. struthiopteris* in various extracts were detected. Ethanol extract has been found to be rich in flavonoids and flavonols with a value of 90.79±1.51 and 57.98±0.82 mg quercetin/g dry extract, respectively. The total anthocyanins were estimated by a pH-differential method. The high anthocyanin content was found in ethanol extract (371.06±6.78 mg cyanidin-3-glucoside equivalent/100 g). The results suggest that *M. struthiopteris* extracts are a potential source for human nutrition and rich source of unique phenolic composition contributing to its antioxidants potential.

Keywords: *Matteuccia struthiopteris*, Various extracts, Phytoconstituents, Antioxidant

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Morphological and Phytochemical Responses of Anise Hyssop (*Agastache foeniculum*) to Foliar Application of Potassium Silicate under NaCl Salinity Conditions

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Salinity is one of the major environmental factors affecting plant growth and productivity in Iran. Anise Hyssop (*Agastache foeniculum* kuntz.) is a perennial and aromatic plant, belongs to the Lamiaceae family. To study the effects of foliar application of potassium silicate (0, 150 and 300 mg/l) on some morphophysiological and phytochemical of Anise Hyssop under NaCl salinity conditions (irrigation with water containing of 0, 25, 50 and 100 mM NaCl); a pot experiment was conducted using a factorial based on completely randomized design with three replications. The results showed that NaCl salinity had significant effects on studied parameters. As the NaCl concentration in irrigation water increased, plant height, dry herb yield, chlorophyll index (SPAD), essential oil content and yield decreased. Antioxidant capacity (using DPPH method) increased as the NaCl concentration in irrigation water increased. Foliar application of potassium silicate increased plant height, dry herb yield and chlorophyll index. Essential oil content and yield increased by potassium silicate application only in 100 mM NaCl salinity. Overall, the findings of this study showed that foliar application of potassium silicate can be used to alleviating the salt stress effects on Anise Hyssop [1, 2].

Keywords: *Agastache foeniculum*, Antioxidant capacity, Essential oil, Salt stress, Yield

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Evaluation of Cytotoxic Activity of *Anthriscus nemorosa* on Cancerous (MCF7) and Non-cancerous Cells (HFFF2)

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Apiaceae as one of the largest family, comprises approximately 450 genera and 3700 species in the worldwide. *Anthriscus* or chervil is a common plant of the family Apiaceae. , Growing in Europe and temperate parts of Asia. This genus is comprised of approximately 15 species, worldwide, and 3 species are represented in Iranian flora. *Anthriscus nemorosa* is one the important species in Iran was collected from Moghan located in Ardabil province, Iran, 2017. Air dried aerial parts of *A. nemorosa* were grinded and soxhlet extracted using n-hexane (n-hex), Dichloromethane (DCM), and methanol (MeOH) solvents. Furthermore, the most potent cytotoxic extract was fractionated by VLC method. Anti-proliferative effect of dried extracts and fractions of its potent extract were evaluated by MTT reduction colorimetric assay. The results of the cytotoxicity assay revealed that n-hex extract (IC₅₀ value 109.4 µg/ml) its 80% as well as 100% VLC fractions had highest cytotoxic activity on MCF7 cell line with IC₅₀ value 22.95 µg/ml and 39.9 µg/ml, respectively. This study showed anti-proliferative activity of n-hex extract and its 80% and 100% VLC fractions of *A. nemorosa* on MCF7 cell line without any side effect on normal cell.

Keywords: *Anthriscus nemorosa*, VLC fractions, MTT, Cytotoxic assay

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Pharmacological Evaluation of the Anti-inflammatory and Antinociception Activities of *Cymbopogon Schoenanthus* Essential Oil in Animals

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Cymbopogon schoenanthus is well known traditionally and is widely used as antispasmodic, a protection against fever, anti-intestinal ailment problems, anti-malaria, and anti-helminthic [1, 2]. Due to the presence of Piperitone as the major component of the essential oil we were prompted to assess the anti-nociceptive and anti-inflammatory properties of *Cymbopogon Schoenanthus* Essential Oil (CSEO) systematically in animal models. The oil was also analyzed by GC and GC-MS in order to identify the potentially responsible compounds for pharmacological properties. The analgesic activities of CSEO (50, 100, and 200 mg/kg, IP) were studied by writhing, hot-plate and formalin tests in mice. Control and standard groups received vehicle, morphine (5 mg/kg, IP) and mefenamic acid (30 mg/kg, IP) respectively. The acute anti-inflammatory effect of CSEO (50, 100 and 200 mg/kg, IP) were assessed by carrageenan-induced paw edema method in 30 min, 1, 2, 3, and 4 hr after carrageenan in rats. In hot-plate and writhing tests, the studied doses of CSEO were not effective. In deed *C. schoenanthus* essential oil could not decrease the number of acetic acid-induced writhes and hot plate latency in mice compared with control group. However, it exhibited an analgesic effect especially in chronic phase of formalin test. In carrageenan test, all studied doses of CSEO significantly reduced the paw edema in comparison to the control animals (P<0.05). Anti-inflammatory activity of CSEO (50, 100 and 200 mg/kg) was found to be comparable with mefenamic acid (30 mg/kg). CSEO was analyzed by gas chromatography-mass spectrometry and 31 constituents, representing 86.8% of the oil, were identified. The major component of the oil was characterized as Piperitone (62.0%) which might be responsible for the anti-inflammatory activity. The results suggest that CSEO possesses biologically active constituents that have significant activity against acute inflammation.

Keywords: *Cymbopogon schoenanthus*, Anti-inflammatory activity, Essential oil

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Responses of Different Fertilizers on Qualitative and Quantitative of Essential Oil of *Satureja Khuzestanica* Jamzad in Alborz Region

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Essential oil produced by aromatic plants is affected by many environmental factors including different nutrition systems [1]. *Satureja Khuzestanica* Jamzad is an aromatic and endemic herb, used in the pharmaceutical industries and is known for its varied medicinal properties [2]. The experiment was based on a randomized complete block design with three replications was conducted in research farm of Research Institute of Forests and Rangelands (Karaj) in 2016-2017. We conducted a study to evaluate the effects of sixteen biological, chemical and organic fertilizer [control, N50, P25, K25 (kg/ha), cow manure (30 ton/ha), cow manure (60 ton/ha), N50, P25, K25 (kg/ha) + cow manure (30 ton/ha), N50, P25, K25 (kg/ha) + cow manure (60 ton/ha), vermi-compost (5 ton/ha), vermi-compost (5 ton/ha) + N50, P25, K25 (kg/ha), *Glomus mosseae*, *Glomus intraradicaes*, *Azospirillum*, *Pseudomonas*, *Thiobacillus* + S₀, *Thiobacillus* + S₂₅₀, *Thiobacillus* + S₅₀₀ and *Thiobacillus* + vermi-compost (5 ton/ha)]. The results indicated that the highest amount of essential oil (3.6%) and essential oil yield (64.3 kg/ha) was obtained in *Thiobacillus* + vermi-compost (5 ton/ha) treatment in the flowering stage. The maximum carvacrol content in the flowering stage (92.1%) and vegetative stage (90.9%) was obtained by application of *Thiobacillus* + S₀ and *Pseudomonas* Respectively. The highest Limonene content in the flowering stage (3.6%) and vegetative stage (2.7%) was measured by application of vermi-compost (5 ton/ha) and *Thiobacillus* + S₀ Respectively. γ -terpinene content in the flowering stage (3.5%) and vegetative stage (3.1%) was observed by application of *Glomus mosseae* and *Thiobacillus* + S₀ respectively. The study suggests that application of the bio-inoculants and organic fertilizers can enhance productivity while maintaining the desired quality of the herb.

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Improving Plant Growth Attributes and Photosynthesis Performance of Garlic (*Allium sativum* L.) Seedlings by Selenium under Cadmium Stress

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Garlic (*Allium sativum* L.) is one of the world most popular vegetables that has beneficial effects on health, viz., protection against cardiovascular diseases and cancers. It is well known for its capability to endure some heavy metals such as cadmium (Cd). Selenium (Se) is known to play a crucial role in regulating and alleviating many abiotic stresses including metal stress. In study the effect of Se (Na₂SeO₄) in ameliorating the toxic effect of Cd in garlic seedlings were investigated. Treatments were as: control, 5 ppm Se, 10⁻⁴ M Cd, 10⁻³ M Cd, 10⁻² M Cd, 10⁻⁴ M Cd + 5 ppm Se, 10⁻³ M Cd + 5 ppm Se, 10⁻² M Cd + 5 ppm Se. The data were processed by the analysis of variance in a factorial experiment with three replications on the basis of completely randomized design. The results showed that the biomass of root and shoot were decreased with the increase in Cd concentration. The garlic roots were more severely affected than the shoots by Cd stress. Cd at 10⁻² M reduced root and shoot biomass by 57.08 and 54.74%, respectively, compared with the control. Employing Se diminished the Cd accumulation by 33.71, 23.48 and 0.80% in the root and by 64.00, 25.00 and 3.60% in the shoot under 10⁻⁴, 10⁻³ and 10⁻² Cd dosages, respectively. The net photosynthesis (P_n), transpiration rate (Tr), stomatal conductance (G_s) and total chlorophyll (Chl) decreased significantly by increasing Cd concentrations. Net photosynthesis, transpiration rate, stomatal conductance and total chlorophyll decreased by 93.8, 81.4, 75.8 and 53.3% under 10⁻² M Cd, respectively as compared to the control. Application of Se improved the net photosynthesis, transpiration rate and stomatal conductance of garlic plants in all Cd treatments except for 10⁻² M Cd concentration. The results indicated that supply of Se, can reduce the damage to the chloroplasts and increase the chlorophyll contents and eventually photosynthesis performance of garlic seedlings.

Keywords: Cadmium, Garlic, Growth, Photosynthesis, Selenium

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Influence of Different Nutrition Treatments on Growth And Yield of *Satureja Khuzestanica* Jamzad In Alborz Region

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Satureja Khuzestanica Jamzad is an endemic herb, with valuable medicinal properties used in the Iranian traditional medicine [1]. The aim of this study was to investigate the effect of some bio-fertilization treatments on the growth and yield of *Satureja Khuzestanica* plant. The research was undertaken to determine the effects of sixteen biological, chemical and organic fertilizer [control, N50, P25, K25 (kg/ha), cow manure (30 ton/ha), cow manure (60 ton/ha), N50, P25, K25 (kg/ha) + cow manure (30 ton/ha), N50, P25, K25 (kg/ha) + cow manure (60 ton/ha), vermi-compost (5 ton/ha), vermi-compost (5 ton/ha) + N50, P25, K25 (kg/ha), *Glomus mosseae*, *Glomus intraradicaes*, *Azospirillum*, *Pseudomonas*, *Thiobacillus* + S₀, *Thiobacillus* + S₂₅₀, *Thiobacillus* + S₅₀₀ and *Thiobacillus* + vermi-compost (5 ton/ha)]. The experiment was based on a randomized complete block design with three replications was conducted in research farm of Research Institute of Forests and Rangelands (Karaj) in 2016-2017. Results revealed that the highest amount of dry matter (1948 kg/ha) was obtained by application of *Thiobacillus* + vermi-compost (5 ton/ha) treatment. Application of cow manure (30 ton/ha) treatment significantly increased the plant height in second year (37cm) as compared with first year (26cm). Applying *Thiobacillus* + vermi-compost (5 ton/ha) treatment significantly maximum the essential oil content (3.6%) and essential oil yield (64.3 kg ha⁻¹). The combined treatment *Thiobacillus* + vermi-compost (5 ton/ha) was superior to solely application concerning all investigated parameters.

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Biotransformation of Hydrocortisone and Nandrolone Decanoate by Fungal Whole-Cells

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Biotransformation with filamentous fungi is a method of considerable value for the partial synthesis of oxygenated and bioactive compounds with a large diversity of biological properties. A number of these fungi have the ability to introduce functional groups, regio- and stereoselectively, in molecular positions difficult or impossible to achieve by conventional chemical means [1, 2]. In this study, biotransformation of hydrocortisone and nandrolone decanoate with fungal species including *Fusarium fujikuroi*, *Circinella muscae*, and *Coniothyrium fuckelii* have been investigated. The biotransformation of hydrocortisone with two species of *C. fuckelii* and *C. muscae* lead to reduction of C₂₀ ketones. Enzymatic reduction of ketone group in C₂₀ is one of the main routes for the deactivate corticosteroids. The biotransformation of nandrolone decanoate by two fungal species including *F. fujikuroi* and *C. fuckelii* was investigated for the first time. Result show that biotransformation by *F. fujikuroi* led to the production derivatives of 17 β -hydroxyester-4-en-3-one and ester-4-en-3, 17-dione. But the biotransformation of this compound with the fungal species of *C. fuckelii* only produced the 17 β -hydroxyester-4-en-3-one with the 42% yield as only product.

Keywords: Biotransformation, Nandrolone decanoate, Fungal species, Reduction.

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Evaluating the Effects of *Crocus sativus* Hydro-Alcoholic Extract on Hepatic Gene Expression of Farnesoid Receptor (FXR) in Rat Model of Acetaminophen-Induced Hepatotoxicity

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Acetaminophen is a widely-used OTC-drug which is relatively safe in therapeutic dose range although it could act as hepatotoxic substance if it is indicated in higher doses [1]. The most important toxicity of acetaminophen is hepatotoxicity. Bile acid receptors known as Farnesoid X receptors (FXR), are one of the nuclear superfamily receptor members which has pivotal role in the bile acid regulation [2]. The objective of the present thesis was to examine the possible role of FXR in modulating the hepatoprotective effects of hydro-alcoholic extract of saffron. male wistar rats allocated into five random groups including a control, vehicle-treated, Acetaminophen-treated and two acetaminophen-treated received extract at 150 and 300 mg/kg/day. The liver function and histology as well as hepatic FXR gene expression, has been evaluate using liver enzyme assay, tissue staining and RT-PCR technique, respectively. The levels of AST, ALT and LDH of acetaminophen-received group was significantly higher compared to that of control group whereas those of extract treated groups was significantly lower than those of acetaminophen-received ones. Moreover, the RT-PCR findings showed that administration of acetaminophen associated with a non-significant down-regulation pattern (-33%) of FXR gene expression however, a dose-dependent FXR up-regulation manner was seen in extract-treated groups of 150 and 300 mg/kg, to 2.7 and 9 times, respectively. The main findings of our study is that the hepatoprotective activity of saffron might be partly, directly or indirectly, mediated by FXR gene up-regulation.

Keywords: Farnesoid X receptors (FXR), Acetaminophen, Saffron, Hepatotoxic

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A Study on the Effects of Aqueous and Alcoholic Extracts of *Salvia Mirzayanii* on Leishmania Major *in vivo*

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Treatment of cutaneous leishmaniasis with pentavalent antimony compounds, as an established drug, may have limitations, side effects and recurrence risk. For this reason, finding new and effective drugs is of great importance. In the present study, the effect of Aqueous and Alcoholic extracts of *Salvia Mirzayanii* on experimental leishmaniasis ulcers in BALB/c Mice were evaluated. BALB/c mice infected with *Leishmania major* were treated in 5 groups of 6-mice, with Aqueous and Alcoholic extracts of *Salvia Mirzayanii* (400 micrograms) and vitamin A in ointment form, glucontime in injection form and untreated (control). Mices were treated 4 weeks, Twice a day at a specific time. In order to evaluate the effect of drug, the wound diameter, weight of the mice, and the mortality rate of mice were measured. The extracts used in the form of ointment caused the wounds diameter decrease. The results showed that the survival rate of the treated mices was significantly different from the control group. Parasite burden in our study decreased in the liver and spleen of Mice treated with Aqueous and Alcoholic extract [1,2].

Keywords: Aqueous, Alcoholic extracts, *Salvia Mirzayanii*, Leishmania Major

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Evaluation of the Effects of *Capparis spinosa* on Vincristine – Induced Neuropathy (CIPN) in Animal Model

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Peripheral neuropathy is one of the most common consequences of frequently used chemotherapy agents for cancer treatment. Vincristine is one of the most important medicines for the treatment of some types of cancers. Although it has good antineoplastic effects, many patients experience peripheral neuropathy when they use this medicine. Currently available analgesic treatments are often ineffective on pain induced by neuropathy [1]. Many researchers have investigated the therapeutic benefits of several herbal medicines on the prevention and treatment of vincristine-induced neuropathy. *Capparis spinosa* has shown antinociceptive, antioxidant and anti-inflammatory effects in both animals and human studies. This study was designed to investigate the effects of hydroalcoholic extract of *Capparis spinosa* on neuropathic pain. Experimental studies were performed on 48 adult male Wistar rats (150-200 g) randomly divided into six groups (n=8 in all groups). The individual groups received normal saline (as control), vincristine sulfate, the extract of *Capparis spinosa* (100 mg/kg)+vincristine sulfate, the extract of *Capparis spinosa* (200 mg/kg)+vincristine sulfate, the extract of *Capparis spinosa* (400 mg/kg)+vincristine sulfate, pregabalin (20 mg/kg)+vincristine sulfate. Vincristine sulfate administrated by intraperitoneal injection (i.p.), Pregabalin (20 mg/kg) and the extract of *Capparis spinosa* administrated orally at doses of 100-400 mg/kg. Following 10 days of treatment, we started experimental studies by Open field test for analyzing locomotor activity and Hot plate test for analyzing thermal hyperalgesia. The results of open field showed that vincristine decrease the locomotor activity and *Capparis spinosa* extract at dose of 400 mg/kg and pregabalin (positive control) at dose of 20 mg/kg significantly ameliorate the locomotor activity dysfunction induced by vincristine sulfate. In hot plate test, vincristine caused thermal hyperalgesia and the extract of *Capparis spinosa* (200 and 400 mg/kg) and pregabalin (20 mg/kg) significantly reduced the thermal hyperalgesia. Results of both open field and hot plate tests indicated that the extract of *Capparis spinosa* might be useful in the prevention and treatment of chemotherapy-induced peripheral neuropathy.

Keywords: *Capparis spinosa*, Chemotherapy-induced, Peripheral neuropathy, Open

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Antibacterial Activity of Carbon Nanodots from White Mulberry *Morus alba* L. on *Listeria monocytogenes*

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Listeria monocytogenes is recognized as a serious foodborne pathogen in human. Carbon nanodots (CD) as a novel material (1 and 10 nm in size) could be used to prevent growth and survival of *L. monocytogenes* in food [1, 2]. CDs are interested as nano-elements in food due to their excellent fluorescence properties, low cost, and easy synthesis and antimicrobial activities [2]. In this study, the CD was synthesized from white mulberry (*Morus alba* L.) by a hydrothermal procedure and the antimicrobial effect of CD on *Listeria monocytogenes* was examined according to well and disk diffusion method. According to the TEM image, the fabricated CD has a size of 1 nm. The diameter of the zone of inhibition at the concentration of 100% and 50% was 21.31 and 14.01 mm in well diffusion, and 19.53 and 12.17 mm in the disk diffusion method. The results showed that CD of white mulberry could be used as an antimicrobial agent in the food.

Keywords: Antimicrobial, Carbon dots, Nanotechnology, White berry, Pathogens

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The Effect of *Teucrium polium* on Irritable Bowel Syndrome Symptoms

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Irritable Bowel Syndrome is one of the chronic functional disorders of the gastrointestinal tract, that is estimated to be prevalent by 10-15% in the world. Patients with severe symptoms do not have a good quality of life because of the high incidence of absence from work and educational centers and frequent visits to treatment centers. The choice of treatment depends on the symptoms of the patient and includes anti diarrheals, laxatives, and low doses of antidepressants to reduce abdominal pain. Due to the long course of treatment, the use of these drugs are associated with side effects. Various herbal medicines have been shown to be effective. Due to the analgesic and anti-spasmodic effects of *Teucrium polium*, it seems that it can play an effective role in reducing the symptoms of patients with IBS. The study was designed as a double-blind, randomized placebo controlled clinical trial. A total of 78 IBS patients who came to the Ziaiean Hospital were enrolled in the study. They were randomly divided into two groups (n=39). The first group received *Teucrium polium* capsules and the second group received placebo capsules for one month. Before and after intervention, the severity of pain, intensity of bloating, defecation satisfaction, IBS severity score, total IBS symptom score and LFT of the patients recorded and analyzed. Fifty-three patients (mean age 42.9 years, 67.19% female) completed the study. At one month, *Teucrium polium* group was associated with a 66.2% reduction in the IBS severity score from baseline, while in the placebo group this score decreased 45.82% ($p < 0.05$). At trial completion, patients in both groups experienced improvement in abdominal pain, bloating, defecation satisfaction, IBS severity score & total IBS symptom score compared to their baselines ($p < 0.001$). *Teucrium polium* capsule was well tolerated with few adverse effects. *Teucrium polium* extract is a safe and effective treatment capable of providing relief of IBS symptoms [1].

Keywords: Irritable bowel syndrome, *Teucrium polium*, IBS severity score, TISS

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Effects of Aromatherapy Using Lavender on the Quality of Sleep of Hospitalized Elderly Case Study: Selected Hospitals Affiliated with Shahid Beheshti University of Medical Sciences

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Elderly people often have problems with a comfortable sleep. The aim of this study was to evaluate the effect of lavender on the quality of sleep in elderly patients hospitalized in internal wards of selected hospitals of Shahid Beheshti. In this clinical trial study, 64 elderly patients admitted to internal hospitals of Shahid Beheshti University of Medical Sciences who had sleep disorders were randomly assigned into intervention and control groups. The intervention group received 3 drops of lavender essential oil and the control group inhaled 3 drops of normal saline for one week from two hours before bedtime until awakening. Sleep quality of both groups was determined before and after the end of the intervention using Pittsburgh standard sleep quality questionnaire and descriptive and inferential statistics. The mean (SD) of the sleep quality score of the control group before intervention was 12.25 (2.28) and after the intervention 12 (2.46) and in the intervention group before intervention was equal 13.18 (2.87) and later The intervention 8.96 (3.71) was. The mean of total sleep quality score in the intervention group at the end of the study was lower than the control group using the Mann-Whitney test (P -value = 0.001), which indicates a significant Being an intervention. Given that complementary medicine is increasingly part of nursing care, the lavender-based herbal remedy with a positive effect on the quality of sleep in the elderly can be used as a complementary measure.

Keywords: Aromatherapy, Lavender, Quality of sleep, Elderly



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The Effect of Priming with Salicylic Acid on *Carthamus tinctorius* under Salinity Stress

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Seed priming is nowadays being extensively used to improve seed germination and seedling emergence in a wide range of crop species [1] and is basically a physiological process in which the seeds are pre-soaked before planting which, by itself, allows partial imbibition though preventing the germination [2]. In order to study the effect of salicylic acid on germination of *Carthamus tinctorius* under salinity stress, this study was done as a factorial experiment using a completely randomized design with 5 levels of salinity (0, 2, 4, 6, 8 dS/m) and 3 levels of salicylic acid (0, 0.01, 0.1%) with 3 replications. The results showed that salinity had significant effect on stem length and fresh weight. The priming effect on germination percentage, root and stem length and fresh weight was significant. The most germination percentage, root and stem length and fresh weight was obtained without priming treatment that was not statistically different with 0.01% salicylic acid.

Keywords: Priming, *Carthamus tinctorius*, Salinity, Salicylic acid

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Formulation and Quality Control of a Topical Semi Solid Product from Extract of Rosehip *Rosa canina L.*

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Cellular degradation by free radicals is one of the most important reasons for skin aging and shows itself as causing spots and pigmentation [1] Recently, efforts are being made to eliminate spots with plant-derived compounds because of their cost-effectiveness, easier access and fewer side effects. Considering that rosehip is rich in ascorbic acid and flavonoids and has strong antioxidant effects, a cream containing rosehip extract can be used to reduce spots and increase skin elasticity [2] As part of this research, rosehip extract was obtained by a maceration process and its ascorbic acid content and free radicals inhibitory capacity (antioxidant effect) was determined by the DPPH test. Based on these findings it was decided to formulate a cream containing 60% rosehip extract. In order to find a suitable cream base for this high extract content, 9 emulsion bases with different percentages of excipients in water and oil phases were prepared. Different proportions of Span60 and Tween 60 as surfactants and cetyl esters as co-surfactant and stabilizer were used. The different formulations were tested for physical appearance, stability (by centrifuge), spreadability and pH. Also 3 ready-to-use cream bases were tested. One of the formulated cream bases was found to be the most suitable and rosehip extract was incorporated in it. The formulated cream containing 60% rosehip extract had acceptable organoleptic properties and spreadability. Therefore, it can be used as a safe, herbal anti-oxidant cream to protect skin from aging and its manifestations.

Keywords: Formulation, Quality control, *Rosa canina L.*, Semi solid product

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Effect of Drought Stress and Salicylic Acid on Essential Oil Compounds of *Rosmarinus officinalis* L.

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Rosemary leaf contains phenolic acids, phenolic diterpenoid, bitter substances, triterpenoid acids, flavonoids, essential oil, and tannins [1]. Among the reported therapeutic, properties of this plant are strengthening memory function [2], using as a carminative or stomachic component of gastrointestinal medicines and for dyspeptic complaints, external using as a supportive therapy for rheumatic diseases and circulatory problems, promotion of wound healing, and as a mild antiseptic, and in traditional European medicine as a tonic, stimulant, and carminative to treat flatulent dyspepsia, stomach pains, headaches, and nervous tension. In order to decrease the negative effect of drought stress on rosemary growth and prevent its severe reduction, an experiment was carried out using drought stress treatments and increasing tolerance and quality of plant using salicylic acid in 2014 at the Research Institute of Forests and Rangelands (Iran) under field conditions. The experiment was conducted as split-plot in a randomized complete block design with three replications. The main factor included drought stress at three levels of 30 (severe stress), 60 (mild stress) and 90 (control) percent of field capacity (Managed Allowed Depletion (MAD)) , and the sub factor included salicylic acid foliar application at four levels of 0, 1, 2 and 3 mM. According to the results, the most suitable level of stress and salicylic acid treatments for the production of essential oil was 60% and 1 and 2 mM, respectively. Rosemary is one of the most drought tolerant plants with an annual consumption of 4500 to 5500 cubic meters of water per hectare. Also, a mild stress about 60% of the field capacity would be applied optimum production of this plant.

Keywords: Drought stress, Regulators, Secondary metabolites, Water use efficiency

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Experimental and Clinical Effects of *Nigella Sativa* and Its Constituent, Thymoquinone

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Nigella sativa L. (Ranunculaceae), has been used as a herbal medicine and has a rich historical background. It has been traditionally and clinically used in the treatment of several diseases. Many reviews have written about this valuable plant, but none of them focused on its clinical effects. Therefore, a comprehensive report of clinical studies on *N. sativa* and some of its constituents was provided. Studies on the clinical effects of *N. sativa* and its main constituent, thymoquinone, which were published between 1979 and 2015, were searched using various databases. During the last three decades, several in vivo and in vitro animal studies revealed the pharmacological properties of the plant, including its antioxidant, antibacterial, antiproliferative, proapoptotic, anti-inflammatory, and antiepileptic properties, and its effect on improvement in atherogenesis, endothelial dysfunction, glucose metabolism, lipid profile dysfunction, and prevention of hippocampus pyramidal cell loss. In clinical studies, antimicrobial, antioxidant, anti-inflammatory, antitumor, and antidiabetic properties as well as therapeutic effects on metabolic syndrome, and gastrointestinal, neuronal, cardiovascular, respiratory, urinary, and reproductive disorders were found for *N. sativa* and its constituents. Extensive experimental and clinical studies on *N. sativa* seed powder, oil, extracts (aqueous, ethanolic, and methanolic), and thymoquinone showed valuable therapeutic effects on different disorders with a wide range of safe doses. However, there were some confounding factors in the reviewed clinical trials, and a few of them presented data about the phytochemical composition of the plant. Therefore, a more standard clinical trial with *N. sativa* supplementation is needed for the plant to be used as an inexpensive potential biological adjuvant therapy.

Keywords: *Nigella sativa*, Thymoquinone, Herbal medicine



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Effective Methods to Break Seed Dormancy of *Alhagi maurorum*

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Alhugi (*Alhagi maurorum*) is a perennial plant that belongs to the Leguminosae family and used as a winter fodder in grassland pastures and as a treatment for cough and chest pain. One of the things that comes from it is manna (tarangebin) that is used as a treatment for kidney and bladder stone, rheumatism and hemorrhoid in traditional medicine. Due to the presence of drought and lack of forage production and the importance of this plant as a medicinal plant, it is important to cultivate it in large scale. This plant is propagated by seeds but the main problem is that the seeds have a kind of dormancy that could be eliminated through scarification treatments. This experiment was carried out with 3 different types of seeds and 7 different types of scarification treatments and 1 control. This experiment was carried out as a completely randomized test and results were analyzed using SAS software. The results showed that the south Khorasan seeds had better germination than other seeds. Also, hot water and soaking, boiling water and soaking, boiling water and hot water were the best treatments respectively and increased seeds germination percentage up to 85%. As regards that, the germination presentation of treated seeds was much more than control seeds, the result showed that before planting, seeds scarification should be done.

Keywords: Alhugi, Scarification, Manna

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Interaction of Hydroalcohol and Deficit Irrigation on Morph-physiological and Phytochemical Characteristics of Garden Thyme *Thymus vulgaris*

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In order to determine the effect of spraying hydroalcohol (methanol) and deficit irrigation on morpho-physiological and phytochemical characteristic of *Thymus vulgaris* an experiment was conducted during August to November 2017 at the Agricultural Research Station of Shiraz University, Shiraz, Iran. The experimental plots were designed according to split plot with completely randomized block design and three replications. The main factors included irrigation at three levels (40%, 70% and 100% field capacity) and sub plots included methanol-based hydroalcohol at two levels (methanol 20% and methanol 0% as control). The traits evaluated in this research were plant height, shoot fresh weight, shoot dry weight, photosynthesis rate, transpiration rate, stomatal conductance, essential oil yield, essential oil percentage. Although deficit irrigation reduced all traits results indicated that application of methanol 20% have significant effect on some experimental traits such as plant height, fresh weight, dry weight, essential oil yield, essential oil percentage by increasing 5, 28.5, 28.5, 48, 14%, respectively. In addition, the interaction between 70% irrigation and methanol 20% significantly increased shoot fresh weight, shoot dry weight, essential oil percentage and essential oil yield 28, 27, 25, 62% compared to control. The highest plant height and photosynthesis rate was 28.47cm and 8.03 $\mu\text{mol m}^{-2} \text{s}^{-1}$ which obtained from 100% field capacity and methanol 20%.

Keywords: Drought stress, Essential oil percentage, Methanol



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Scientific Reassessment of Old Medical Sources Can be a Futuristic Approach for New Opium Addiction Drug

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The aim of this study is to clarify past prominent persian scholars' point of views on treatment of addiction. Hyoscyamus niger, has been used as a medicine since last centuries and has been described in all traditional medicines. It applies as a herbal medicine. Hyoscyamus niger has pharmacological effects like antisecretory, urinary bladder relaxant, spasmolytic, hypnotic, hallucinogenic, pupil dilating, sedative and anti-diarrheal properties. Iranian physicians have named it Bazrolbanj or Banghdaneh and they applied it for several propose. They also used Hyoscyamus niger to abstinent therapy of opium addict persons. The most important referenes of traditional persian medicine has been searched on keywords such as "treatment of opium addiction" and "gradually quitting opioid addiction" and "opium". Also, a literature search was conducted in electronic databases including Pubmed, Science Direct, Elsevier, SID, Magiran, and Google Scholar and articles published were selected. According to the traditional persian medicine, hyoscyamus niger is the best replacement therapy for gradually quitting opioid addiction. About 30 medicinal herbs have been introduced by prominent persian scholars for treating opium addiction. Prominent persian scholars were the first to discuss various ways of opium addiction treatments. Some of which have been emphasized to have rehabilitation effects via clinical trials. A scientific review of persian scholars other proposed methods and terms can result in new treatment for opioid [1].

Changes in the Amount of Malic Acid, Flavonoid and Cineol Accumulation in *Rosmarinus Officinalis* L. Extract, Under Different Fertilizer Treatments

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Rosemary has anti-inflammatory compounds that can be used to treat various types of inflammation, skin infections, rheumatoid arthritis, fever and infections [1]. It also has strong antioxidant compounds that are beneficial in cancer treatment, neurodegenerative disorders and aging, and oxidative stress reduction [2]. In order to evaluate the effect of manure fertilizers, vermicompost and chemical on the amount of malic acid, flavonoids and cineol in *Rosmarinus officinalis* L. extract an experiment was conducted in a randomized complete block design with three replications at the Alborz Research Station in 2016. Treatments included different levels of chemical fertilizers (N.P.K), manure (M) and vermicompost (V). The 16 treatments used included N0.P0.K0.M0 (1), N0.P0.K0.M10 (2), N0.P0.K0.M20 (3), N50.P25.K25.M0 (4), N100.P50.K50.M0 (5), Vermicompost 5 (6), Vermicompost 15 (7), 2+4(8), 2+5(9), 3+4(10), 3+5(11), 2+6(12), 3+6(13), 2+7(14), 3+7(15) and 6+4+2(16). The plant was harvested at flowering stage to measure malic acid, flavonoid and cineole and immediately transferred to the laboratory. The results showed that there was a significant difference between treatments in terms of malic acid, flavonoid and cineol in extract at 1% level. Comparison of mean treatments showed that the highest malic acid was obtained with 9.91 μ L in treatment of 16 (2+ 4 + 6). However, there was no significant difference between 15, 14 and 13 treatments. The highest flavonoids were obtained with 9.87 and 8.97 μ L from treatments No. 16 and 15 respectively. The highest amount of cineol was also produced with 9.91 μ L in treatment 16. The results showed that fertilizer application improves the quality of rosemary.

Keywords: Rosemary, Manure, Vermicompost, Chemical fertilizers

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Formulation and Physicochemical Evaluation of a Polyherbal Syrup, Prepared According to Iranian Traditional Medicine

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In Iranian traditional medicine (ITM), several formulations could be found for maturing the phlegm (one of the four humors according to the humorism theory). The polyherbal formulation, “Munzij-e-balgham”, is a combination used in ITM for maturing (making ready for the next stage) and expelling materials produced due to excess or putrefaction of phlegm which would result in diseases known as Alzheimer disease, epilepsy, fatty liver, obesity, vitiligo, atherosclerosis, impotence, polycystic ovary, anxiety, asthma, bronchitis and also gastrointestinal disorders like poor digestion and reflux in modern research. Traditional products can be reformulated to achieve pharmacopoeia standards for modern medical usage. In this study, the polyherbal “Munzij-e-balgham” syrup has been formulated according to ITM manuscripts and quality control evaluations have been. The product contained *Vitis venifera* L., *Ficus carica* L., *Foeniculum vulgare* Mill., *Glycyrrhiza glabra* L., *Adiantum capillus-veneris* L., *Rosa damascena* Herrm. and *Onopordum acanthium* L. which were crushed and extracted. Several formulations were prepared and finally a formulation containing the herbs and sodium benzoate, potassium sorbate and glycerin was considered acceptable. The physicochemical characteristics and the stability during six month were evaluated according to standard protocols. The final syrup was light brown in color with appropriate flavor. No precipitation or cap locking were observed. The quality control evaluation results were acceptable and no significant changes were observed during 6 month. Regarding the results, the formulated syrup could be introduced for further mass production after completing the final required evaluations [1,2].

Keywords: Formulation; Iranian Traditional Medicine, Quality control

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Use of Formulated Combination of Bitter Apple to Control the Pest of *Tuberolachnus salignus* Giant Willow Aphid in Tehran's Urban Green Space

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In recent years, green spaces pest control by using environmentally friendly pesticides is one of the goals of executive management and plant protection experts in urban green spaces. *Tuberolachnus salignus* (Order: Hemiptera) is one of the most important pests of green space every year in several gardens of the municipality's greenery region 17 and 6 of Tehran. In this research, the contact and fumigant toxicity of a plant insecticide formulated from aqueous extract of *Citrullus colocynthis* (Order: Cucurbitales) (bitter apple), on nymph and adults insects of the giant willow aphid were studied. At first, sampling of the branches of the willow trees was carried out, and after the identification and confirmation of the pest, Bioassays experiments were carried out. Bioassays tests were performed using Topical test and Paper test in a completely randomized design with three replications. After performing preliminary tests and determining the range of 80-20% of the fecundity, the main test was performed in laboratory conditions and the concentration of 50% (LC50) of the compound, 24 hours after treatment, on the matched second instar nymphs and adult insects, was estimated separately. Were struck. Then, the obtained data were analyzed statistically. The results showed that the LC50 values of the second instar nymphs and adult insects in the first method were 3.079, 2.525 and in the 2.383, 3.383 second method, respectively, 1018 and 1024 ml / Liter is obtained. The findings of this study, in both methods, show the effect of this compound on this pest and the possibility of using the aqueous extract of bitter apple in the management of giant willow aphid in urban green space.

Keyword: Giant willow aphid, Bitter apple, Plant pesticide, Green spaces pests

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Reformulation of a Traditional Polyherbal Product to a Standard Pharmaceutical Molded Tablet

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The use of herbal medicines for improving the quality of human life has been well practiced during centuries. In Iranian traditional medicine (ITM), herbal medicines have important role in treatment of different illnesses; however, they should be converted into modern dosage forms for patient acceptance and easier usage. In the present research, a polyherbal tablet namely “Munzj-e- balgham”, that is a well-known Iranian traditional formulation, has been reformulated and quality control evaluations have been performed to present a suitable formulation. Various preparations of “Munzj-e- balgham” were found in ITM textbooks, among diverse prescriptions, a combination of seven herbal ingredients consisting *Glycyrrhiza glabra* L., *Rosa damascena* Herrm., *Adiantum capillus-veneris* L., *Onopordum acanthium* L., *Vitis venifera* L., *Ficus carica* L. and *Foeniculum vulgare* Mill. was selected. The plants were coarsely powdered and extracted by using decoction method with distilled water; afterward, the extract was spray dried and various ingredients in the different ratios were used for preparing different formulations of the tablet by direct compression method. Several pre and post-formulation evaluations were performed for quality control and validating the polyherbal tablets and finally the best formulation was selected. The tablets were evaluated for microbial and physical characteristics and stability according to standard protocols. No microbial growth was observed and the quality control and stability results were acceptable. The outcome of this research is a modern pharmaceutical standardized formulation from the traditional “Munzj-e- balgham” which can be considered for further optimization processes for mass production of the formulation based on traditional knowledge [1,2].

Keywords: Iranian traditional medicine, “Munzj-e- balgham”, Tablet

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Preparation and Radiolabeling of Extract from *Carthamus Tinctorius* with ^{99m}Tc for Cancer Cells and Tumor Imaging

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Safflower (Kajirah, Kafshe) with a scientific name of *Carthamus tinctorius*, is a native plant of Iran and a one-year-old herb with a height of about 60 cm, which grows in Khorasan, Tafresh, Khuzestan and some other parts of Iran. Safflower grows mainly in warm and dry weather. This plant is originated in Asia and has since been transferred to other parts of the world. Its leaves are broad, jagged and without petioles. Its flowers are single, tubular and reddish yellow, appearing at the end of the stem. Its fruit is white in spherical shape and at the end there is a bunch of thin cords. The flowers of this plant have a red color substance called Cartamin, which is soluble in ethanol. Cartamines are used in dyeing industries. Due to the fact that the effects of the extract of this plant have not been studied in cancer cells until now, the present study aims to investigate and evaluate this effect on the cancer cell line through labeling method. First, production of hydroalcoholic extract of the plant (total extract) was performed by the maceration method and then normal hexane, chloroform and ethyl acetate fractions were prepared from this hydroalcoholic extract. Samples from fractions in polar, semi-polar and non-polar solvents is taken and TLC was performed. Due to the fact that flavonoids are polyphenolic compounds, they are suitable for labeling with radionuclide ^{99m}-technetium. A sample of Ethyl acetate fraction was labeled with ^{99m}Tc and SnCl₂ as a reducing agent and a labeling efficiency of over 80% and 24-hour stability. The labeled compound was injected into a tumor mouse with a C6 cell line, which achieved a good biological distribution of the labeled compound in the tumor. Therefore this compound could be introduced for further studies as a diagnostic radiopharmaceutical for the imaging of cancerous tumors.

Keywords: *Carthamus tinctorius*, Labeling, ^{99m}Tc, Tumor, Imaging

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Age-dependent Variations of Phenolic Acids and Associated Enzyme Activities in *Salvia leriifolia* Benth.

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Medicinal plants are commonly rich in phenolic compounds such as phenolic acids, flavonoids, tannins and lignins. The amount of phenolic compounds varies with plant organ, age, phenological stage and environmental conditions. *Salvia leriifolia* Benth. (Lamiaceae) is a medicinal plant native to Iran and Afghanistan. Pharmaceutical properties of this species is due to its phenolic compounds, particularly phenolic acids [1]. The present study was aimed to investigate the variations in phenolic acid composition and activity of biosynthesis-related enzymes including phenylalanine ammonia lyase (PAL), tyrosine aminotransferase (TAT) and rosmarinic acid synthase (RAS) in *Salvia leriifolia* Benth. at different growth stages. Mature seeds were collected from wild grown plants in Sarogh area of Razavi Khorasan province. The seeds were planted in controlled greenhouse condition and the plant materials were harvested at 8-, 16- and 24-leaf stages. The dried leaf samples were extracted with methanol (80%) by cold maceration and then were analyzed for five individual phenolic acids including rosmarinic acid (RA), salvianolic acid A (Sal A), salvianolic acid B (Sal B), lithospermic acid (LA) and caffeic acid (CA) by HPLC method. The enzyme extracts were obtained from the frozen samples and used for determination of PAL and TAT activities by a spectrophotometric method and RAS activity with the HPLC technique. An age-related increase was observed in the content of all phenolic acids and in the activity of TAT and RAS enzymes. The highest contents of RA (3.84 ± 0.33 mg/g DW), LA (0.48 ± 0.04 mg/g DW), SalA (0.19 ± 0.00 mg/g DW), SalB (0.10 ± 0.00 mg/g DW) and CA (0.024 ± 0.00 mg/g DW) were measured at 24-leaf stage. The plants carrying 24 leaves showed the highest activities of PAL (8.7 ± 0.79 nkat/mg protein), TAT (168.15 ± 13.6 nkat/mg protein) and RAS (12.27 ± 0.71 nkat/mg protein). PAL activity decreased from the value of 8.3 ± 0.56 nkat/mg protein at 8-leaf stage to 5.04 ± 0.51 nkat/mg protein at 16-leaf stage and then elevated again up to 8.7 ± 0.79 nkat/mg protein at 24-leaf stage. In conclusion, age-dependent enhancement in the phenolic acid contents might be possibly due to the elevated activities of related enzymes.

Keywords: *Salvia leriifolia*, phenolic acid, PAL, TAT, RAS

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The Effect of Pre-treatment and Drought Stress on Seeds Germination Indices of Quinoa (*Chenopodium quinoa*)

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Drought stress reduced plant growth and production is very important. The experiment to evaluate the effect of on seed germination characteristics of quinoa (Titicaca variety) under drought stress, a factorial experiment based on completely randomized design with four replications was conducted at seed technology laboratory of Shahed University in 2018. Factors examined included seed produced in four levels of drought stress (0, -1, -2 and -3 bar) and four levels salicylic acid (0, 50, 100, 150 ppm). Studied traits percentage germination, total germination, germination rate, germination rate and average time of germination. According to the results of analysis of variance showed a significant main effects of priming and drought stress effect the studied traits. In addition, the results showed that drought stress reduced the seeds germination indices of quinoa and the use of salicylic acid improved the germination characteristics of quinoa seeds. In drought stress conditions, the application of 150 ppm salicylic acid showed a higher increase in germination percentage than other pretreatment levels at this stress level. In non-drought stress, the application of 50 ppm salicylic acid with an average of 98.33% had the highest percentage of germination. Although quinoa is inherently drought tolerant, different climatic models predict an increase in drought frequency, especially in the altiplano region of the Andes, where quinoa is grown traditionally by small farmers [1]. Thus, understanding the drought response mechanisms in quinoa is critical for developing varieties with improved drought tolerance.

Keywords: Quinoa, Drought Stress, MGT, Germination

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The Effects of Multi-Walled Carbon Nanotubes on Rosmarinic Acid Production in Leaves of *Salvia verticillata* L.

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Salvia verticillata L. (Lamiaceae family) is a potent medicinal plant, which is used for health purposes in Iranian traditional medicine. Similar to the other species of *Salvia* genus, *S. verticillata* contains phenolic compound specially rosmarinic acid (RA) and is a candidate for Alzheimer's and vascular dementia drugs [1]. As a result of rapid growth in the production of various types of nanomaterials, recently many projects have been conducted on the study of their effects on physiology and development of plant systems. For this reason, the present study was carried out to explore the uptake of multi-walled carbon nanotubes (MWCNTs) at different concentrations (0, 50, 100, 250 and 500 mg L⁻¹) and their potential effects on RA production in the leaves of *S. verticillata*. MWCNTs powder was dissolved in deionized water and sonicated for 30 min before treatment. Different concentrations of MWCNTs were sprayed on leaves surface of two-month old plants and leaves were harvested after 10 days. Transmission electron microscopy and Raman spectroscopy analysis of the treated leaves showed that MWCNTs could penetrate through the cell walls and possibly distribution in parenchyma cells layers. RA content in the treated leaves was estimated by HPLC method and chromatographic data revealed that RA production improved significantly at 50-100 mg L⁻¹ concentrations of MWCNTs, while a rapid decrease was observed in RA content of the treated leaves with 250-500 mg L⁻¹ of the nanotubes. In addition, oxidative injury indices including H₂O₂ and malondialdehyde content dramatically increased according to the rise of MWCNTs concentration. In conclusion, our finding demonstrated that MWCNTs can effectively penetrate to plant cells and trigger oxidative stress responses via production of reactive oxygen species. Also, the effect of MWCNTs on RA production was dose-dependent, so that at the low concentrations (50-100 mg L⁻¹) could act as an elicitor for enhancement of biosynthesis of RA in the leaves of *S. verticillata*, while at the higher concentrations this nanomaterial was toxic.

Keywords: MWCNTs, Rosmarinic acid, *Salvia verticillata* L.

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Total Phenolic and Total Flavonoid Contents and Antioxidant and Cytotoxic Activities of *Dracocephalum moldavica* Extracts

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The purpose of the present investigation is to evaluate the total phenolic (TPC) and flavonoid contents (TFC), antioxidant and cytotoxic activities of *Dracocephalum moldavica* extracts as well as the chemical composition of its essential oil (EO). Total phenolic and flavonoid contents were estimated by Folin-Ciocalteu and aluminum chloride methods, respectively. Antioxidant activity of extracts were tested by the β -carotene-linoleic acid bleaching (BCB) and the 1, 1-diphenyl-2-picrylhydrazyl (DPPH) methods. The identification of chemical constituents of the EO was carried out using gas chromatography-mass spectrometry analysis (GC-MS). The cytotoxic activity of the extracts against three cell lines including human breast cancer cell lines (MCF7), colorectal cancer cell lines (SW48) and a normal cell lines mouse embryonic fibroblast cells (NIH 3T3) determined by AlamarBlue assay. The major compounds of *D. moldavica* EO were Citrol (20/27%), methyl chavicol (13.13%), neral (7/93%) and phytol (5.07%). The buthanolic extract showed the highest TPC (381.45 μ g gallic acid (GA)/mg dry extract (DE), while the ethyl acetate showed the highest TFC (795.3 μ g quercetin (QE) /mg DE). The plant extract at concentration of 50-400 μ g/mg did not show any toxic effect on all cell lines. The highest antioxidant effect in DPPH test was belong to the methanol extract with IC₅₀ value of 9.75. Furthermore, the ethyl acetate extract had the highest inhibition (98%) at concentration of 150 μ g/ml in the BCB method. The results obtained from this study indicate that *D. moldavica* is a potential source of antioxidants and thus could prevent many radical diseases.

Keywords: *Dracocephalum moldavica*, Extract, Essential oil, Antioxidant, Cytotoxic



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Assessment of Anticancer Properties of *Rosmarinus officinalis* L Extract and Gamma Rays on Viability of MCF7, Skbr3 and Fibroblast Cell Lines

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Despite significant advances in radiation therapy and treatment of cancer in the recent years, resistance to chemotherapy is a major obstacle in the recovery of patients with cancer. This study aims to evaluate the anticancer activity of the methanolic extract of rosemary alone and in conjunction with the gamma rays on growth inhibition of MCF-7, SKBR3 and HU02 cell lines. We examined cytotoxicity of different concentrations (1, 5, 10, 50, 100, 500 µg/ml) of rosemary extract and various doses of gamma rays (1.5, 3, and 7.5 Gy) on MCF-7, SKBR3, and fibroblast (HU02) cell lines. The cell lines were grown in DMEM supplemented with 10% FBS, 1% penicillin and streptomycin and was incubated at 37 °C, in an atmosphere containing 5% CO₂ and 100% humidity. Standard MTT assay was performed for estimating viability of the cells after treatment with gamma rays and rosemary extract. The results of the MTT assay showed that rosemary extract had time- and concentration-dependent anticancer activities on the MCF-7 and SKBR3 cell lines (p<0.01). Rosemary extract had no remarkable cytotoxicity on the normal HU02 cell line. Gamma rays along with rosemary extract had more cytotoxic activity in a time-dependent manner on viability in the cancer cell lines (p<0.03). Our results, along with results from other studies, have suggested that rosemary extract is a potential candidate, either alone at pre-determined doses or in combination with gamma rays, for the treatment of chemotherapy resistant breast cancer. [1,2].

Keywords: *Rosmarinus officinalis*, Extract, Gamma rays, Cytotoxicity

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Effect of Different Inoculation Treatments of *Piriformospora indica* on Growth, Chlorophyll and Carotenoid Content of Licorice (*Glycyrrhiza glabra* L.) under Drought Stress

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Licorice (*Glycyrrhiza glabra* L.), is an herbaceous perennial and has been used as a flavoring agent in foods and medicinal remedies for years. *Piriformospora indica*, as an endophyte Mycorrhizal-like fungus, promotes the growth and survival of plants belonging to a number of species when exposed to various abiotic stresses, including drought and salinity stress. Drought stress is a major constraint of crop productivity. The goal of this research was the study of *P. indica* potential to colonize the roots of the licorice plant and to enhance growth and photosynthesis capacity under drought stress. This study was done as a factorial experiment in a completely randomized design with three replications and was conducted in the greenhouse of Malayer university (Malayer). The experimental factors included three fungal levels (inoculated with spore and mycelium and non-inoculated) and two drought levels (F.C., 50% F.C.). The results demonstrated that *P. indica*, promotes growth and confers drought resistance. Inoculation of the plant with *P. indica* increased the biomass of licorice plants, as in inoculated plants under drought stress total shoot and root dry weight was increased. The results showed that the chlorophyll and carotenoid contents of *P. indica*-inoculated licorice leaves were also higher than those of the uninoculated controls in drought stress. Higher chlorophyll and carotenoid content and thus photosynthesis rates might accelerate carbohydrate synthesis and thus growth of *Glycyrrhiza glabra*. These results suggest that *P. indica* is a helpful symbiont for promoting licorice growth and drought resistance [1, 2].

Keywords: Endophyte, Sustainable agriculture, Colonization, Chlorophyll content

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Antioxidant Activity, Total Phenolic and Oleuropein Contents of Seventeen Cultivars of Iranian Olive, *Olea europaea* L.

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The olive tree (*Olea europaea* L.) is widely distributed in the European Mediterranean countries, and northern Iran. The leaves are considered as a potential natural antioxidant source because of their phenolic contents like phenolic compounds, flavonoids, and secoiridoids such as oleuropein. Among these compounds, oleuropein is the major constituent of the leaf. In this study, the leaves of 17 cultivars of olive (Manzanilla, Conservolea, Arbequina, Mishen, Coratina, Roghani, Kalamon, Amphissis, Yellow, Amigdalifolia, Mary, Leccino, Shenge, Gordal, Sevilencia, Fishomi, and Beleidi) were collected from Olive Research Center, Guilan Agricultural and Natural Resources Research and Education Center, Roudbar, Guilan province, Iran, in March 2015. The leaves were dried at room temperature, powdered and then extracted separately by the percolation method with MeOH/H₂O (50/50) three times. The total phenolic contents were measured by the Folin–Ciocalteu method. Finally, the identification and quantification of oleuropein were performed by reverse phase high performance liquid chromatography (HPLC) with diode array detector (PDA). The results showed that the maximum radical scavenging activities were found in Gordal, Coratina, and Kalamon extracts (IC₅₀ 20.66, 22.95, and 26.74 µg.ml⁻¹, respectively). The cultivars Kalamon, Gordal, and Coratina contained the highest concentration of phenolic compounds (190.65±0.03, 184.72±0.001, and 155.91±0.06 mg GAE/g extract, respectively). The highest oleuropein concentrations were observed in Mishen and Beleidi (11.12%), Kalamon (10.7%) and Roghani (10.07%) while it was not detected in cultivars Conservolea, Amigdalolia, Leccino, and Fishomi. In conclusion, three cultivars, Gordal, Coratina, and Kalamon had the highest phenolic contents and antioxidant activity. They can be considered as the subject of further studies to use as sources of natural antioxidants. Also cultivars, Mishen, Beleidi, Kalamon and Roghani are potential sources of oleuropein.

Keywords: *Olea europaea* L., Antioxidant activity, Total phenol, Oleuropein

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The Effect of Salicylic Acid on Seedling Growth Indices of Quinoa (*Chenopodium quinoa*) Under Drought Stress

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This study was conducted to evaluate the effect of seed priming with salicylic acid in mitigation of drought stress on growth characteristics of quinoa (Titicaca variety), an experiments was conducted in year 2018 at Seed Technology Laboratory Shahed University. Factorial experiment in a completely randomized design with three replications. Experimental treatments includes four levels of salicylic acid (0, 50, 100 and 150 ppm) and four drought levels (0, -1, -2 and -3 bar). The traits studied were root length, stem length and seedling length, seedling fresh weight, seedling dry weight and relative water content. The results of analysis of variance of the data showed that the tested factors had a significant effect on the studied traits (P<0.01). Salicylic acid pre-treatment improved the characteristics of quinoa seedling growth under drought stress. The maximum percentage and rate of germination, seedling vigor, root length, stem length, stem fresh weight and seedling dry weight were observed at salinity levels of 50 ppm priming in -1 bar stress. In general, the results obtained in this study indicate that pretreatment with 50 ppm salicylic acid, as compared with other levels, improves the quinoa seedling growth indices. In conclusion, by treating seeds with Salicylic acid under drought could be quinoa accelerate germination. Quinoa is considered a drought-tolerant crop, capable of growing and producing seed grain in the semi-desert conditions of Chile, the arid mountain regions of northwest Argentina, and the Altiplano area of Peru and Bolivia. These environments are characterized as extremely arid, with less than 200 mm of annual rainfall [1]. Quinoa can also adapt and produce seed in semi-arid and arid environments outside of the Andean region, such as Asia, North Africa, the Near East, and the Mediterranean [2].

Keywords: Quinoa, Salicylic Acid, Seedlings, Seedlings, Dehydrated

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Evaluation of Genetic Diversity of Different Species of *Rumex spp.* by Using Seed Proteins Electrophoresis

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Iran has a large diversity in *Rumex spp* genotypes, and the introduction and recognition of this genetic diversity can be considered as a strategy for the development of species. This study was intended to evaluate the protein diversity of 14 *Rumex spp* populations belong to three species consisting of from Khorasan Razavi, Ardebil and Moghan. The results of the electrophoresis of the extracted proteins revealed the presence of 26 strips based on relative motion on the gel, showing six repeatable bands in all populations, and only 20 bands among them were polymorphic among populations. There was also a significant variation in the pattern of 20 bands of proteins studied between populations. The dendrogram fragmentation from cluster analysis was grouped into six clusters based on different protein profiles. The first cluster consists of a species and two populations, a second cluster of one species and a population, a third cluster of three species and six populations, a fourth cluster of two species and three populations, a fifth cluster of a species and a population of sixth species of a species and three populations they got.

Keywords: Cluster analysis, Hereditary reserves, Genetic diversity, Dendrogram

Postharvest Quality of Jujuba *Ziziphus jujuba* Miller. as Affected by Harvesting Time and Edible Coatings

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Nowadays, application of natural compounds has increased for preserving of quality and shelf-life of agricultural products. In order to investigate the effect of harvesting time and edible coatings on quality criteria and shelf life of Jujuba (*Ziziphus jujuba* Miller.), a factorial experiment was conducted based on completely randomized design with three replications in Department of Horticultural Science and Landscape Engineering, University of Tehran during 2017-2018. Treatments were included two fruit harvest times (half-red and red mature fruit) and edible coating based on natural *Aloe vera* gel in combination with different concentrations of ascorbic acid (immersion in distilled water as control, pure *Aloe vera*, diluted *Aloe vera* with distilled water at the ratio of 1: 3 in combination with 1, 3 and 5% ascorbic acid). Qualitative characteristics such as vitamin C content, fruit firmness, ethylene, ion leakage, fruit decay, total phenol content and total antioxidant activity were evaluated every seven days, during 35 days of storage at 5 °C and relative humidity of 85-80%. The results revealed that the use of edible coatings increased the shelf life of the fruits compared to the control. Application of *A. vera* gel in combination with ascorbic acid, in most of the studied traits, showed better performance than pure gel coating. Also, the progress of fruit ripening resulted in decreasing of the quality characteristics of the fruit. According to the results, it seems that the use of *A. vera* gel alone and in combination with ascorbic acid as a natural preservative compound, can maintain the jujube fruit quality and prolong its shelf life.

Keywords: Ascorbic acid, *Aloe vera* gel, Maturity stage, Shelf- life, Medicinal plant



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Lectin-Immobilization On Silica Nanoparticle For Affinity Purification

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Lectins are proteins capable of binding reversibly to carbohydrates and agglutinating and/or precipitating polysaccharides and glycoproteins [1]. WGA is a lectin from *Triticum vulgare* has an affinity to N-acetyl-glucosamine and sialic acid residues, there are two specific binding sites per molecule [2]. The existence of these active sites make this lectin a useful biological tool to investigate carbohydrate-protein interactions and structural modifications of glycoconjugates. Since most proteins are glycosylated and their glycans take part in molecular and cellular communication process, and interestingly all FDA-approved cancer biomarkers are glycosylated proteins, so in most cases, aberrant glycosylation patterns can be used as a sign of the disease. Many glycoproteomics studies used a wide variety of lectin based glycan structural strategies to improve the methods for early detection. In this study, we immobilized WGA lectin on non-porous silica nanoparticles to early cancer diagnosis. At the first we synthesize silica nanoparticles by Stober method after that use Glysidoxo propyl trimethoxysilan as linker. Then immobilized wheat lectin on nanosilica. This substrate was able to distinguish between cancer cell (mda_mb231) and normal cell by gel Electrophoresis and HPLC instrument.

Keywords: Plant lectin, WGA, Breast cancer, Silica nanoparticles

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Determination of Caffeine Content of *Erodium Cicutarium* by UV/Vis Spectrophotometric and Fluorimetric Method

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Caffeine as an alkaloid of the methylxanthine family is a naturally occurring substance found in the leaves, seeds or fruits of over 63 plants species worldwide. The most commonly known sources of caffeine are coffee, cocoa beans, cola nuts and tea leaves. In its pure state, it is an intensely bitter white powder. Caffeine is used as a drug on the basis of its effect on respiratory, cardiovascular and the central nervous system. It is included with aspirin in some preparations for treatment of headaches as it decreases cerebral eye blood flow. *Erodium cicutarium* (EC) is a one- or two-year plant found in the fields, roadsides of the lowlands and lower piedmonts in Poland. It is known for its antihemorrhagic activity, antiviral effect in relation to myxoviruses, Herpes virus type 1, and vesicular stomatitis and vaccinia virus. In this study, the concentration of caffeine in *Erodium cicutarium* were measured with the UV/Vis spectrophotometric and fluorimetric methods. Pure Caffeine was used as standard to produce the calibration curve, and the absorbance and fluorescence intensity of the samples were measured at 274 and 340 nm, respectively. The results from the experiments showed that there is caffeine in the *Erodium cicutarium*, which is significant compared to tea.

Keywords: *Erodium cicutarium*, Caffeine, UV-Vis, Fluorimetry

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Use of Multivariate Analysis for Forage Yield and its Traits in Yellow Alfalfa under Salinity

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In order to evaluate several agro-morphological traits in yellow alfalfa under salinity and normal conditions, an experiment based on a completely randomized design with four replications was carried out. Simple correlation coefficients indicated that forage yield had a significant positive relationship with stem (0.80) and leaves (0.90) weights, while negatively correlated with root weight (-0.69) under non-stress condition. But under salinity, forage yield had a significant positive relationship with leaves (0.86) weight and leaf no. (0.63), while unlike non-stress condition positively correlated with root weight (0.44). Principal component analysis (PCA) was used for understanding the traits relations. From PCA, the first three principal components explained 82.3% and 82% of the total variation under non-stress and salinity conditions, respectively. The first PCA under non-stress condition was assigned 42% and the second PCA was assigned 29% of total variation among traits. The selected PCAs were more related to forage yield, branch number and stem weight. The first and second PCAs under salinity were assigned 45% and 23% of total variation among traits. The selected PCAs were more related to root weight, root length and leaf weight. Therefore, the selection may be done according to the specified traits and it was helpful for a good breeding program for development of high yielding alfalfa. Cluster analysis using Un-weighted Pair Group Method with Arithmetic mean (UPGMA) algorithm revealed that the nine traits were grouped into three and four clusters under non-stress and salinity conditions. The root length grouped lonely at separate cluster under salinity condition. These results indicated the importance of root related traits and their positive influence on forage yield of yellow alfalfa at salinity condition.

Keywords: Correlation, Forage yield, Morphological traits, Principal component

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Honey and Its Effect on Tumor Necrosis Factor Alpha in the Rat Air Pouch Model of Inflammation

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Synthetic anti-inflammatory drugs have dangerous side effects which lead to research involved in identification of cheaper and safer alternatives from the natural resources. Honey is a natural product that is rich in carbohydrates, proteins, vitamins, trace elements, enzymes, and phenolic compounds. Honey for centuries has had a valued place in traditional medicine. Despite widespread research, honey has a limited use in modern medicine due to lack of scientific support. Because tumor necrosis factor alpha (TNF- α) as a key cytokine, can play a main role to regulate inflammation, the aim of present study was to investigate the effects of honey on the TNF- α concentration in a rat model for rheumatoid arthritis, namely air pouch model of inflammation. Male Wistar rats were anesthetized; 20 ml and 10 ml of sterile air were injected subcutaneously on the back on day 0 and day 3, respectively. On day 6, inflammation was induced by injection of 1 ml of carrageenan 1% -as a phlogistic agent- into pouches. One ml of honey (0.25, 0.5, 1) was administered intra pouch at the same time as the carrageenan and then for 2 consecutive days. The negative and positive control rats received saline and diclofenac sodium respectively. After 72h, the rats were sacrificed. The pouches fluid was collected and was centrifuged at 10000 g for 10 min to remove infiltrating leukocytes. The level of TNF- α was measured in supernatants using commercial ELISA kits. The concentration of TNF- α was significantly inhibited ($P < 0.05$, $P < 0.01$ & $P < 0.001$) by honey with doses of 0.25, 0.5 & 1%, respectively. Interestingly, attenuation of TNF- α concentration by 1 % honey was similar to diclofenac sodium. The study confirms that honey has an inhibitory effect in the TNF- α production in the air pouch model of inflammation. Therefore, honey may be used to treat certain chronic inflammatory conditions.

Keywords: Honey; TNF- α ; Rat, Air Pouch, Rheumatoid Arthritis



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Growth Performance of Licorice (*Glycyrrhiza glabra* L.) Ecotypes by Application of Mycorrhizal Fungi under Heavy Metals Stress

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Licorice (*Glycyrrhiza glabra* L., Fabaceae) is an economically important medicinal plant which is used worldwide in pharmaceutical, food and cosmetic industries. In order to investigate growth and morphological characteristics of licorice ecotypes under arbuscular mycorrhizal fungi and heavy metals stress, a factorial experiment based on completely randomized design with three replications was conducted in Research Greenhouse of Department of Horticultural Science and Landscape Engineering, University of Tehran in 2018. Two licorice ecotypes (Baft and Ramjerd), arbuscular mycorrhizal fungi (inoculated and non-inoculated) and heavy metals stress (0, 300 mg.kg⁻¹ Pb+ 20 mg.kg⁻¹ Cd and 600 mg.kg⁻¹ Pb+ 40 mg.kg⁻¹ Cd) were applied. Criteria such as plant height and diameter, internode length, herbal dry weight and root dry weight were measured. According to the results, the main and interaction effects of ecotype, mycorrhizal fungi and heavy metals significantly affected most of the studied traits. The highest plant height observed in control plants (non-mycorrhizal and no heavy metals). Plant inoculation with mycorrhizal fungi resulted in decreasing of plant diameter compared to non-inoculated plants. Application of mycorrhizal fungi in Ramjerd ecotype caused the highest internode length. Also, by increasing heavy metal concentration, herbal dry weight significantly decreased in Baft ecotype rather than Ramjerd ecotype. Mycorrhizal inoculation of Ramjerd ecotype under using of 300 mg.kg⁻¹ Pb+ 20 mg.kg⁻¹ Cd caused the highest root dry weight, although, there was no significant difference between heavy metals combination levels. According to the primary results, Ramjerd ecotype showed better growth performance than Baft ecotype under heavy metals stress.

Keyword: Abiotic stress, Biological input, Medicinal plant, Morphological traits

Study of Salinity Stress on *Melilotus officinalis* and Reducing its Effects with Abiotic Elicitors

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Melilotus officinalis is a valuable medicinal plant with pharmaceutical compounds such as flavonoids, acidophilic, tannin, coumarin, and lignin. This study aimed to investigate the effects of salinity stress and mitigate its effects on exposure to salicylic acid and methyl jasmonate on morphological traits of *Melilotus officinalis*. For this purpose, a factorial experiment was carried out using two factors including salinity stress (0 and 30 mM) and abiotic elicitors (100 μM salicylic acid, 2 mM methyl jasmonate and water-spray as control) based on a completely randomized design in four replications. Based on the results of variance analysis, it was determined that salinity stress had a significant effect on root weight, stem weight and leaf number, and based on the mean comparison, salinity stress reduced leaf number and increased root and stem weights. With foliar application of abiotic elicitors, the number of leaves and some morphological traits increased. Therefore, application of salicylic acid and methyl jasmonate reduced the effect of salinity stress on *Melilotus officinalis*. In conclusion of this research, salt stress did not significantly decrease in some morphological traits and biomass yield of *Melilotus officinalis*, which it shows the high *Melilotus officinalis* resistance to salinity stress and, on the other hand, salicylic acid and methyl jasmonate are responsible for reducing the effects of salinity.

Keywords: Elicitor, *Melilotus officinalis*, Salinity stress

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Rooting Performance of Stevia (*Stevia rebaudiana* Bertoni) as Affected by Stem Cutting Type and Growing Media

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Stevia rebaudiana Bertoni, a perennial herb of the Asteraceae, is one of the most important sources of non-caloric natural sweeteners. The present study aimed to investigate the effect of cutting type and growing media on growth and rooting characteristics of Stevia. A factorial experiment based on completely randomized design with four replication was conducted at Research Greenhouse of Department of Horticultural Science and Landscape Engineering, University of Tehran in 2016. Treatments were included stem cutting type (middle and terminal) and growing media (peat moss, peat moss+ perlite (1:1/ v:v), cocopeat+perlite (1:1/ v:v), cocopeat-perlite+ cow manure (2:1/v:v), cocopeat-perlite + vermicompost (2:1/ v:v), sand, sand+ vermicompost (2:1/ v:v), soil+sand+vermicompost (1:1:1/ v:v:v), soil+sand+cow manure (1:1:1/ v:v:v), soil+sand+leaf litter (1:1:1/ v:v:v). Criteria such as root fresh and dry weight, root volume, root number per cutting, main root length, shoot fresh and dry weight, lateral branch length, leaf number per plant, rooting percentage and callus formation percentage were measured. Results revealed that the main and interaction effects of cutting type and growing media significantly affected most criteria. Terminal cutting in peat moss+perlite media caused the highest root fresh and dry weight, root volume, root number per cutting, root length, leaf number per plant, rooting percentage. The highest shoot fresh and dry weight observed in middle cutting growing in peat moss media. Also, terminal cutting resulted in the longest lateral branch length. Using terminal cutting in combination with peat moss media caused the highest percentage of callus formation. Overall, results indicated that terminal stem cutting and using of peat moss+ perlite as growing media showed positive effects on rooting performance of stevia.

Keywords: Cutting, Callus formation, Medicinal plant, Media, Rooting percentage

Study of Color Factors and Antioxidant Activity in 24 Damask Rose Populations of two Eastern and Western Azerbaijan Provinces

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The Term "Medicinal plants" are defined as plants that have medicinal properties. These plants are a rich source of components that can be used for drug producing and synthesis [1]. Damask rose or Persian rose with scientific name of *Rosa damascena*, is from Rosaceae family [2]. Regarding the lots of diversity among the local genotypes of Damask rose in the country, it is necessary to recognize its genetic resources and phytochemical variation, and then use them for breeding. Twenty-four genotypes of 11 cities and 24 regions were collected from eastern and western Azerbaijan provinces and transferred to the Horticulture Department of Agriculture faculty, Urmia University. Color factors L, a, b were measured by Hunter lab apparatus. The Chroma and hue angle were calculated by related relationship. The petals of samples were dried and used in antioxidant resources in two ways FRAP and DPPH by mentioned protocols. The results of experiment showed the first G of Urmia has the highest amount of factor L (transparency). G10 showed the highest amount of factor b (being yellow) and hue angle; G12 showed the highest amount of color factor a (being red) and Chroma. Also, G1 of Urmia showed the highest amount of antioxidant activity in two ways. Color factors are important in terms of ornamental and medicine. In petals, a (red color) can be the reflect anthocyanin amount. The high amount of antioxidant observed in methanolic extract can be the sign of the high amount of negative components in petals. These components are very important in terms of medicine.

Keyword: Antioxidant Activity, Chroma, Damask rose, Hue angle

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Comparative Study of Phenolic Content and Antioxidant Activity from Aerial Parts and Roots of *Phlomis olivieri* Benth.

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Use of medicinal plants and their active ingredients as natural resources with high antioxidant properties are interested recently. *Phlomis* L. is an important plant from Lamiaceae family, with over 100 species distributed throughout Euro-Asia and North Africa continents [1]. 17 species of this genus including, *Phlomis olivieri* Benth. are endemic to Iran [2], and have anti-nociceptive, antibacterial, antifungal and antioxidant activities. In the present study, the aerial parts and roots of *Ph. olivieri* were collected from natural habitat from West Azarbaijan of Iran at spring season (2017). Then ultrasonic apparatus was used for extraction. Total phenolic content of methanol extracts was determined by Folin-Ciocalteu method and antioxidant activity using 2, 2'-diphenyl-1-picrylhydrazyl radical scavenging assay (%DPPH). All data on repeated three were statistical analysis using completely randomized designs by SAS software (ver. 13). The results from analysis of variance showed that total phenolic in aerial parts and roots were significant at ($p < 0.01$). Total phenolic were (61.30 mg/g DW and 93.22 mg/g DW) and (18.95 mg/g DW and 31.31 mg/g DW) in aerial parts and roots respectively. The highest amount of total phenols (93.22 GAE/g DW) recorded in aerial parts. Also the lowest content of total phenols (18.95 GAE/g DW) were obtained in roots sample. Also the results showed that antioxidant activity based on DPPH% in aerial parts and roots was significant at ($p < 0.05$), highest antioxidant activity were recorded in aerial parts (46.32%) and lowest were obtained in roots with the (34.37%). The results showed that the aerial parts of *phlomis olivieri* Benth. are a natural source of phenolic compounds with higher antioxidant activity and can use in medicine and food production.

Keywords: *Phlomis olivieri* Benth., Antioxidant activity, Phenolic content, Extraction

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The Therapeutic Effects of *Teucrium polium* Extract on Wounds Healing in Diabetic Rats

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Diabetic foot ulcer is one of the most important health problems in the life of diabetic patients. The process ulcer healing is difficult in diabetic patients and has always been challenging due to high costs. In traditional medicine, numerous medicinal herbs are used to treat diabetic foot ulcers. *Teucrium polium* is one of the plants that have been used in Iranian traditional medicine for treatment of burn wounds as well as diabetic foot ulcers. The goal of the current research is to investigate the therapeutic effect of topical *Teucrium polium* ointment on wound healing in diabetic rats. For this propose, sixty four male Wistar rats with 6 months old selected and then were induced diabetes with intraperitoneal administration of Alloxan (125 mg/kg). After two weeks the rats with a blood glucose level of 150 to 250 mg/dl were selected and area of 2 cm² back skin was removed by scalpel under anesthesia. The rats were divided into 8 groups of eight rats each: control group, placebo group (Eucerin), phenytoin group, *Teucrium polium* ointment with a concentration of 2%, 3%, 4%, 5% and 10%. The ointment was rubbed on the wound and dressed twice a day. The process of wound healing was screened macroscopically and by digital imaging on days 14, 21 and until wound healing complete, the wound area and duration of complete healing in each group was compared with phenytoin (positive control) and Eucerin (negative control). The results indicate that the process of wounds healing on day 14 and 21 decreased significantly in *Teucrium polium* ointment showed that the with 4% ($P = 0.003$), 5% ($P = 0.001$), 10% ($P = 0.001$) and phenytoin cream group ($P = 0.001$) compared with Eucerin group. In conclusion: The results of this study showed that the wound healing of 5% and 10% *Teucrium polium* ointment are comparable to the phenytoin as a standard medicine.

Keywords: Diabetic wound, *Teucrium polium*, Traditional medicine, Rat

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The Study of Morphological Characteristics and Essential Oil Percentage of *Hymenocrater longiflorus* Benth. In the West of Iran

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Hymenocrater longiflorus Benth. is belongs to Lamiaceae family which utilized as medicine in local and traditional medicine. The crude and backed form of plant aerial parts is used as anti-inflammatory, sedative and anti-skin allergic (for skin diseases and insect bites) [1]. This genus has over 21 species in the world [2]. In order to breeding and domestication, we studied morphological variety among eight wild-growing population collected from western reigns of Iran, including; Kalushamshi, Dalani, Quri qaleh, Goli, Zhalana, Paveh, Shmsher and Dzli. In morphological variations 15 traits were evaluated based on classification methods including means of cluster and principle components analysis. For phytochemical indices essential oil percentage were utilized. Plants were collected in full bloom stag then, air-dried and essential oil were obtained by water distillation method (Clevenger apparatus). Results of cluster analysis categorized the populations in three groups. The results were indicated the highest and lowest percentage of essential oils in Dzli (0.78%) and Zhalana (0.40%) respectively. Considering that the Shmsher population has the highest essential oil percentage and highest flower characteristics, it was introduced as the elite genotype for breeding and domestication projects and also described as a valuable source of essential oil.

Keywords: *Hymenocrater longiflorus* Benth, Essential oil, Morphology

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The Effect of Different Fertilizers on Morphological Characteristics of *Satureja Bachtiarica* in Second Year of Plant Growth

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Satureja bachtiarica belonging to the Lamiaceae family is an endemic species, which is rich in carvacrol, thymol and other aromatic compounds. The essential oil of the plant could be added in fatty food against radicals similar to synthetic antioxidant BHT. It is a perennial aromatic herb distributed in Zagros mountain range, southwestern Iran. This research was conducted in Alborz research station, Research Institute of Forests and Rangelands, Karaj, Iran, in 2016. The experiment was conducted in the form of randomized complete block design with three replications. Treatments were including control, manure 30 ton/ha, manure 60 ton/ha, vermi-compost 5 ton/ha, N₅₀P₂₅K₂₅, N₅₀P₂₅K₂₅M₃₀, N₅₀P₂₅K₂₅M₆₀, N₅₀P₂₅K₂₅V₅, *Glomus mossea*, *Glomus intraradices*, and *Pseudomonas stain 187*, *Azospirillum*, *Thiobacillus*, S₂₅₀ + *Thiobacillus*, S₅₀₀ + *Thiobacillus* and Vermicompost (5 ton/ha) + *Thiobacillus*. Plots were 2 in 3 meters. The distance between the plots was 1 meter and the distance between the blocks was 1 meter too. Planting intervals were 40 cm long and between 50 cm lines. Planting was carried out through transplantation. The harvest was done at flowering stage. Branches that dried in shade, used to measure the morphological traits of plant. The results of variance analysis of the second year of plant growth showed significantly difference between fertilizers only on canopy that it was the highest in N₅₀P₂₅K₂₅M₃₀ with 250 cm. The results showed that this plant could produce many lateral shoots under the influence of manure and chemical fertilizer.

Keywords: *Satureja bachtiarica*, Fertilize, Canopy, Lateral shoots



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Effect of Allelopathic Impact of Bark *Cupressus Arizona* Essential Oil Extract on two Weeds Species *Amaranthus retroflexus* and *Lactuca sativa*

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Weed resistance to herbicides and environmental pollutions have drawn attention to the biological control methods recently. Therefore use of plant extracts and essential oils as safe natural substances are interested. For this aim the allelopathic effect of bark *Cupressus Arizona* EXTRACT were investigated at pre-emergence stage on two weeds species *Amaranthus retroflexus* and *Lactuca sativa*. Present work was conducted in a factorial base experiment with completely randomized design during 2017 in laboratories of Horticulture department of Urmia University. The Essential oil of bark samples (yield 9% v/w) were obtained from plant grown in Urmia University and were used with different concentrations (0, 750, 1500, 2250, 3000 and 3750) with four replications. Finally, germination percentage, viability and morphological traits (root growth, shoot and seedling weight) was evaluated during seed germination for both of species. Results showed that *Cupressus Arizona* EO reduced germination in all concentration and all species, in compare with control. Our results indicate that the lowest percentage of germination of two species (*A. retroflexus* and *L. sativa*) occurred in the Sixth treatments 4 and 44% respectively. *L. sativa* seeds were more sensitive than other seeds in different concentrations. The greatest reduction in root length and shoot (0.96mm 0.6 mm respectively) were recorded in 3750 concentration, obtained in *A. retroflexus* seedlings. Our experiment have shown that bark of *C. Arizona* extracts of can be used as a useful natural herbicides, however future studies are necessary to fully understand the reason by which medicinal plant extract may affect as herbicide in order to commercial application.

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Interaction of Brassinosteroid and Deficit Irrigation on Some Physiological Characteristics of Garden Thyme (*Thymus vulgaris*)

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This experiment was conducted to investigate the effect of spraying brassinosteroid and deficit irrigation, on some physiological characteristics of the garden thyme as a medicinal plant. The study was conducted during August to November 2017 at the Agricultural Research Station of Shiraz University, Shiraz, Iran. The experimental plots were designed to split plot with completely randomized block design and three replications. The main factors included irrigation at three levels (40%, 70% and 100% of field capacity) and the sub factors included brassinosteroid at three levels (control, 10⁻⁶ molar and 10⁻¹² molar). some physiological characteristics such as photosynthesis rate, transpiration rate, stomatal conductance, essential oil yield and essential oil percentage were measured. The results showed that deficit irrigation treatments reduce all indices except the essential oil content. Although photosynthesis rate, stomatal conductance and transpiration rate were not affected by application of brassinosteroid, but essential oil percentage and essential oil yield, significantly increased 13, 14.5% compared to control, respectively. The interaction between irrigation and brassinosteroid also had a significant effect on the percentage and essential oil yield, so the highest percentage and essential oil yield were obtained from 70% irrigation treatment and brassinosteroid at level 6⁻¹⁰ molar, which respectively increased the percentage and essential oil yield to 26, 27% compared to control.

Keywords: Drought stress, Essential oil yield, Essential oil percentage, Medicinal plants



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Measuring the Quality of Rose Waters Produced in Populations of Damask rose Collected from Northwest of Iran

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Damask rose with the scientific name of *Rose damascena* Mill. and English name of Persian Rose and Damask rose is belong to Rosaceae family. Iran is one of the native country of Damask rose and has first rank in producing of rose water [1]. Hydrosol of this flower is known as rose water in Iran. In Iran extracting of rose water has been done for thousand years and the area of cultivation is about 4000 ha. The main regions of Damask rose cultivation are Fars, Kerman, Isfahan and Eastern Azerbaijan provinces. Kashan with more than 800 h cultivation area is the most important site in producing of rose water [2]. The purpose of this study is to investigate the rose water produced of 24 populations in term of three physical and chemical factors (special weight, pH, antioxidant activity) stated in the standard notice of Standard Organization. After finishing three hours of extraction essential oil, Clevenger was cleaned and then distillation process was continued for one hour. Obtained rose water was collected from Clevenger in the 300 cc bottles in the first thirty minutes and the first code recorded. Immediately, second bottle was collected during the next thirty minutes in the 300 cc bottles and second code recorded and was transferred to 4 °C. Two factors (pH and special weight) were measured by pH meter, sampler, and sensitive scale. Antioxidant activity were measure by DPPH method. Normally, rose water pH is higher than 7 (alkaline). For that it makes blood be alkaline and is used in traditional medicine as a warmth agent. In all samples the first rose water pH was higher than second, probably it is because of the high amount of essential oil in the first rose water. Also the specific weight of the first code was higher than that of the second code. This is probably due to a higher percentage of essential oil in the first code samples. Given that rose water usually has at least 15% rose water samples were expected to have antioxidant activity. Since second samples had less essential oil than the first one, it is expected to have less antioxidant activity, which as the same as been predicted.

Keyword: Antioxidant activity, Damask rose, Rose water, Special weight

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Fast Extraction and Determination of Triterpenoid Acids from *Ganoderma Lucidum* by HPLC-DAD

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Ganoderma lucidum (*G. lucidum*) is a species of basidiomycetes that belongs to Ganodermataceae of Aphyllophorales. *G. lucidum*, is one of the most highly useful herbal medicines by Asian people, whose fruiting body, mycelia and spores were traditionally used as a local medicine for treatment of weakness, insomnia, hepatitis, cardiovascular diseases, cancer, etc. Many studies have been reported on the constituents of *G. lucidum*, including triterpenes, polysaccharides, nucleosides, steroids, fatty acids, alkaloids, proteins, peptides, amino acids and inorganic elements [1]. Specially, triterpenoids isolated from *G. lucidum* showed significantly anti-HIV-1 protease, anti-tumor, and anti-complement activities. So extraction and determination of triterpenoids of this plant is necessary. In this study, we extracted and quantified of some triterpenoids by HPLC-DAD. For this purpose, the air-dried fruiting body of *G. lucidum* was extracted with chloroform and the process was repeated three times. After the evaporation of the solvent under reduced pressure, the crude methanol extract was obtained. This extract was suspended in water and partitioned with petroleum ether, EtOAc and ethanol, successively. The solution was concentrated and the residue was dissolved again in EtOAc. The extracted solution was analysed by HPLC {mobile phase: MeOH-H₂O (65: 35, V/V); DAD: 254 nm, 220 nm, 275 nm; flow rate: 1 mL min⁻¹; column: RP-C18: (5 mm × 150 mm× 4.6 mm)}. All extraction and instrumental parameters were optimized and figure of merits of the analytical method were investigated and reported successfully.

Keywords: *Ganoderma lucidum*, High performance liquid chromatography

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Analysis of *Nitraria schoberi* Fruit and Leaf with Gas Chromatography Mass Spectrometry (GC-MS) by Headspace Method

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The genus *Nitraria* with close to 13 species belongs to family of *Zygophyllaceae*. Various species of the genus *Nitraria* are important from the medical and culinary aspects. Among these, *Nitraria schoberi* is commonly grown as a shrubs. From the *N.schoberi* fruit extract is used as an antibacterial, antioxidant, antifungal and anti-inflammatory activities. The purpose of this study was to evaluate the *N.schoberi* fruit and leaf compounds using GC-MS by headspace method. Substances in *N.schoberi* fruit and leaf were separated by gas chromatography coupled with mass spectrometry and their ingredients identified by comparing the obtained mass spectra with spectral data in the reference data library. 16 components were identified in *N.schoberi* fruit; for example: Acetic acid, silver (1+) salt (7.571%), Pyridine (7.663%), Furan (38.210%), 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl- (29.898%), 2-Acetamido-d-mannitol (1.643%), Thiocyanic acid, 2-propynyl ester (2.516%), 2H-Pyran-2-one (1.109%), d-Glycero-d-ido-heptose (1.267%), 1,2-Cyclopentanediol, trans- (2.336%); and 5 components were identified in leaf; these combinations include: Pyridine (2.631%), 4,5-Dimethylthiazole S-oxide (10.542%), N'-(Diaminomethylidene) butanehydrazide (44.356%), cis-7,cis-11-Hexadecadien-1-yl acetate (4.672%), 9,17-Octadecadienal, (Z)- (37.799%). Some of these compounds are important for medical purposes.

Keywords: *Nitrariaschoberi*, GC-MS

Effect of Different Fertilizer Treatments on *Rosmarinus Officinalis* L. Essential Oil Compounds

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Leaves of rosemary contain effective ingredients. One of the most important compositions of this plant is essential oil, which is reported in dry leaves of 1 to 2.5 percent. The most important compounds identified in essential oils are 1, 8-cineol, camphor, borneol, bornyl acetate, α and β pinene, camphene and linalool [1]. In order to evaluate the effect of different fertilizers on essential oil composition of *Rosmarinus officinalis* L., a completely randomized block design experiment with three replications was conducted at 2016 in Alborz Research Station. Treatments included different levels of chemical fertilizers (NPK), manure (M) and vermicompost (V): N₀.P₀.K₀.M₀ (1), N₀.P₀.K₀.M₁₀ (2), N₀.P₀.K₀.M₂₀ (3), N₅₀.P₂₅.K₂₅.M₀ (4), N₁₀₀.P₅₀.K₅₀.M₀ (5), Vermicompost 5 (6), Vermicompost 15 (7), 2 + 4 (8), 2 + 5 (9), 3 + 4 (10), 3 + 5 (11), 2 + 6 (12), 3 + 6 (13), 2 + 7 (14), 3 + 7 (15) and 6 + 4 + 2 (16). At the flowering stage, the plants were harvested and dried in shade. Essential oil extraction were carried out with water distillation by Klevenger in 2 hours. The percentage and type of essential oil compounds were determined by GC and GC-MS. In rosemary essential oil, 25 compounds were identified. Major components include α -pinene, Camphene, Sabinene, Limonene, 1.8-cineol, Linalool, Camphor, Borneol, Verbenone and Bornyl acetate. Analysis of variance showed significant differences between treatments in α -pinene, Linalool, Camphor, Borneol, Verbenone and Bornyl acetate. Comparison of meanings showed that the highest α -pinene with 24.1% and 23.1%, was related to combined treatments N₁₀₀.P₅₀.K₅₀.M₂₀ and control, respectively.

Keywords: Essential oil, Rosemary, Fertilizer, Components

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Trigonelline Evaluation in Fenugreek Based Phytodrugs

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Seeds of *Trigonella foenum-graecum* L. have been used since ancient times for their therapeutic actions. Hakims in traditional and physicians in modern medicine use widely this herbal medicine to treat different diseases. From the long list of pharmacological effects attributed to this plant some indications became more frequent: regulation of carbohydrate metabolism, lowering effect on cholesterolaemia and appetite stimulant. These effects are mainly linked to two secondary metabolites: trigonelline and 4-hydroxy isoleucine. In this paper an easy, rapid and precise method for trigonelline quantification in seeds, dry extracts, granules and capsules containing Fenugreek dry extract is reported. A 1 to 100 ratio (sample weight/solvent volume) and 3 to 7 ratio (water/methanol) extraction conditions were used for sample preparation. 2 µl aliquots from samples and standards were spotted on HPTLC paper. Linear ascending development was carried out in glass chamber saturated with mobile phase consisting of n-propanol/methanol/water (4/1/4) (v/v/v) at room temperature (25±2 °C). A Camag TLC scanner was used for spectrodensitometric scanning and quantitative analysis in absorbance mode at 269 nm. The linear regression analysis data for the calibration plot showed a good linear relationship at the used concentration range (0.024, 0.048, 0.096, 0.192 and 0.384 mg/ml). Our analysis showed that this method was able to quantify, with high precision (2.23%), the trigonelline content of seeds (0.42-0.5%), dry extracts (0.42-0.47%), granules (0.5%) and capsules (0.47- 0.53%) [1].

Keywords: Fenugreek, Trigonelline, High-performance thin layer chromatography (HPTLC)

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Effects of Ag⁺ Ions and Methyl Jasmonate on PAL and TAT Gene Expression and Activity and Phenolic Acids Content in *Perovskia abrotanoides* Karel.

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Perovskia abrotanoides Karel. has several pharmacological properties, including antibacterial, antifungal, anti-cancer, and HIV antiviral effects. These effects are attributed to the presence of phenolic acids and tanshinones in this plant [1, 2]. The main purpose of this study was to investigate the stimulatory effects of Ag⁺ ions and methyl jasmonate (MeJA) on gene expression and activity of PAL and TAT enzymes, as well as total phenolic acids content in *P. abrotanoides*. In this assay, 40-day-old plants were cultured on MS medium containing 50 µM MeJA and 15 µM of Ag⁺ ions separately. Then activities and gene expression of PAL and TAT were measured in plants at eight time point (0, 4, 8, 12, 24, 48, 72, and 120 hours) after elicitation. The highest values of TAT gene expression were estimated in plants after 12 and 72 hours elicitation with MeJA (9.77±0.23) and Ag⁺ ions (5.25±0.35), respectively. Also, the maximum levels of PAL gene expression were achieved in plants after 12 hours elicitation with Ag⁺ ions (9.7±0.12) and 24 hours elicitation with MeJA (10.07±0.25). Our results indicated that TAT and PAL activities were more sensitive to MeJA than Ag⁺ ions in the treated plants. So that, the highest levels of TAT (109.33±2.04 nKat/mg pr) and PAL (83.03±2.9 nKat/mg pr) activities in the treated plants were obtained after 12 and 120 hours elicitation with MeJA, respectively. Also, the maximum content of phenolic acids (14.09±0.20 mg rosmarinic acid/g DW) was measured in plants after 72 hours elicitation with MeJA. In conclusion, the finding of this study showed that the two elicitors were effective on total phenolic acids content via increasing the activity and gene expression of TAT and PAL in *P. abrotanoides*.

Keywords: *Perovskia abrotanoides* Karel., Ag⁺ ions; Methyl jasmonate, PAL, TAT

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Impacts of Organic Amendments and Urea Nitrogen on Plant Growth and Chemical Composition of Fenugreek *Trigonella foenumgraecum* and Goat Pea *Securigera securidaca*

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Fenugreek and goat pea were grown to compare the effects of composted municipal waste (CMW), vermicompost (SM) and urea nitrogen (N) to field soil (C0). Germination percentage was significantly higher in urea N (76.5 %), CMW (75.5 %) and VC (51.6 %) compared to C0 (36.3 %). Fenugreek performed better in organic amendment treatments than goat pea. Urea N also increased fenugreek plant dry matter significantly compared to C0, but this increment was not as high as CMW and VC. Plants grown in VC had higher whole plant N content (3.2 %) than those grown in CMW (2.8 %) and plants grown in N (2.6 %). Plants that treated with CMW (8613 mg kg⁻¹) and VC (8503 mg kg⁻¹) had significantly a higher P content than those treated with N (7430 mg kg⁻¹) or grown in C0 control (7236 mg kg⁻¹). Application of VC caused a significant increase in plant K content (2483 mg kg⁻¹) compared to CMW (1850 mg kg⁻¹), N (1750 mg kg⁻¹) and C0 control (1716 mg kg⁻¹). Fenugreek had significantly higher Fe (109.37 mg kg⁻¹ vs. 30.74 mg kg⁻¹), Zn (40.06 mg kg⁻¹ vs. 30.62 mg kg⁻¹), Cu (17.1 mg kg⁻¹ vs 14.9 mg kg⁻¹) and Mn (104.9 mg kg⁻¹ vs. 75.1 mg kg⁻¹) content than goat pea.

Keywords: Medicinal plants, Compost, Vermicompost, Sustainable agriculture

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The Effect Frankincense Ointment on Pain Intensity in Primiparous Women

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Episiotomy is one of the most commonly used midwifery practices, which, despite its small size, may cause complications like inflammation, infection or pain, like any other scars. Due to its anti-inflammatory properties, Frankincense is used empirically for many uses like pain relief. The aim of this study was to evaluate the effect of Frankincense ointment on pain intensity in primiparous women. This experimental study was performed in Mahdiah hospital of Tehran, during 1396-1397. A total of 95 primiparous women with vaginal delivery and mid lateral episiotomy were examined. Demographic, midwifery, health assessment, pain scale(VAS) were used to evaluate the subjects. The ointment was administered every 12 hours and for 10 days from the first day after delivery. Evaluation of pain intensity, was performed on days 1,5,10 after delivery. Data were analyzed using SPSS software and Mann-Whitney test. The significance level considered 0.05. There was no significant difference in terms of demographic and midwifery information also in health status. There was no significant difference between the two groups in term of the pain intensity in the first day The mean of pain intensity on days 5 and 10 in the intervention group was 2 ± 23.1 and 0.95 ± 0.5 respectively. In the control group, it was 1.64 ± 1.57 and 1.97 ± 1.17 . In both of these cases, these differences were significant ($P=0/030$, $P<0/001$). Frankincense ointment is effective in the episiotomy pain reduction. However, further investigation is needed in order to conclude more definitively.

Keywords: Frankincense, Episiotomy, Pain, Primiparous

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The Necessity of Laboratory Educations for Herbal Sellers and its Effect on Community Health

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Nowadays, the use of medicinal plants in developed countries has increased significantly, and many people in Iran also use the plant compounds, which be presented by herbalist, for curing their health problems and their illnesses, [1-3]. Clinical experiments are one of the most important tools for evaluating the diagnosis of the disease. Obviously, without considering laboratory results, choosing a medicinal plant can threaten the health of individuals. Therefore, in this study, the necessity of laboratory training for herbal sellers was investigated. The data gathering tool was a researcher-made questionnaire and the statistical population consisted of 40 herbal sellers with official accreditation in Tehran. And the questions were scored based on Likert's Scale. Cronbach's alpha coefficient of the questionnaire was calculated to be 0.875. Data obtained from this study were analyzed using SPSS software version 23. The results of this study showed that the majority of the studied population in the job of herbal sellers do not use laboratory reports. The most important barriers facing them were related to the components of "traditional attitudes" and "skill and structural problems". The obtained data also showed that there is a significant correlation between these two components with the "use of herbal sellers from laboratory results" ($p < 0.05$). So that the spearman's correlation coefficient for these two components of research was $r_s = 0.317$ and $r_s = 0.355$, respectively. Based on this study, the selection of medicinal plants by herbal sellers is not consistent with laboratory reports. As a result, it is necessary for them to carry out appropriate education programs, which could have important effects on the health of the community and the wide range of people receiving plant treatment.

Keywords: Clinical Laboratory Educations, Health Care, Skill, Structural Problems

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Cytotoxic Effects of the Essential Oil from *Achillea wilhelmsii* C. Koch

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The cytotoxicity activity of the essential oils from the leaves of *Achillea wilhelmsii* C. Koch were studied on six tumor cell lines and a normal cell line with Lactate dehydrogenases (LDH) and trypan blue methods. The composition of the essential oil was also analyzed by Gas Chromatography–Mass spectrophotometry (GC-MS). The LDH test showed that the oil had marked cytotoxicity activity against all cancer cell lines. K562 (Human chronic myelogenous leukemia) and PC3 (Human prostate adenocarcinoma), were the most sensitive to the essential oil with IC50 value (the concentration of the essential oil causing 50% inhibition) of $12.62 \pm 1.3 \mu\text{g/ml}$ and $15.88 \pm 2.4 \mu\text{g/ml}$, respectively. The least cytotoxic activity was exhibited on HUVEC (Human umbilical vein endothelial cell) and Hela (Human cervix carcinoma) cell lines with IC50 values of 19.85 ± 3.2 and 46.34 ± 2.7 , respectively. Trypan blue assay approved these results. In conclusion, cytotoxic activities of the oil may be described by the presence of monoterpene derivatives. The results of this study suggest that the essential oil of *A. wilhelmsii* has a potential source for cancer therapy. As a significant result, HUVEC (as normal cells) exhibited the least sensitivity to cytotoxic effects of the oil, confirming its high selectivity and specialty against cancer cell lines.

Keywords: Chemical Composition, Achillea, Essential oil, Cytotoxicity, LDH

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Cytotoxic Effect of Flavonoid Extracted from Green Tea on Neuroblastoma Human Nervous Cancer Cells BE(2)C

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Between all types of tea, Green tea has more antioxidant and therapeutic properties than the other types, which extracted from *Camellia Sinensis*, with high concentration of polyphenolic flavonoids. Polyphenol compounds contain lots of biological effects including antioxidant, anti-propagation, anti-angiogenesis and anti-inflammation. Green tea Polyphenols, classified as Catechin with anti-cancer properties and the lowest side effects [1]. Neuroblastoma is the third common types of cancers among children. Due to the side effects of cytotoxic chemotherapy, the cured children confront many problems in their future life. Thereafter, it is necessary to plan targeted treatments with low toxicity which improves quality of life. Several natural antioxidants contain anti-cancer properties with low toxicity on normal cells. Catechin as a natural antioxidant of green tea has protective effects on Prostate and Colorectal cancer models [2]. In the present experiment, the effects of Catechin extracted from green tea on Neuroblastoma cellular model is under investigation. BE(2)C cancer cells and Fibroblast as normal cells were studied. For this purpose, the cells were treated with different concentrations of Catechin for periods of 24h and 48h. Cytotoxic effects of the drug were assessed with the MTT assay and the cells morphological changes and their nucleus variation were studied microscopically. The data showed that 290 μ M of Catechin caused more than 50% cell death, whereas such effect has not seen in normal fibroblast cells. Catechin treatment caused the cells lose their normal morphological shapes into rounded cells and some of them detached and floating to the media. Nuclear analysis with fluorescent microscopy and Hoechst stain showed that catechin caused nuclear fragmentation, the property which seen in apoptotic cells. These results indicated the cytotoxic effects of Catechin on Neuroblastoma cancer cells which could induct program cell death in spite of normal ones.

Keywords: Neuroblastoma, Flavonoid, Cytotoxicity, Green tea, BE(2)C

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Total Phenolic and Flavonoid Contents and Antioxidant and Cytotoxic Activities and Essential Oil Composition of Tarragon *Artemisia dracunculolus*

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The current study aimed to evaluate the total phenolic and flavonoid contents, antioxidant and cytotoxic activities of tarragon extracts and the identification of the chemical composition of its essential oil (EO). Total phenolic (TPC) and flavonoid contents (TFC) of extracts were measured by standard methods using spectroscopy. The antioxidant activity of tarragon was tested by two methods; 2, 2'-diphenyl 1-picrylhydrazyl (DPPH) radical scavenging activity and B-carotene bleaching (BCB). The cytotoxicity of the extracts were evaluated against three different cell lines including (MCF7), (SW48) and (NIH 3T3) [1]. Furthermore, in order to identifying the chemical composition of the essential oil of the plant, (GC-MS) was used [2]. The results showed that the highest TPC was obtained in ethyl acetate extract (227.86 \pm 0.6 μ g gallic acid (GA)/mg dry extract (DE)) and the highest TFC was observed in methanolic extract (102.6 \pm 1.67 μ g quercetin (QE)/mg DE). In addition, in DPPH method, Buthanolic extract showed the greater antioxidant potential with a low IC₅₀ (37.57 μ g/ml), while it was demonstrated that in BCB assay, methanolic extract had the highest antioxidant activity with IC₅₀ value of 4.09 μ g/ml. Interestingly, no extract have cytotoxic activity against three mentioned cell lines (MCF7, NIH and SW48) in tested concentrations (>400 μ g/ml), except for petroleum ether extract with IC₅₀ values of (146.3, 92.62 and 82.02 μ g/ml, respectively). Finally, It was found that Anethole (62.6%), Methyl eugenol ether (7.8%), Bicyclogermacrene (2.13%) and Terpinole (2%) was the major components of the EO of the tarragon. In this work it was demonstrated that tarragon, as a leafy vegetable consumed by people, have high levels of total phenolic and flavonoid contents with potent antioxidant activity and no cytotoxicity.

Keywords: *Artemisia dracunculolus*, Asteraceae, Antioxidant activity, Cytotoxicity

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Effect of Biotic Elicitor on Atropin and Scopolamine Production in *Atropa belladonna* Hairy Roots

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Plant alkaloids, are one of the largest groups of pharmaceuticals and industrial secondary metabolites. Scopolamine and atropine are most common tropane alkaloids in *Atropa belladonna* L. with great application in pharmaceutical industry. Phytochemical biosynthetic pathways induction via various elicitors is an effective strategy for increasing the production and accumulation of valuable substances. In this research, hairy roots were obtained from cotyledon explants by A7 strain of *Agrobacterium rhizogenes*. Polymerase chain reaction (PCR) analysis with specific primers confirmed the insertion of *rolB* in putative transgenic hairy roots genome. Different concentrations of yeast extract (YE) (0, 0.5, 1 and 1.5 mg/L) were used as elicitors. Scopolamine and atropine content and activity of antioxidant enzymes such as guaiacol peroxidase, ascorbate peroxidase and catalase increased in elicited hairy roots compared to control. High concentration of yeast extract decreased the growth of hairy roots but increased the atropine content compared to the control. According to the results, the highest rate of scopolamine (9.21 %) and atropine (43.39 %) with 9 and 5 fold increase compared with control cultures, were obtained by 1.5 and 1 mg/L YE at 48 exposure time, respectively. The results demonstrated that yeast extract can be used as effective elicitor to increase tropane alkaloids production in hairy root cultures of *A. belladonna*.

Keywords: *Atropa belladonna* L., Antioxidant enzymes, Biotic elicitor, Hairy roots

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Phytochemical Studies of *Pistacia atlantica* subsp. *Kurdica*

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Pistacia is a genus of perennial herbs belonging to the family Anacardiaceae. Members of this genus are mainly distributed throughout the Zagros Mountains and are reputed in traditional medicine for their therapeutic usages against a range of disorders for example hyperlipidemia and diabet. *Pistacia atlantica kurdica* is an endemic plant in Iran which is frequently used as a spice, culinary herb. In the present study, phytochemical screening of *P. atlantica kurdica* was tested by using standard methods and the hydro-distilled volatile oils from the fruit and twig were investigated by GC-MS and GC-FID. A total of 55 compounds representing of the volatile oil were identified. The main constituents were α -pinene and bornyl acetate. preliminary phytochemical tests for extracts done by standard method and result showed extracts contain bioactive constituents such as flavonoids, phenol, steroidal terpenes, terpenoids, tannins, anthraquinones and reduced carbohydrates. The data of this study suggests that the essential oil and extract from *P. atlantica kurdica* has potential for application as a prospective source of anti hyperlipidemic agent in pharmaceutical and food industries.

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Efficacy of Hab-o Shafa in Craving of Opioid Addicted Patients, 6-Month Follow-up

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The main problem in maintenance treatment of opioid use disorder is relapse and craving. Craving, described as a strong desire for substance use is one of the main reasons for relapse [1]. This study is continuation of the previous our study on the efficacy of Hab-o Shefa in the opioid maintenance treatment. Considering the significant effect of Hab-o Shefa in craving of opioid treatment, 6 months' post-treatment, all participants that received the drug were re-evaluated. Craving were assessed using visual analog scale. The results were compared with the results of the maintenance treatment study (the previous phase of the study). Of the 21 participants in the Hab-o Shefa group who completed 3 months of primary intervention, 14 participants were in the 6-month follow-up. The mean of craving scores in pretest, 3th month of intervention and 6-month post test follow-up were respectively 4.69 ± 3.06 , 1.15 ± 1.14 and 1.84 ± 2.23 . The craving score decreased significantly in the third month after the intervention in order to study started (p -value= 0.001). These results also indicate that the craving score of 6 months' post test has slightly increased, so that the score of 6 months' follow-up is still significantly lower than the start of the intervention (p -value= 0.01). The obtained results indicated that the Hab-o Shefa can be useful for opioid craving also after cessation of drug, and it can also be considered as a new promising drug for prevention of craving and relapse.

Keywords: Hab-o Shefa; Addiction; Persian medicine; Craving; Follow-up

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Evaluation of Biometric Properties, Physicochemical Characteristics and Fatty Acid Profiles of Chia Seeds and Oil *Salvia hispanica* L. in Iran

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Salvia hispanica L. is an annual herbaceous plant that belongs to the Lamiaceae family. This species has been cultivated in tropical and subtropical conditions. Today, Chia is grown commercially in Mexico, Bolivia, Argentina, Ecuador, Guatemala and Australia. *Salvia hispanica* L. is a crop that was used as food and medicine. Chia seeds oil (CSO) is rich in Polyunsaturated fatty acids (PUFAs), particularly Linolenic acid (ω 3) and Linoleic acid (ω 6) which pose great benefits for human and animal health. The objective of this study was to evaluate physicochemical characteristics and fatty acid contents of Chia seeds cultivated in Iran. Our results showed that seed had an average of 2.15mm length, 1.32mm width, 0.85mm thickness, 0.80mm geometric mean diameter, 0.37 Sphericity and 2.06mm² surface area. Analysis showed that Chia seed is a good source of Protein (24.21g/100g), Oil (25.73g/100g) and Total dietary fiber (27.48g/100g) with predominant insoluble fiber (25.10g/100g). Oil of Chia seeds comprised of valuable unsaturated fatty acids including α -Linolenic acid (%54.37), Linoleic acid (%19.67), Oleic acid (%7.10), Palmitic acid (%6.70), Stearic acid (%3.33) and saturated fatty acids content were less than %5. We have also studied the amount of Total Phenolic content (TPC) (0.94 mgGA acid/g DW). Our results indicated that the oil of this plant had valuable quality. The Viscosity was 41.12mpa.s, Refractive index (1.47), Acid value (2.31mgKOH/g oil), Peroxide (4.28meq₂/kg), Saponified value (196 mgKOH/g oil), Iodin value (211 gI₂/100g oil) and Unsaponifiable matter content (%1.15). This research showed that Chia seed is an excellent source of essential fatty acids for food and pharmaceutical industries and the quality of produced seeds and oil in Iran are roughly similar to the original regions.

Keywords: *salvia hispanica* L.; Physicochemical, Fatty acid, Linolenic acid

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The Positive Effects of Supplementation with the Betalain/Betacyanin Rich-Extract Foods on *SIRT1/LOX1* Gene Expressions in Patients with Coronary Artery Disease: A Pilot Clinical Trial

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Sirtuin-1 (SIRT1) influences aspects of age-dependent atherosclerosis. Studies had shown that betalains have desirable clinical and molecular consequences in vitro and in vivo. These effects may be agreeable with elevated expression of SIRT1 and cause prevention of atherogenesis. The aim of this study was to examine the effects of consumption of two edible sources of betalains on *SIRT1* gene or protein and *LOX1* gene expressions in patients with coronary artery disease. In this randomized crossover clinical trial, 24 male patients with coronary artery disease received two treatments with betalain-rich of red beetroot (*Beta vulgaris*) and betacyanin-rich of Prickly Pear (*Opuntia stricta*), daily for two weeks on two occasions which separated by a two-week washout period. Plasma concentration of hs-CRP, and gene expression levels *LOX1* and *SIRT1* genes/proteins were also measured. The hs-CRP level was significantly reduced after consumption of *Opuntia stricta* ($P=0.0454$) and red beetroot ($P=0.0484$). Also, a considerable decrease in the expression levels of *LOX1* gene and a notable elevation in the *SIRT1* gene/protein was observed after both interventions ($P<0.0001$). In conclusions, Betalain-rich sources could be promising alternatives to supplement therapies in age-related diseases such as atherosclerosis. Nevertheless, further studies are required in order to gain a deeper understanding of their precise biological functions.

Keywords: Atherosclerosis, Sirtuin, gene expression, *Beta vulgaris*, *Opuntia stricta*

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New Methods on Extraction and Formulation of Lycopene from Tomato Products

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Tomato (*Solanum lycopersicum*) is one of the most essential herbaceous plants that have been probed against various life sight related disorders. It is important source of vitamin C, potassium, folic acid, and carotenoids, especially lycopene. Lycopene is the pigment principally responsible for the characteristic deep-red color of tomato fruits and its products, such as tomato paste. It is a lipophilic carotenoid with linear structure that shows antioxidant activity and no vitamin A activity and it has important functions in reducing the risk of many diseases. It has attracted attention due to its biological and physicochemical properties, especially related to its effects as a natural antioxidant. This would make it a valuable micronutrient that raised interest in dietary supplement's clinical studies. Just as, it's provided this molecule has a prominent role for protection against a broad range of epithelial cancers. As aforementioned red tomato is one of the most important sources of lycopene however it could be found in notable amount in other sources like guava, rosehip, pink papaya, watermelon and pink grapefruit. Various methods have been developed for the extraction of lycopene from fresh tomatoes and its products, although for many of them, high costs or highly advanced technologies are required. The aim of this study was to design a simple and practical method based on former studies as well as physicochemical properties of lycopene, using very simple materials and equipments. The extraction method used in this study was designed to utilize the minimum amount of hydrocarbonic solvents (petroleum ether and acetone) and at a shorter time than similar methods. Also, according to the results of the experiments done during this study, using tomato paste was more efficient, comparing to fresh tomato and tomato juice. The purity of lycopene was measured at $\lambda_{max}=476$ nm by uv-vis spectrophotometer. The obtained lycopene had a purity of $57\pm 5\%$; implying that 1000 grams of tomato paste was contained 3 grams of total extract on average. Correspondingly after further purification procedures, at least 1.6 grams of pure lycopene (over 90%) were obtained. Prepared lycopene was finally formulated as oral tablets, each tablet containing 25 mg of purified lycopene. This product had much lower price compared to commercially available foreign brands. It can be used in the treatment of many metabolic disorders, different malignancies, skin conditions and prostate cancer. Also, a clinical trial is underway to investigate the effects of lycopene on metabolic syndrome.

Keywords: Lycopene, Hydrocarbonic solvents, Extraction

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Comparison of the Spathe Volatile Oil of Date Palm *Phoenix dactylifera* in Two Regions of South Iran

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Phoenix dactylifera L. a monocotyledonous tree, is a plant of the family Arecaceae or palmaceae. in order to investigate the effect of region on the essential oil percentage and yield of four date palm varieties, an experiment was conducted in Bam and jiroft, Iran. The experiment was carried out as a factorial experiment based on a Randomized Complete Block Design with three replications. Treatments included four varieties (with names mosafati, zahedi, Hallilehie, piarom) and two region (Bam and jiroft). The variety and region interaction was significant for spathe dry matter yield. ($p < 0.01$) the comparison of the mean values showed the mosafati variety in Bam had the highest spathe dry matter yield (989.187 gr). The lowest spathe dry matter yield was obtained from Hallilehie variety in jiroft (422.83 gr). The effect of region was significant for spathe essential oil yield. The highest spathe essential oil yield was obtained in Bam region (1.246 gr). The result showed significant difference between volatile oil percentage and spathe oil yield of different varieties at $p < 0.05$. the comparison of the mean values showed the varieties piarom, zahedi, mosafati had the highest spathe essential oil yield (1.085, 1.100, 0.895 g/date palm of a tree). The lowest spathe essential oil yield was obtained from Hallilehie variety (0.513 gr). the comparison of the mean values showed the varieties zahedi and piarom had the highest volatile oil percentage (0.16%, 0.148% respectively). Sixteen compounds were identified in the essential oil. The main components of this oil 3,4- dimethoxy toluene, p-methyl anisol.

Keywords: P-methyl anisol, 2,6- dimethoxy toluene, Spathe essential oil

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Acute Toxicity of *Tamarix stricta* BOISS. in Rats

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Different species of the genus *Tamarix*, commonly known as tamarisk, are used by local people as ethnic remedies for different ailments. *Tamarix stricta* BOISS. is a halophyte medicinal plant native to Iran and Pakistan. There are also several studies on the pharmacological activities of other species of *Tamarix*; however, there is no evaluation on *T. stricta*. The aim of this study is to evaluate the acute toxicity of *T. stricta*. Plant material was obtained from Fariab, Kahnooj, Kerman province and was authenticated by the botanist in the herbarium of Faculty of Science, University of Tehran (Voucher number: 48379-TUH). The plant was shade-dried and was grinded before extraction. The extract was obtained by maceration method using ethanol: water (70:30) for 72 h and was concentrated by rotary evaporator. Twenty Wistar rats were used to evaluate the acute toxicity of the extract. Five male and five female rats were treated with a single dose of 5 g/kg of the extract by gavage; whereas ten other animals (five of each sex) were treated with water as control. Animals were under close observation for the first 48 h for any sign of toxicity such as weight change, behavioural changes or death. Then, they were daily checked for further 14 days. At the end of the study, all animals were sacrificed and vital organs including heart, liver, lung, kidney, and spleen were weighted. Statistical analysis was performed using SPSS software and $p < 0.005$ was considered as statistical significant difference. The yield of extraction was 21%. There was no sign of toxicity in animals received the extract. Also, no death occurred. There was no statistical significant difference between the body weight of the treated animals in comparison to the control groups ($p > 0.05$). The weight of vital organs were not different between the groups ($p > 0.05$). Results of the study shows that the extract induces no acute toxicity in rat; however, this study does not guarantee the long-term safety of the plant. Further investigations are needed to evaluate chronic toxicity of the plant.

Keywords: Tamarisk; Toxicity, Ehnopharmacology, Polyphenol, Flavonoid

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Prediction of Inhibitory Potential of Glabrone on Influenza Virus Surface Glycoproteins Activities

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Influenza virus is considered to be a major human pathogen, despite a long-established vaccination programme and approved antiviral drugs including viral matrix2 and neuraminidase inhibitors. The emergence and co-circulation of drug-resistance variants highlight the need for new anti-influenza therapy targeted one or two virus replication cycles [1]. Extracts from the root of *Glycyrrhiza glabra* has shown remarkable activity against a broad spectrum of DNA and RNA viruses, however, its mode of actions have not been fully elucidated. Here, we investigate the anti-viral potential of glabrone, a constituent of *Glycyrrhiza glabra* root, against the two influenza virus surface glycoproteins hemagglutinin (HA) and neuraminidase (NA) which role in virus attachment and fusion with host cell membrane, and budding using docking analysis. The physicochemical property and biological activity of the active compound glabrone (C₂₀H₁₆O₅; 4H-1-Benzopyran-4-one, 7-hydroxy-3-(5-hydroxy-2,2-dimethyl-2H-1-benzopyran-6-yl)) was analyzed using SwissADME incorporated in Swiss Institute of Bioinformatics. Then the three-dimensional structure of glabrone was retrieved from PubChem database. Structures of influenza H1N1 virus glycoproteins were retrieved by Protein Data Bank (PDB) with PDB ID's of 1jsh and 1inh. Docking analysis was performed with SwissDock program. The binding affinities of glabrone and each of HA and NA protein were calculated. The dock scoring was performed to calculate the energy of hydrogen bond interaction and hydrophobic and electrostatic interactions. The energy from lipophilic interactions, hydrogen bonding interactions were also calculated and the interactions between the component and the proteins were visualized. The computed physicochemical as well as the predicted ADME parameters, pharmacokinetic properties, druglike nature and medicinal chemistry friendliness of glabrone support favorable results which reveal the efficiency of the component to act as a drug candidate. The results of dock scoring and the number of hydrogen bonds formed between the active compound and the viral proteins indicated that glabrone shows the higher binding affinity to HA than NA in atom pair interactions. In conclusion, the results suggest that glabrone has potential as an anti-influenza drug possibly by damaging the virus-cell membrane fusion and blocking viral entry into cells. The pathway is distinct from the currently available antiviral therapeutics.

Keywords: Anti-influenza drug, Glabrone, Hemagglutinin, Neuraminidase

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Antioxidant Potential of Methanolic Extract of *Salsola* sp. Seedling

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The halophytes are highly specialized plants, which have greater tolerance to salt. They germinate, grow and reproduce successfully in saline areas which would cause the death of regular plants. *Salsola* sp. is one of these plants that grows around Urmia Lake with very high salinity tolerance. In this study, total phenolic, anthocyanin and flavonoids content of *salsola* sp. seedlings were determined in 4 levels of salinity (0, 200, 400 and 600 mM). Phenolic and flavonoids content were measured by Folin-Ciocalteu and aluminium chloride methods, respectively. Anthocyanin content was obtained by methanolic extract at 550 nm spectrophotometrically. The lowest total phenol (66.09 mg/gFW), flavonoids (0.02 mg/g FW) and anthocyanin (0.081 mg/g FW) were observed in control plants (0 NaCl). The results showed that total phenol, flavonoids and anthocyanin increased by increasing NaCl. Flavonoids and anthocyanin as plant secondary metabolites with high antioxidant activities were induced by increasing NaCl concentrations in the plants medium. In this case, it can be suggested that *salsola* sp. may have a nutritional value.

Keywords: *Salsola* sp., Antioxidant capacity, Phenolic content

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Effects of Salinity on Germination and Protein Content of *Salsola* sp.

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Salsola sp. is a perennial halophytic shrublet, common in saline habitats as well as on sand dunes of Urmia Lake region. *Salsola* sp. has many uses such as: fuel wood, medicinal uses, forages and fodders and etc. In this study, germination factors and protein content of this plant were determined in 4 levels of salinity (0, 200, 400 and 600 mM). Analysis of variance results showed that although germination speed among different levels of salinity was different, all of treatments had a high germination after 5 days. Seed germination of *salsola* sp. was not significantly affected by salt stress. Salinity decreased seedling length and fresh weight but it did not have a significant effect on dry weight. On the other hand, protein content of seedlings increased with increasing NaCl concentrations. However the highest and lowest amount of protein in seedlings was observed in 600 and 0 mM respectively. Overall results suggest that when *salsola* sp. plants germinate in saline medium, the amounts of compatible solutes were increase in different parts of plants.

Keywords: *Salsola* sp., Protein content, Germination Factors

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Effect of Nitrogen Deficiency on Photosynthetic Pigments and Essential Oil of *Lavender*

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Lavandula Officinalis L. is a perennial plant from Lamiaceae family. Lavender essential oil has more than 40 different types of compounds, most importantly: limonene, linalill acetate, 1, 8-cineole, linalool, nerool and borneol. Lavender has been used in traditional Iranian medicine for treating some neurological diseases such as epilepsy, insomnia, restlessness and obsession for a long time. Nitrogen deficiency is present almost everywhere, because it is stored in the organic part of the soil and Iran's soils are also low in organic matter (Average of 1%). Due to the fact that lavender is an ornamental and medicinal plant and its essential oil is also of great value; the growing importance of this plant in different climates and countries is increasing day by day. In order to evaluate the essential oil and photosynthetic pigments of lavender under nitrogen deficiency conditions, a factorial experiment based on completely randomized design was conducted with three replications in greenhouse. The treatments included nitrogen in two levels of nitrogen deficiency and control for this purpose, three months lavender plants were irrigated with Hoagland solution for one month. Then amount of dissolved nitrogen decreased to half, and after 15 days to one quarter and finally to zero. The results showed that nitrogen deficiency reduced chlorophyll a, b and total chlorophyll contents, and increased carotenoids content. Nitrogen deficiency reduced shoot and root lengths and dry weights. Analysis of variance results showed that the effect of phosphorus deficiency on photosynthetic pigments (chlorophyll a, b, total chlorophyll and carotenoid), essential oil percent and root and shoot lengths and dry weights were significant at 5% probability level. The essential oil percentage of lavender decreased under deficiency compared to control. In nitrogen deficiency conditions amount of limonene, 1, 8-cineole, beta-myrcene and beta-pinene, increased compared to the control, but camphene, and borneol decreased. Nitrogen shortage also caused the production of new materials such as alpha.-pinene, sabinene, p-cymen-8-ol, crypton and cuminal in essential oil, which was not present in normal conditions. There was a positive significant correlation between nitrogen deficiency and essential oil major constituents.

Keywords: Hoagland solution, Limonene, Nitrogen deficiency, Photosynthetic

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Evaluation of Photosynthetic Pigments and Essential Oils of Pennyroyal in Phosphorus Deficiency Conditions

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Mentha aquatica L. is a perennial plant from Lamiaceae family and is one of the medicinal plants that has attracted the attention of the researchers due to its medicinal effects [1]. The most important essential oil compounds of Pennyroyal are: beta-caryophyllene, hydrofilorol, 1, 8-cineole, piperitenone and pulegone. From the view point of the drug, the pennyroyal essential oil is stomach strengthening, anticonvulsant, stimulant, gastroesophagitis reducer, soothes and relieves stomach ulcers. Phosphorus is one of the macronutrients for growth and biosynthesis of essential oil, which its deficiency is one of the limiting factors for growth of plants in most soils. Due to the fact that the most Iranian soils in rain-fed areas are limestone and limestone soils are one of the limiting factors for absorption of many nutrients such as phosphorus. On the other hand, the high pH, fixation and deformation of phosphorus and can be reduced its absorbable forms for plants. In order to investigate the effect of phosphorus deficiency stress on photosynthetic pigments and essential oils of pennyroyal plant, a factorial experiment based on completely randomized design was conducted with three replications in greenhouse. Treatments consisted of phosphorus deficiency in two levels of control and phosphorus deficiency. For this purpose, three months pennyroyal plants were irrigated with Hoagland solution for one month. Then, to create phosphorus deficiency conditions, first, the amount of dissolved phosphorus reached to half, and after 15 days to one quarter and finally to zero. The results showed that phosphorus deficiency reduced the chlorophyll content (a, b and total chlorophyll) and increased carotenoids content compared to control. Application of phosphorus deficiency also cause decrease in root and shoot lengths and dry weights. The results of analysis of variance showed that the effect of phosphorus deficiency on photosynthetic pigments (chlorophyll a, b, total and carotenoid) and essential oil and shoot and root lengths and dry weights were significant ($P < 0.05$). Also, phosphorus deficiency increased the percentage of essential oil compared to the control by increasing the percentage of limonene, pulegone and the production of new materials such as 3-octanol, and 3-octanyl acetate in pennyroyal essential oil. There was a positive significant correlation between nitrogen deficiency and essential oil major constituents.

Keywords: Carotenoid, Chlorophyll, Hoagland solution, Phosphorus deficiency

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Effect of Olive Leaf Extract as an Antioxidant Agent on Shelf Life of Muffin Cake

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Oxidation of fat and oils has a key role in reduction of nutritional and organoleptic properties of foodstuffs. Now days, new tendency has created to use of natural antioxidant such as herbal extract in food industry. olive leaf is a medical plant that have so healthy benefits. In this study, antioxidant and antimicrobial effects of olive leaf extract in muffin cake preparation were evaluated during 0,15 and 30 days of storage. For evaluation of this matter three different group of muffin cake were produced. 1- cake were treated with olive leaf extract in three levels (750,1500 and 2250 ppm) 2- cake were treated without any synthetic and natural antioxidant and antimicrobial agent as blank sample 3- control samples, commercial cake including synthetic antioxidant (TBHQ) and antimicrobial (potassium sorbate) agent. in all samples peroxide value, acidity, humidity, microbial test (yeast and mold) and sensory evaluation (color, taste, flavor, texture and overall quality) were determined. Statistical results showed that, the sample containing of 750, 1500 and 2250 ppm olive leaf extract, respectively, have good antioxidant activities.in comparison with the blank and samples containing TBHQ. in sensory evaluation, samples containing of 750 and 1500 ppm olive leaf extract have higher score than the sample with 2250 ppm olive leaf extract. Generally, it can be concluded that olive leaf extract could be used as natural antioxidant in muffin cake. Results of antioxidant, antifungal and organoleptic assays showed that optimum concentration of olive leaf extract for using in cake is 1500ppm.

Keywords: Olive leaf extract, Muffin cake, Antioxidant activity

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Evaluation of Antioxidant and Antimicrobial Effects of *Pimpinella affinis* Extract on Durability of Meat Products to Reduce the Nitrite Consumption

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In recent years, due to health and nutritional issues originated from using synthetic preservatives, the use of herbs and their components as natural resources are considered in food processing. In this study, the effect of *Pimpinella affinis* extract on lipid oxidation and *Staphylococcus aureus* count in 55% chicken sausage are investigated. For this purpose, the methanolic extracts of leaves and stems of *Pimpinella affinis* was prepared, the percentage of free radical inhibitory DPPH and its polyphenolic compounds are measured. the BHT antioxidant was used to control the process. Moreover The extracts in four different concentration levels of 500, 1000, 2000 and 4000 ppm were compared in 55% chicken sausage with the The control group consists 120 ppm nitrite, for 30-day maintenance period At 4 ° C were evaluated in this comparative study. The results showed that the *Pimpinella affinis* extract had more significant antioxidant power compared to the BHT antioxidant. Furthermore, the amount of phenolic compounds is directly related to the concentration of the extract. The lowest amount of lipid oxidation was observed in the 4000 ppm concentration level of extract, which is higher than the control group containing the nitrite. The observation of results indicates that the ability of the *Pimpinella affinis* extract to delay fat oxidation in meat products. and the highest concentrations of the extract was resulted in a higher antimicrobial activity against the Gram positive bacterial strain. Although, it was lower than the activity of the control group, this level of activity was in the standard range of microbial characteristics of sausage. These data indicate that *Pimpinella Affinis extract* can exhibit antimicrobial activity against *Staphylococcus aureus* and delay fat oxidation in meat products. so it can be considered as an alternative natural preservative in food products.

Keyword: *Pimpinella affinis* extract, Fat oxidation, *Staphylococcus aureus*, Sausage

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Chemical Composition of the Essential Oil of *Salvia santolinifolia* from Iran

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Salvia L. species constitute the largest genus in the family Lamiaceae with over 1000 species distributed mainly in Central and South America (500 spp.), Central Asia/Mediterranean (250 spp.) and Eastern Asia (100 spp.). Most species are perennial herbs but annuals, shrubs and a few trees and vines also exist. 58 *Salvia* species are native to Iran with their distribution located in North-West to North-East and South-West to South-East as well as central of Iran. One of the *Salvia*'s species is *S. santolinifolia* Boiss. and its local name is Boeing which is distributed throughout the drier parts of subtropical areas, ranging from the South-West to the South-East of Iran. *Salvia* species have been used in the treatment of more than sixty different ailments ranging from aches and pains to epilepsy although their main application has been in treating colds, bronchitis, tuberculosis, hemorrhage and menstrual disorders. *S. santolinifolia* has been traditionally used as herbal tea for the treatment of hemorrhoids, inflammations, high blood concentration and skin ailments. In this study, to determine the essential oil composition of wild plants of Iranian *S. santolinifolia* for the first time, the aerial parts of it, collected at the flowering stage from its natural habitat in Meymand, Hormozgan province, at latitude of E 28° 10' and at longitude of N 56° 10', at an altitude of 1140 m at full flowering stage in March 2018. They were dried at room temperature and stored inside paper bags in a dark place until analysis. The essential oil of air-dried samples (100 g) was extracted by hydro-distillation for 3 h for each sample, using a Clevenger-type apparatus according to the method recommended in the British Pharmacopoeia. The essential oil yield was measured on the basis of the volume of dried essential oil/primary dried material weight × 100 for the sample. The essential oil yield was found 0.7% (w/w). The essential oil was analyzed by a combination of GC-FID and GC-MS techniques, to check for chemical profile. Twenty-six components, representing 97.8% of the total components, were identified. The main constituents of the essential oil were α -Pinene (53.9%), limonene (5.3%), humulene epoxide (5.1%), α -Cadinol (4.7%), germacrene B (4.0%), myrcene (3.2%), α -terpinenol (3.1%), camphene (3.1%), *p*-cymene (2.1%), α -copaene (2.1%) and borneol (1.1%). The identification of the bioactive compounds will be useful for relevant industries [1].

Keywords: *Salvia santolinifolia*, Essential oil, Chemical content, Natural habitat

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Investigation of Yield Improvement and Antioxidant Activity of Hyssop *Hyssopus officinalis* L. with Foliar Application of Kaolin at Different Times and Drought Stress.

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Hyssop (*Hyssopus officinalis* L.) belongs to the family Lamiaceae [1]. It is used in tea blends for cough relief, antispasmodic effects, and relieving catarrh [2]. In order to investigate the effect of Kaolin on improvement yield and antioxidant activity of Hyssop at different times and drought stress, a factorial split plot experiment was conducted in a randomized complete block design with three replications at the research field of Yazd Agricultural and Natural Resources Center in 2016-2017. The experimental treatments included irrigation at three levels 25%, 50% and 75% of the available water discharge from the soil, so as control, middle stress and intense stress as main treatments, and spraying treatments in two levels of distilled water (control), kaolin (2.5%) and time of spraying 1. vegetative and flowering 2. just flowering were considered as sub plots. The results indicated that different irrigation treatments reduced the total fresh and dry weight, essential oil yield, and total phenol and flavonoid content. But the anthocyanin level increased significantly ($P < 0.05$). The highest measured traits were seen in spraying during vegetative and flowering time. Spraying with kaolin was increased the total fresh weight (3.15%), total dry weight (0.96%), total phenol (7.17%) and flavonoid (0.20%) compared to control. The present study showed that kaolin application modulated damages of water stress by increasing the total fresh weight and total dry weight, phenol and flavonoids content of hyssop plant.

Keywords: Transpiration, Essential oil, Total phenol, Medicinal Plants

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Improving Water use Efficiency of *Aloe vera* under Water Stress by Reducing Light Intensity

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Aloe vera is one of the most economically important medicinal plants in many countries which used in food, cosmetics and pharmaceutical industries. Despite the proven economic importance of *Aloe vera*, studies of water and light stress and their effects on the water use efficiency of this plant are scarce. The objective of this study was to grow *Aloe vera* under different light intensities (100, 75 and 50% of sunlight) and different levels of water deficit stress (irrigation after depleting 20, 40, 60 and 80% of soil water content) were arranged in a split-plot in time based on a randomized complete block design with four replications. Generally, low light intensity and water deficit stress increased water use efficiency. The highest water use efficiency leaf and gel were obtained from plants which were subjected to 50% of full sunlight and irrigated after depleting 60% of the field capacity (38.93 and 26.40 g L⁻¹), Conversely, the lowest value was recorded from plants which were irrigated after depleting 20% of the filed capacity under high light intensity. In general, the present study indicates that application of shade can reduce the harmful effects of water deficit and improve plant growth, yield water use efficiency.

Keywords: *Aloe vera*, Light intensity, Water stress, Water use efficiency



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Untargeted Data Dependent Metabolic Profiling and Combined In-silico MS/MS Dereplication with Molecular Networking Approach for Annotation of Phytochemical Constituents of Iranian *Glaucium* Species

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The genus of *Glaucium*, Papaveraceae family, are a rich source of different classes of isoquinoline alkaloids with various pharmacological activities. This study focused on isolation and identification of phytochemical constituents of three Iranian *Glaucium* species: *G. corniculatum*, *G. fimbriigerum* and *G. grandiflorum* based on information obtained from preliminary untargeted data dependent metabolic profiling, molecular networking and in silico dereplication [1]. Sequential extraction was performed and chromatographic separation was achieved on a UPLC I-class system interfaced to a Q-Exactive Focus mass spectrometer. Molecular networks were created using the GNPS platform (<http://gnps.ucsd.edu>) after pre-processing the HRMS/MS data by Mzmine 2.32. Output data from GNPS were visualized using Cytoscape 3.4.0 software. The annotation of the molecular networks was performed by spectral matching against an *In-Silico* MS/MS DataBase. The spectral scores were taxonomically pondered using occurrence of the hits in *Glaucium* species and Papaveraceae family as a weight. This resulted in the annotation of several characteristic alkaloids. The large scale isolation and purification of the methanolic extract by combination of fractionation by high speed counter current chromatography and preparative reversed phase chromatography resulted in the identification of various alkaloids such as glaucine, predicentrine, *N*-methylindcaprine, bulbocapnine, corydine, and *N*-methyl- β -canadine. Their structures were established by extensive spectroscopic methods, including 1D (¹H NMR) and 2D-NMR (COSY, HSQC and HMBC) as well as HRMS.

Keywords: Glaucium, Molecular Networking, In-Silico dereplication

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Antifeedant Activity of Ethanolic Extract from *Fumaria parviflora* on Stored Product Insect

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Fumaria parviflora (Fumariaceae) is a small, scandent, branched annual herb that grows wild in plains and low hills in Europe, Asia and Africa. From an ecological point of view, antifeedants are very important since they rarely kill the target insects directly and let them be available to their natural enemies and help in the maintenance of natural balance [1]. In this study, the ethanolic extract from aerial parts of *F. parviflora* were tested against the stored product insect, *Tribolium castaneum* (Herbst) for antifeedant activity, which was measured by nutritional indices parameters such as relative growth rate (RGR), relative consumption rate (RCR), efficiency of conversion of ingested food (ECI) and feeding deterrence index (FDI). Treatments were evaluated by the method of flour disc bioassay in the dark, at 27±1°C and 60±5 % RH. Concentrations of 0, 0.25, 0.5, 0.75, 1.0, 1.5 and 2.0 percent were prepared from each extract. After 72 h, nutritional indices of adults were calculated. One-way analysis of variance for comparing between different extract concentrations with Duncan's multiple range tests ($P<0.05$) were used to determine differences between means. Also correlations between measured factors were calculated. According to this findings, nutritional indices were significantly affected as extract concentrations increased. Relative growth rate, relative consumption rate and efficiency of conversion of ingested food decreased in *T. castaneum* adults as the concentration level was increased. While feeding deterrence index percent increased significantly as the concentration level increased. There was significant positive correlations ($P<0.05$, $r^2>0.9$) between RGR and RCR or ECI, also there was significant negative correlation between RGR and FDI. It was shown that ethanolic extract from *F. parviflora* had a strong effect on a feeding behavior and growth of this pest. Total mean values of relative growth rate, relative consumption rate, efficiency of conversion of ingested food and feeding deterrence index of this extract were 0.40 mg/mg/day, 0.54 mg/mg/day, 56.46% and 44.70%, respectively. It seems likely, the use of natural insecticides such as plant extracts could be a useful method of controlling pests in stored products.

Keywords: Plant extract, Nutritional indices, *Tribolium castaneum*, *Fumaria parviflora*

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Comparative Study of Biochemical Characterization of Different Parts of Bene fruit (*Pistachia atlantica* subsp. *kurdica*)

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Persian turpentine or *Pistachia atlantica* subsp. *kurdica* from Anacardiaceae family is a plant resistant to the adverse environmental and local conditions of Iran which is useful for hair boosting, treatment of digestive diseases and joint pain relief. In this research, biochemical properties of different parts of Persian turpentine fruit were studied. The experiment based on completely randomized design with four replication. Fresh fruit was used and treatment including whole fruit, green peel (exocarp), brown crust (wooden endocarp) and kernel. The most measured factors consist of flavone and flavonol, flavonoid content, amount of phenolic compounds, antioxidant activity and tannin content. The results of analysis variance indicate the significant effect of treatment on most measured traits. The maximum total flavonoid (3.81 mg Quercetin/g) related to green peel while minimum content was observed in kernel. The highest and lowest amount of phenolic compound (16.86 and 5.36 mg Gallic acid/g) are measured in green peel and kernel respectively. Also the highest antioxidant activity (98.62%) related to green peel while the maximum tannin content (7.09 and 6.37 mg Catechin/g) in endocarp and kernel parts was identified. Generally, the green peel have high value as relation to this biochemical factors measured.

Keywords: *Pistachia atlantica* subsp. *kurdica*, Antioxidant activity, Phenolic

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Effects of Fe Foliar Application on Iron Deficiency in Lemon Balm

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Melissa officinalis L. is a medicinal plant from Lamiaceae family and are used in Iranian folk medicine for their digestive, carminative, antispasmodic, sedative, analgesic, tonic, and diuretic properties, as well as for functional gastrointestinal disorders [1]. Lemon balm oil has contain potentially active components primarily include monoterpenoids and sesquiterpenes, in particular geranial, neral, citronellal, geranyl acetate, β -caryophyllene, caryophyllene oxide and 1, 8- cineole [2]. Iron is one of the essential nutrients for plants. Among all the micronutrients plants need to iron more than other. Among micronutrients, Iron (Fe) is a cofactor for approximately 100 enzymes that catalyze unique biochemical reactions. Deficiency or low activity of iron in the plant causes chlorophyll is not produced in sufficient quantities and the leaves are pale. In order to investigate the effect of Iron deficiency stress on growth factors and essential oils of lemon balm plant, a factorial experiment based on completely randomized design was conducted with three replications in greenhouse. Two months plants was irrigated by Hoagland solution for one month, then plants treated by Hoagland solution containing half, quarter and free nitrogen each for two weeks. Control and deficient plants sprayed by Fe EDTA and FeSO₄ 0.5% and 1% once every two weeks. The results showed that iron deficiency treatment decreased growth factors (lengths, fresh and dry weights) in all plants, but spray of Fe increased plants growth. Also the roots and shoots length of plants, fresh weights and dry weights increased significantly ($P < 0.05$) either in control or deficiency plants under spray treatments, the effects of FeSO₄ was higher than Fe EDTA. Also iron deficiency reduced the chlorophyll content (a, b and total chlorophyll) and increased carotenoids content compared to control. Also, iron deficiency decreased the percentage of essential oil compared to the control by increasing the percentage of caryophyllene, geranial and thymol. There was a negative significant correlation between nitrogen deficiency and essential oil constituents.

Keywords: Caryophyllene, Deficiency, Essential oil, Iron, Medicinal plant

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Effect of Selenium on Nutrient Uptake and Antioxidant Enzyme Activities of Garlic *Allium sativum* L. Exposed to Cadmium

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Selenium (Se) is an essential element for living organisms that play an important role in reducing adverse effects of environmental stresses in plants. To evaluate the effects of selenium on garlic (*Allium sativum* L.) seedlings exposed to various concentrations of cadmium (Cd), a factorial experiment was conducted in a completely randomized design with three replications. Cd in four concentrations (0, 10⁻⁴, 10⁻³ and 10⁻² M of Cadmium chloride), and Se in two levels (0 and 5 mg/L of Sodium selenite) were used. The results showed that the accumulation of Na, K, Ca and Mg in the shoot and root tissues of garlic plants changed under different Cd concentrations and Se treatment significantly. Uptake of Na increased by the supply of 10⁻⁴ to 10⁻² M Cd and shoot tissues contained higher Na than the roots in all treatments. While K, Ca and Mg concentrations decreased under Cd stress conditions. Selenium supply suppressed the negative effects of Cd on the nutrient uptake. The application of Se increased K, Ca and Mg contents by 25.40, 28.12 and 27.23% in the roots and 8.10, 22.27 and 20.96% in the shoot, respectively at the 10⁻³ M Cd concentration. Also, Cd toxicity reduced Zn, Cu and Mn contents of garlic plants, while increased Fe concentration in the root and shoot tissues. With Se supply the concentrations of Fe, Zn, and Cu in the shoot and Mn in the root back to control levels. The presence of 10⁻² M Cd in media led to dramatic decreases in the activity of the antioxidant enzymes (SOD, APX and CAT). The activity of SOD and APX under 10⁻⁴ M Cd concentration by 48.2 and 42.1%, and under 10⁻³ M Cd concentration by 100 and 94.7% were more than the control, respectively. In contrast, CAT activity was decreased after exposure to 10⁻⁴ and 10⁻³ M Cd concentrations. Plant treated by Se resulted in a significant increase in SOD and APX activities at both 10⁻⁴ and 10⁻³ M Cd concentrations, while it did not alleviate the inhibitory effects of Cd on CAT activity. The results of this study identify that Se exogenous application could be reduced the uptake and accumulation of Cd, thereby minimize antagonistic effects of Cd on essential mineral transportation with up-regulation of antioxidant defense in garlic plants.

Keywords: Antioxidant enzymes, Garlic, Nutrient uptake, Oxidative stress Selenium

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The Effect of Cinnamaldehyde on Serum Testosterone Concentration and Histopathological Changes in Testis Induced by Chronic Injection of Morphine in Rats.

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Opioid addiction is one of the major problems of the world. Opioid change the function of sexual organs and affected spermatogenesis and related hormones and cause infertility. Morphine is the main component of opium and directly affect the opioid receptors of testicular tissue and inhibit spermatogenesis and has harmful effects on sperm proliferation by the production of free radicals and oxidative stress. Naloxone is an opioid antagonist medication used to block or reverses the effects of opioid drugs. Cinnamon is one of the important spices used daily by people all over the world. Cinnamaldehyde occurs naturally in the bark of cinnamon trees and has beneficial effects such as antioxidant, anti-inflammatory, antidiabetic, antimicrobial, anticancer, neuroprotective. The present study evaluated the protective effects of cinnamaldehyde on the morphine induced structural pathology of testis. Fifty male rats were randomly divided into 10 groups (n=5) and were treated intraperitoneally for 28 days with normal saline, cinnamaldehyde (1.25, 5, 20 mg/kg/day), morphine (20 mg/kg/day), naloxone (0.5 mg/kg/day) and morphine (20 mg/kg/day) + cinnamaldehyde (1.25, 5, 20 mg/kg/day) and morphine (20 mg/kg/day) + naloxone (0.5 mg/kg/day). Administration of morphine decreased serum testosterone concentration as compared to control group and could disrupt the normal histological structure of rat testis. All spermatogenic cell population and germinal layer thickness of seminiferous tubules had decreased compared to the control group. Administration of naloxone was modification level of serum testosterone and spermatogenic population compared with morphine group but did not reach to normal level. Increasing doses of cinnamaldehyde and cinnamaldehyde plus morphine administration showed increased testosterone in all groups compared to the morphine group and the side effect of morphine on testis greatly eliminated after cinnamaldehyde administration. It seems that cinnamaldehyde neutralized oxidative stress and prevent the damage cause by free radicals by antioxidant activity and has therapeutic effects on the testis.

Keywords: Cinnamaldehyde, Morphine, Testosterone, Testicular damage, Rat

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Effect of Essential Oils on Reducing Menstrual Pain and Symptoms of Dysmenorrhea by Aromatherapy

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Dysmenorrhea is still a major public health problem that in every menstrual cycle negatively affects women's health, social relationships, school activities or work, and mental status. Emotional factors such as stress, anxiety and panic are important for the development of pain in menstruation. In fact, the determinants of changes in dysmenorrhea are due to stress-related conditions. One of the non-pharmacological methods used to relieve menstrual pain and reduce stress during this period is aromatherapy. In this method, aromatic essential oils and herbal oils are used for massage. In terms of Iranian Traditional Medicine, the best topical treatment is to massage the abdomen with herbal oils. To evaluate the therapeutic effects, essential oils of the herbs were selected with antispasmodic, anti-inflammatory, sedative and phytoestrogen effects such as cinnamon, fennel, rosemary and lavender. Ginger oil was also used as the base oil for the composition of essential oils. This aromatic herbal oil called "Aromagol". The results showed that aromatherapy massage with Aromagol oil during menstruation, is effective in reducing menstrual pain and also reducing stress.

Keywords: Aromatherapy, Essential oils, Dysmenorrhea, Stress

A New Study of Biological Properties of the Lichens *Diploschistes Ocellatus* and *Diploschistes Diacapsis* from Iran

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Lichens are symbiotic organisms that consist of fungi and photosynthetic symbionts such as algae and cyanobacteria. Lichens belong to the fungi in the classification of living organisms. Lichens produce many kinds of secondary metabolites. Due to this fact, lichens attract great attention as source of new bioactive substances^{1,2}. We studied the biological activities such as antibacterial and anti UV properties of two species of *Diploschistes* genus in Iran. At the beginning for the first time, the lichens of *Diploschistes Ocellatus* (Fr.) *Norman* and *Diploschistes Diacapsis* (Ach.) *Lumbsch* from the north of the country (Golestan province) were sampled, collected and transferred to the Museum of lichens (herbarium) in Iranian Research Organization for Science and Technology and they were studied. Extracting was done by maceration as a fast extraction technique. Acetone is the best solvent of choice. Antibacterial properties in each lichen extract were evaluated using disk diffusion method and measuring of inhibition zone diameter (mm). For this purpose the gram (+) bacteria *Staphylococcus aureus* and the gram (-) bacteria *Pseudomonas aeruginosa* were chosen. Erythromycin antibiotic for gram (+) bacteria and Amikacin antibiotic for gram (-) bacteria as a positive control and DMSO as a negative control were used. Also ultraviolet radiation protection was achieved using spectrophotometric scanning. The UV absorption maxima of ethanol, methanol and acetone solution were measured for both extracts. In the lichen *Diploschistes Ocellatus* (Fr.) *Norman*, the results of the antibacterial test revealed, it does not have antibacterial properties. But it has ultraviolet radiation protection and was an anti UV. In the lichen *Diploschistes Diacapsis* (Ach.) *Lumbsch* has an acceptable antibacterial effect. Also it was an UV filter and natural photo protective agent. In this study, we have succeeded in increasing and improving the data of two important samples of native Iranian lichens. These lichens have good potential for use in cosmetic products and pharmaceutical applications.

Keywords: Lichen, Maceration, Antibacterial, Anti ultraviolet, *Diploschistes*

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Effect of Titanium Dioxide Nanoparticles on Total Phenol, Total Flavonoid and Rosmarinic Acid Content in *Hyoscyamus reticulatus* Hairy Root Cultures

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The genus *Hyoscyamus* L. belongs to the tribe Hyoscyameae Miers of Solanaceae family with 18 species all over the world and 13 species in Iran. *Hyoscyamus reticulatus* L. is a rich source of hyoscyamine and scopolamine which are used for their mydriatic, antispasmodic, anticholinergic, analgesic and sedative properties. Hairy root (HR) induction is the result of the infection of plant tissues with *Agrobacterium rhizogenes* and subsequently integration of root induction plasmid (PRi) T-DNA into the plant genome and its subsequent expression. Hairy root cultures and elicitation are proposed to enhance important metabolites production. In the present study, the effects of different concentrations (0, 10, 20, 30 and 50 mg L⁻¹) of titanium dioxide nanoparticles (TiO₂ NPs) at different exposure times (24 and 48 h) on growth, total phenolic content (TPC), total flavonoid content (TFC) and production of rosmarinic acid of hairy root cultures of *H. reticulatus* were analyzed. Polymerase chain reaction (PCR) analysis with specific primers for *rolB* gene confirmed the insertion of *rolB* in putative transgenic hairy roots genome. The results show that the highest hairy root fresh weight (4.1 g) were found in the medium supplemented with 10 mg L⁻¹ TiO₂ NPs at 24 hours of exposure time and the lowest fresh weight (2.75 g) were found in the medium supplemented with 0 mg L⁻¹ TiO₂ NPs. The highest (7.27 mg GAE per g FW) and lowest (1.04 mg GAE per g FW) amount of TPC was obtained in 30 and 0 mg L⁻¹ TiO₂NPs at 48 h of exposure time, respectively. The maximal flavonoids content (0.72 mg QUEU per g FW) was observed in the medium supplemented with 50 mg L⁻¹ TiO₂ NPs at 48 h of exposure time. HPLC analyzed show that the higher amount of rosmarinic acid content (18.04 µg g⁻¹ FW) with 2-fold increase compared to control, was observed in 10 mg L⁻¹ TiO₂ NPs concentration at 48 h of exposure time.

Keywords: *Agrobacterium Rhizogenes*, Hairy Root, Tropane Alkaloids, Titanium Dioxide

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Phytochemical and Antioxidant Analysis of *Clinopodium umbrosum*

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Plants of genus *Clinopodium* have been used in different cultures as traditional medicines. Due to the importance of medicinal properties of genus *Clinopodium*, *C. umbrosum* was selected for phytochemical analysis along with evaluation of its antioxidant property. The aerial parts of *C. umbrosum* were extracted with petroleum ether, chloroform, and methanol. Later, the methanol extract was fractionated via solid phase extraction (SPE), vacuum liquid chromatography (VLC), and reversed phase high performance liquid chromatography (HPLC). Consequently, structures of the isolated compounds were analyzed through spectral analysis 1D NMR and 2D NMR data. Additionally, the antioxidant property of *C. umbrosum* methanol extract together with its phenolic and flavonoids content were assessed. Structure elucidation of the purified compounds revealed presence of two triterpene saponins and a caffeic acid derivative in *C. umbrosum* methanol extract. Moreover, the RC₅₀ value for free radical scavenging activity of the methanol extract was determined as 38.52 µg/ml and values for the total phenolic and flavonoids content were calculated as 5.14 g gallic acid equivalent and 4.25 g quercetin equivalent per 100 g of dried plant material, respectively. Overall, the present study is the first report on the phytochemical analysis of *C. umbrosum* which revealed presence of buddlejasaponin IVa, buddlejasaponin IV, and rosmarinic acid as the main components of methanol extract [1].

Keywords: Buddlejasaponin Iva; Buddlejasaponin IV; *Lamiaceae*; Palmitic acid

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Study on Phenolic Compounds and Antioxidant Activity of *Marrubium propinquum*

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The genus *Marrubium* with about 40 species of flowering plants is considered to be one of the largest genera of lamiaceae. Since ancient times, this genus has been accepted for remedy of several disorders such as dyspeptic complaints, loss of appetite, cough, wound healing and as a choleric in digestive and biliary complaints. Phytochemical analyses of *Marrubium* have been demonstrated that it is rich in polyphenols, flavonoids, phenylethanoids, sterols, saponins and tannins. According to the widespread usage of the species in traditional and folk medicine in Iran, *M. propinquum* was selected for phytochemical study along with an assessment on antioxidant activity which has not been studied so far. The air-dried and powdered aerial parts of *M. propinquum* was successively extracted at room temperature with solvents of increasing polarity, petroleum ether, chloroform and methanol using maceration method. The methanolic extract (2g) was subjected to Sep-Pak fractionation using a step gradient of MeOH-H₂O mixture (10:90, 20:80, 40:60, 60:40, 80:20, 100:0). Furthermore, purification of the fractions by preparative reversed-phase HPLC yielded 24 compounds. The structure of three compounds have been elucidated by 1D NMR and 2D NMR. The essential oil was obtained by hydro-distillation with a Clevenger-type apparatus. The composition of the essential oil was determined by GC-MS. Additionally, free radical scavenging activity of the methanolic extract and its fractions were evaluated using DPPH and nitric oxide assays. Preparative reversed-phase HPLC analysis of 40% and 60% Sep-Pak fractions yielded a flavonoid, an acylated flavonoid and one phenylethanoid glycosides. Essential oil was typically a complex mixture of mainly non-terpenoids, sesquiterpene hydrocarbons, oxygenated sesquiterpene and some monoterpenes. The methanol extract and its fractions showed significant antioxidant activity. Phytochemical analysis on the aerial parts of *M. propinquum* showed the presence of phenolic compounds (flavonoid, acylated flavonoid and phenylethanoid glycosides) with significant antioxidant activity.

Keywords: Acylated flavonoid, *Marrubium propinquum*, Nitric oxide, Phenylethanoid

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The Effects of Dimethyl Sulfate (DMS) in Some Traits Related to Stem of Purslane (*Portulaca oleracea*) at M2 Generation

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Purslane, or *Portulaca oleracea*, is edible and has many health benefits. In order to the study of genetic diversity in the M2 mutant lines which was treated with dimethyl sulfate (DMS) at concentrations of 0.0, 0.08, 0.1, 0.12, 0.14 (%), a nested experimental design was conducted with two replications. Due to the high experimental error for traits such as the number of main stem (NMS), stem fresh weight (SFW), stem dry weight (SDW), square transformation was applied through them the differences among concentration of DMS were statistically significant. For the ratio of dry weight to fresh weight (DW/FW), despite of reduction in experimental error, the differences among concentration of DMS were not significant. Difference among mutant lines was significant for all studied traits including plant height, NMS, number of sub-stems (NSS), stem diameter, SFW, SDW, and for DW/FW it was not significant. The amounts of all studied traits was higher at concentrations of DMS in comparison with the check (DMS 0.0%). Usually, with increasing in the concentration of DMS, a decrease was observed in the values of traits. The correlation between traits under study was significant, with exception of correlation between DW/FW and NMS, NSS and SFW. Correlation between DW/FW was negative with all other traits, with exception with except of SDW. The correlation between other traits was positively significant.

Keywords: Dimethyl sulfate (DMS), Mutant, Purslane (*Portulaca oleracea*)

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Oil Yield and Composition of Fresh and Dry Bene (*Pistachia atlantica* subsp. *kurdica*)

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Pistachia atlantica subsp. *Kurdica* in Persian name known as Bene or wild Pistachia belongs to Anacardiaceae family. The oil extracted from its fruit due to unsaturated fatty acids has high nutritional values. On order to, biochemical variation among fresh and dry fruit, an experiment (t-test) investigated the comparison of the oil percentage and fatty acids composition of two samples with three replications. Oil extraction was done by soxhlet type apparatus and fatty acid constituents were identified by Gas Chromatography (GC). The results of analysis variance indicate the significant difference between fresh and dry fruit as some measured factors. The amount of oil in fresh sample in comparison with dry sample (v/w) decreased by 23.9% (In fresh and dry samples was 24.81% and 30.74% respectively). Some oil fatty acid significantly influenced by drying (Linoleic acid and Oleic acid). Linoleic acid content in oil from fresh and dry fruits was 29.20% and 45.11% while amount of Oleic acid was determined 39.23% and 24.65% respectively. The other oil compounds were not affected by drying. According to the results of this study, it can be concluded that the type of sample (fresh or dry) has a significant effect on the quality of the bane oil and we have to process this product depending on the type of consumption (fresh dish for salad or frying).

Keywords: *Pistachia atlantica* subsp. *Kurdica*, Linoleic acid, Oleic acid, Drying, Oil

Reference

[1] Hatamnia, A.A., Abbaspour, N., Darvishzadeh, R. 2014. *Food Chemistry.*, 145: 306–311.

Antimicrobial Activity of *Marrubium crassidens* Methanol Extract

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Marrubium crassidens endemic to Armenia, Azarbaijan, Turkey and Iran is used in folk medicine for a variety of ailments. The goal of our study was to assess the biological activity of *M. crassidens* testing the methanol extract of aerial parts of the plant for its antimicrobial activity against 5 known bacteria and a fungus. The air-dried aerial parts of *M. crassidens* were successively extracted with petroleum ether (40–60°C), dichloromethane and methanol via maceration at room temperature. The agar disc diffusion method was employed to determine the microbial growth inhibitory properties of the methanol extract against both Gram-positive and Gram-negative bacteria species; *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Micrococcus luteus*, *Pseudomonas aeruginosa*, *Escherichia coli*, and a fungus; *Candida albicans*. Besides, minimal inhibitory concentrations (MICs) were also determined by agar serial dilution method for the strains of bacteria which had zone of microbial growth inhibition to evaluate the inhibitory properties. The methanol extract of *M. crassidens* revealed moderated activity when evaluated against pathogenic microorganisms of *S. aureus* and *S. epidermidis* (Gram positive bacteria) with inhibition zone of 11.2 ± 0.4 and 10.5 ± 0.8 mm, and MIC of 1 and 0.5 mg/μl, respectively. Overall, *M. crassidens* methanol extract showed antibacterial activity against two gram positive microorganisms whereas differences in microbial susceptibility were registered.

Keywords: Lamiaceae; *Marrubium crassidens*, Minimal inhibitory, Concentrations

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The Effect Frankincense Ointment on Pain Intensity in Primiparous Women

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Episiotomy is one of the most commonly used midwifery practices, which, despite its small size, may cause complications like inflammation, infection or pain, like any other scars. Due to its anti-inflammatory properties, Frankincense is used empirically for many uses, including pain relief. The aim of this study was to evaluate the effect of Frankincense ointment on pain intensity in primiparous women. This experimental study was performed in Mahdiah hospital of Tehran, during 1396-1397. A total of 95 primiparous women with vaginal delivery and mid lateral episiotomy were examined. Demographic, midwifery, health assessment, pain scale(VAS), was used to evaluate the subjects. The ointment was administered every 12 hours and for 10 days from the first day after delivery. Evaluation of pain intensity was performed on days 1,5,10 after delivery. Data were analyzed using SPSS software and Mann-Whitney test. The significance level considered 0.05. There was no significant difference in terms of demographic and midwifery information also in health status. There was no significant difference between the two groups in terms of the pain intensity in the first day. The mean of pain intensity on days 5 and 10 in the intervention group was 2 ± 23.1 and 0.95 ± 0.5 respectively. In the control group, it was 1.64 ± 1.57 and 1.97 ± 1.17 . In both of these cases, these differences were significant ($P=0/030$, $P<0/001$). Frankincense ointment is effective in the episiotomy pain reduction. However, further investigation is needed in order to conclude more definitively.

Keywords: Frankincense, Episiotomy, Pain, Primiparous

Crop Coefficients of *Rosmarinus officinalis* Factor at Different Stages of Growth Using the MicroLysimetric Method (Case Study Area: Birjand)

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Rosmarinus officinalis is a perennial, fragrant plant that has a needle-shaped, evergreen leaves. *Rosmarinus* is a native of the Mediterranean region and the country of Uruguay. Its flowers grow in various colors of white, pink, purple or blue [1]. The optimal use of water resources in the agricultural sector requires the determination of the exact amount of water consumed by different plants in different conditions. In order to evaporate, transpiration of the plant, drainage microlysimeters and water-balance method in an open place with three replications of rosemary and three replicates of the grass were examined. This research was conducted in 110 days, which was divided into 11 decades of 10 days, in 96-97 at the Agricultural Faculty of Birjand. The results of this experiment showed that the rosemary vegetation coefficients at different stages of growth including the primary, developmental, middle and end stages were 0.823, 1.808, 1.454, and 0.728, respectively. According to the region of the region located in a dry and semi-arid region, due to the plant's water requirement and the importance of medicinal plants for this area, the plant has been resistant to the conditions of this region. Also, the average K_c in this study was estimated to be 1.12. According to the comment Linsley et al (1982), evapotranspiration is one of the main parts of the hydrological cycle, and precise prediction of this parameter is required for studies such as water-balance [2].

Keywords: Birjand, Water-Balance, Evapotranspiration, *Rosmarinus officinalis*, Microlysimeter

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Changes in Essential Oil Composition of *Lippia Citriodora* Exposed to Different Intensity of Drought Stress

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Drought stress affects a vast range of morphological, physiological and biochemical characteristics in medicinal and aromatic plants. *Lippia citriodora* has been traditionally used in infusions for the treatment of asthma, cold, fever, spasms, colic, diarrhea and indigestion. This study examined the impacts of various drought stress levels including 10% (WD1), 30% (WD2), 50% (WD3) and 70% (WD4) water depletion of field capacity on essential oil composition of *Lippia citriodora* under greenhouse conditions. Essential oils were isolated by hydro-distillation procedure and characterized using GC and GC/MS apparatus. Data were subjected to analysis of variance in a completely randomized design with three replications ($n=3$). The maximum (0.79%) and the minimum (0.43%) essential oil content were obtained under WD₄ and WD₁ treatments, respectively. The results also showed that essential oil of lemon balm plant predominantly consisted of monoterpenes such as 1,8-cineol, *cis*- and *trans*-thujene, camphor, and borneol. According to the results of GC-MS analysis, geranial (27.31%), neral (19.28%) and limonene (14.35%) were the major constituents of essential oil under moderate water stress (WD₃). However, the highest content of neral, limonene and geranial were obtained at low drought stress (WD₁). Apart from the tremendous negative effects of drought situations on growth and development, the corresponding stress situations frequently lead to an increase in the concentration of natural products. In principle, there are different possibilities to explain this enhancement. First, it could be the consequence of a reduced production of biomass in the stressed plants: when the rate of biosynthesis of natural products is not changed or only slightly reduced, their concentration on dry or fresh weight basis simply will be elevated. Alternatively, the drought stress enhances the actual rate of biosynthesis. This could be due either to a passive shift or an active up-regulation of the enzymes involved in natural product biosynthesis. Both options are related to the strongly enhanced reduction status of the leaves exposed to drought stress.

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Effect of Topical Application of Honey on Skin Wound Healing in Rat

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Different types of honey have been valued for its nutritional and medicinal properties throughout history. About 4500 years ago, as long as bacteria have been known, medicinal and antimicrobial activities of honey for wound healing were recognized. The medicinal use of honey has reappeared in modern medicine. Honey has anti-inflammatory, antibacterial, anti-allergic, antithrombotic and wound healing properties without harmful effects on tissues because it contains antioxidants and flavonoids. The aim of this study was to evaluate the effect of topical application of Vaseline and honey on wound closure during inflammation, proliferation and remodeling phase. [1, 2]. 75 male Wistar rats were randomly divided into 5 equal groups: as follow: the treatment groups (4 different types of honey) and control group. Following an intraperitoneal local anesthesia of rats with the Ketamine-Xylazine mixture under aseptic conditions, a 7-mm scar was made in each rat. In the treatment (experimental) groups, 3-4 gr of different types of honey was put on the scar each day. The control group received normal saline respectively. On the third, seventh, fourteenth, and twenty-first days, five rats were euthanized (using ether) and their tissue samples were sent to the laboratory for histopathological examination. Appropriate samples were fixed in 10% neutral buffered formalin, dehydrated in graded ethanol, cleared in xylene, and embedded in paraffin wax. Sections in 5 μ m thickness were stained by hematoxylin and eosin (H&E) and studied microscopically. Histopathological examinations revealed that the wound healing indices (including the presence of inflammatory cells, vessel formation, granulation tissue formation, collagen threats arrangement, and formation of the epidermis and dermal appendages) were always better in the experimental groups than the control group. Based on the microscopic results of the present research, it could be concluded that different types of honey accelerates skin wound healing process and decreases the duration of complete wound healing, particularly in first hours after wound creation. Since the commencement of healing calls for mitigation of wound inflammation and since infections delay the healing process, it is concluded that the anti-inflammatory and antimicrobial properties of honey can accelerate wound healing. However, further research on the mechanism and the type of honey affecting skin wound healing deems necessary.

Keywords: Honey, Wound healing, Rat, Histopathology

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Evaluation of Antioxidant Properties, Total Phenol and Flavonoid Content of some Herbal Tea

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The consumption of medicinal herbs for medicinal purposes is expanding for a variety of reasons (including cultural or psychological) because people believe that consuming natural products is more healthy than commonly used chemical drugs and have less side effects at recommended doses. A study by the World Health Organization found that around 80% of the population in world's developing countries was trusted with therapies based on herbal medicine and herbal drink are not exception. Herbal drink is referred to any plant source drink that is obtained from brewing plants. Herbal drink preparation is done by boiling or mixing with warm water that can be served in cold or hot form. In this study, the amount of antioxidant activity, total phenolic compounds and flavonoids of the three general of chamomile (*Matricaria chamomille*), thyme (*Thymus vulgaris*) and rosella (*Hibiscus sabdariffa*) herbal tea were investigated. One gram of each plant was mixed in 15ml methanol (80%) and shaken for 24 hours on a shaker at ambient temperature and then filtered by vacuum pump and filter paper. The antioxidant activity of the extracts was evaluated using a Radical Scavenging Capacity reduction (RSC) method with 2, 2-diphenyl-1-picrylhydrazyl (DPPH) at five concentrations and IC₅₀ was evaluated. The amount of total phenol compounds of the extracts was measured by Folin ciocalteu method and the results were expressed in terms of milligram of gallic acid per 100 g of dry herb. Total flavonoids content were measured by aluminum chloride colorimetric method. The research was set as completely randomized design with four replications and the data analyzed by JMP software. The results on antioxidant properties showed that IC₅₀ of chamomile, thyme and roselle tea were 4982, 2505, 11184 mg / l, respectively. Total phenolic content in chamomile, thyme and roselle tea was 798, 646.33 and 471 mg gallic acid per 100 g of dry herb, and the total flavonoid content was reported 524.55, 738.712 and 240.850 mg quercetin per 100 g of dry herb. According to the results of this study, thyme has the most antioxidant properties, while roselle tea has the least antioxidant activity. Comparing the phytochemical properties of the studied plant with related antioxidant properties showed that there was a positive correlation between antioxidant properties and total flavonoid content, and antioxidant properties increased with increasing flavonoid content in the sample.

Keywords: Antioxidant activity, Total phenolic compound, Flavonoids, Herbal tea

The Effect of *Viscom album* Extract on Skin Wound Healing in Male Rat

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Viscom album (Mistletoe) is a plant which its biological properties including anti-inflammatory, antimicrobial, anti-HIV and exerting immune-potentiating activities that may enhance the host defense system and anti-tumoral properties has been widely reported. In traditional medicine, *Viscom album* is also used to treat inflammation, cancer and scars. Seemingly, this plant can also be effective in accelerating skin wound healing. In the present research, effect of hydroalcoholic extract of Mistletoe on skin wound healing in male rats is investigated [1]. Sixty male Wistar rats were randomly divided into 3 equal groups: as follow: the treatment group, negative and positive control group. Following an intraperitoneal local anesthesia of rats with the Ketamine-Xylazine mixture under aseptic conditions, a 10-mm scar was made in each rat. In the treatment (experimental) group, 10% extract of the plant was put on the scar each day. The negative control and positive control groups also received normal saline and Phenytoin ointment respectively. On the third, seventh, fourteenth, and twenty-first days, five rats were euthanized (using ether) and their tissue samples were sent to the laboratory for histopathological examination. Appropriate samples were fixed in 10% neutral buffered formalin, dehydrated in graded ethanol, cleared in xylene, and embedded in paraffin wax. Sections in 5 µm thickness were stained by hematoxylin and eosin (H&E) and studied microscopically. Histopathological examinations revealed that the wound healing indices (including the presence of inflammatory cells, vessel formation, granulation tissue formation, collagen threads arrangement, and formation of the epidermis and dermal appendages) were always better in the experimental group rats than the negative control group rats. Based on the microscopic results of the present research, it could be concluded that hydro-alcoholic extract of *Viscom album* accelerates skin wound healing process and decreases the duration of complete wound healing, particularly in first hours after wound creation. Since the commencement of healing calls for mitigation of wound inflammation and since infections delay the healing process, it is concluded that the anti-inflammatory and anti-microbial properties of this substance can accelerate wound healing. However, further research on the mechanism and the type of *Viscom album* substance affecting skin wound healing seems necessary.

Keywords: *Viscom album*, Wound healing, rat, Histopathology

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An Investigation on some Phytochemical Compounds within Different Organs of Mallow *Malva sylvestris*

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Mallow (*Malva sylvestris*) is native to Europe, North Africa and Asia and has long been used as food in Mediterranean regions. Mallow has many medicinal properties such as anticancer, anti-nociceptive, anti-ageing, anti-bacterial and anti-ulcerogenic [1]. The purpose of the present research was to compare the amount of phytochemical compounds within different vegetative and reproductive organs of mallow. Mallow seeds were cultivated in an experiment based on randomized complete design in Jahrom university farm research in November, 2016. Plant samples including petal, green leaf, immature fruit and root were separately harvested in April, 2017. Dried samples (24 hours in 60 °C) were extracted using methanol 70% and this extract was used for measuring total phenol, total flavonoids, flavone and flavonol, tannin, DPPH free radical scavenging activity, total carbohydrate and mucilage. The results showed that petals had the most amount of total phenol (19.7 mg/gr), total flavonoids (25.0 mg/gr), and carbohydrate (138.0 mg/gr) and antioxidant activity (70.0%). Petals also contained the most amount of tannin (71.7 mg/gr) while the other organs were deprived of any tannin. There were positive and significant correlation between antioxidant activity and amount of the foregoing compounds [2]. The leaves contained the most amount of mucilage (12.2%) followed by petal (6.3%), immature fruit (2.0%) and root (0.7). It can be concluded that phytochemical compounds were differently distributed in various mallow vegetative and reproductive organs. The leaves and flowers were excellent source for mucilage and antioxidant activity, respectively. Therefore, mixture of leaves and flowers of mallow can be considered as functional food or even pharmafood since they accumulate various phytochemical compounds.

Keywords: Antioxidant; Chemical Compounds, Mucilage, Pharmafood, Phenols

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The Effect of Priming with Potassium Nitrate on *Borago officinalis* under Salinity Stress

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The beneficial effects of priming are not exclusive of seed germination and can be extended to later stages by increasing tolerance to different biotic and abiotic stresses [1]. In order to study the effect of KNO₃ on germination of *Borago officinalis* under salinity stress, this study was done as a factorial experiment using a completely randomized design with 5 levels of salinity (0, 2, 4, 6, 8 dS/m) and 3 levels of KNO₃ (0, 0.03, 0.5%) with 3 replications. The results showed that salinity had significant effect on germination percentage, stem length and fresh weight. The priming effect on germination percentage, stem length and fresh weight was significant. The most germination percentage, stem length and fresh weight were obtained with using KNO₃ in level of 5%.

Keywords: Priming, *Borago officinalis*, Salinity, Potassium nitrate

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Physical Seed Dormancy in *Paeonia Wittmanniana* Dormancy Breaking Requirement

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Paeonia wittmanniana one of endangered medicinal plant, is native to northern part of Iran. The propagation, vegetative or sexual is very difficult. Its seeds are known for their physical and deep physiological dormancy. In the present study, seeds' coat were analysed anatomically to determine their water absorption ability. Later, some pretreatments of physical and chemical scarification were carried out to break physical dormancy of the seeds. For physical scarification, a sharp knife or sand paper were utilized. For chemical scarification, seeds were immersed in pure sulphuric acid (H₂SO₄) up to 2, 4, 6, 8, 10 or 20 min., and then rinsed thoroughly in running water for 20 min. After scarification, different treatments of gibberellic acid and potassium nitrate were applied to break dormancy and speed up the germination process. Anatomical analysis indicated that the seeds were covered with hard impermeable macrosclereids layers. Scarified seeds absorbed water up to 120 percent of their net weight. Analysis of variance indicated that seeds scarified with knife; or treated with sulphuric acid for either 10 or 20 min absorbed the highest. However, germination of such seeds (56%) only happened under gibberellic acid treatment (both 250 and 500 mg/l). These results suggested that *Paeonia wittmanniana* seeds' paradormancy and endodormancy could be removed by acid scarification and gibberellic acid treatment; respectively. Therefore, dependant on seed-coat thickness and results of viability tests, longer scarification durations are suggested .

Keyword: *Paeonia wittmanniana*, Scarification, Dormancy

Antibacterial Activity of Different Parts of *Spirulina Platensis* Substances

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Spirulina platensis is a species of cyanobacteria that are known to produce metabolites with diverse biological activities such as antimicrobial activity and has an international demand in healthy foods, feed, therapeutics and diagnostics industries. In this study, we used Extraction methods and several solvents such as deionized water, methanol, dichloromethane, ethyl acetate to extract bioactive metabolite from the spirulina biomass. Antibacterial assay were applied for against 6 test strains consist of gram positive: *Micrococcus luteus*, *Staphylococcus aureus*, *Bacillus subtilis*, and gram negative: *Escherichia coli*, *Klebsiella pneumoniae*, *pseudomonas aeruginosa*. The antimicrobial activity of Extracts were determined by using two methods, the agar well diffusion method and the disk diffusion method. Each extracts exhibited various degrees of antimicrobial activity against an array of all Gram-positive and the experiments don't effect on Gram-negative bacteria. Characterization and study of different extracts of this cyanobacterium are promising a big potential for incorporation into various products for which a natural antimicrobial additive is desired. This work aimed to clarify the production, extraction, purification and identification of the active metabolic product(s) produced by *Spirulina platensis* to test their antimicrobial activities.

Keywords: *Spirulina platensis*, Antimicrobial activity, Extraction



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Antimicrobial Activity of the Essential Oil of *Thymus fedtschenkoi* R. Collected from Semnan Province

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Indiscriminate and overuse of commercial antimicrobial agents for long time made the infectious organisms resistant to them, making necessity to find new antimicrobial agents to cure resistant ones from different sources, especially plants and their products. This research was aimed to investigate the antibacterial activity of *Thymus fedtschenkoi* R. The essential was obtained by Clevenger method and the antibacterial activity was determined by disk diffusion method and compared with Ciprofloxacin and Ceftizoxime. The experiment was conducted in a factorial based on randomized complete block design with two main factor including microorganisms (five levels) and essential oil concentration (three levels) with four replication. The statistical analysis showed the significant effect ($p < 0.01$) of microorganisms, essential oil concentration and their interaction on antimicrobial activity. Mean comparison of inhibition zone indicated *Pseudomonas aeruginosa* and *Staphylococcus aureus* as the most and least resistant bacteria, respectively. Essential oil which diluted 1:5 had the highest activity even more than Ceftizoxime and Ciprofloxacin. The interaction effect between microorganisms and essential oil concentration made the most sensitive was *Candida albicans* which treated with 1:5 concentration of essential oils. In conclusion, it seems the high potential of *Thymus fedtschenkoi* R. against microorganism and can be used as a source to produce new antimicrobial agents to treat infectious diseases caused by resistant microorganisms.

Keywords: Antimicrobial, Essential oil, Microorganisms, Semnaan, *Thymus*

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Efficacy of Hibiscus Esculentus Extract on Glycemic Control and Lipid Profile in Hyperlipidemic Type 2 Diabetic Patients: a Randomized Double-Blinded, Controlled Trial

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Hibiscus esculentus L. is a plant of the family of *Malvaceae* that contain plenty of phenolic compounds, phytosterols, triterpenes, tannins and flavonoids, so the current investigation was conducted to provide the first assessment of the antidiabetic characterises of hydroalcoholic extract of *H. esculentus* in type 2 diabetic patients. This randomized, placebo- controlled, double blind study was included 66 T2D patients which randomly either *H. esculentus* capsules (700 mg/d; $n = 33$) or the placebo ($n = 33$) twice daily alongside routine antidiabetic for 2 months. Serum concentration of fasting blood sugar (FBS), 2-h plasma glucose, hemoglobin A1c (HbA1c), total cholesterol, triglyceride (TG), low-density lipoprotein, and high-density lipoprotein were measured as the markers of metabolic control. Data analyzed using repeated measure analysis of variance test. There were significant differences in serum FBS ($P = 0.005$), HbA1c ($P = 0.004$), TG ($P = 0.03$), HDL- c ($P = 0.05$), LDL-c ($P = 0.05$) and total cholesterol ($P = 0.001$) between the two groups at the end of the study. Hydroalcoholic extract of *H. esculentus* may improve blood glucose and lipid profile in T2D patients. No adverse effects were observed. It seems that *H. esculentus* is safe and effective in improvement of lipid profile and glycemic control.

Keywords: Diabetes mellitus, Fasting bloo, Metabolic syndrome, *Hibiscus esculentus*



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Evaluation of Anti-Bacterial Activity of Three Species of *Cousinia* against 5 Gram Positive Bacteria

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The increasing pattern of anti-bacterial resistance among bacteria had led to difficult and expensive treatment of infectious diseases, beside that there are many concerns about side effects associated with the anti-biotic therapy. Flora of Iran is one of the richest floras in SW of Asia and it has 1800 endemic species from 8000 taxa (1). The genus *Cousinia* with 600-700 species is the largest genera of flowering plants in Central and Western Asia. *C. harazensis* Rech.f., *C. calocephala* Jaub. and Spach and *C. pterocaulos* (C.A.Mey.) Rech.f. are endemics to Iran. Aerial parts of plants were collected from Lasem (Mazandaran Province) in July 2018. The air-dried and milled whole plants were macerated for 24 hours in methanol 80% and this rout was repeated for four times. Primary anti-bacterial effects of methanol extracts against five gram positive bacteria including: *Staphylococcus aureus* (ATCC: 6838), *Staphylococcus epidermidis* (ATCC: 12228), *Micrococcus luteus* (ATCC: 9341), *Bacillus subtilis* (ATCC: 6633) and *Bacillus cereus* (ATCC: 10876) were evaluated by cup-plate method and MIC values were determined by agar dilution method described by CLSI. Results of both cup-plate and agar dilution methods demonstrated that these three extracts can inhibit growth of examined bacteria strains. The best result of cup-plate test is related to *C. harazensis* with over than 22 mm inhibition zone and against *S. epidermidis* this result was 30 ± 0.5 mm for concentration of 500 mg/ml. According to results of MIC value test, effect of extract of *C. pterocaulos* against *S. epidermidis* and *B. cereus* were 15.62 and 7.81 mg/ml and they were the best results. About MBC results, main of effective concentrations was 62.5 mg/ml. This research showed that these three species of *Cousinia* can be used for future works such as: phytochemical screening, bio-assay guided fractions and etc.

Keywords: *Cousinia harazensis*, *C. calocephala*, *C. pterocaulos*, Cup-plate, Agar

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Effect of Salinity, Ethanol and pH on Germination of *Plantago major* L.

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Evaluation of tolerance to environmental stress in germination stage is very important in domestication and cultivation of medicinal plants [1]. In order to investigate the effect of salinity stress, ethanol and pH on percentage germination of *Plantago major* L., three experiments were carried out at weed science laboratory in Sari Agricultural Sciences and Natural Resources University in 2019. Each experiment was carried out separately in a randomized complete design with four replications. Treatments for salinity stress, included different levels of NaCl at concentrations of 0, 40, 80, 160 and 320 mmol/L, different pH levels including 3, 5, 7, 9 and 11, and time of seed placement in 2, 5, 10, 20 minutes intervals in ethanol. The results showed that all treatments had the significant effect on germination percentage. Seed germination severity decreased significantly by increasing the duration of ethanol treatment. Salinity stress also caused a significant reduction in germination and reached to zero when the NaCl concentrations got higher than 40 mmol/L. Salinity prevents seed germination by reducing the availability of seeds to water or interfering in some aspects of metabolism [2]. Also, the best soil acidity for germination of this plant was pH = 7. The results showed that *Plantago major* seeds had a very high sensitivity to ethanol and salt stress, and the most suitable soil acidity for germination was in neutral range.

Keywords: Environmental stress, Germination, *Plantago major*

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Biosynthesis of Silver Nanoparticles from *Melia azedarach* L. Aqueous Extract and their Spectrochemical and Antibacterial Activity

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Nanotechnology involves 'manufacturing of particles at Nano scale and also creates new products which improves a wide range of physicochemical properties include durability, strength, reactivity and conductivity. Nanoparticles (NPs) have attracted much attention due to their potential applications in catalysis, biology, computing, biomedical science, drug gene and photo chemical applications. In current year synthesis of nanoparticle by green method in which plant extract is used as reducing agent is gaining importance over photochemical reduction, heat evaporation, electrochemical reduction, and chemical reduction methods due to its simplicity, less toxicity and eco-friendliness. Nanoparticles can be synthesis by green method by using several biological system including bacteria, fungi, and yeast. In this study the biosynthesis of silver nanoparticles using fruits *Melia azedarach* L. extract as a reducing agent by microwave irradiation method and its antibacterial properties has been reported. Green synthesis of silver nanoparticles (AgNPs) was characterized by UV-visible (UV-Vis) spectroscopy, Fourier transform infrared spectroscopy (FT-IR), X-ray diffraction (XRD) and Transmission electron microscopy (TEM). The UV-Vis spectra gave surface plasmon resonance (SPR) for synthesized AgNPs at 450 nm. FT-IR spectroscopy revealed that AgNPs were functionalized with biomolecules that have primary amine group, carbonyl group, OH groups and other stabilizing functional groups. X-ray diffraction pattern showed high purity and face centered cubic (FCC) structure of AgNPs with size of 38 nm. Transmission electron microscopy experiments showed that these nanoparticles are spherical and uniformly distributed and its size is from 20 to 40 nm. Later, the antibacterial activity of the synthesized silver nanoparticles was tested using both gram positive as well as gram negative bacteria i.e. *Staphylococcus aureus* (ATCC 25923) and *Escherichia coli* (ATCC 25922), respectively. The zone of inhibition increased with the increase in the concentration of silver nanoparticles. Further, efficient antibacterial activity of the synthesized silver nanoparticles proves the application potential of green synthesis in the area of nano-medicine. Therefore, green synthesis of AgNPs with fruits *Melia azedarach* L. extract, is beneficial from its biological and medical applications.

Keywords: *Melia azedarach* L., AgNPs, SPR, TEM, Medical applications

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Phytochemical Analysis of Ethanolic Extract of Leaves of *Rheum ribes* L.

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Medicinal plants have the presence of bioactive chemicals or phytochemical constituents that occur naturally in plants and are widely used for various pharmacological purposes. The aim of this study was to evaluate the phytochemical evaluation of ethanolic extract of leaves of *Rheum ribes* L. belonging to the family Polygonaceae. The leaves of *Rheum ribes* L. were collected from Ramsar, Iran and ethanolic extract prepared by microwave assisted extraction (MAE) method. Then total flavonoids and total phenol content of ethanolic extracts were determined by the Aluminum Chloride Colorimetric and Folin-Ciocalteu method respectively. Also, in vitro antioxidant activity of ethanolic extracts was assayed by DPPH 0 free radical scavenging assay. in vitro qualitative analysis, were tested in ethanolic extracts according with standard protocols. Our data showed total phenolic content of ethanolic extracts of *Rheum ribes* L. leaves was 65 ± 0.2 mg GAE/g dry plant material. Also, total flavonoid content of ethanolic extracts of leaves of *Rheum ribes* L. was 42 ± 0.3 QE/g dry plant material. The value IC₅₀ of ethanolic extract of leaves of *Rheum ribes* L. determined 8.89 mg/ml. The results of the phytochemical screening of ethanolic extract of leaves of *Rheum ribes* L. (Alkaloids, Terpenoids, Flavonoids, Di-Terpenes, Tannins, Cardiac glycosides and Phenols) presented. The results obtained shows that the ethanolic extracts of *Rheum ribes* L. contain medicinally important bioactive constituents. This justifies its use in the traditional medicine for the treatment of different diseases. Regard to phytochemical and antioxidant results, *Rheum ribes* L. from Ramsar can be considered as a new natural drug in future, while more studies needed.

Keyword: Microwave Assisted Extraction (MAE), *Rheum ribes* L., DPPH 0



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Investigation of Medicinal Microalga *Dunaliella salina* Teodoresco Using Morphological, Ecological and Physiological Characteristics

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Dunaliella salina Teodoresco (Chlorophyceae) is the most salt-tolerant eukaryote ever known that is currently cultivated commercially for the production of natural β -carotene in some countries due to its pharmaceutical, food and cosmetic properties, mainly because *D. salina* has the highest cell content of β -carotene, with concentrations of up to 14% of dry weight (Borowitzka & Siva 2007). Stated as such, the species delimitation and determination of the correct scientific name of the alga is a critically important step. Identification of this taxon is very complicated especially due to phenotypic plasticity. Owing to the absence of cell wall, phenotypic traits of the alga change under different conditions depending largely on the age of the cells and growth conditions. A good example for this is that they alter their shape in high salinity concentrations. In this study several strains of the species from different habitats (aquatic and terrestrial ecosystems, intentionally saline areas with high light intensity) were isolated and identified using classical taxonomy, physiological characteristics and ecological parameters. All quantitative and qualitative characters were examined under a certain range of physiological factors, including salinity, temperature, light intensity and pH. Ecological survey was carried out using climatic conditions and water/soil factors. All these clearly indicate that for the precise identification of this valuable taxon, the use of multiple traits is really essential.

Keywords: Taxonomy; β -carotene; *Dunaliella salina*; Iran

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Optimization of Cell Suspension Culture of the Medicinally Important Plant *Plumeria Rubra*

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Plumeria rubra is a member of the apocynaceae family that commonly known as 'Frangipani'. This plant is an ornamental tree species bearing fragrant flowers, which is abundantly found in India and tropical and sub-tropical regions. *P. rubra* also known as a medicinal plant due to its pharmacological properties such as antimutagenic, antiinflammatory, Cytotoxic, anticancer, and anti-HIV. Phytochemical investigation of *P. rubra* have showed the occurrence of different bioactive compounds like bitter glycosides, plumieride, plumericin, limonene, and phytol [1]. Through plant biotechnology, it is possible to sustainably produce bioactive compounds using cell suspension culture systems. Plant tissue and cell suspension cultures provide a promising bio-production platform for desired natural products. The aims of this study were to establish a protocol for establish a cell suspension culture system from *P. rubra*. The 60-day-old leaf-derived friable calli were used to establish the cell suspension cultures. The basal culture medium consisted of liquid MS (Murashige and Skoog 1962) and 3% (w/v) sucrose. Different concentrations (0.0, 0.25, 0.5 mg/L) of kinetin (KIN) or 6-benzylaminopurine (BAP) with combination with different concentrations (0.0, 1, 2 mg/L) of 2, 4-dichlorophenoxyacetic acid (2, 4-D) were used for cell suspension culture optimization and the flasks were supplied with fresh medium after every 4 weeks. Cell growth parameters such as fresh cell weight (FCW), dry cell weight (DCW), settled cell volume (SCV), packed cell volume (PCV), cell number and doubling time (dt) were measured. Based on statistical analysis, cell suspension cultures on MS medium supplemented with 2 mg/L 2, 4-D plus 0.5 mg/L KIN grew appropriately and gave the maximum cell growth parameters. The maximum cell density (5.2×10^8 cells per mL), PCV (2.8%), SCV (3%), and FW and DW of cells (75 g/L and 25 g/L, respectively) were recorded, which were significantly higher than those of hormone-free MS medium. The minimum amount of dt (16 days) was also obtained at combination of 2 mg/L 2, 4-D plus 0.5 mg/L KIN. The present study, for the first time, established cell suspension culture of *P. rubra*, which can be used for the enhancement of its valuable secondary metabolites production in future studies.

Keywords: *Plumeria rubra*, Cell suspension culture, MS medium

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The Effect of Magnetic Water on Yield of Essential Oil of Savory (*Satureja hortensis* L.)

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Satureja hortensis is an annual, herbaceous and aromatic herb from Lamiaceae family in addition to use as spice and food, it's an important medicinal plant due to having compounds such as carvacrol, thymol, limonene and p-Cymene. Magnetic water use is very important in organic production of many agricultural products. Water passed through a magnetic field, is called the magnetized water. The use of magnetized water, causing physical and chemical changes that may lead to increase water uptake and plant yield and quality. This research is conducted to evaluate the effect of magnetic water on morphological, chlorophyll, carotenoids, and flavonoid content of *Satureja hortensis*. The experiment carried out using Magnetic treatment (0, 0.1, 0.2 tesla) and four replications in Faculty of Agriculture, university of Tabriz. The results of analysis of variance showed that magnetic water has a significant effect on the percentage of essential oil compared to the control. Application of magnetic treatment increased carvacrol, pinene, terpinene amount in savoury essential oil.

Keywords: Magnetic water, Electrolyte leakage, p-Cymene, Limonene, Carvacrol

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Gas Chromatography-Mass Spectrometry Analysis of Pomegranate Stem Bark

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The objective of the experiment was to analyse the chemical components in stem bark of pomegranate. The extract was prepared by soxhlet apparatus using methanol as solvent during 8 hours. A Varian GCMS-QP2010 Ultra system was applied to detect the volatile chemical components of the extract sample. The sample after dilution was introduced into the ion trap Mass Spectrometer. Identification of the chemical compounds was taken place by retention time and using of database of National Institute of Standards and Technology (NIST08). GC-MS chromatogram revealed the presence of forty-nine peaks indicating the presence of 50 chemical constituents one of them related to the GC MS stationary phase. Some of these components might be biologically active and valuable in aspect of antiglycation ability or other beneficial activities. The most abundant volatile phytochemical constituents were pyrrolidine alkaloids 7.25% [(1,2-dimethylpyrrolidine and 1-ethyl-2-pyrrolidinyl) methanol] pyrrolidinemethanamine, 1-ethyl-), pseudopelletierin (2.92%) , dodecanamine (13.9%), decanoate group, (18.99%), hexadecanoic acid (2.01%), butyloctadecanoate (0.94%), undecane (0.9%), oxacycloheptadec-8-en-2-one (1.25%), heptadecanoic acid (1.61%), cyclotetradecanone oxime 2.16%, hydrocarbons (pentacosane, docosane, heneicosane, pentacosane, docosane, docosanoic acid, hexacosane, docosanoic acid) 22.14%, 2,3-diphenylcyclopropyl methyl phenyl sulfoxide (15.73%), triacontane (4.46%), benzenemethanamine (1.74%), phthalic acid (1,2-benzenedicarboxylic acid) 3.99%. Similarly, several compounds of pomegranate were formerly identified through GC-MS such as undecane, n-hexadecanoic acid, octadecadienoic acid, decanoic acid, tetra decanoic acid or n-hexadecanoic [1]. There are two major alkaloids in root and stem bark including piperidine and pyrrolidines. In the present experiment both of the alkaloids were detected in the sample.

Keywords: Pomegranate, Stem bark, GC-MS, Piperidine, Pyrrolidines

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Effect of *Piriformospora indica* and *Pseudomonas fluorescens* Symbiosis on Growth Parameters, Essential Oil and Total Phenol Content of *Salvia officinalis* under Drought Stress Condition

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Common sage, or garden sage (*Salvia officinalis* L., Lamiaceae) is an important medicinal and aromatic plant that has been used in folk medicine for centuries. Mycorrhizal like fungi and plant growth promoting rhizobacteria provide the greater absorbing surface for the transfer of water and nutrients to plant roots and therefore improve the plant growth under drought stress condition. In order to study the effects of mycorrhizal like fungus (*Piriformospora indica*) and plant growth promoting rhizobacteria (*Pseudomonas fluorescens*) symbiosis on sage under different irrigation regimes (100%, 70% and 40% FC), a pot experiment was conducted using a factorial based on completely randomized design with three replications. The results showed as the soil water content decreased, plant height, number of leaves and dry herb yield decreased but total phenol and essential oil content increased. Inoculation with fungi and bacteria had significant effects on growth parameters. Plants inoculated with fungi and bacteria had higher plant height, number of leaves and dry herb yield under drought stress and non-stress conditions. The highest amount of essential oil content (1.6 ml/100 g dw) and total phenol (2.67 mg/g dw) were observed in plants inoculated with *P. indica* in moderate drought stress (70% FC). Overall, the findings of this study showed that *Piriformospora indica* and *Pseudomonas fluorescens* symbiosis can be used to alleviating the drought stress effects on sage [1].

Keywords: *Salvia officinalis*, Yield, Essential oil, Water deficit stress

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Effect of Different Nitrate to Ammonium Ratios and Humic Substances Concentrations on Antioxidant Activity, Essential Oil and Chlorophyll Content of Basil (*Ocimum basilicum*)

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Basil (*Ocimum basilicum*) is an annual and aromatic plant, belongs to the Lamiaceae family. To study the effects of two NO₃:NH₄⁺ ratios (80:20 and 20:80) and four concentrations of humic substances (0, 15, 30 and 45 mg/l) on essential oil content and yield, antioxidant activity (using FRAP method) and chlorophyll index (SPAD) in hydroponically grown basil, a pot experiment was conducted using a factorial based on completely randomized design with three replications. The results showed that different NO₃:NH₄⁺ ratios had significant effects on essential oil content and yield, antioxidant activity and chlorophyll index. The 80:20 NO₃:NH₄⁺ ratio had higher essential oil content and antioxidant activity and lower essential oil yield and chlorophyll index than the 20:80 NO₃:NH₄⁺ ratios. The effects of humic substances concentrations were significant on essential oil yield and antioxidant activity. As the humic substances concentration increased essential oil yield and antioxidant activity increased. Overall the findings of this study showed that basil plants grown in higher ratio of ammonium had higher essential oil yield and chlorophyll index [1, 2].

Keywords: *Ocimum basilicum*, Essential oil, Nitrogen, Hydroponic, FRAP

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Ethnobotanical Investigation on Traditional Medicinal Plants Sold in Apothecary Shops of Karaj, Iran

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Apothecary shops (Attari shops) are operating all over Karaj (Alborz Province, Iran). Citizens of Karaj, like many of their compatriots, are interested in herbal medicines. The importance of medicinal plants is rooted in historical and intergenerational experiences which proved their effectiveness in the treatment of various physical and psychological ailments and maladies. Due to the importance of apothecaries and their traditional healthcare services, the authors executed a research plan in several phases on the apothecaries of Karaj. Present work, the first phase of the study, covered the traditional apothecaries and evaluated their knowledge about medicinal plants and the precision of their prescriptions. The preliminary assessment indicated that as many medicinal plants have various vernacular names on one hand, and many vernacular names were attributed to different medicinal plants on the other, therefore many apothecaries were prone to failure by making inevitable mistakes. Moreover, plant-derived medicinal materials were sold as powders, fragments, aquatic extracts and other modified forms, which add complications to the proper identification of the original materials for the apothecaries as well as their end-users. This study aimed to identify the widely used medicinal herbs in Karaj by taking samples from apothecary shops. The samples were identified by different Flora and medicinal references, and the correctness of their alleged vernacular names were examined. As a result, a complete list of medicinal plants sold in apothecary shops of Karaj were prepared and their scientific and vernacular names were mentioned, of which some examples were as follows: *Lavandula angustifolia* (Ostokhodous), *Thymus* spp. (*Avishan*), *Malva sylvestris* (Panirak), *Nigellasativa* (Siah-daneh), *Zingiber officinale* (Zanjabil), *Teucrium polium* (Kalpureh), *Foeniculum vulgare* (Raziane), *Bunium persicum* (Zireh Siah), *Cuminum cyminum* (ZirehSabz), *Plantagoovata* (Esfarzeh), *Cydonia oblonga* (Behdaneh), *Alyssum* spp. (*Ghoddumeh*), *Tribolusterrestris* (Kharkhasak) and *Adiantumcapillus-veneris* (Paresiavoshan). In addition, common mistakes were found and categorized, for example *Melissa officinalis* (Badranjbuyeh) is often mistaken with *Hymenocrater* spp. Moreover, specimens of *Tripleurospermum disciforme* were often sold instead of *Matricaria chamomilla* (*Babouneh*). Finally, as apothecary shops deal with medicinal plants, it is necessary to supervise the preparation and usage of medicinal plants in order to the prevention of costly mistakes and elevation of society healthcare.

Keywords: Medicinal Plants, Ethnobotany, Disease, Karaj

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Phytotoxic Effects of a Medicinal Plant (*Achillea millefolium*) on Different Weeds- A Bioherbicidal Approach

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Environmental pollution due to the excessive use of pesticides in agricultural ecosystems, have attracted the attention of many researchers to introduce the eco-friendly and safe methods for management of agricultural pests [1, 2]. This study was conducted to evaluate the allelopathic effects of Yarrow (*Achillea millefolium*) on germination and seedling growth of three different weed species including wild mustard (*Sinapis arvensis* L.), common lambsquarters (*Chenopodium album* L.) and wild barley (*Hordeum spontaneum* Koch) in laboratory and greenhouse conditions using water extracts of yarrow dried leaf powder. Experiment was performed in controlled condition according to the completely randomized design (CRD) and 4 replications in 2018. Treatments were 0, 0.2, 0.4, 0.6, 1, 2 and 4% water extract of yarrow. Results showed that germination, root and shoot dry weight of all weed species were significantly reduced by using yarrow water extracts ($p < 0.05$). Wild mustard was the most sensitive weed species to yarrow extract compared to other weeds. Germination of wild mustard, common lambsquarters and wild barley was 40, 52 and 67% respectively when expose to 2% of yarrow water extract. The root biomass was more susceptible than shoot biomass in response to different concentrations of the yarrow extract. Sousa et al reported that the highest concentration of yarrow aqueous extracts (30 mg/mL) reduced the seed germination and the root development of lettuce (*Lactuca sativa*). According to these results it could be concluded that yarrow extract had significant phytotoxic effect and inhibition of seed germination and seedling growth of these weeds and could be considered as a bioherbicide.

Keywords: Allelopathy, Phytotoxicity, Seed germination, Yarrow extract

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Effect Sowing Data and Rate of Nitrogen on the Yield Performance and Quality Characteristics of Dragonhead

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In order to determine the effects of planting date and nitrogen on some quantitative and qualitative traits of dragonhead a field experiment was conducted based on a randomized complete block design with three replications in Khoy Firuraq. The treatments were consisted of planting dates (late May, mid-June and late June) and nitrogen fertilizer (without nitrogen (control), 150, 225 and 300 kg N ha⁻¹). In this study, were measured Plant height, distance between the first flower and ground, the number of lateral branches, number of flowering branches, total dry weight, percentage of essential oil, essential oil yield and seed yield of dragonhead. The most of morphological traits and percentage of essential oil and essential oil yield were affected by sowing date. Effect of nitrogen were significant on stem diameter, plant height, height of first flowering branch, number of primary branches, number of secondary branches, number of lateral branches, number of flowering branches, dry weight, grain yield, essential oil percentage and essential oil yield. The results showed that planting date of late May with the application of 150 kg N per hectare improved morphological traits and essential oil yield. Application of 225 kg and 150 kg nitrogen per hectare produced the highest amount of essential oil yield respectively. In the total, planting date of mid-June and application of 150 kg N per hectare is recommended as a superior treatment to achieve maximum qualitative and qualitative yield of dragonhead.

Keywords: *Dracocephalum moldavica* L., Essential oil, Medicinal plants, Nitrogen

Macro and Micromorphological Study of Cypselas in Three Species of *Cirsium* (Asteraceae) in Iran

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Cirsium Mill. (Asteraceae) with about 250 species in the world mainly grows in Northern hemisphere [1]. This spiny genus is described in Flora Iranica with 28 species in 5 sections. Some species of this genus had medicinal properties. For instance, *C. congestum* showed antioxidant activity. Moreover, due to having high level of iron, this plant can be used as iron supply. *C. echinus* had antibacterial activity. In this study, Cypselas of three *Cirsium* species, *C. congestum* Fisch. and C.A.Mey. ex DC., *C. echinus* (M.Bieb.) Hand.-Mazz. and *C. ciliatum* (Murray) Moench were studied macro and micromorphologically. Eleven populations of these taxa were gathered from different geographical distribution in Iran and mature cypselas were selected. Stereomicroscope, Scanning Electron Microscope (SEM) and dino-Lite Digital Microscope were used to evaluate diagnostic features between species studied. Our results showed that quantitative characters as length of cypselas, thickness of carpopodium, length of stylopodium and carpopodium to cypselas width ratio, and quantitative ones as cypselas colour, cypselas sculpture and type of beak of cypselas can delimit species studied.

Keywords: Asteraceae; *Cirsium*; Cypselas, Macromorphology, Micromorphology

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Cancer Diagnosis with the Tools of Plant Lectins

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Lectins are carbohydrate-binding proteins that extracted from legumes. According to the carbohydrate-binding ability of these proteins, there are being used in different fields like cancer diagnosis, cancer therapy and also protein enrichment and purification. Concanavalin A (ConA) is one the most used lectin that was purified from the jack-bean, *Canavalia ensiformis*. Several glycan traps on chromatography stationary phase and nanoparticles have been used for purification of Con A. In other hand, Con A has a reversibly affinity through mainly internal and non-reducing terminal α -D-mannosyl and α -D-glucosyl groups of glycoproteins [1]. Since all FDA-approved cancer biomarkers are glycosylated proteins, so in the most cases, aberrant glycosylation patterns can be used as a sign of the disease, as biomarkers. Lectins are widely used as a ligand to enrich and capture glycoproteins to investigate the profile of glycoproteins in cancer and diseases [2]. In this work, we modified home-made non-porous silica nanoparticles with Con A. We utilized the synthesized sorbents for glycoproteins enrichment of three different breast cancer cell lines. We obtained different profiles of mannosylated glycoproteins for normal (MCF10A) and cancerous cells (MDA-MB-231, MDA-MB-468) proteins.

Keywords: Concanavalin A, Glycoproteins enrichment, Triple Negative Breast Cancer.

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Effect of Drought Stress on Yield and Some Physiological Characteristics of Indigo *Indigofera tinctoria* L.

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Indigo (*Indigofera tinctoria* L.) is one of the resistant plants to drought which is planting in warm and dry areas of the country such as south of Kerman for extracting natural dyes. This study was carried out to evaluation of drought stress effects on yield and some physiological characteristics of Indigo in Jiroft area. The experiment was planned in a randomized complete block design with four treatments: 1. irrigation at field capacity (FC) as a control, 2. Irrigation at the 75% FC (mild stress), 3. Irrigation at the 50% FC (moderate stress) and 4. Irrigation at the 25% FC (severe drought) with four replications in Jiroft Agricultural Research Center. In different growth stages, yield (total leaf dry weight), stem dry weight, proline content in leaf and root, total soluble carbohydrates in leaves were measured. The results revealed that the effect of different levels of drought stress on dry weight of leaves and stems, leaf and root proline and total soluble carbohydrates in leaves was significant. Mild drought stress has not significant effect on leaf dry weight (yield), but the yield decreased with increasing severity of drought stress. The highest yield, was observed in control and mild drought stress by 3548 and 3420 kg/ha, respectively. Drought stress causes the accumulation of compatible osmolytes in indigo plants such as proline and soluble carbohydrates. Stress intensity increases the soluble carbohydrates content in the leaves, but the difference was not significant between moderate and severe stress. With increasing drought stress, the leaf and root proline accumulation increased, and the highest proline accumulation was observed in the severe drought stress.

Keywords: Drought stress, Indigo plant, Proline, Total sugar, Yield

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Effect of Planting Space and Cutting Height on Henna *Lawsoniainermis L.* Leaf Production in South of Kerman

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Henna (*Lawsoniainermis L.*) is a perennial plant from the Lythraceae family, which is mainly cultivated in the southern regions of Iran. This experiment was planned in Split plot based on randomized complete block design with three replications in south Roodbar area of Kerman province. The main factor was planting space at three levels (30 * 20, 50 * 15 and 70 * 10 cm) and the sub plot was cutting height in four levels (10, 25, 40 and 55 cm above ground level). The measured traits included leaf dry weight, stem dry weight, leaf to stem ratio, economic yield (total leaf dry weight in three harvesting). The results of data analysis showed that the effect of planting space and cutting height on leaf and stem dry weight, leaf to stem ratio and economic yield were significant, but the interaction of planting space and cutting height was not significant. A comparison of the mean of studied traits showed that with increasing planting space, leaf dry weight and economic yield significantly decreased and the highest economic yield achieved from the planting space of 30 * 20 by 11670 kg ha⁻¹. With increasing cutting height, dry leaves and economic yield decreased significantly and the highest amount of dry leaves and economic yield obtained from cutting height of 10 cm. The highest leaf to stem ratio obtained from planting space of 30 * 20 and 50 * 15 in the second and third harvesting.

Keywords: Cutting height, Henna, Planting space, Yield

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Comparison of Mefenamic Acid with Mixed *Zingiber officinal e-Matricaria Chamomile* for Reliving of Dysmenorrhea

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Dysmenorrhea is one of the most common pelvic pain in young women, and is one of the main factors disrupting the quality of life and social activities of young women (1, 2). This study aims to investigate the combined effect of ginger-chamomile herbs coupled with honey in mitigating the pain, associated symptoms, and extent of bleeding. This randomized clinical trial study was performed on 200 girl students suffering from primary dysmenorrhea at universities in Arak city. The inclusion criteria were single students with no known psychological disease, and having primary dysmenorrhea. Once included in the study, the samples signed written informed consent form, and were then assigned into two groups of Ginger-chamomile mixed sachet plus honey (containing 1000 mg of the ginger root powder and 5000 mg chamomile, one teaspoonful honey) and mefenamic acid capsule (250 mg) three times a day. Evaluation of pain, bleeding, and associated symptoms was performed in two consecutive cycles by filling in a questionnaire. Data analysis was performed by SPSS 21 using Mann-Whitney- Wilcoxon, and Chi² tests. The results indicated that the pain intensity in the combined ginger-chamomile plus honey group diminished significantly one and two months after the intervention, compared to the mefenamic acid group (0.014). The mean bleeding, however, did not differ significantly one and two months after the intervention between the two groups. Nevertheless, the mean value of dysmenorrhea accompanying symptoms decreased significantly in the ginger-chamomile plus honey group. The present study indicated that consuming the mixed ginger-chamomile sachet plus honey can be as effective as nonsteroidal anti-inflammatory drugs to mitigate pain and bleeding. They can also be a low-risk and effective alternative for treatment of dysmenorrhea.

Keywords: Complementary Medicine, Dysmenorrhea, Youth, Pain

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Variability of Rosmarinic Acid Content among *Zataria multiflora* Populations from Iran

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Using wild plants collected from natural habitat to accelerate plant-breeding program have been used to enhance plant secondary metabolite quantity and quality. Elite plant can be addressed to pharmaceutical and other related industries. In this study, aerial parts of *Zataria multiflora* were collected from seven province from Iran (thirty-one natural populations). Rosmarinic acid (RA) content among 93 individuals was evaluated. The characterization by HPLC analyses revealed that content of RA of the MeOH extracts of *Z. multiflora* populations show a high level of variability. The highest amount of RA (8.00 ± 0.2 mg g⁻¹ DW) was observed in *Jiroft*, followed by *Gachooyeh* (7.3 ± 0.3 mg g⁻¹ DW) and *Darbast* (6.7 ± 0.8 mg g⁻¹ DW). In addition, *Iranshar* had the lowest amount of RA (1.4 ± 0.1 mg g⁻¹ DW). RA content of 29 species of Lamiaceae family had a range of 0.0-58.5 mg g⁻¹ DW [1-3]. In this study, RA content of *Z. multiflora* (1.4 - 8.0 mg g⁻¹ DW) was almost similar to *Rosmarinus officinalis* (7.2 ± 0.1 mg g⁻¹ DW), *Salvia limbata* (7.5 ± 0.1 mg g⁻¹ DW), *Salvia hypoleuka* (4.3 ± 0.03 mg g⁻¹ DW), *Salvia macrosiphon* (6.4 ± 0.1 mg g⁻¹ DW), *Satureja bachtiarica* (5.7 ± 0.1 mg g⁻¹ DW) and *Satureja macrantha* (4.2 ± 0.1 mg g⁻¹ DW). In addition, the plant RA content was less than *Menthae spicata* (58.5 ± 1.4 mg g⁻¹ DW), *Salvia officinalis* (39.3 ± 0.9 mg g⁻¹ DW) and *Mellisa officinalis* (36.5 ± 0.8 mg g⁻¹ DW) [1]. Furthermore, it seems the content of RA in *Z. multiflora* has a considerable range, and the best populations with the highest content of RA can be entered to future breeding program.

Keywords: Lamiaceae, HPLC, Methanolic extract, Natural populations

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Antibacterial Effect of *Zataria multiflora* extract on different Gram-Positive and Gram-Negative Bacteria

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Bio-compounds are the well-known and very effective source of antimicrobials substances in treating bacterial infections. Plant-derived extracts have a rich variety compound, which can control bacterial growth better than synthetic drug. Extraction from dried aerial parts of 31 wild-grown population of *Zataria multiflora* from different region of Iran, were carried out. The bacterial strains used in this study included five Gram-positive, namely *Staphylococcus aureus*, *Enterococcus faecalis*, *Bacillus licheniformis*, *Bacillus subtilis* and *Bacillus cereus*, and five Gram-negative: *Escherichia coli*, *Salmonella enteritidis*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae* and *Serratia marcescens*. Standard bacterial strains were cultured in Tryptic Soy Agar under aerobic conditions (for 18 hours at 37 °C). Chloramphenicol was used as positive control. The minimum inhibitory concentration (MIC) of the extracts ranged from 0.03 mg/ml to 4.0 mg/ml, while the minimum bactericidal concentration (MBC) was between 0.25 mg/ml to 32.0 mg/ml. According to the results, the extract of *Z. multiflora* had great antibacterial activity, especially against *Klebsiella pneumoniae* (MIC = 0.03 mg/ml; MBC = 0.25 mg/ml) followed by *Bacillus licheniformis* (MIC = 0.06 mg/ml; MBC = 0.5 mg/ml) as opposed to chloramphenicol. In previous reports, *Z. multiflora* extract had a great ability to control Gram-negative bacteria [1-2]. Antibacterial activity of extracts has been linked to various secondary metabolites including phenolics, flavonoids and rosmarinic acid [3-4].

Keywords: *Klebsiella pneumoniae*, *Bacillus licheniformis*, Avishan-e-shirazi, Plant

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Protection against Neurotoxins in Neuronal Cells by Methanolic Extracts of Iranian Olives

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Inducing oxidative stress and neuro-inflammation are common features of extrinsic and intrinsic neurotoxins, which lead to subsequent neurons death. Given that the incidence of neurodegenerative diseases is being increased, using the procedures for protecting neuronal system from neurotoxic agents is considerable. Rotenone is as a pesticide which has been used world-wide. *In vitro* or *in vivo* exposure of neuronal cells with rotenone makes similar symptoms exhibiting the pathologies of Parkinson's disease (PD). The mechanism of the neurotoxicity of rotenone mostly related to its effect on respiratory complexes in mitochondria and production of dangerous level of oxidant compounds. In this study we examined the effect of the methanolic extracts derived from the pulp of fruits of three Iranian olive cultivars including Zard (Mex-Z), Roghani (Mex-R) and Majnoon (Mex-M) on the toxicity of rotenone. Firstly, SHSY5Y neuroblastoma cells were shifting to PD model by overexpression of alpha-synuclein (α SN). α SN, is one of the most abundant presynaptic protein of the brain, that its gene mutation which may lead to two or three fold expression causes early onset PD. Treatment of SHSY5Y with rotenone (1 μ M) caused decreased cell viability and increased intracellular ROS after 24 hours treatment. Adding different concentrations of the extracts (200- 1000 μ g/ml) alone did not affect on the viability of SHSY5Y cells; however, co-treatment with rotenone mostly attenuated rotenone's toxicity. Measuring ROS level also demonstrates that co-treatment with all studied extracts did not allow ROS species to be increased. ROS scavenging activity using DPPH was determined that Mex-M was more antioxidant activity than Mex-Z and Mex-R. It is interesting that the protective effect of Mex-Z and Mex-R against rotenone was more than Mex-M. It seems that other mechanisms may involve in neuroprotective effect of the olive extracts against rotenone rather than their antioxidant activity which needs more investigation.

Keywords: Antioxidant activity, Iranian Olive cultivars, Parkinson's disease, Rotenone

The Effect of Betaine Administration on Rat Sperm Quality Following Cadmium Toxicity

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The aim of this study was to survey the protective effects of betaine against cadmium and on sperm quality including progressive motility, sperm membrane integrity, concentration as well as testicular weight. Thirty adult male rats were allocated into the following three groups (n=10 in each group): control-saline, cadmium-saline and cadmium-betaine. Induction of testicular injury was achieved by a single injection of cadmium chloride intraperitoneally, and betaine was given orally 1 day before Cd injection and continued for 10 consecutive days. Five rats from each group were sacrificed on days 5 and 10 after Cd toxicity and sperm was taken from the epididymal tail for the evaluation. Testicular weight significantly decreased by cadmium toxicity. Likewise, the percentages of sperm progressive motility, membrane integrity and concentration significantly decreased in cadmium group compared to the control rats, whereas, betaine treatment could enhance membrane integrity on day 10. Although, progressive motility increased following betaine therapy by day 10, however the difference was not statistically significant. Betaine may prevent cadmium-induced oxidative stress probably due to its antioxidant properties. This resulted in increase of sperm membrane integrity in addition to partial recovery of sperm progressive movement.

Keywords: Bataine, Cadmium, Sperm, Rat

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Correlation Analysis Grain Yield and Essential Oil at Fennel *Foeniculum vulgare* Mill. under Water Deficit

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In order to evaluate the response of different populations of *Foeniculum vulgare* Mill. in terms of grain yield and essential oil content in two conditions of normal and limited irrigation, a split plot experiment in time and place was conducted based on randomized complete block design with three replications under normal and limited irrigation conditions at Faculty of Agriculture Research Station University of Tabriz. In this research, 19 fennel populations including 15 indigenous populations of Iran and 4 foreign populations in two different irrigation conditions. In compound analysis of variance, there was a difference between populations and irrigation conditions in terms of the most traits. There also was significant difference between normal and limited irrigation conditions in terms of most traits. Birjand, Garineh and Varamin populations under normal irrigation condition, and Birjand, Ziar, and Garineh populations in limited irrigation condition, were the superior populations than others. In normal and limited irrigation conditions, grain yield with number of umbrellas, number of seeds per umbrella, biomass and essential oil yield had a positive and significant correlation. the populations of Birjand, Turkey (Izmir) and Karaj in terms of essential oil Content, the populations of Khorouslari, Garineh and Turkey (Izmir) in terms of essential oil yield and the populations of Shirvan, Bonab and Khorshid Abad in terms of 1000 grain yield were the most stable and highest populations. At total, the populations of Turkey (Izmir), Birjand and Garineh were the most superior and stable populations for most of the traits.

Keywords: Essential oil, *Foeniculum vulgare* Mill. Fennel, Water deficit stress, Fennel

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Comparison of Essential Oil Compositions of Style and Stigma of Saffron Plant by Two Methods of Hydrodistillation and Ultrasonic as a Pretreatment of Hydrodistillation

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Crocussativus L. (Saffron) belongs to Iridaceae family which is commonly cultivated in Asia, Europe and America. The Saffron, known as Red Gold, is one of the most important herbs in the economy and pharmaceutical industry and has many effective compound. saffron traditionally used as a coloring or flavoring agent, but recent research has shown its potential to promote health.¹ Therefore, considering the many uses of this plant, especially in the treatment of depression, due to its antioxidant and anti-cancer properties, it is necessary to select and apply the best method and the minimum time possible to obtain the highest amount of extraction of effective compounds. In this study saffron was cultivated in Ghaenat of South Khorasan province. Extraction of effective compounds in style and saffron stigma was investigated by two methods of hydrodistillation and ultrasonic as pretreatment before hydrodistillation. Essential oil were identified by the GC-MS. A Box-Behnken design and response surface modeling was utilized to determine the optimal extraction conditions². Extraction temperature (30-45-60 °C), extraction time (20-30-40 min) and water to solid (W/S) ratio (100-150-200ml/g) were considered as the variables for the extraction of effective compounds. The optimum conditions of extraction in stigma and style were estimated to be W/S ratio of 200 and 100ml/g, temperature of 60°C and time of 39.7 and 34.1 min. conditions and the important identified compounds under optimized extraction, Saffranal 79.64% and Isophorone 9.39% Ketoisophorone 4.38% Betaphorone- 6.3% Decane, 7.1% Beta-Ionone-1.52% Comphene 6.54%, and Alfa pinene 0.45 and in style Saffranal 12.41% Ketoisophorone 21% Betaphorone 6.1% Beta-ionone 6.15% I-Phellandrene 1.37% Verbanone is 1.52%. The ultrasonic as pretreatment method, before hydrodistillation cause increased the efficacy of the extracted compounds. Thus, the application of this emerging technology for extraction uses and low-cost raw materials is an economical alternative to conventional extraction methods according to industry demands and a sustainable development. Also the results showed that most of the effective compounds present in the stigma and style. The only difference is in the percentage of compounds. Thus, considering the application of effective compounds in various industries and the lower cost of style than stigma, can be used the style of saffron for extracting effective compounds.

keywords: Saffron, Hydrodistillation, Ultrasonic, Essential oil, Box Behnken

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Facile Synthesis of Silver Nanoparticles Using *Carya illinoensis* (pecan) Extract and Their Antioxidant and Antibacterial Activities

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In present work, silver nanoparticles (Ag NPs) were synthesized as a green method through the application of the aqueous leaf extract of *Carya illinoensis* from Iran. The AgNPs prepared were identified by various techniques such as UV–vis spectroscopy, Dynamic Light Scattering (DLS), X-ray diffraction (XRD) and transmission electron microscopy (TEM). UV-Visible spectrophotometer showed absorbance peak in range of 436-446 nm. Transmission electron microscope image illustrated AgNPs with spherical shape and an average size of 12 nm. It was found that only few seconds after adding the extract at room temperature, the conversion of silver ions into silver nanoparticles was completed. Additionally, the in vitro antioxidant and antibacterial activities of the extract has been evaluated. The antioxidant activity was assessed based on 2, 2-diphenyl-1-picryl-hydrazyl (DPPH). On the other hand, the result of antibacterial activities of extract showed that the biosynthesized Ag NPs had an inhibiting activity against gram positive and no result was observed against gram negative microorganisms.

Keywords: Silver nanoparticles, Green synthesis, Antioxidant, Antibacterial

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A New Phytochemical Investigation on Two Iranian Endemic Species of *Salvia* L.

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Genus *Salvia* with over 58 species in Iran, 17 of which are endemic, is one of the largest members of the Labiatae family [1]. *Salvia aristata* Aucher ex Benth. and *S.chorassanica* Bunge are two of the Iranian endemic species of *Salvia* that only grow in Iran [1]. However, recently *S.aristata* has been found in the area of Turkey [2]. Tanshinones are abietane-type norditerpenoidquinone compounds that until now, the roots of *S.miltiorrhiza* and *Perovskia abrotanoides* Kar. have been introduced as the main sources of these valuable medicinal compounds. This study was performed to identify and to determine of tanshinone I, tanshinone IIA and cryptotanshinone in the root extracts of *S.aristata* and *S.chorassanica* by HPLC and LC-MS methods for the first time. Based on our results, the roots of both studied *Salvia* species were rich sources of tanshinones. The highest content of tanshinone I (36 ± 2.24 mg/g DW) and tanshinone IIA (2.02 ± 0.16 mg/g DW) was detected in the roots of *S.aristata* and *S.chorassanica*, respectively. Also the presence of cryptotanshinone was confirmed in the root extracts of both species by LC-MS. As a general result, some Iranian *Salvia* species could be introduced as new potent sources of tanshinone derivatives in order to medicinal, food and industrial purposes.

Keywords: *Salvia aristata*; *Salvia chorassanica*; Tanshinone I, Tanshinone IIA

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Evaluation of the Beneficial Effect of Chamomile Alcoholic Extract Against Mycotoxins in Broiler Chickens

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The aim of this study was to use chamomile alcoholic extract in broiler chicken diet to reduce the harmful effects of Aflatoxin and Ochratoxin on functional traits and biochemical parameters of blood associated with immune system. In this experiment, in order to investigate the effect of chamomile alcoholic extract to reduce the effects of Aflatoxin and Ochratoxin from 384 male Ross-308 broiler chicks in a completely randomized design with factorial arrangement 2×2×8 with 8 treatments, 4 replicates and 12 birds per replicate used. Treatments included: 1 base diet (control), 2: base diet+ppb 500 Aflatoxin, 3: base diet+ppb 250, Ochratoxin, 4: base diet+0.3 percent chamomile extract, 5: base diet + 500 ppb Aflatoxin with ppb 250 Ochratoxin, 6: Base diet + ppb 250 Ochratoxin with 0.3% chamomile extract, 7: Base diet+ppb 500 Aflatoxin with 0.3% chamomile extract, 8: Base diet + ppb 500 Aflatoxin with 250 ppb of Ochratoxin with 0.3% Chamomile extract. The results showed that the addition of chamomile alcoholic extract improved the functional traits of broiler chicks receiving Aflatoxin and Ochratoxin toxins. Also, the concentration of immune-related blood parameters in chickens receiving the same alcoholic extract of chamomile and Aflatoxin and Ochratoxin improved compared to birds that received only Aflatoxin and Ochratoxin poisons.

Keywords: Aflatoxin, Ochratoxin, Alcoholic Extract, Chamomile, Broiler Chickens

The Effect of Alcoholic Extract of Fumitory and Antibiotics and Probiotics on Immune Response, Concentration Liver Enzymes and Serum Total Protein on Broilers Chickens

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The aim of this study was to investigate the effect of three feed additives: Alcoholic extract of fumitory herb, Antibiotic and Probiotic herbs on immunity against influenza and Newcastle disease and also the concentration of AST and ALT liver enzymes and serum total protein in chicken. Ross 308 broiled in a completely randomized design with 5 treatments, 5 replicates and each replicate of 12 broiler chicks. Treatments were: 1) control group; 2) 0.2 percent extract of alcoholic extract of Shahtera herb; 3) 0.4 percent extract of alcoholic extract of Shahterter herb; 4) receiving 0.5 grams Viral antibiotic kilogram, 5. Propagasic Bacillus coagulants were 200 mg / kg. The results showed that the immune target against influenza and Newcastle disease in chicks improved feed additives compared to control treatment, and also improved the concentration of liver enzymes and total protein in feed recipient chickens compared to Improved control treatment.

Keywords: Antibiotics, Probiotic, Broiler chickens, Immune Response



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Study on the Antiviral Activity of Ethanolic Extracts of *Mentha Pulegium* on Tobacco Mosaic Virus

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Pennyroyal (*Mentha pulegium* L.) is an important medicinal plant of the family Lamiaceae. It is native species of Europe, North Africa and in Asia Minor and near East. Leaves, flowers and the stems of Pennyroyal are frequently used due to their antiseptic properties. The major components of *Mentha pulegium* essential oil are menthone and pulegone. Viruses that infect plants are responsible for reduction in both yield and quality of crops around the world, and are thus of great economic importance. Tobacco mosaic virus (TMV) one of the most important viruses infecting vegetables and ornamental plants. *Nicotiana tabacum* is particular importance in the historiography of TMV. The antiviral effect of pennyroyal against TMV was studied in *Nicotiana tabacum* model plants. under controlled conditions (16:8 h L:D at 25 ± 1 C and $65 \pm 5\%$ RH). The ethanolic extracts of pennyroyal were prepared. Five concentrations (0%, 1.25%, 2.5%, 5%, and 10%) were used with the control, which was treated with ethanol. This project was designated in a experiments based on completely randomized design with three replication. DAS-ELISA (double antibody sandwich ELISA) was used with a polyclonal antiserum to determine the viral infection in model plants. A 200 μ l aliquot of IgG was added to coat each well of plates. Each step of ELISA was followed by a 4-hr incubation at 37°C or a 12-hr incubation at 4°C. This was followed by three washes with a washing buffer. Ten milliliters of sample buffer, pH 7.4, was added to 1gr tissue samples that had been ground in liquid nitrogen, and 200 μ l of this extracted was added to each well. The reaction was read using a colorimeter at 405 nm after adding conjugate incubation with substrate for about one hour. Results of serological assay showed lower absorbance values for the pennyroyal treated samples as compared with non-treated. Also the ethanolic extract of pennyroyal, at level of 0.10, had an inhibitory effect against TMV infection in tobacco model plants with a maximum controlling effect up to two days post-inoculation. It seems that this activity is due to the direct inactivation of virus in the infected plant contain extract of pennyroyal.

Keyword: *Mentha pulegium*, Tobacco mosaic virus, DAS-ELISA, Antiviral activity

Study of the Effect of *Malva sylvestris* Drug Extract on Changes in T3, T4, and TSH Hormones in rats Receiving Acetate

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Thyroid gland is one of the important glands of the body that regulates the body's energy metabolism. This gland is shaped like a butterfly and is located in front of the trachea. Considering the increasing prevalence of thyroid gland diseases and the lack of proper treatment of this disease, the present study was conducted to investigate the effect of *Malva sylvestris* herbal extract on changes in T3, T4, and TSH hormones in rats receiving acetate. For this study, 30 neonate Wistar rats were used. For induction of disease, rat lead acetate was used for dietary intake of rats and mice in the treatment groups at concentrations of 125, 250 and 500 mg / kg The body weight was obtained from the *Malva sylvestris* herbal extract. According to the results of T3, T4, and TSH hormones tests in the studied mice, it can be concluded that the *Malvasylvestris* drug extract results in the relative return of normal levels of T3, T4, and TSH levels. In the study of the interaction effect of the concentrations of *Malva sylvestris* herb extract, it was found that the concentration of 500 ml / kg had the most effective therapeutic effect and the concentration of 125 ml / kg had the least effect on the condition of hypothyroidism. Based on the results of this study, it can be concluded that the extract of *Malva sylvestris* is an effective therapeutic treatment for thyroid parameters abnormalities.

Keywords: *Malvasylvestris*, Hormone T3, T4, TSH, Extract, Lead Acetate, Rat



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Effect of Berberine on Polycystic Ovary Syndrome- Induced by Letrozole in Adult Female Wistar Rats

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Berberine which is the major active component of *Berberis vulgaris*, has been widely used in traditional medicine. Berberine decreases elevated blood glucose level, and improves insulin sensitivity in diabetic patients. Berberine also has an antioxidant activity against oxidative stress. Recently, it has been reported that berberine possesses some additional effects such as anti-inflammatory, anti-bacterial, and anti-viral. Polycystic ovary syndrome (PCOS) is a prevalent endocrinological disorder in reproductive-age women and is often associated with a metabolic syndrome. In the present study, the effect of berberine on letrozole-induced PCOS was investigated in adult female Wistar rats. The rats were randomly divided into 8 groups: normal control, berberine (25, 50 and 100 mg/kg intragastrically, daily) alone, PCOS control rats (letrozole, 1 mg/kg, intragastrically, daily), berberine (25, 50 and 100 mg/kg intragastrically, daily) together with (letrozole 1 mg/kg, intragastrically, daily), and treatment was performed accordingly. Administration of berberine was started 30 min. before the first dose of letrozole and continued up to 30 days. The animals were euthanized 24 h after the last dose of the treatment. Histopathological changes in ovary were examined by hematoxylin and eosin staining. Histopathological studies further confirmed the protective effects of berberine on letrozole-induced PCOS injury in rats. The results of this study suggest that berberine treatment may be beneficial in letrozole-induced PCOS in rats.

Keywords: Berberine, Letrozole, PCOS, Rat

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Relaxant Effect of *Dracocephalum kotschy* and its Components Apigenin and Luteolin on Isolated Rabbit Trachea

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Dracocephalum kotschy is a native Iranian plant with antispasmodic activities on smooth muscle such as ileum and uterus [1]. However, so far antispasmodic effect of *D. kotschy* on tracheal smooth muscle has not been reported. Therefore, the objective of this research was to investigate antispasmodic activity of *D. kotschy* extract and two of its components luteolin and apigenin on rabbit tracheal contraction *in vitro*. Rabbits were euthanized by carbon dioxide and tracheae was dissected and immersed in a Tyrode's solution. Tracheal rings were prepared and mounted vertically in an organ bath at 37 °C and gassed continuously with O₂. The tracheal ring preparations were contracted with acetylcholine (ACh) and KCl. The isotonic tension was recorded before and after addition of aminophylline, apigenin, luteolin or flavonoids rich extract of *D. kotschy*. Flavonoids rich extract were prepared from *D. kotschy* using solvent-solvent fractionation technique. Standard drug aminophylline, prevent tracheal ring preparation contracted with ACh. Cumulative addition of aminophylline also attenuated tonic contraction induced by KCl on tracheal smooth muscle. *D. kotschy* extract at concentration ranges of 32-512 µg/mL in concentration dependent way inhibited KCl and ACh induced tracheal contraction. Apigenin and luteolin (range, 16–512 µg/mL) relaxed KCl and ACh-induced contraction of tracheal smooth muscle *in vitro* in a concentration-dependent manner. This study demonstrated that *D. kotschy* extract is a relaxant of tracheal smooth muscle. The relaxant effect of *D. kotschy* extract could be due to its flavonoids component such as apigenin and luteolin.

Keywords: *Dracocephalum kotschy*, Apigenin, Luteolin, Trachea, Smooth muscle

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Green Synthesis of Gold Nanoparticles Using Petal Aqueous Extract of *Carpobrotus acinaciformis*

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In the recent years, researchers have focused on developing the methods of green chemistry for synthesis of metal nanoparticles. One of the most important methods to produce nanoparticles is using organisms and plants. The present study is the first report on the green synthesis of gold nanoparticles (GNPs) using petal aqueous extract of *Carpobrotus acinaciformis* L. For synthesis, 2 ml of extract added to 4 ml of HAuCl₄.3H₂O with concentration 1 mM. To synthesize GNPs with smaller size and best morphology, the affecting parameters to synthesis such as pH of reaction, extract concentration and volume, concentration of HAuCl₄.3H₂O and reaction time, were studied and optimized with UV-Vis spectrophotometry [1]. To characterize the GNPs, Transmission Electron Microscopy (TEM) and X-Ray Diffraction (XRD) were used. Fourier Transform Infra-Red (FT-IR) spectroscopy was used to identify possible functional groups involved in the synthesis of GNPs. The aqueous extract of plant acts as a strong factor in the production of gold nanoparticles by reducing the Au³⁺ and converts them to Au⁰ and stabilization of them in one-step process. The UV-Vis spectrophotometric spectrum showed that the GNPs had maximum absorbance at 543 nm (SPR). Also, the best condition for the synthesis of GNPs were at: pH= 4, 1 ml of extract with concentration of 3% and HAuCl₄.3H₂O with concentration of 3.5 mM and these nanoparticles were very stable in 6 days after synthesis. The results showed that, GNPs with spherical, triangular and polygonal shapes with an average size of 18.25 nm has been synthesized.

Keywords: *Carpobrotus acinaciformis*, Green Synthesis, Gold Nanoparticles, Surface plasmon

Reference

[1] Azizian Shermeh, O.; Einali, A.; Ghasemi, A. *Advanced Powder Technology*. **2017**, *28(12)*, 3164-3171.

Optimization and Characterization of Green Synthesis of TiO₂ Nanoparticles Using Leaf Aqueous Extract of *Maclura pomifera*

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Syntheses of nanoparticles (NPs) with plant extracts are widely carried out nowadays and known as green and eco-friendly methods of nanomaterial preparation. Titanium Dioxide nanoparticles (TiO₂ NPs) have become the focus of intensive research owing to their wide range of application in the development of new techniques in areas of medicine, materials sciences due to their long-term thermodynamic stability, strong oxidizing power, and relative non-toxicity, photocatalytic activity for the decomposition of organic contaminants in water and aqueous wastes and anti-fogging effect. This research describes a method for synthesis and characterization of TiO₂ NPs using leaf aqueous extract of *Maclura pomifera*. After extracting, 2 ml of it was added to 4 ml of TiO₂ salt with concentration of 1 mM. To synthesize TiO₂ NPs with smaller size and best morphology, the affecting parameters to synthesis such as: pH of reaction, extract concentration and volume, concentration of TiO₂ salt, temperature and reaction time, were studied and optimized with UV-Vis spectrophotometry [1]. To characterize the TiO₂ NPs, Transmission Electron Microscopy (TEM) was used. Fourier Transform Infra-Red (FT-IR) spectroscopy was used to identify possible functional groups involved in the synthesis of TiO₂ NPs. The successful nanoparticle formation was monitored by UV-Vis spectrophotometer through color conversion due to Surface Plasmon Resonance (SPR) bands at 390 nm. The best condition for the synthesis of TiO₂ NPs were at: pH= 8, 3 ml of extract with concentration of 2% and TiO₂ salt with concentration of 2 mM in 60 °C and these nanoparticles were very stable in 72 h after synthesis. TEM images revealed that TiO₂ NPs are spherical shape with an average diameter of the particle size of 15-35 nm. According to these results, the leaf aqueous extract of *Maclura pomifera* can be a good candidate for the synthesis of TiO₂ NPs with the best morphology and size that can be used for a variety of medical items, especially the anticancer and antimicrobial properties.

Keywords: Green Synthesis, *Maclura pomifera*, Surface Plasmon Resonance, TiO₂

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Optimization and Characterization of Biosynthesis of CuO Nanoparticles Using Leaf Aqueous Extract of *Hibiscus sabdariffa* L.

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Physical and chemical methods for synthesis of nanoparticles (NPs) are not cost efficient due to their need for high energy and requirement of high temperature and reductant and stabilizer materials which are harmful to environment. Present study is a report to biosynthesis of CuO NPs using leaf aqueous extract of *Hibiscus sabdariffa* L. In this research, 2 ml of extract was added to 4 ml of Copper salt (CuCl₂. 2H₂O) with concentration 5 mM. In order to obtain NPs with uniform shape and size, the parameters affecting to synthesis, such as: pH of reaction, volume and concentration of extract, concentration of Copper salt and time of reaction were studied and all of them were optimized by UV-Vis spectrophotometry technique [1]. Transmission Electron Microscopy (TEM) was used for investigated the shape and size of NPs. Fourier Transformation Infra-Red (FT-IR) spectroscopy was used for detection the functional groups involved in the synthesis and stabilization the CuO NPs. Results showed that the extract of *Hibiscus sabdariffa* L. can reduces the Cu²⁺ ions to Cu⁰ atoms with nanometric size and the color of solution changed to green and the TEM image of CuO NPs showed that the average size was 45.11 nm and all of them had spherical shape. Also, the best condition for the synthesis of CuO NPs were at: pH= 8, 9 ml of extract with concentration of 5% and CuCl₂.2H₂O with concentration of 10 mM and these NPs were very stable in 6 days after synthesis.

Keywords: Biosynthesis, CuO Nanoparticles, *Hibiscus sabdariffa* L, Optimization

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[1] Azizian Shermeh, O.; Einali, A.; Ghasemi. A. *Advanced Powder Technology*. **2017**, 28(12), 3164-3171.

Seed Bio-priming to Improve Germination, Seedling Growth, and Essential Oil Yield of *Dracocephalum kotschy* Boiss: an Endangered Medicinal Plant in Iran

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The study was conducted to evaluate the effects of 10 and 20 min seed soaking in *Azotobacter chroococcum* and *Bacillus polymixa* suspension culture on seed germination, seedling growth and essential oil yield of *Dracocephalum kotschy* Boiss. Up to day 13, 20 min of *B. polymixa* suspension culture soaking seeds had shown germination more than 20%, whereas control seeds did not begin germination until day 13. The highest germination rate (1.67) was observed with 20 min of *B. polymixa* suspension culture soaking seeds compared to other treatments. *B. polymixa* improves seedling length and vigour index more than those of *A. chroococcum* suspension culture soaking seeds. The highest fresh (81.06 g) and dry weight (11.76 g), relative leaf chlorophyll content (42.24) and *Fv/Fm* ratio (0.66) of emerging *D. Kotschy* seedlings were recorded with seed bio-priming with *B. polymixa* for 20 min. The main components affected by *B. polymixa* and *A. chroococcum* were limonene, α - pinene, γ - terpinenecaryophyllene oxide, germacrene D and terpinen – 4- ol and the highest percentage of essential oil constituents (97.6%) of *D. Kotschy* seedlings were observed with 20 min of *B. polymixa* suspension culture soaking seeds. The results indicated that seed bio-priming with *B. polymixa* for 20 min was more effective than the other treatments for seed germination, seedling growth and essential oil yield of *D. Kotschy*.

Keywords: *Azotobacter chroococcum*, *Bacillus polymixa*, *Dracocephalum kotschy* Boiss

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Comparative Study of Biochemical Characterization of Different Parts of Bene Fruit *Pistacia atlantica* subsp. *kurdica*

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Persian turpentine or *Pistacia atlantica* subsp. *Kurdica* from Anacardiaceae family is a plant resistant to the adverse environmental and local conditions of Iran which is useful for hair boosting, treatment of digestive diseases and joint pain relief. In this research, biochemical properties of different parts of Persian turpentine fruit were studied. The experiment based on completely randomized design with four replication. Fresh fruit was used and treatment including whole fruit, green peel (exocarp), brown crust (wooden endocarp) and kernel. The most measured factors consist of flavone and flavonol, flavonoid content, amount of phenolic compounds, antioxidant activity and tannin content. The results of analysis variance indicate the significant effect of treatment on most measured traits. The maximum total flavonoid (3.81 mg Quercetin/g) related to green peel while minimum content was observed in kernel. The highest and lowest amount of phenolic compound (16.86 and 5.36 mg Gallic acid/g) are measured in green peel and kernel respectively. Also the highest antioxidant activity (98.62%) related to green peel while the maximum tannin content (7.09 and 6.37 mg Catechin/g) in endocarp and kernel parts was identified. Generally, the green peel have high value as relation to this biochemical factors measured.

Keywords: *Pistacia atlantica* subsp. *Kurdica*, Antioxidant, Phenolic Compound

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Neuroprotective Effects of Cinnamic Acid in 1-methyl-4-phenyl-pyridine-Induced Toxicity in PC-12 cells

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Parkinson's disease (PD) is the second common chronic neurodegenerative disorder, affecting about 6 million people around the world [1]. Cinnamon (*Cinnamomum zeylanicum* Blume), due to its hot and dry nature, is suggested as a therapeutic agent for neurodegenerative diseases in Persian medicine. We aimed to evaluate the effect of cinnamic acid, one of the main ingredients of cinnamon, in 1-methyl-4-phenyl-pyridine (MPP⁺)-induced toxicity in Rat pheochromocytoma (PC-12) cells. Cinnamic acid was purchased from Sigma company. PC12 cells were cultured in Dulbecco's modified Eagle's medium with 10% (v/v) heat-inactivated fetal bovine serum, 100 mg/ml streptomycin, and 100 U/ml penicillin. Cells were treated with 1 mM concentration of MPP⁺ and 200 µg/ml of cinnamic acid. Normal saline was used as negative control. Cell viability was assessed using the methyl thiazol tetrazolium bromide method (MTT assay). The activity of pro-apoptotic markers including caspase-3 and -9 was also measured. Statistical analysis was performed using Graphpad Prism software and p value < 0.05 was considered as statistically significant difference. Results showed significant protective effect of cinnamic acid in the *in vitro* model of PD. Number of apoptotic cells in cinnamic acid-treated cells were significantly lower in comparison to negative control (p < 0.05). Also, cinnamic acid significantly decreased the activity of caspase -3 and -9 with p < 0.05 and p < 0.01, respectively. These data suggest a neuroprotective effect for cinnamic acid in MPP⁺-induced neurotoxicity; thus, the molecule can be considered as a lead compound for the design and development of new neuroprotective agents. Further studies are recommended to clarify the structure-activity relationship, underlying mechanism, and safety of the compound.

Keywords: Parkinson, Neurodegeneration, Phytopharmacology, Persian medicine

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Medicinal Plants Flora of Veshnaveh Village in Ghum Province

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Iran, with an area of 1648000 km², located in south west Asia, has a great variety of topography, geological and climatic conditions, Iran has become one of the most significant area of diversity and speciation. Therefore, there are valuable medicinal plants in Iran that are important to identify. Medicinal plant species are distributed in most of Iran regions. Knowledge of the traditional application of medicinal plants has been considered in Iran since many years ago and research centers, pharmaceutical and chemistry departments have accomplished a great task of researching chemical analyses the present substances in plants. In this survey, flora of medicinal plants of veshnaveh village has been studied with total area of ca. 400 hectares and range of height between 2000-2200 m. It is located in the 60 km of south eastern of Ghum at 34° 14' 58/56" N and 50° 59' 39/84" E and limited to kuh-e Ghaledej in the north and kuh-e Bokhare in the north west. In this study 101 medicinal species belonging to 88 genera and 39 families were recognized. The following families have the highest number of medicinal species: Asteraceae with 14 species, Fabaceae with 8 species, Lamiaceae with 7 species. The distribution of the 101 species is restricted to Irano-Turanian region. The drug species collected from this area are most commonly used in the field of anesthetics, spasmodic, relaxing, antispasmodic, analgesic, antipyretic and anti-inflammatory drugs.

Keywords: Ghum, Iran, Irano-Turanian, Medicinal species

Effect of *Allium sativum* Extract as Green Modifier Precursor on the Synthesis Process Zinc Oxide and Iron Oxide Nanostructures

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Nanostructures have dimension under 100 nm. Metal-oxide nano-materials can be distinguished by their properties such as chemical-reactivity, energy-absorption, and biological-mobility from their bulk. *Allium sativum* (Liliaceae) is an herbal medicine with different pharmacological activities. It has rich source of Zn and Fe. This study design to evaluate garlic extract (GE) effect on preparing ZnO and FeO. *Allium sativum* (100 gr) was powdered by a mixer. Hydroalcoholic extract was prepared (3×48). Suspension was filtered using a whatman filter paper no 3. Dryness of suspension was carried out under vacuum at 37 °C with a rotary evaporator. ZnO-GE nanocomposites was synthesized by mixed Zinc solid (Zn (OAc)₂·2H₂O), Sodium-Citrate, and GE in degas distilled-water: ethanol. FeO-GE nanocomposites was synthesized by mixed Iron solid (FeCl₃·6 H₂O/FeSO₄·4H₂O), Sodium-Citrate, and GE in degas distilled-water: ethanol. PH of above solutions was adjusted in natural-pH by acid-base solutions. These solutions were kept in three synthesis conditions: ice-bath, ultrasonic-bath, and thermal-conditions, respectively. The samples were characterized using physical-methods. Based on above instruction, pure ZnO and FeO were prepared without GE. XRD (X-ray Diffraction) patterns showed a FCC (Face Center Cubic) and Cubic structures for ZnO-GE and FeO-GE nanocomposites, respectively. FT-IR spectra of ZnO-GE and FeO-GE nanocomposites showed that GE are present on metal-oxides surface. SEM (Scanning Electron Microscopy) images for ZnO-GE and FeO-GE nanocomposites exhibited porous-network and nanoparticles morphologies respectively. Particle size of ZnO and FeO were 286 and 654 nm. Adding GE as surfactant was reduced particle size to 70 and 61 nm. AAS (Atomic Absorption Spectroscopy) results showed that ZnO and FeO (without GE) contained 77 and 68 wt.% Zn and Fe ions, respectively. Adding GE as surfactant in synthesis process metal-oxides, was caused Zn and Fe ions wt.% contained 90 and 65 wt.%, respectively. Particle-size of ZnO and FeO decreased about 4 and 11 times when GE was used as surfactant in the synthesis process. With this chemical synthesis method, Zinc sites of GE successfully extracted into metal-oxides. To the best of knowledge, there is no report on the fabrication of metal-oxides nanostructures with *Allium sativum*.

Keywords: Zinc, Iron, Metal oxide, Garlic extract, Nano-scale, Green chemical

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Use of Herbal Medicines to Predict the Future Trends of the Pharmaceutical Market of Iran

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Over the last decade the benefits of herbal treatments as traditional medicine not only in developed countries but in developing countries is also significantly increased. International experience is also extremely increased use of herbal medicine and pharmaceutical companies, including many multinational companies have attracts. However, many plants needed raw materials in the manufacturing industry of herbal medicines in the country is imported. In addition, approximately two million dollars and pasture wood forest products to global markets including Germany, France and the United Arab Emirates will be issued. In general we can say that the main buyers of Iranian medicinal plants, western European countries, especially Germany, England, France and Eastern Europe and the United States, India, Pakistan and the Persian Gulf countries are. However, many plants needed raw materials in the manufacturing industry of herbal medicines in the country is imported. However, many plants needed raw materials in the manufacturing industry of herbal medicines in the country is imported.

Keywords: Medicinal plants, Herbal medicines, Consumer behavior

An Assessment of R & D Activities in Herbal Medicine Related Industries in Iran

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As global competition intensifies, research and development (R&D) oriented organizations need to enhance their strategic management in order to become goal-directed communities for innovation and allocate their resources consistent with their overall R&D strategy. The world pharmaceutical market has undergone fast, unprecedented, tremendous and complex changes in the last several years. The pharmaceutical industry is today one of the most intensive, innovative and lucrative of the so-called “high-tech” industries. This industry has an important role in society’s health and gross domestic product. Herbal medicine industry is facing increasing people’s interest and demand in the whole world and has an important role in health and economy. Herbs are the source of major percentage of chemical drugs or serve as leading compound in their production. The importance of R&D in industries especially herbal medicine industries are obvious and create a lot of income. So far no study has been done about R&D in herbal medicine related industries in Iran. The purpose of this study is to investigate R&D activities in herbal medicine related industries in Iran and also to highlight critical factors which have influential effect on the result of these activities. To run this study a valid questionnaire based on the literature review and expert’s opinion was designed and delivered to 40 herbal medicine producer companies. Empirical data show there is not acceptable situations regarding the factors that should be taken into account by the managers including: management commitment, human resource, information technology and financial management. In terms of manager’s attitude to importance of critical factors in R and D management, human resource management show the first priority and management commitment, financial resource and information technology were next. In conclusion managers must be aware of their performance in R&D, accordingly they will be able to implement a comprehensive policy nationally and within the company.

Keywords: Research and Development, Industries, Herbal Medicine, Iran



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Effect of Some Commercial Emulsifiers on Caster Oil Emulsion Stability and its Acaricidal Properties on Two Spotted Spider Mite

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The two-spotted spider mite, *Tetranychus urticae* Koch, as a devastating polyphagous mite is considered as serious pest worldwide. Nowadays because of chemical pesticides deficiencies such as pest resistance and endanger environment, uses of botanical agents are in progress for control of insect pests and mites. It's demonstrated that, castor oil *Ricinus communis* L. is used for pests control efficiently. Since castor oil is insoluble in water, such as the other oils, it should be able to use with suitable emulsifiers. In this study, castor oil mixed with some commercial emulsifiers (Ethoxylate Lauryl-Myristyl alcohol (ELMA), ethoxylated coconut fatty acid (ECFA), tallow amine polyethylene glycol ether (TAPGE), ethoxylated castor oil (ECO), coconut fatty acid diethanolamide (CFADA) and ethoxylated nonylphenol (ENPH)) in a rate of 9:1. Stability assessments of created emulsions was investigated by spectrophotometer at 600 nm over 24 hours. Contact toxicity of this emulsions were tested against adult female of *T. urticae* at 25±2 °C, 70±5% RH and 16L: 8D. Mortality was estimated for the adult females after 24 h of treatment. The results were showed that absorbance of emulsion was prepared by ECO (absorbance:1.038) was significantly higher and the TAPGE and CFADA (absorbance:0.129 and 0.122 respectively) was lower than others. High absorbance indicates high stability of emulsion during the time. As well as, mortality rate of ECO emulsion was the highest (100 % mortality) at 1000 ppm against adult females. It is the time to focus on green chemistry processes and commercialization of natural products as green pesticides. It can also be improved by formulating with advanced technologies such as nano-emulsions.

Keywords: Botanical pesticides, Pest control, Formulation

Extraction and Purification of Stevia Sweeteners by the Methods of Liquid-Liquid Extraction and Liming and Organic Solvents

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The plant stevia which has been used for centuries by the Guarani natives as a traditional sweetener (for herbal teas and other beverages) belongs to the Asteraceae family and tribe Eupatoriae [1]. The commercialization of stevia rebaudiana as a sugar substitute is rapidly increasing due to the enhancement of calorie consciousness among the people, while calories play a substantial role in normal physiology. This plant is gaining importance and is expected to develop into a major source of high potency sweetener for the growing market of natural food. Stevioside and rebaudioside A are natural sweeteners extracted from the stevia leaves, which are commercially produced by conventional processes (both physical-chemical processes). The conventional extraction methods have been categorized into those based on the solvent extraction, ion exchange, adsorption chromatography and solvent plus a decolorizing agent [1]. In this study, liquid-liquid solvent extraction was used with RDC (Rotary Disc Contactor) device for separating and purifying the stevia sweeteners. Solvents used for liquid-liquid extraction were hexane and butanol solvents. Extraction and purification processes in the production process included liquid-solid extraction, liquid-liquid extraction, vacuum-condensing operations, drying with spray dryer, crystallization to purify the sweeteners, and finally milling the product. The liquid-liquid extraction efficiency was about 90% and the overall efficiency of the production process was 50%. Conventional extraction methods for stevioside from the stevia leaves involve aqueous or alcohol extraction followed by precipitation, coagulation, and crystallization [1]. In this research, calcium hydroxide was used for coagulation and the removal of impurities, and the organic solvent of butanol was used to separate the stevia sweeteners. The process of extraction and purification in this research includes the following steps: solid-liquid extraction, liming operations for the removal of impurities, removal of lime in solution, drying, solubilizing in butanol, condensation, crystallization in methanol. In order to determine the amount of sweetener compounds extracted, we used high-performance liquid chromatography (HPLC) [1]. The efficiency of the extraction process at the solid-liquid extraction step was about 63%. Using the quantitative results obtained in this process, the overall efficiency of the production process was determined to be around 52%. The purity of the final product was about 92%.

Keywords: Butanol, Hexane, Methanol, Calcium hydroxide, Rebaudioside A

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Larvicidal Activity of *Teucrium polium* L. Against *Anopheles stephensi*

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Anopheles stephensi is an important malaria vector mosquito in Iran and other western Asian countries [1]. The control of *Anopheles* mosquitoes with synthetic repellent and insecticides is expensive and also, their environmental effects and resistance are the main concerns in the new world. In many of human communities, plant products have been used traditionally instead of synthetic pesticides for mosquito control due to their minimal hazardous effects. In Persian Medicine (PM), *Teucrium polium* L., belongs to Lamiaceae family, is used to control insects from a long time ago. Therefore, the present study was undertaken to evaluate larvicidal activity of dichloromethane (DCME) and ethanolic extracts (EE) of *T. polium* L. against *An. stephensi* under laboratory condition. In this study fourth and third instar larvae of *An. stephensi*, chabahar strain was exposed to serially diluting of test concentrations of 62.5, 125, 250, 500, 1000, and 2000 ppm of ethanolic and dichloromethane extracts for 24 hours according to standard method described by WHO protocol with minor modifications. Based on the results, DCME showed better larvicidal activity than EE with 81.66 and 49.41%, respectively. These results suggested DCME, can be considered as a new natural herbal candidate for *An. stephensi* mosquito control after further work on this fractionation to get the effective molecule, qualify the formulation, semi field and field trial.

Keywords: Larvicidal activity, Persian Medicine, *Anopheles stephensi*, *Teucrium polium* L.

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Production of Stevia Sweetener Powder on the Industrial-Scale Using an Organic Solvent Extraction

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Stevia rebaudiana Bert. is a herbaceous perennial plant (2n=22) of genus *Stevia* Cav., which consists of approximately 230 species of herbaceous, shrub and sub-shrub plants [1]. The leaves of this plant produce the diterpene glycosides (stevioside and rebaudiosides), non-nutritive, non-toxic, high-potency sweeteners and may substitute sucrose as well as other synthetic sweeteners, being 300 times sweeter than sucrose [1]. In addition to its sweetening property, stevia has medicinal values and uses. Stevia has self-incompatible flowers and its pollination is probably carried out by insects [1]. Among the glycosides produced in the stevia leaves, Rebaudioside-A is more desirable due to its flavor profile, while, stevioside is responsible for aftertaste bitterness [2]. Development of new varieties of this plant with a higher content of rebaudioside A and a reduced content of stevioside is the primary aim of plant breeders concerned with the improvement and utilization of this source of natural sweeteners [2]. There are several methods for extracting and purifying the stevia sweeteners on an industrial scale [1]. The most important industrial methods of extraction and purification are ion exchangers, solvent extraction, chelating agents, ultrasonic waves, membrane filters. In this research, the method of extraction using butanol solvents and the crystallization with methanol was used in a cold chamber. The general stages of the production process are as follows: grinding the dry leaves, extracting, filtration, condensing, solvent extraction with a condensing-resolvent, solvent recovery, extract-to-powder conversion with a spray dryer, decolorization, crystallization. The purity of the final product was about 92% and no remnants of solvent and heavy metals were observed. The overall efficiency of the process at an industrial scale was estimated at 32%.

Keywords: Industrial scale, Organic solvents, Rebaudioside A, Stevia powder

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Antibacterial Effects of the Ethanol Aerial Parts and Roots of *Lagochilus macranthus* against 3 Gram Positive and 3 Gram Negative Bacteria

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Over the past decades, we obtained great deal of information regarding disease transmission, treatment and prevention, especially those of infectious diseases, however, infection remain the leading cause of mortality worldwide, regarding the adverse reaction of drugs especially those of antimicrobial nature and the increase of resistance to antibiotics, this of science, separation of new drugs, from plants gained great importance in go's. For this reason, several studies being performed showing antimicrobial effects of medicinal plants. In this study the antibacterial effects of ethanol extract Aerial part and ethanol extract roots of the *Lagochilus macranthus*. Were evaluated against three gram positive and three gram negative. Utilizing cup plate methods *in-vitro*. Minimum inhibitory concentration (MIC) by microdilution method were determined. The ethanol extracts were prepared by maceration. The result showed the antibacterial effect of ethanol extract of aerial parts of *Lagochilus macranthus* had the best effect on *Bacillus cereus* at the concentration (125 mg/ml) with inhibition zone diameter (9.66mm) and MIC value (15.625 mg/ml) and *Micrococcus luteus* at the concentration (1000 mg/ml) with inhibition zone diameter (15 mm) and MIC value (31/25 mg/ml). The antibacterial effect of ethanol extract of roots had the best effect on *Micrococcus luteus* at the concentrations (125 mg/ml) inhibition zone diameter (8 mm) and MIC value (125 mg/ml) and hadn't antibacterial effect on *Klebsillia pneumonia* at the concentration (1000 mg/ml) with inhibition zone diameter (0 mm). In this study is shown that ethanol extract of the aerial part of the *Lagochilus macranthus* plant has more antibacterial effects than the ethanol extract of the roots.

Keywords: *Lagochilus macranthus*, Antibacterial effects, Minimum inhibitory

Comparison of Water Soluble and Non-Soluble of *Nepeta crispa* L. Volatile Components

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Nepeta crispa Willd. known as "Mofarra" is a plant in lamiaceae family and one of the endemic aromatic and medicinal plants and endangered in Hamedan province of Iran. Floral water and infusion of mofarra is used traditionally as a restorative tonic for nervous and respiratory disorders. In this study, the essential oil and floral water of mofarra has the non-soluble and soluble part of volatile oil, were isolated and evaluated. Plant materials were hydrodistilled by Clevenger for 3 h and after evacuation of the essential oil, by continuing the hydrodistillation the aroma water distillate has been collected as the floral water. A portion of floral water (50ml each) fractionated with hexane (He), ethyl acetate (EA) and chloroform (CH), separately to isolate the soluble volatile compounds in floral water and to choose the best solvent for separation of natural volatile compounds dissolved in water through hydrodistillation. Analyse of all samples was carried out by gas chromatography (GC) and gas chromatography mass spectrometry (GC-MS). Twenty two components representing 96% of the oil was identified. The main components were 1, 8-Cineole (49.4%), Nepetalactone 4 α , 7 β , 7 α (27%), Myrtenol (4.7%) and β - Pinene (4.2%). The yield of each fractions were 86, 110, 100 mg/100ml floral water for He, EA and CH, respectively. Six components representing 85-97% of the fractions was identified. The highest yield was for the ethyl acetate fraction. The main components were Nepetalactone 4 α , 7 β , 7 α (76.3%, 79.9%, 76.8%), Myrtenol (3.1%, 4.3%, 5.5) for He, CH and EA, respectively. In the essential oil of mofarra, the main compound was 1, 8-cineol, while the fractions contain Nepetalactone 4 α , 7 β , 7 α as the dominant metabolite and more soluble compound in the floral water [1, 2].

Keywords: *Nepeta crispa*, Essential oil, Nepetalactone, Floral water, GC/MS

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Comparison of Volatile Oil in Wild and Cultivated *Nepeta crispa* L.

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Nepeta crispa L. known as “Mofarrah” from Lamiaceae family is an endemic and endangered Iranian medicinal plant in Hamedan province. It has traditionally been used in yoghurt and dough and also as an herbal tea and floral water because of its pleasant aroma. Mofarrah also showed some activity against pain and inflammation in experimental rat models. In this study, the essential oil composition in of two wilds and three different cultivated samples in their flowering stage were evaluated. The natural habitats were Arzanfood (AF) and Pist-e-eski (PS) in Alvand Mountain of Hamedan with 3015 and 2780 m altitude above the sea level. Mofarrah was also cultivated in greenhouse (GH) and also research farm (RF) of Faculty of Agriculture in TarbiatModares University, Tehran and in a farm of Kohnoush (KF), a village near the natural habitat with 2400 m above the sea level, in Hamedan province. All the samples were collected and shade dried. Plant materials were hydrodistilled by Clevenger-type apparatus for 3 h. Essential oil analysis was carried out by gas chromatography-mass spectrometry (GC-MS) and quantified by GC-FID. The yield of essential oil for all samples were 1.85, 1.63, 0.95, 0.59, 0.44 % W/W for PS, AF, KF, RF and GH, respectively. The highest yield was for the Pist-e-esky as the natural habitats and the lowest one was for greenhouse cultivation. Twenty two components representing 90-98% of the oil was identified. The main components were 1, 8-Cineole (49.4%, 44.2%, 30.8%, 43.3%, 60.0%), Nepetalactone 4 α , 7 β , 7 α (27.0%, 6.0%, 31.5%, 5.0%, 5.7%) and β -Pinene (4.2%, 4.4%, 4.3%, 2.6%, 3.2 for AF, PS, GH, RF and KF, respectively. It is concluded that ecological parameters and other natural stresses have affected the yield and composition of the essential oil of cultivated *N. crispa*. However, the more similar condition to the natural habitat, the more success for domestication of *N. crispa* related to its yield and compositions [1, 2].

Keywords: *Nepeta crispa* L., Essential oil, 1, 8-cineol, Domestication, GC/MS

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Impact of Humic Acid on Growth Indices and Photosynthetic pigments of Purslane (*Portulaca Oleracea* L.) Plant under Nickel Stress

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Portulaca oleracea is an annual medicinal plant in the family of Portulacaceae. Nickel, one of the important heavy metal pollutants which is required in traces amounts for growth and development of higher plants; however it is strongly phytotoxic at high concentrations for majority of plant species and alters their various physiological processes [1]. In this study, in order to investigate the growth indices and photosynthetic pigments responses of *Portulaca oleracea* plant to humic acid under nickel stress conditions a split plot experiment with two factors carried out based on completely randomized design with 3 replicates in the greenhouse of the Medicinal Plants Research Center of Shahed University in 1397. The factors were nickel concentrations with four levels (0, 0.2, 0.4 and 0.6 mM) as the main plots and four levels of humic acid concentrations (0, 200, 400 and 600 mg/L) as sub-main plots. After 30 days of treatment, the growth indices and photosynthetic pigments trait were measured. The results showed that different nickel concentrations had significant effects on morphological and physiological traits. By increasing nickel levels, the growth indices such as root length, fresh weight of root, chlorophyll *a*, total chlorophyll and the amount of carotenoid decreased, while by increasing the nickel levels the proline content decreased. The results showed that applying humic acid under nickel stress reduced the growth indices and photosynthetic pigments. The highest number of branches, number of leaves, chlorophyll *a* and carotenoid amounts was obtained at 0.4 mM nickel and 600 mg/L humic acid. However, the use of humic acid resulted improving in biochemical parameters and increased plant tolerance to nickel stress. Therefore, it can be concluded that applying the humic acid can be a suitable procedure to reduce the harmful effects of nickel stress in *Portulaca oleracea*.

Keywords: Humic acid, Morphological, Nickel stress, Photosynthetic pigments, Purslane

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Terminalia Chebula Alcoholic Extract Can Reduce the Proliferation of BCPAP Thyroid Cancer Cell Line

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Thyroid cancer is one the most common cancer world wide and its treatment have been notoriously challenging. Traditional herbal medicines are getting significant attention due to lower side effects. The fruits of *Terminalia chebula* are used to treat many diseases such as digestive and diabetes, asthma and the others. In this study we investigated the role of *Terminalia chebula* alcoholic extract on the proliferation of BCPAP thyroid cancer cell line. At first, methanol extract of *Terminalia chebula* was prepared and then its effect on BCPAP proliferation was measured by MTT assay at different concentration (20, 50, 100, 250, 500, 1000, 2000 µg/ml). Cell viability was determined in compare to control group. Results showed that IC₅₀ amount on 500 µg/ml. Cell cycle analyses showed that the increased sub-G1 phase in treated group compare to untreated group. The S-phase also significantly increased in treated group. Our data showed that *Terminalia chebula* extract can inhibit the growth of BCPAP thyroid cancer cell line.

Keyword: Terminalia chebula, BCPAP cell line, Thyroid cancer

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Evalouation of Antibacterial Activity of three different extracts of *Ganoderma applanatum* and *G. adspersum* Collected from North Iran

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As reported by different scientists in previous years, the genus *Ganoderma* has two subgenera in Iran which three of them, *G. applanatum*, *G. adspersum* and *G. colossus*, belong to *Elfvigia* subgenera [1]. The first two species mostly could be found in Northern Iran whereas the third one in Southern Iran. In this study, the pure mycelia of three isolates belonging to *G. applanatum* and *G. adspersum* collected from the Northern forests of Iran, were reproduced using submerge culture technique. Duplicated mycelia dried using freezing drying method and 70% Methanol, Hexane and Chloroform solvents were used to macerate and extract the mycelia. The antimicrobial activity of the extracts were investigated against *Pseudomonas aeruginosa* (PTCC 1430), *Bacillus subtilis* (PTCC 1715), *Escherichia coli* (PTCC 1399) and *Kocuria rhizophyla* (PTCC 1110). Results indicated that two isolates out of three had antibacterial activity. The Hexan and 70% Methanol extracts of non laccate *G. applanatum* inhibited the growth of *B. subtilis* in 62.5 mg/ml and *K. rhizophyla* in 125 and 62.5 mg/ml respectively. Also the Hexan and 70% Methanol extracts of extracts of *G. adspersum* in 62.5 mg/ml prevented the growth of both *K. rhizophyla* and *B. subtilis*.

Keywords: *Ganoderma*, Submerge culture, Antibacterial activity

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Comparison of Supercritical Fluid Extraction and Ultrasound-Assisted Extraction of Fatty Acids from Citrus Seeds

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Medicinal plants, since times immemorial, have been used in virtually all cultures as a source of medicine. The widespread use of herbal remedies and health care preparations obtained from commonly used traditional herbs and medicinal plants has been traced to the occurrence of natural products with medicinal properties. The use of traditional medicine and medicinal plants in most countries, as a normative basis for the maintenance of good health, has been widely observed and as a result the extraction and development of several drugs and chemotherapeutics from these plants have been occurred. In this research, citron, a fragrant fruit with the botanical name *Citrus medica*, was chosen to investigate its nutritional value. It is a small tree, having large fruit (20-22.5cm.long) resembling pineapple in shape. From ancient through medieval times, the citrus medica was used mainly for medical purposes: to combat sea sickness, pulmonary troubles, intestinal ailments, and other disorders. All different parts of this fruit is nutritionally important and useful. Citrus seed compounds were extracted using supercritical fluid extraction (SFE) and ultrasound assisted extraction (UAE) methods; the extracts were analyzed using GC-MS. The experimental parameters such as pressure, temperature, modifier volume and dynamic extraction time were optimized using a central composite design, after a screening step. The result of chemometrics analysis showed the highest yield for SFE (32.39%), which was obtained at a pressure of 235 atm., temperature of 40 °C, modifier (Ethanol) volume of 183 µl and dynamic extraction times 67 min. In UAE method, n-hexane was selected as the extraction solvent and the parameters solvent volume, temperature and extraction time were optimized using central composite design. The optimum obtained values are solvent volume of 23.5 mL, extraction time of 20 min and temperature of 23°C. This resulted in a maximum extract recovery of 47.69 %. The major components of oil extract were palmitic acid, linoleic acid, oleic acid, petroselinic acid and stearic acid.

Keywords: Medicinal plants, Citrus seed, Supercritical fluid extraction, Ultrasound

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Quantitative and Qualitative Study of the Active Ingredient in the Aerial and Root Parts of Echinacea Purpurea for Industrial Scale

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The genus Echinacea has nine species with purple and pink flowers, none of which are native to Iran. Three species of E.purpurea, E.angustifolia and E.pallida are important in terms of drug. Echinacea purpurea is an herbaceous and perennial herb that is native to North America but is now cultivated massively in most parts of Europe and Asia, and even in some parts of Iran. All parts of the plant have therapeutic properties and contain valuable substances of flavonoids such as acidic derivatives of cichoric acid and chlorogenic acid and also contain a small amount of essential oil. Echinacea Purpurea is nowadays one of the most important and most valuable medicinal plants and it has the property of strengthening the immune system and anti-virus. The medicinal products derived from this plant enhance the immune system by increasing the body's defences and confronting bacterial and viral infections. [1]. In this work, the effective materials of aerial and root of Echinacea Purpurea extracted separately and measured. 0.5 kg from each of aerial parts and plant roots extracted with 3 L alcohol solution 70%, at 60 ° C for 3 hours, and after filtration, total polyphenols content based on UV-Visible and the amount of chlorogenic acid and cichoric acid was obtained by the HPLC methods. The results showed that the polyphenols, chlorogenic acid and cichoric acid extracted from aerial part of the plant is richer than the root respectively 43%, 69% and 71%. Therefore, the aerial parts of plant are recommended for production on an industrial scale.

Keywords: Echinacea Purpurea, Industrial scale, Flavonoid, Polyphenols, HPLC

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Effect of Chemical and Biological Fertilizers on Morphological Trait, Essential Oil Yield and Fodder Quality of Fennel *Foeniculum vulgare* Mill

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Herbal medicines have always been a form of therapy for livestock among resource poor small holder farmers [1]. Herbal plants is necessary because they are likely to be more important in the future, especially given the escalating costs of drugs and the focus on organic products in developing countries. In addition, with the development of resistance of pathogens to drugs, medicine might be the route to take since herbs tend to be broad spectrum. In order to study the effect of usage of biological, chemical and integrated fertilizers on morphological trait, essential oil yield and fodder quality of fennel, a field study was conducted during spring planting season at research station farm of medicinal plants at Institute of Forestry and Rangelands Research, Karaj, Iran in 2016. Experiment was conducted as a randomized complete block design with five treatments and three replications. The treatments consisted of five levels of fertilizers (chemical (200 kg.ha⁻¹ N, 100 kg.ha⁻¹ P and 50 kg.ha⁻¹ K), biological (2.6 ×10⁸ CFU.ml⁻¹), vermicompost (6 ton.ha⁻¹). The result incicated that different soil fertility mangement had a significant effect on essential oil yield and as well as quality of forage of fennel. Integrated treatment (75% of recommended dosages of chemical fertilizers alongside vermicompost and biofertilizer) could increase morphological trait, essential oil yield and quality and quantity of forage compared with 100% chemical fertilizers. Integrated treatment (75%), included the highest biological yield (1191.6 kg ha⁻¹), seed yield (138 kg ha⁻¹) and harvest index (11.6%). Both combined treatments, showed an increase of 50% and 46% in essential oil respectively. This increase in essential oil yield was 37 % and 31%, respectively. Integrated treatments compared to the application of chemical fertilizers were able to improved some of the important traits in forage quality, such as the percentage of digestible dry matter, the percentage of soluble sugars in water and ash content by 8.8%, 46.8% and one time, respectively. In general, results indicated that combined application of bio-chemical fertilizers could reduce production cost and increase quantity and quality of yield and fodder of fennel.

Keywords: Biofertilizer, Essential oil, Morphology, Soil fertility, Vermicopost

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DCM Extract of *Scutellaria Pinnatifida* Protects Dopaminergic SH-SY5Y Cells against Rotenone

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Parkinson's disease (PD) is the second most prevalent neurodegenerative disease in the world, affecting approximately 1% of adults older than 60 years [1]. Dopaminergic neuronal loss in the substantia nigra pars compacta is the most important features of PD. Investigations suggest that PD may be associated with mitochondrial dysfunction through a variety mechanism, including the generation of toxic free radicals and mitochondrial respiratory chain complex I dysfunction which lead to neuronal cell death [1]. Rotenone, a pesticide which can accumulate in the brain, hinders microtubule polymerization, arrests the cell cycle and impairs mitochondrial functions, finally leading to neurodegeneration. The identification of natural phytochemicals inhibiting the toxicity of such compounds may pave the way in preventing PD progression. A rich flavonoid plant extensively used in traditional medicine is *Scutellaria* (Lamiaceae). *Scutellaria* has about 360 species, and two hybrids are endemic to Iran. One of the Iranian species of *Scutellaria* is *S. pinnatifida*. This genus is well known for use in the treatment of several diseases. In this study, we assess the effect of Dichloromethane extract (DCMEx) of *S. pinnatifida* on the cell toxicity induced by rotenone. The protective properties of DCMEx were investigated by cell viability assay and ROS analysis on SHSY5Y cells. Here we report that the DCMEx has neuroprotective properties on SHSY5Y cell lines and also can scavenged the free radicals which are produced during neurodegeneration. Therefore, *S. pinnatifida* may potentially be a valuable medicinal herb for the treatment of PD.

Keywords: Dichloromethane extract, Neurotoxicity, Parkinson's disease

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Total Phenolic and Flavonoid Content of *Clematis songarica* Using Different Solvent Polarities
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Clematis songarica Bunge is one of the species of genus *Clematis* in Buttercup family which growth naturally in Iran and Afghanistan. This species is distributed in eastern parts of Iran. The genus *Clematis* was comprised about five different species in Iran. Phenolic and flavonoid content of some other species of Iranian species were investigated previously [1]. Regarding our finding in the genus evaluation of phenolic and flavonoid content of this species by different solvent polarities was defined as the aim of study. Therefore this study is the first to compare total phenolic and total flavonoid content of aerial parts of plant. The extracts were obtained by hydrolyses extraction method using different solvent polarities consist of Methanol, Hexane, Ethyl-Acetate, Butanol and Water. [2, 3]. The highest amount of phenolic content was found in the Methanol extract (10.68 ± 0.47 mg gallic acid equivalent/g DW) followed by Water (2.19 ± 0.14), Butanol (1.41 ± 0.07), Ethyl acetate (0.21 ± 0.01) and Hexane (0.16 ± 0.01) extracts respectively. While total flavonoid contents of Methanol solvent (7.90 ± 0.51 mg rutin equivalent/g DW) was found significantly higher than other solvents consist of 2.66 ± 0.17 , 2.65 ± 0.12 , 2.05 ± 0.09 and 0.95 ± 0.05 for Water, Butanol, Hexane and Ethyl-Acetate extracts respectively. So the data from present study revealed that *Clematis songarica* is a rich natural source of phenolic and flavonoid compounds. But the extraction solvent is more affective on the extracted compound amounts.

Keywords: *Clematis songarica*, , Phytochemical evaluation, Antioxidant potential, Iran

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Effect of *Anabaena vaginicola* as a Plant Growth Promoting Cyanobacteria on Essential Oil Composition of *Salvia officinalis* L.

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Salvia officinalis L. is one of the most important medicinal plants which naturalized in many places throughout the world. The essential oil of this plant contains several medicinal substances such as manool, carnosol, rosmarinic acid, and carnosic acid [1]. Cyanobacteria are photosynthetic prokaryotes which some of them assist higher plant growth by supplying growth promoting substances. In this study, the effect of one isolate of *Anabaena vaginicola* on quality and quantity of essential oil in *S. officinalis* was investigated. Cyanobacterium was isolated and purified. Inoculation of treated plants was performed with 1% cyanobacterial extract in greenhouse conditions for 60 days. Application of cyanobacterial inoculum was conducted on the first day of planting and every 20 days thereafter. Essential oils were obtained using Clevenger apparatus and the compositions were evaluated using GC-MS. The results showed a significant effect (at the 0.05 level) of cyanobacterial extract in essential oil composition of aerial parts in comparison of control and treated plants. The results indicated an increase in some of the major components of essential oil (such as camphor, manool and eucalyptol) in plants treated with cyanobacterial inoculum. So the results can be regarded as a template for increasing in future uses of medicinal plants.

Keywords: Essential oil, Cyanobacteria, *Salvia officinalis*, Medicinal plant

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Insecticidal Activity of Essential Oils in *N. glomerulosa* and *N. binaloudensis* Against *Sitophilus Oryzae*

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Storage Pests are the most important and worrying issues in the cereal and grain storage products. Rice weevil (*Sitophilus oryzae* L.) is the major and cosmopolitan storage insect pest which its adults are insatiable feeders on a great variety of grains [1]. This study was conducted to estimate the insecticidal effect of essential oils from *Nepeta glomerulosa* Boiss. and *Nepeta binaloudensis* Jamzad against *S. oryzae*. Bioassays were performed to determine the insecticidal activity of essential oils from mentioned medicinal plants against insect. Mortality rates of insects in six Essential oil concentrations and also LC₅₀ and LC₉₅ of essential oils were determined through fumigant toxicity method [2]. Assays were conducted with airtight exposure chamber in lab conditions (27±1°C, 75 ± 5% R.H., dark cycle: 12:12 h). In this way essential oils were obtained by Clevenger-type water distillation method. The LC₅₀ and LC₉₅ after 72 h were 124/318 and 369/65 µL/L air for *N. glomerulosa* and 336/80 and 514/67 µL/L air for *N. binaloudensis* respectively. At the 214 µL/L air dose level of *N. glomerulosa* essential oil caused 73 and 98% mortality of *S. oryzae* adults within 48 and 72 hours of exposure, respectively. While the mortality rate of *N. binaloudensis* essential oils were 9% and 32% respectively. The results showed that the essential oil of *N. glomerulosa* was the most active against *S. oryzae* in comparison with the essential oil from *N. binaloudensis*. So *Nepeta glomerulosa* can be regarded as the suitable source for bio-control of stored-product insects and prevention of human food deterioration.

Keywords: Biological activity, *Nepeta glomerulosa*, *Nepeta binaloudensis*, Rice weevil

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Phytochemical Evaluation of *Equisetum arvense* L. Extract

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Equisetum arvense L. field horsetail is herbaceous perennial fern. It is widely used in the world, because it has many health benefits. Steril stems are used for treatment of diseases such as anemia, inflammation, diabetes, ulcers, cancer, convulsions, anxiety and depressive disorders. Phytochemical studies of *Equisetum arvense* L. have reported the occurrence of inorganic compounds (especially silica), caffeic acid derivatives, flavonoids, alkaloids, saponins. Total polyphenolic compounds were quantified by Folin-Ciocalteu method using different solvents in order to prove their extraction efficiency. Focus within total polyphenolic quantification study was placed on the traditional reflux and solvents used were: water, 100% acetone, 100% ethanol, 80% ethanol, 50% and methanol. In order to make flavonoids free from glycosidic moiety for quantification, hydrolysis was performed in 50% MeOH at 90°C using 6 M HCl concentration. Measure the absorbance of the test solution after 30 min, by comparison with the compensation solution at 425 nm. Calculate the percentage content of flavonoids, calculated as isoquercitroside, from the expression [2]. The results showed that extracts of *Equisetum arvense* L. are rich sources of phenolic compounds, flavonoids and phenolic acids, with antioxidant capacity and reducing power. This study has provided useful information for screening this plant as potential source of bioactive components with antioxidant properties that may be included in dietary supplements helpful in preventing different diseases.

Keywords: *Equisetum arvense*, Horsetail, Flavonoids

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Evaluation of Anti-Inflammatory and Analgesic Effect of *Ferula persica* Essential Oil in Animal Models

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Non-steroidal anti-inflammatory drugs are one of the most commonly drugs for treating pain, fever and inflammation; however, they are limited in use due to their adverse effects. *Ferula persica* gum (FpG) (Apiaceae) is an endemic Iranian medicinal plant that its gum (sagapenum) has been used in Iranian traditional medicine for treating various disorders such as stomach ache, epilepsy, inflammation, and pain. This study was done to evaluate the antinociceptive and anti-inflammatory effects of essential oil of FpG in male rat and mice. The essential oil of FpG was extracted by hydro-distillation method in a Clevenger-type apparatus. The anti-inflammatory and analgesic effects of the essential oil at doses of 2.5, 5, 10, 20 mg/kg (i.p) was evaluated in the model of acute inflammation (carrageenan-induced paw edema), Writhing test and Hot plate test. In this study, the sweet almond oil (10 mg/kg) as a vehicle of the essential oil was used and diclofenac sodium (50 mg/kg, i.p) was used as positive control. According to results, all of the mice that received FpG essential oil (2.5, 5, 10, 20 mg/kg) showed significant differences ($p < 0.001$) with control groups in writhing test. In hot plate method, dosage 10, 20 mg/kg of FpG essential oil showed significant difference ($p < 0.001$) with control groups 45 and 60 minutes after injection. In carrageenan method, dosage of 20 mg/kg had significant difference ($p < 0.01$) with control groups 60 minutes after injection. Also doses of 5, 10 and 20 mg/kg indicated the differences with control group ($p < 0.05$) 360 minutes after injection. The results suggest that The essential oil of *F. persica* gum have significant analgesic and anti-inflammatory effects. This oleo gum resin could be studied in future clinical investigations for management of pain and inflammation. This study supports previous claims of Iranian traditional uses for *F. persica* for inflammation and pain.

Keywords: *Ferula persica*., Persian medicine, Antinociceptive, Anti-inflammatory

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A Reliable and Low Cost Method for Rapid Analysis of Morphine, Codeine and Thebaine Using Ion Mobility Spectrometry

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Ion Mobility Spectrometry (IMS) is a widely used technique that separates ions in the gas phase. It is a low cost method for fast and sensitive evaluation of different analytes. Originally this portable technique was applied to the determination of compounds in security and military use. Some of IMS instruments operate with an electric field that provides space separation, and the other instruments also operate with a drift gas flow which provides also a temporal separation [1]. Ions in the gas phase are separated at atmospheric pressure under the influence of an electric field, according to their size and shape. IMS is the best choice for detection of narcotics in airports and customs. Different species of *Papaver* genus have various amounts of morphine, codeine and thebaine. Some methods developed for the detection and determination of these alkaloids, including GC-MS, HPLC and capillary electrophoresis are costly and time consuming techniques. In British Pharmacopoeia, HPLC is the standard method for analyzing of isoquinoline alkaloids. The purpose of this study was to validate the ion mobility spectrometry method for analysis of these three isoquinoline alkaloids and compare it with the results of HPLC method. In this work, several parameters such as drift and dopant flow, carrier gas, injection and cell temperature, shutter gride and voltage of drift cell were optimized through chemometric methods. Linearity, specificity, precision, accuracy, LOD and LOQ, robustness and ruggedness of the proposed method were investigated. This procedure created better sensitivity through faster and lower cost quantification than HPLC methods. Based on these experimental studies, the most suitable method to test morphine, codeine and thebaine in *Papaver* species is proposed IMS method.

Keywords: Ion mobility spectrometry, Alkaloids, *Papaver*, HPLC

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Improving Extraction of Fenugreek *Trigonella foenum-graecum* Seed and Investigation of the Blood Glucose Reduction in Rat Animal Model

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Nowadays, with the advancement of pharmaceutical science and the development of researches on medicinal plants, the use of these plants is enhanced to help to cure various diseases. Herbal remedies are taken into consideration because have lower side effects than chemical drugs. One of the herbs that have a medicinal and edible use is fenugreek, which has a significant effect on reducing the blood glucose levels [1]. This research was conducted to determine the effect of *Trigonella foenum-graecum* (fenugreek) seed extract on the blood glucose reduction. Fenugreek seeds have mucilage, complex alkaloids like trigonelline, and saponin compounds such as diosgenin, oils and carbohydrates. Trigonelline is the most important and effective alkaloid for reducing the blood glucose levels. In this research, the best method for extracting of oil from seeds was obtained using a cold press machine. The highest amount of extract from defatted seeds was obtained by using percolator and ethanol as solvent. Different doses of fenugreek seed extract were orally administrated to diabetic rats [2]. The amount of trigonelline absorption in the extract was measured by use a spectrophotometer and compared with the standard trigonelline. Rat animal model was used to determine the effective dose. Animal test results showed that the fenugreek seed extract at a dose of 500 mg/kg exhibited the highest level of the blood glucose reduction. Finally, as a conclusion of this research, fenugreek seed extract is proposed as an alternative therapy in diabetes.

Keywords: Fenugreek, Seed, Extract, Blood glucose, Rats

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Exhibition of Valid Method for Extraction and Analysis of Spirotetramate Insecticide and the Main Metabolite Spirotetramate-Enol in Pistachio

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Iran is the first pistachio producer in the world. Considering the strategic importance and facilitating the export of this product, the evaluation and determination of pesticide residues in this product to ensure the health of the product, based on the optimized and validated method is very important. Spirotetramate is one of the new and widely used pesticides in plenty of pistachio gardens to control *Agonoscaena pistaciae*. To extract this insecticide from the pistachio matrix, the optimized method was used. In order to save costs, all stages of optimization of the extraction method were performed using high performance liquid chromatography with UV detector (HPLC-UV) [1]. The results of this optimization was removal of expensive C18 and GCB materials, which resulted in a reduction of at least 60% of the cost of extraction. The residue analysis method validation was carried out per the DG-SANCO guideline. All validation steps were carried out using blank pistachio samples. The samples were artificially infected in a laboratory with different concentrations. Standard calibration was established on the basis of solvent and matrix-matched standards in the concentration range of MRL. Limits of detection (LOD) and quantification (LOQ) were determined by considering signal-to-noise ratios (S/N) of 3 and 10, respectively. In order to confirm the optimized final method and using this method for real samples, HPLC with mass detector (LC-MS/MS) was used. Under optimum conditions, the extraction recovery ranged from 88.5 to 100.12%, the RSD value was less than 10%, and the LOQ value was equal to 0.05 µg / ml.

Keywords: Spirotetramate-enol, Pistachio, High Performance Liquid Chromatography

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Antibacterial Activity of Submerged Culture of Shiitake Mushroom

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The shiitake (*Lentinula edodes*) is a Basidiomycete and an edible mushroom which is considered as a medicinal fungi in traditional medicine. Because the fructification of shiitake is time-consuming process, liquid culture of mycelia could be an alternative source of bioactive metabolites production from this mushroom. This culture method increased availability of products and liquid phase that might facilitate subsequent downstream processing. Cultivation of *Lentinula edodes* was performed in 100 ml aliquots of YM broth distributed in 250 ml Erlenmeyer flasks. Mycelia were cut from YMA plate, and inoculated into flasks and shake-incubated for 10 days at 25 °C and 150 rpm. Samples of the culture were filtered during incubation and filtrate was extracted by different solvents for bioactive compounds. Antibacterial assay was applied for against 6 type test strains bacteria consist of Gram positive: *Micrococcus*, *Staphylococcus*, *Bacillus* and Gram negative: *Escherichia coli*, *Klebsiella* and *Pseudomonas*. Activity was determined by using two methods: the Agar well diffusion and paper disk. Each extracts exhibited varying degrees of antibacterial activity against an array of all Gram-positive bacteria but no effect against Gram-negative bacteria was showed. The results of this study indicate the potential use of liquid culture of shiitake as a source of antimicrobial compounds. The goal of the present work was to evaluate if submerged cultivation of shiitake mycelia could be a feasible way of producing Antibacterial substances.

Keywords: Shiitake, *Lentinula edodes*, Submerged culture, Antibacterial

Effect of Altitude on Quantitative Characteristics and Phytochemistry of Essential Oil of *Achillea wilhelmsii* C. Koch in Zanjan Conditions

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Achillea wilhelmsii C. Koch is one of the valuable medicinal plants, belongs to Asteraceae family which is grown in Iran and widely used by Iranians. There are also several reports in Iranian Traditional Medicine such as anti-inflammatory, antibacterial, antihypertensive, anti-hyperlipidemia, antitumoral, gastrointestinal disorders [2], antispasmodic, choleric, antiulcer, antibacterial (*Helicobacter pylori*) have been reported for *Achillea* species [1], But so far no attempt has been made to domesticate and cultivate about this valuable plant. The aim of this project was determining of the effect of altitude on quantitative characteristics and phytochemistry of essential oil of *Achillea wilhelmsii* C. Koch in Zanjan conditions. The samples of inflorescences and leaves were collected in Aghgadick mountain in Taham village in Zanjan province at full flowering stage in July 2018. For sampling, this plant was selected from 4 heights [1550 m, 1750 m, 1950 m and 2150 m], location with definite distance (200 meter) and three replication at length of one transect. Then air dried parts of the plants (50 gr) at room conditions subjected to hydrodistillation for 4h using a Clevenger apparatus and then essential oils analyzed by GC and GC/MS. Results showed, there is no significant difference between leaf oil yields of *Achillea wilhelmsii* C. Koch in four heights, while there is significant difference between the oil yields of flowers ($p < 0.01$) and the highest percentage of flower oil (0.1%) belong to 1750m. Major components of flower oils were 1,8-cineole (15.4% and 8.2%), cis-cadin-4-en-7-ol (6.6% and 15%), E-caryophyllene (3.5% and 3.8%), γ -muurolene (2.4% and 5.2%), camphor (2.6% and 4.1%), eudesma-4(15),7-dien-1- β -ol (3.7% and 6.4%) in 1550 m and 2150 m, respectively.

Keywords: Altitude, *Achillea wilhelmsii* C. Koch, Hydrodistillation, Phytochemistry

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Population Genetic Structure and Genetic Diversity in Medicinal Plant *Lamium amplexicaule* L. Lamioideae, Lamiaceae

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Lamium L. is the type of the family name Lamiaceae, comprises about 17–30 herbaceous annual and perennial species, depending on circumscription. In flora Iranica, there are 7 *Lamium* species recorded, of which one of them is *L. amplexicaule* L. The popular Persian name of the plant is “Gazanehsaye Sagheh Aghoush”. It contains essential oils and vitamins, and possesses significant pharmacological and biological activities including antioxidant, free radical scavenging, antiproliferative, anti-inflammatory, antinociceptive, bacteriostatic, cytotoxic, antispasmodic and tyrosine inhibitory activities. Aerial parts of this plant are used as medicine by locals in Iran for relieving of some gastrointestinal, respiratory, topical, inflammatory and blood disorders. In order to study the population genetic structure in *L. amplexicaule*, we collected 103 plant specimens of 13 different populations. ISSR molecular markers were used for genetic diversity analysis. ISSR molecular marker has revealed a high degree of within-population (67%) and among (33%) populations genetic diversity. AMOVA and Gst analyses produced a significant difference. Nm estimation revealed certain degree of gene flow/shared alleles between these populations, indicating that *L. amplexicaule* is predominantly an out-crossing species in Iran. Mantel test produced significant correlation between genetic distance and geographical distance of the studied populations ($r = 0.097$, $P = 0.04$). STRUCTURE plot identified two main gene pools for this species in Iran. The first gene pool is comprised of populations that are mainly located in the Northern parts of Iran. The second gene pool showed a higher concentration in western and southwestern parts and Eastern regions of the country. These populations are genetically and morphologically diverged from each other. The present study provides information on potential gene pools of this medicinal plant in the country which may be used for further conservation and breeding studies.

Keywords: Genetic diversity, Gene flow, ISSR, *L. amplexicaule*.

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Ligand–protein Reverse Docking Study on Anticancer Activity of Two Isolated Abietane Diterpenoids from *Salvia ceratophylla*

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Reverse docking has been well known as a powerful technique to predict receptor targets of small molecules. In the present study, a reverse molecular docking investigation has been performed on two rearranged abietane diterpenoids (ceratol, ceratodiol) with proven anticancer activity from *Salvia ceratophylla* for characterization of their mode of action [1]. Docking studies were carried out using Autodock 4.2 simulation software into a few well validated targets of anticancer therapy including cyclin-dependent protein kinase 2 (CDK-2), CDK-6, DNA topoisomerases I (topo I) and topo II. The docking results indicated that ceratol and ceratodiol demonstrated better binding energies to CDK-2 than the known CDK-2 inhibitor (-7.84 and -8.16 kcal/mol, respectively). Combination of *in silico* results with *in vitro* experimental data can help us to achieve better understanding of anticancer mechanism of selected diterpenoids in a short time.

Keywords: Docking study, Anticancer, Diterpenoids

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Effect of *Achillea millefolium* Extract on the Cancer Cells

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Achillea millefolium L. belongs to *Asteracea* family. Over the past two decades, a lot of work on producing new drugs from natural sources has been done. Secondary metabolites in plants are an important source of compounds with medicinal properties. These compounds are usually inducible and vary in content due to different elicitors. In the present study, the effect of silver nanoparticles and their possible role as a chemical elicitors on secondary metabolites of *Achillea millefolium* L. has been studied. For this purpose, the effect of induction of silver nanoparticles on *Achillea millefolium* plant was investigated in three (0, 5, 20 and 60 ppm) concentrations at 48 hours intervals. The evidence of the morphological test of Hela cells indicated that the *Achillea millefolium* plant samples treated with silver nanoparticles caused a change in the shape of Hela cells and reduced their growth. The results also show that the bioavailability of cancerous cells treated with root extract and aerial parts of the Yamradan plant decreased significantly compared to control.

Keywords: *Achillea millefolium*, Secondary metabolites, Silver nanoparticles, Cancer cells

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Oil Content and Composition of *Callistemon citrinus* (Curtis) Skeels from Southwest of Iran

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The genus *Callistemon*, commonly known as bottlebrush, belongs to the family Myrtaceae and comprises over 30 species. *Callistemon* species are used for forestry, essential oil production, farm tree/windbreak plantings, degraded land reclamation, and as bioindicators for environmental management and ornamental horticulture among other applications [1]. Moreover, this plant is used to treat gastrointestinal disorder, pain and infectious diseases caused by bacteria, fungi, virus and other pathogens. The plant is used traditionally in India to combat respiratory conditions like cough, bronchitis and also as insecticides, while its volatile oil is employed as an antimicrobial herbal drug. The leaves are also known for its anti-inflammatory, fungitoxicity, antinociceptive activities [2]. In this experiment, aerial parts were harvested during the middle of each month. Essential oil of fresh samples was extracted immediately after harvest. The second part was dried in shade and room temperature and then oil obtained with Clevenger apparatus. Oil was dried using sulfate sodium and then, oil profile was identified by GC and GC-MS. The result showed that oil content and composition was affected by harvest time. Plant's oil was declined during the summer for both fresh and dry samples. The highest level was recorded on January and March for fresh and dry samples, respectively. Alpha-pinene, alpha-phellanderene, Limonene, 1, 8-cineol and alpha terpineol were the most important fresh and dry oil components. In conclusion, the plant showed a good source for essential oil during the year with favorable oil profile in which can be used in different industries.

Keywords: Bottlebrush, Seasonal change, Pinene, 1,8-cineol, Alpha terpineol

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Antioxidant Properties of Medicinal Plants; a Comparison of DPPH and ORAC Assays

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To search for novel sources of antioxidants from natural sources, medicinal plants have been extensively studied for their antioxidant activity. They are rich in natural antioxidants and have been associated with prevention of cancer and cardiovascular diseases [1]. In addition, these naturally occurring antioxidants can be formulated to give nutraceuticals, which can help to prevent oxidative damage from occurring in the body. Several assays have been frequently used to evaluate antiradical scavenging capacities in plant extracts including DPPH, ABTS, FRAP, and ORAC. However, these techniques have shown different results among plants tested and across laboratories. The current study assesses ORAC (the oxygen radical absorbance capacity) method, the most relevant one for biologic samples and DPPH method to screen methanol extracts of some valuable medicinal plants for antioxidant activity. Chamomile flower, leaves of *Satureja khuzestanica* and *Thymbra spicata* from Ilam province and aerial parts of *Teucrium polium*, bottlebrush, Jashir and chavil leaves, squill bulbs from Khuzestan province were collected and air dried in room temperature. The plants were individually extracted with MeOH (3×75 mL) in ultrasonic bath (VWR-USC300D) at room temperature. Free radical scavenging activity of the plant extracts was evaluated by DPPH and ORAC assays using a microplate reader. The plant extraction had shown different antioxidant potential. In DPPH assay, the capacity of bottlebrush to scavenge free radicals was higher than other plant extracts with $EC_{50} = 2.77 \pm 0.06$. Moreover, its antioxidant activity was close to the positive control ascorbic acid ($EC_{50} = 0.3 \pm 0.02 \mu\text{g/mL}$). However, the weakest antioxidant potential was recorded in chavil extract with $EC_{50} = 52.01 \pm 9.45$. Interestingly, ORAC assay confirmed the DPPH assay results. The most powerful antiradical agent was obtained in bottlebrush extract with $15843.39 \pm 291.99 \mu\text{mol TE/g}$, in which was more than EGCG and less in comparing Rutin as control. In conclusion, bottlebrush was the most powerful antioxidant that can be used in different industries. Moreover, *Thymbra spicata* and Chamomile were the next candidates for antioxidant properties and more investigations are recommended.

Keywords: Chamomile, *Satureja khuzestanica*, *Thymbra spicata*, bottlebrush, assay

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A Survey on *Teucrium polium* L. Essential Oil Content, Composition and Antioxidant Activity

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Teucrium polium L., an important medicinal plant in traditional Iranian medicine, belongs to the family Lamiaceae is found in the dry and stony places of the hills and deserts of Mediterranean countries, South Western Asia, Europe and North Africa. Diverse phytochemicals such as terpenoids, flavonoids and iridoids have been reported in which responsible for its valuable medicinal properties [1]. However, Secondary metabolites are affected by, environmental conditions, evolution, geographic variations, physiological factors, and harvest time as well as plant genetic. This research was aimed to assess essential oil content and composition as well as antioxidant activity of *Teucrium polium* L. from different habitats in southwest of Iran. Aerial parts of plant were collected at full flowering during June. After drying the plant material, essential oil (EO) was extracted by Clevenger apparatus and analyzed by GC-MS. Additionally, the preparation of methanolic extract was done by ultrasonic methods. Antiradical potential was measured using plate reader. EO content was significantly changed on different location. The main oil components were affected by habitats comprising alpha pinene, beta pinene, trans-caryophyllene, Germacrene D, Bicyclogermacrene, delta-cadinene, Elemol, Germacrene B, cubenol and Valerianol. Moreover, the extract from different places had shown diverse antiradical scavenger potential in two DPPH and ORAC assays. In conclusion, plant can be harvested from different location depending to demand of industries.

Keywords: *Teucrium polium* L., Habitats, Environmental conditions, Secondary metabolites

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Genetic Structure among and within Some Iranian Populations of *Stachys lavandulifolia* Revealed by ISSR Molecular Markers

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Betony (*Stachys lavandulifolia*) is one of the 34 wild species of important genus *Stachys* from *Lamiaceae* family which grows naturally in Iran [1]. In present study, seven endemic populations of *S. lavandulifolia* (including 56 samples) from five provinces were investigated. ISSRs (Inter simple sequence repeats) were used to survey genetic diversity and to infer population structures. In total, 12 used primers produced 176 fragments which all of them (100%) were polymorphic. By using NTSYS-pc software and UPGMA method, the samples were divided into six groups based on Jaccard genetic similarity matrix. Principal coordinates analysis (PCoA) confirmed the clustering results. POPGENE software was used to describe genetic variation within populations according to Shannon's index and Nei's gene diversity analysis. Genetic diversity within the populations of Azna and Toureh was the most and the least, respectively. The average observed number of alleles to the effective number of alleles (Na/Ne) was obtained to be 83% which showed that the gene distribution were balanced in each population. Moreover, GeneAlex and POPGENE software's were used to analyse genetic diversity and molecular variance among populations. G_{st} and N_m indexes average of the populations were accounted 0.20 and 1.94, respectively, indicating a balanced gene exchange among seven studied Betony populations. Molecular variance analysis of the populations (AMOVA) showed that genetic diversity within and among the populations were 75% and 25%, respectively. According to the results, Nei's genetic similarity ranged between 0.79-0.97, the most similarity was distinguished between Toureh with Zia-Abad and Khoramdareh whereas the least similarity was between Toureh and Salavat-Abad. STRUCTURE analysis revealed four subpopulation (K=4) in Betony populations. According to the results, ISSR marker could be used as a valuable tool for getting molecular information and investigating genetic diversity. In spite of overharvesting from the wild, the results of this study showed a high variation among and within populations of *S. lavandulifolia*. The findings of the present study could also be considered for domesticating and breeding programs of Betony.

Keywords: *Stachys lavandulifolia*, Polymorphism, Population Structure, ISSR

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Broad Variations of Genetic Structure in Some Iranian Populations of Sumac (*Rhus coriaria*) Revealed by ISSR Molecular Markers.

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Sumac (*Rhus coriaria*) is a medicinal species from *Anacardiaceae* family which grows naturally in Iran and its fruit is spice and has healing property [1]. In present study, six endemic populations of *R. coriaria* (including 60 samples) from five provinces were investigated. ISSRs (Inter simple sequence repeats) were used for surveying genetic diversity and population structure of sumac. In total, 21 used primers produced 190 band, of which 132 (69.4%) were polymorphic. Individual plants were clustered into five groups based on Jacquard genetic similarity matrix, Using NTSYS-pc software and UPGMA method. Principal coordinates analysis (PCoA) confirmed the accuracy of clustering results. POPGENE software was used to describe genetic variation within populations according to Shannon's index and Nie's gene diversity analysis. Genetic diversity within populations of Asad-Abad and Shazand were the most and the least respectively. The average observed number of alleles to the effective number of alleles (Na/Ne) was calculated to be 93%, which showed that the gene distribution were balanced in each population. Moreover, GeneAlex and POPGENE softwares were used to analyse genetic diversity and molecular variance (AMOVA) among populations. G_{st} and N_m indexes average of populations were accounted 0.615 and 0.315, respectively, indicating a low gene exchange among six sumac populations. Molecular variance analysis of the populations showed that genetic diversity among and within the populations were 62% and 38%, respectively. According to the results, Nie's genetic similarity ranged between 0.81-0.89, the most similarity was observed between Asad-Abad and Toysekan, and the least one was between Ilam and Toyserkan. After analysis of genetic structure of the populations using STRUCTURE software, they were divided into 5 groups. In spite of over-collecting from natural habitats, the results of this study revealed a high variation among the investigated populations. ISSR marker could be used as a valuable tool for getting molecular information and surveying genetic diversity. This markers have shown effective genetic relationships between the populations. The findings of the present study could also be applicable for domesticating and breeding programs of sumac.

Keywords: *Rhus coriaria*, Genetic Diversity, ISSR, Marker Index

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Determination and Quantification of Naringenin in Aerial and Root Parts of *Amygdalus lycioides* Spach var. *horrida*

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Amygdalus lycioides Spach var. *horrida* which is locally named Tangars, is a kind of almonds and belongs to the Rosaceae family. This species is widely grown in different regions of Iran and used by rural inhabitants in various diseases treatment, such as diabetes. There is not obvious phytochemical studies about this species but some studies recorded several flavonoids that obtained from aerial parts of Tangars, such as Naringenin which is belonging to flavonoid effective on improvement of different disease such as cancer, diabetes and cardiovascular diseases [1] the purpose of this study was determination and quantification of Naringenin in aerial and root parts of Tangars (*Amygdalus lycioides* Spach var. *horrida*). Aerial and roots of native tangars specimens from the north-east of Isfahan was collected and after determining the herbarium sample, these specimens were dried, powdered and extracted. In the final the Naringenin analysis was performed by HPLC method in extracts. A Waters liquid chromatography apparatus consisting of a Separations module: Waters 2695 (USA) and a Dual absorbance Detector waters 2487 (USA) was used for the HPLC analysis. The chromatographic assay was performed on a 25 cm×4.6 mm with pre-column, Eurospher100-5 C8 analytical column provided by KNAUER (Berline, Germany) reversed phase matrix (5 μm) (Waters) and elution was carried out in a gradient system with methanol as the organic phase (solvent A) and distilled water (solvent B) with the flow-rate of 1 mL min⁻¹. Peaks were monitored at 280 nm wavelength. Injection volume was 20 μL and the temperature was maintained at 25°C. According to the results of this study, Naringenin was present in extract of aerial parts at a concentration of 2.11 μg/mg. If the root is locally used for the purpose of diabetes, the aerial parts with a noticeable Naringenin could be replaced, and this way will prevent this plant from destruction.

Keywords: *Amygdalus lycioides* Spach var. *horrida*, HPLC, Naringenin, Tangars

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Investigation of Salinity Effect on Cytosine DNA Methylation in *Linum usitatissimum* L. with MSAP Technique

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Salinity is considered as one of the important environmental challenges in the world limiting plant growth and productivity [1]. Plants as sessile organisms, often exposed to various biotic and abiotic stresses, which adversely affect the crop production and yield. Genetic and epigenetic information are required to build up an organism. In recent years, plant epigenetics has received notable attention by researchers. Epigenetics refers to heritable variation in gene regulation that can determine the functional state of cells and tissues during differentiation and developmental stages. MSAP is based on digestion with methylation-sensitive restriction endonucleases (*HpaII* and *MspI*) followed by amplification of restriction fragments which has been frequently used for the detection of differential sensitivity of DNA cytosine methylation in plants and animals. In this study, the extent and pattern of cytosine DNA methylation was investigated in flaxseed (*Linum usitatissimum* L.) under salinity using MSAP technique. Results showed that total methylation of CCGG sequences was decreased in comparison to control groups by NaCl. The fully methylated loci were always more than the hemi-methylated loci. Sequencing of four randomly selected MSAP fragments indicated genes involved in various biological and molecular processes such as vitamin B1 biosynthesis, protein targeting and localization, post-translational modification, gene regulation and responses to abiotic and biotic stresses.

Keywords: Brassinosteroids, Gene expression, Flaxseed, MSAP, Salinity

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Effect of 24-epibrassinolide on Amino Acid Contents and Profiles in NaCl-Stressed *Linum usitatissimum* L.

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Flaxseed (*Linum usitatissimum* L.), is one of the economically important oilseed crops, that commercially cultivated as a multipurpose crop i.e. high amount of protein, linolenic-rich oil, lignans and fiber over the world. Salinity is a common environmental challenge which limits worldwide agricultural crop yields and will continue to be of concern in future years. One of the major challenges in plant physiological studies is to increase the plant productivity under adverse environmental conditions. BRs are considered ubiquitous in plant kingdom which at low concentrations, act as important metabolism regulators. As a general response to different stresses, all plants accumulate large quantities of different types of compatible solutes such as amino acids [2]. In this study, we investigate the effects of 24-epibrassinolide on some amino acid contents and profiles in NaCl treated flax plants by HPLC. Results showed that, under saline conditions, free amino acid (Asp, Ser, Glu, Val, Ile, Leu, Arg, and Pro) contents increased, while Ala content declined. Total amino acids raised (1.79 fold) in salt-treated plants compared to controls. The application of 24-epiBL declined total amino acids (31%) in salt-treated plants in comparison to salt treated plants alone. Free amino acids (Asp, Ser, Val, Ile, Leu, Arg, and Pro) decreased by 24-epiBL in salt-treated plants, while the content of Glu and Ala were induced compared to salt stressed plants alone.

Keywords: Amino acid, HPLC, Salinity, 24-epiBL

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Isolation and Structure Elucidation of Secondary Metabolites from *Ziziphora tenuior*

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Ziziphora tenuior is from Lamiaceae family that comprises 62 species growing as perennial or annual herbs from South-West Asia to Eastern Europe [1]. Traditionally it is used as flavoring agent for tea and dairy products in Iran and included in various antimicrobial, antiseptic, expectorant and wound healing agent preparations. It is used for the treatment of cough, stomachache, dysentery, fever, uterus infection, gut inflammation and painful menstruation. In the best of our knowledge, any column chromatography studies have not been reported on this specie of *Ziziphora* genus before. In this study, some bioactive compounds from the extract of the aerial parts of *Ziziphora tenuior* collected in May-2017, from Kashan area, was analyzed for the first time. Some of the secondary metabolites from non polar extracts, extracted by n-hexane and ethyl acetate, were isolated by column chromatography. β -sitosterol, Ursolic acid and Daucosterol were isolated and characterized as the major constituents. The molecular structures were identified by comparison of ¹H NMR, and IR spectrums as well as physical Specifications with the literature values and Standard data.

Keywords: *Ziziphora tenuior*, Column chromatography, Separation, Identification

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Anti-Bacterial and Anti-Cancer Effects of Essential Oils from *Ziziphora tenuior*

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Ziziphora genus, belongs to the Lamiaceae family and grows widely in Iran. Its common name in Persian is "Kakotti" [1]. *Ziziphora tenuior* L. is a medicinal plant in Iran, which is included in various antimicrobial, antiseptic, expectorant and wound healing preparations. It is used for the treatment of cough, stomach ache, dysentery, fever, uterus infection, gut inflammation and painful menstruation. In this study, the essential oil of *Ziziphora tenuior* collected from Kashan area, in May-2017, was analyzed. Antimicrobial and anticancer effect of the essential oil of it were also evaluated. The compounds of the essential oil were analyzed and identified by Gas Chromatography (GC). demonstrated that in *Z. tenuior* essential oil, 14 chemical compounds were identified. Essential oil's analyses showed that pulegone (70%) and 2-Cyclohexen-1-one, 3-methyl (14%) were the main components [2]. The antibacterial activity against 10 gram negative and gram positive bacteria and 2 fungus and yeast strains were assessed by disc diffusion (DD) method. Moreover minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) tests were also investigated. Evaluation of anticancer activity was performed via brine shrimp lethality assay. Results exhibited no activity in DD method but surprisingly high activities in the MIC and MBC methods ($\leq 31/25$ $\mu\text{g/ml}$) for all bacteria strains. Anticancer activity of the mentioned sample was also very high, with $\text{LC}_{50} \leq 150$.

Keywords: Anti-Bacterial, Anti-Cancer, Essential Oils, *Ziziphora tenuior*, Kakotti

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Quercetin ameliorates Acetamidrid-induced Memory deficit and hippocampal damage in Male Rat

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Quercetin is a flavonoid widely found in fruits and vegetables. The neuroprotective effects of quercetin have been reported by several studies and also memory improving activity of quercetin has been shown in various animal models of cognitive deficit. Therefore quercetin is considered as a nutraceutical in neurological disorders [1]. Acetamidrid (ACT) belongs to a new class of pesticides known as neonicotinoids and commonly used in agriculture. ACT acts as an agonist and stimulates nicotinic acetylcholine receptors then it is potentially considered as neurotoxicant. The aim of the present study is to investigate the protective effect of quercetin against acetamidrid-induced memory impairment. The male rats were divided into three groups: control, ACT (40 mg/kg) and quercetin + ACT. All treatments were orally administered once per day through gavage for 28 days. The cognitive performance of animals was measured by Morris water maze test. Animals received one training session consisting of four trials per day for four consecutive days and probe test was performed on fifth day. After behavioral test, the brain tissues were collected for histological investigation. The results of our study indicated that performance of animals in probe test significantly improved in ACT-treated group compared to control group ($p < 0.05$) which indicates impairment of memory consolidation in this group. Co-administration of quercetin with ACT significantly improved memory performance. Also histological study indicated that ACT-induced neuronal damage in the hippocampus was completely prevented by quercetin administration. Our study showed that quercetin attenuates ACT-induced memory impairment and neuronal damage. Quercetin is a potent antioxidant agent and also up-regulates neuron's own antioxidant defense. Then it is postulated that the protective effect of quercetin may be due to its antioxidant effects.

Keywords: Quercetin, Acetamidrid, Memory, Hippocampus

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Influence of Organic and Non-Organic Fertilizers on Yield and Essential Oil of *Echinaceae Purpurea*

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Nowadays, *Echinaceae purpurea* is one of the most widely used herbs in the treatment of colds and influenza. Active components of *Echinaceae purpurea*, are caffeic acid derivatives, polysaccharides, alkaloids and essential oils. One of the main pillars of sustainable agriculture is the use of organic fertilizers in agronomic ecosystems to eliminate the use of chemical fertilizers. Hence, the use of organic fertilizers, along with the removal or reduction of chemical fertilizers, can increase the growth, yield and quality of the crops, especially in the production of medicinal plants and maintain the soil fertility and environmental health in sustainable agricultural systems. The purpose of this study was to determine the most suitable fertilizer treatments for increasing the essential oil content and yield of *Echinaceae purpurea*. For this purpose, an experiment was conducted based on randomized block design with three replications in research farm of Research Institute of Forests and Rangelands (Karaj) in 2017- 2018. The treatments included NPK fertilizer treatments, cow manure 30, 60 and 90 ton/ha, vermi-compost 5, 10 and 15 ton/ha, 30 ton/ha cow manure with N₅₀, P₂₅, K₂₅ (kg/ha), 5 ton/ha vermi-compost along with bio-fungal and bacterial fertilizers. The results showed that the highest leaf and stem dry matter weight was obtained in 15 ton/ha vermi-compost treatment. Also, the highest flower dry matter weight was obtained in 15 tons/ha vermi-compost with NPK fertilizers treatment. On the other hand, the highest root dry weight was obtained in 30 ton/ha manure accompanied by NPK chemical fertilizers treatment. The highest flower essential oil was obtained in 30 ton/ha manure with NPK fertilizers and the highest stem and leaf essential oil were obtained in treatment of 15 ton/ha vermi-compost at the flowering stage. In general, the results indicated that the treatment of biofertilizers such as vermi-compost (15ton/ha) and manure (30 ton/ha) had the highest effect on the increase of essential oil and yield in *Echinaceae purpurea*.

Keywords: Dry matter, Essential oil, NPK fertilizers, Vermicompost

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Drying Kinetics and Quality Characteristics of Saffron Dried with a Combined Hot Air-Infrared Dryer

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Saffron is a dry, red color of the *Crocus Sativus L.* It is the most expensive spice in the world. Drying is an important step in saffron processing. Drying causes physical, chemical and biochemical changes to achieve the desired properties of saffron. In this study, the kinetics of drying saffron stigma using a combined hot air-infrared dryer at three temperature levels of 40, 50 and 60°C and two hot air flow speeds of 0.3 and 0.6 m/s as well as an ordinary hot-air dryer using the same conditions were studied. The effect of the studied parameters on the amount of crocin, picocrocin and safranal and the microbial load of the final product were also investigated. The results showed that, the Midley model was found to be the best model in fitting data of both drying methods. According to the results of analysis of variance, the main effect of temperature, air flow rate and infrared irradiation and their interaction on drying time was significant ($p < 0.05$). The infiltration coefficient ranged from 1.8003×10^{-08} to 2.38346×10^{-08} m²/s for the hot air-infrared method and 5.07×10^{-10} to 2.7892×10^{-09} m²/s for hot air drying. The amount of activation energy in the combination method of hot air-infrared varied from 10.43 kJ/mol to 11.6 kJ/mol, and was obtained at 34.1 kJ/mol and 62.4 kJ/mol in hot-air drying. In terms of maintaining the color strength of saffron, the amount of Crocin was significantly different between treatments ($p < 0.05$) and the highest Crocin was obtained when the combination of hot air-infrared at 50 °C and 0.3 m / s was used with an average of $^{1\%}E_{440nm}$ 278.5. According to the national standard of Iran, microbial tests were carried out on different treatments. No significant differences were observed between the treatments.

Keywords: Saffron, Drying kinetics, IR radiation, Quality

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Investigation of Habitat and Phenological Stage of Caper in Sirjan Region

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Caper (*Capparis spinosa* L.) from Capparidaceae is a xerophytic shrub with remarkable adaptability to harsh environments. This plant species is of great interest for its medicinal/pharmacological properties and its culinary uses [1] and can be seen from warm tropical regions to temperate regions of the world. This study was carried out to evaluate the habitat and phenology of this species in the Sirjan area (Kerman province). At first, the habitat of the species was identified in the southern part of Sirjan city (on the margin of Sirjan to Shiraz road). The habitat included abandoned land, which previously included pistachio gardens. 35 soil samples were taken at depths of 0-30 cm and their characteristics were determined in the lab. By periodic visits, during from March to October Life cycles of this plant were studied too. The climatic characteristics of the study area were evaluated in order to find the climate required for plant growth. The results showed that soil texture is relatively heavy in different areas (Clay loam to Clay sandy loam) of Caper habitat while the amount of salinity in the soil saturation extract varies from 6.7 to 14 dS/m. Organic matter in all soil samples was less than half a percent. The amount of nitrogen (0.01 %) and phosphorus (1.2 mg/l) was also low in soils and the soils were poor in this regard. In the studied area, the flowering stage and the seeding stage occur at approximately the same time in June, and there is no significant difference with each other in the other hands the vegetative period starts in late March and lasts until September. Climatological studies showed that in the studied area, rainfall varies between 124 and 155 mm and the length of the dry season is 8 months The climate of the region is dry according to de martonne aridity index. The results reflect plant tolerance to severe climatic and harsh soil conditions. Drought tolerance is one of the unique characteristics of this plant, which has been emphasized by Inocencio *et al.* [1]. Due to the severe drought in Iran, planting of Camper can be recommended in abandoned lands to improve economic income for farmers and local communities.

Keywords: Medicinal plant, Soil, Vegetative period, Habitat, Caper

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Study of Chromotoxicor Anti-chromotoxic Effects of Several Medicinal Plants Extracts Using *Allium cepa* Bioassay

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Herbal medicines having the different compounds such as the flavonoids, glycosides, resins, vitamins, tannins, terpenes and etc. show various probable mutagenic, cytotoxic or chromotoxic effects on environment as well as human health. The aim of this study was assessment of the chromotoxic or anti-chromotoxic effects of three medicinal plants extracts. For this, extracts of *Echinacea purpurea*, *Urticadioica* and *Foeniculumvulgare* were used at three concentrations (5, 10 and 15 ml L⁻¹) along with Ethyl methanesulfonate (EMS) as positive control and distilled water as negative control in an *Allium cepa* bioassay under three applications: 1) Onion bulbs were treated with three different concentrations (5, 10 and 15 ml L⁻¹) of the extracts for 48 h without EMS treatment, 2) the onion bulbs were treated with 0.03 M EMS for 2 h, after then they were treated with three different concentrations of aqueous extracts of the mentioned medicinal plants for 48 h, and 3) onion bulbs were treated with the three different concentrations of the above extracts for 48 h and then with 0.03 M EMS for 2 h. The root tips of onion bulbs were squashed after aceto-orcein staining and the cells were analyzed for mitotic index and chromosome abnormalities. Also, growth of onion roots was measured after each treatment. Significant decrease in mitotic index and chromosome defects were observed in root-tip cells treated with extracts before and after the EMS treatment when compared with the positive control in concentration-dependent manner. The results suggested that the extracts of these medicinal plants is non-chromotoxic. However, these extracts have anti-chromotoxic potential against EMS induced chromosomal abnormalities in onion root-tip cells. Meanwhile, the root growth of onion bulbs were decreased in higher concentrations of these extracts as compared with negative control (distilled water) showing some cytotoxic effects of these extracts [1,2].

Keywords: Cytotoxic; *Echinacea purpurea*, *Foeniculumvulgare*, Onion assay

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Studying of the Effect of Acidity on Dandelion (*Taraxacum officinale*) Germination Behavior

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Dandelion (*Taraxacum officinale*) is a flowering herbaceous perennial plant of Asteraceae (Compositae) family. It can be found growing in temperate regions of the world, in lawns, on roadsides, on disturbed field and shores of water ways, and other areas with moist soils. *T. officinale* is considered a weed, especially in lawns and along roadsides, but it is used as a medicinal plant too. Environmental factors play an important role in determining the germination ability of plants. The effects of factors such as temperature [1] and water [2] on dandelion seed germination behavior have already been investigated, but no information is available on the effects of pH on seed germination. Therefore, this study was conducted to investigate the effects of pH on dandelion germination behavior at weed science laboratory of Sari Agricultural Sciences and Natural Resources University. For this purpose, germination test in 4 replicates of 25 seeds was carried out in Petri dish (9 cm in diameter) on one layer of filter paper. Five ml from the desired pH solutions was added to each petri dish. pH treatments included 3, 5, 7, 9 and 11 in a randomized complete design. Comparing germination percentage of seeds at different pH levels showed that the highest germination percentage (63%) occurred at pH=7. The highest germination rate (2.24 per day) was also, observed at the same. By increasing or decreasing the pH, the percentage and rate of germination severely decreased. Germination percentage at pH 3, 5, 9 and 11 was 17, 23, 40 and 31%, respectively, and germination rate was 0.6, 0.8, 1.4 and 1 per day respectively. So, tolerance of dandelion to acidic pH is lower than alkaline pH. Also, a sharp reduction in percentage and rate of germination as a result of deviation from the neutral pH indicates its limitation in compatibility to various pHs.

Keywords: Compatibility, Environment, Germination percentage, Germination rate.

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Ethnobotanical Survey of Medicinal Plants Used in Treatment of Gastrointestinal Diseases in Mazandaran Province (Case Study: Larijan)

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Today traditional medicines are a great part of modern health care systems in the world [1, 2]. Larijan District is an important region located in Amol county of Mazandaran province in north of Iran. The traditional usage of plant species is commonly observed in the region. However, very little information is available on the traditional plants of this region. The results of study revealed 23 plant species that are used for the treatment of Gastro Intestinal disease such as stomachache, intestinal worms, gallstones, flatulence, diarrhea and constipation. These plants belong to 22 genera and 13 families. Lamiaceae with 6 Rosaceae with 3 and Brassicaceae with 3 species are the most important families respectively. The most commonly utilized portions of plants for medicinal purpose include the fruits and leaves. Other part used are flowers and seeds. The methods of preparation often employed are infusions and decoctions along with raw eating. Furthermore, based on current findings many of the mentioned plants have potential active ingredients to influence Digestive disease. Therefore the comprehensive ethnobotanical survey in the area is necessary to finding more useful species.

Keywords: Ethno-botany, Traditional medicine, Iran.

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Improvement of Yield Product in *Lavandula angustifolia* Using Cyanobacterial Elicitor

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Heterocystous cyanobacteria are able in fixation of atmosphere nitrogen and also they have increasing effect in plants growth through hormonal and non- hormonal stimulants production. Hence they can use in production of medicinal plants as growth stimulators [1]. Present study deals with the impact of cyanobacteria on mass production characteristics of *Lavandula angustifolia* treated with *Anabaena vaginicola*. The experiment was designed as randomized complete block test all in three replications. Cyanobacterial treatment was applied as the main factor, applying method as the second (with 3 methods) and concentration (with 2 levels) as the Third. Among the evaluated characteristics morphological traits such as shoot and root length, shoot fresh and dry weight and root fresh and dry are mentionable. Based on the results all treated plants showed a significant increase in the rate of biomass production and growth parameters at the 0.05 level. Indeed *A. vaginicola* in addition to improvement of growth conditions significantly increased the growth parameters of treated plants. Among the treatments, the maximum vegetative growth was observed in plants treated with Irrigation+ Spraying treatment in concentration 1 % of cyanobacteria. Altogether, our findings suggest that *A. vaginicola* can be used as a natural biofertilizer to enhance medicinal plants growth.

Keywords: Cyanobacteria, Biofertilizer, Yield of production, *Lavandula angustifolia*.

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Natural Compounds Modulate Molecular Pathways and Senescence Markers *in vitro*

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Aging contributes to an increased risk of developing a number of neurodegenerative and chronic disorders, predominantly related to oxidative stress (OS) and defects in the antioxidant balance [1]. This study focused on the antisenescence effect of four plant species (*Falcaria vulgaris*, *Ixiolirion tataricum*, *Ajugachamaecistus*, and *Scabiosa flavida*) on H₂O₂-induced premature senescence in rat NIH3T3 fibroblasts, which were found to be rich in effective phytochemicals with traditional ethnobotanical backgrounds. Plant materials were collected, identified, and extracted. To determine the viability of NIH3T3 cells, an MTT assay was conducted. The levels of OS markers and the senescence-associated β -galactosidase (SA- β -GAL) activity were analyzed by the Elisa reader. The cell cycle pattern was evaluated by flow cytometry. The expression of senescence-related inflammatory cytokines and the molecules involved in aging signaling pathways were investigated using the real-time reverse transcription polymerase chain reaction (RT-PCR). H₂O₂ treatment decreased cell viability and increased lipid peroxidation (LPO) and the reactive oxygen species (ROS) in NIH3T3s. However, *S. flavida* exhibited low cytotoxicity, reduced OS and SA- β -GAL activities in NIH3T3 cells compared with the H₂O₂-treated group. *I. tataricum* was the second best plant, although it was more toxic to NIH3T3 cells. *S. flavida* decreased G0/G1 arrest and facilitated the G2/M transition of NIH3T3s, also downregulated the expression of p38, p53, p16, and the related inflammatory mediators. *S. flavida* potentially modulated senescence-associated hallmarks in fibroblasts exposed to H₂O₂, thus it may inhibit the aging process via controlling the OS. Therefore, it is a promising candidate for future antiaging exploration.

Keywords: Fibroblasts, Inflammatory cytokines, Oxidative stress, *Scabiosa flavida*

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The Effect of Combined Application of Chemical and Biological Fertilizers on Some Morphological, Physiological and Biochemical Characteristics of Lemon Verbena *Lippia citriodora* L.

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In order to study the effects of applying chemical and biofertilizers on some quantitative and qualitative characteristics of lemon verbena (*Lippia citriodora* L.), a factorial CRD experiment including 18 treatments with 3 replications, was conducted at Bu-Ali Sina University research greenhouse. The treatments were: vermicompost (0, 20 and 40 V/V), phosphate biofertilizer (application and no-application) and chemical fertilizer (0, 50 and 100% of the recommended amount equal to 0, 0.52 and 1.04 gr/pot respectively). The essential oil was extracted by hydro distillation method by using a cleverger apparatus and were analyzed by GC and GC/MS. Results were showed that the maximum plant height, number of branches per plant, fresh and dry weight and the highest percentage of essential oil were obtained as a result of using 40% vermicompost. Plants treated by 50% of recommended NPK + 40% vermicompost showed the highest rate of photosynthesis and transpiration. The maximum nitrogen concentration in leaf tissue was obtained from applying 100% of the recommended amount of NPK + biophosphate. Applying 100% recommended NPK + 40% vermicompost, resulted in higher phosphorus concentration in leaves. The highest concentration of potassium in leaves was obtained from plants treated with 40% vermicompost. 35 different compounds were identified in the essential oil among them geraniol, davanone and p-cymene were the main components. The highest amounts of these three compounds were obtained under 40% vermicompost treatment. Generally, in order to achieve sustainable agriculture, it seems that reduction of chemical fertilizers and replacing them with vermicompost can be an effective method.

Keywords: *Lippia citriodora* L., Sustainable agriculture, Geraniol, Essential oils

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Investigation of The Effect of Hydroalcoholic Extract of Licorice (*Glycyrrhiza glabra*'s) Rhizome on Mechanical Activity of Isolated Trachea of Male Rat

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Some of the studies have shown that the extract of licorice rhizome induces vasodilation. In order to determine some of its mechanisms, the present study was performed by the following procedure : 15 male wistar rats were kept at animal room with condition of 12 hr/12 hr darkness-lighting cycle, 22±2°C temperature, available food and water. Then each rat was anaesthetized by 50 mg/kg intraperitoneal injection of sodium pentobarbital and its trachea was dissected and divided into 3mm strips that were put in 37°C oxygenated Krebs solution for 15 minutes. Then each strip was held on hooks that connected to a force transducer linked to power lab instrument to record its mechanical activity. The above strips were immersed to organ bath contained oxygenated 37°C krebs solution. Then mechanical activity of the strips was recorded after administration of efficient dose of hydro alcoholic extract of licorice rhizome (0.036 mg/ml) and solvent in experimental and control group respectively. The data were analyzed by SPSS and using paired sample t-test with $P \leq 0.05$ as the significant level. The results showed a significant decrease of mechanical activity of isolated strips of trachea after administration of (0.036 mg/ml) hydro alcoholic extract of licoricerhizome. It can be concluded that in present study hydro alcoholic extract of licoricerhizome has a significant effect on smooth muscle relaxation and consequently decreased mechanical activity.

Keywords: Licorice rhizome, Isolated trachea, Mechanical activity

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Cytotoxicity of Different Extracts of Two Species of *Otostegia* Genus against Human Leukemia Cells **Mina Doorandishan^{1,2}, Omidreza Firuzi¹, Hossein Mirkhani¹, Amir Reza Jassbi^{1*}**

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Three species of *Otostegia* genus (Lamiaceae/Labiatae) are available in Iran, *Otostegia persica*, *O. aucheri* and *O. michauxii*, of which the last two are endemic [1]. The aim of this study was to evaluate the cytotoxicity of dichloromethane (DCM) and methanol (MeOH) extracts of *O. aucheri* and *O. michauxii*. The aerial parts of *O. aucheri* and *O. michauxii* were collected from Hormozgan and Fars province of Iran, respectively. The cytotoxicity of extracts at different concentrations (5-50 µg/mL) was assessed by MTT reduction assay against human cancer cell line: MOLT-4 (acute lymphoblastic leukemia). The results indicated that DCM extracts exhibited considerable cytotoxic activity against MOLT-4 cells, while MeOH extracts were inactive (IC₅₀ > 50 µg/ml). The DCM extract of *O. michauxii* (IC₅₀: 25.0 ± 4.1 µg/ml) was more active than DCM extract of *O. aucheri* (IC₅₀: 37.8 ± 2.9 µg/ml). Based on our findings, the DCM extract of *O. michauxii* could be considered as potential extract for further investigations to isolate biologically active compounds.

Keywords: Cytotoxicity, *Otostegia* genus

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Assessment of the Effects of Cinnamon on Depression Caused by Diabetes Mellitus

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Chronic hyperglycemia of poorly controlled diabetes can result in long-term damage, dysfunction, and failure of different organs such as nerves, eyes, heart, kidneys, and blood vessels. Diabetes has been identified as a risk factor for depression development. Due to insufficient research in this field and for examining herbal medicine as an adjuvant intervention among diabetic patients, we evaluated the antidepressant effects of cinnamon on patients with diabetes mellitus. In this randomized clinical trial, referred individuals completed the questionnaire of demographic data and Beck Depression Inventory (BDI); those with a score >11 were enrolled in the study. Study and control groups received 2 capsules of cinnamon (each weighing 500 mg) and 2 placebo capsules (500 mg of chickpea flour), respectively. For evaluation, the subjects filled Beck depression questionnaire in one-month and three-month intervals (after administration). BDI, Chi-square test, and t-test were used in this study, and SPSS v.16 was utilized for data analysis. In the study group, 7 (21.9%) and 25 (78.1%) patients were males and females, respectively. Also, there were 2 (83%) males and 22 (91.7%) females in the control group. Most of the studied cases were housekeepers in both study and control groups, [23 (71.9%) and 21 (87.5%), respectively]. Only 12 (21.4%) individuals were illiterate in both groups. The evaluation of the relationship between depression rate and cinnamon use showed a significant difference between the control and study groups, three months after cinnamon administration, (P=0.021). T-test did not indicate any significant differences between the two groups, one month after cinnamon use (P=0.065). With 95% confidence, it can be concluded that regarding cinnamon intervention, there is a statistically significant difference in the rate of depression between pre- and post-administration periods (one and three months after administration). Therefore, cinnamon can reduce depression among patients with diabetes mellitus.

Keywords: Diabetes mellitus, Cinnamon, Depression



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Phytochemical and Biological Studies of *Eryngium Bornmuelleri* Essential Oil and Extracts

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Eryngium bornmuelleri is a member of *Eryngium* L., a species-rich genus of Apiaceae, with almost 317 species particularly 250 species growing in Eurasia, North Africa, North and South America, and Australia [1,2]. Different biological activities such as antioxidant, antimicrobial, anti-inflammatory and antinociceptive were reported for *Eryngium* species. The aerial parts of *E.bornmuelleri* growing wild in Kurdistan, Iran were subjected to hydrodistillation using a Clevenger to produce light yellow oils. The volatile constituents in the essential oil of *E. bornmuelleri* were investigated by GC/Mass and GC/FID. The dried aerial parts of *E.bornmuelleri* was macerated successively in *n*-hexane, ethyl acetate and methanol for 3 days at room temperature and the extract was concentrated by Rotary evaporator to give a green extract. The preliminary phytochemical analysis of the extracts carried out using standard procedures to identify the various constituents. The qualitative and quantitative phytochemical analysis of essential oil was performed and the major components of it were Dodecanal, Cubenol<1-epi> and Heneicosane. The different extract of *E.bornmuelleri* afforded three major group components as flavonoids, terpenoids and steroids. According to the dimensions of the compounds of *Eryngium* genus and their biological effects, the study on *E. bornmuelleri* has important effect on improvement of phytochemical and pharmacological activity of *Eryngium* genus.

Keywords: *Eryngium bornmuelleri*, Essential oil, Extract, Dodecanal

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Investigation of Total Phenolic Contents, Antioxidant Activity and Some Micronutrients in *Chaerophyllum macrospermum* (Spreng.)

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This study was designed to investigate Antioxidant activity and determine some Micronutrients of aerial parts of *Chaerophyllum macrospermum* (Spreng.). This plant is an endemic perennial shrub, belongs to *Apiaceae* family. Samples were harvested from Zerehshouran of Takaab, in Azarbaijan Province in the north west of Iran in May. The total phenolic content was determined by Folin–Ciocalte Method, antioxidant activity by 1,1-diphenyl-2-picrylhydrazyl (DPPH) Method and the amount of micronutrients including Fe, Mn, Zn and Cu by Using Atomic Absorption Spectroscopy method. TPC was measured to 43.1 mg/g dry weight, expressed as gallic acid equivalents (GAE). Antioxidant activity or inhibitory activity of samples was evaluated to 79%. The amount of Fe, Mn, Zn and Cu was calculated as 278, 45, 1271 and 19 mg/Kg. The results has shown that *C. macrospermum* (Spreng.) has significant scavenging capacity and TPC. Is could also be a valuable source of micronutrients.

Keywords: Medicinal plants, Micronutrient, Antioxidant, Phenolic content



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Residue Levels and Risk Assessment of Pesticides in Pistachio of Iran

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The pesticide residue levels of pistachio collected from main markets of Iran were investigated. Twenty-six pesticides were analyzed by Liquid Chromatography (LC). An LC-MS/MS method covering 26 multiclass pesticides was investigated. The separation of the compounds from the pistachio was achieved using a short C₁₈ column (50 mm×4.6 mm i.d.) with 1.8µm particle size. The identification and confirmation of the compounds was based on retention time matching along with the presence (and ratio) of two typical MRM transitions. Limits of detection obtained were lower than 3 µgkg⁻¹ for analytes. Recoveries studies performed on pistachio samples spiked at two concentration levels (10 and 100µgkg⁻¹) yielded average recoveries in the range 80–110% for about 77% of analytes. The methods were successfully applied to the analysis of real pistachio samples, revealing the presence of some of the target species in the µgkg⁻¹ range. There was no significant health risk for consumers via pistachio consumption. As compare with national MRLs because these MRLs for pistachio are lower than the values of the highest residues that used in above risk assessment, that, the health hazard due to pesticides residue in pistachio may not be of great concern, therefore Iranian National MRLs validated again and consumer would be sure of safety.

Keywords: Pistachio, Pesticide residue, Multiple Reaction Monitoring (MRM) mode

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Evaluation of the Optimum Temperature for Rhizome Germination of *Tanacetum balsamita* L.

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Tanacetum balsamita L. (balsam herb) is a medicinal plant, perennial rhizomatous herb, with yellow capitulates, which grows in Europe and West Asia. Germination is one of the important part of plant life cycle which can be controlled by hormones and environmental factors such as temperature. To evaluate the optimum temperature for germination, rhizomes of balsam herb were collected from Maragheh, East Azerbaijan Province, Iran. The rhizomes were divided into 5 cm long parts and sowed in pot and incubated in a seed germinator chamber under dark condition. The experiment was done in a completely randomized design with 7 treatments (temperature: 5, 10, 15, 20, 25, 30, 35 °C) and three replications. The number of germinated rhizomes was counted every day and germination percentage and germination rate were calculated after fourteen days. The results showed that there was a significant difference between germination percentage and germination rate among treatments. The maximum percentage of germination (100%) was observed in the temperature of 20 and 25 °C, but no germination was observed at 5, 10 and 35°C temperatures. The maximum rate of germination was observed at 25 °C and the minimum germination rate was observed at 15 °C. In conclusion, the temperature of 25 °C is recommended for rhizome germination of *T. balsamita*.

Keywords: Germination percentage, Germination rate, Rhizome, Medicinal plants

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Effect of Gamma Radiation on the Activity of Poly Phenol Oxidase (PPO) Enzyme in *Thymus vulgaris* L.

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Thyme (*Thymus vulgaris* L.) is a medicinal plant belonging to the Lamiaceae. Essential oil of thyme is a mixture of mostly monoterpenes. The main compounds of this oil are natural terpenoids, thymol and its phenol isomer carvacrol [1]. Gamma rays interact with atoms and molecules to motivate the production of intracellular primary and secondary free oxygen radicals. ROS plays important roles in plant defense responses and accumulation of secondary metabolites such as phenolics, flavonoids, terpenoids, and alkaloids. PPO catalyzing the oxygen-dependent oxidation of phenols to quinines is ubiquitous among angiosperms and is assumed to be active in plant defense against pests and pathogens. The main objectives of this research were to investigate how various low doses of gamma irradiation effects on PPO activity in root and shoot of *T. vulgaris*. Four weeks old Plants irradiated with 3 different levels of gamma ray doses (0, 1, 3, 5 Gy). Root and shoot were harvested after 24h. Protein extract was done by using phosphate buffer. PPO activity was determined according to the method of Gholamnezhad et al using The PPO activity was expressed as a change in absorbance of the reaction mixture at 420 (ΔOD) per min per mg of total protein. The results reveal that treatment with gamma irradiation was effective in PPO activity in root and shoot. In shoots gamma irradiation caused significant decrease in PPO activity comparing with control plant. Although The decrease was statistically similar in 1 and 5 Gy, The greatest effect was observed in 3 Gy. Root form plant which treated by 3Gy showed the highest activity of PPO following by control, 1Gy and 5Gy.

Keywords: Gamma Radiation, Poly Phenol Oxidase (PPO), *Thymus vulgaris* L.

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Complex Forming Affinity of *Ziziphus spina-christi* Total Saponin with Cholesterol

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Saponins are high molecular weight glycosides, consisting of a sugar moiety linked to a triterpene or steroid aglycone. In recent years, they have received considerable attention because of their various biological activities including hepatoprotective, anti-tumor, antimicrobial, and anti-inflammatory activities. It has been shown that oral administration of some saponins may lead to prevention of hypercholesterolemia, the phenomenon which is the result of complex formation with cholesterol. Because of the presence of considerable amounts of saponins, the leaves of *Ziziphus spina-christi* have been traditionally used for washing hair and body. The objective of the present study was to extract and characterize total saponin from *Z. spinachristi* leaves, and also evaluate possible interaction between the saponin and cholesterol. The collected leaves of the plant were identified, dried, powdered and defatted with petroleum ether in a Soxhlet apparatus. The air-dried powder was successively extracted with methanol, n-butanol and diethyl ether. Then foaming power of the extracted *Z. spina-christi* total saponin (ZTS) was measured using the Ross-Miles foam column method and the index of emulsification (E24) of the extracted saponin was also determined. The results were compared to data from *Quillaja saponaria* total saponin (QTS), and sodium lauryl sulfate (SLS) as a potent synthetic surfactant. Using a Du-Nouy tensiometer, critical micelle concentrations (CMCs) of the saponins were determined by measuring surface tension as a function of surfactant concentration. The effect of complex formation with cholesterol was determined by measuring the changes in surface tension and critical micelle concentrations after addition of cholesterol in saponin solutions. The results indicated that ZTS and QTS due to relatively high surface activity were capable of reducing surface tension, and therefore forming complexes with cholesterol. It can be concluded that oral administration of total saponins may cause a reduction in cholesterol absorption through gastrointestinal system.

Keywords: Saponin, *Ziziphus spina-christi*, Surface tension, Cholesterol



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Effect of Methanolic Extract of Medicinal Plants *Myrtus communis* and *Eucalyptus camaldulensis* on Reducing Growth of some Plant Pathogenic Bacteria

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Myrtus communis is a species of flowering plant in the myrtle family Myrtaceae. It is an evergreen shrub native to southern Europe, north Africa, western Asia, Macaronesia, and the Indian Subcontinent, and also cultivated [1]. In order to assess the effect of methanolic extract of two medicinal plants including myrtle and eucalyptus on controlling plant pathogenic bacteria consisting *Xanthomonas perforans*, *Clavibacter michiganensis* subsp. *Michiganensis*, *Xanthomonas euvesicatoria* and *Curtobacterium flaccumfaciens*, the shoots of the plants were powdered by blender. Five ml methanol 70% (Merck Co.) was added to 1 gr of the dried powder. The samples were shaken in 200 rpm for 18 h and then were centrifuged in 4000 rpm for 15 min and the supernatant was filtered. Finally, the extracts were stored at -20 °C. The mentioned bacteria were enriched on Nutrient broth medium and for purification were cultured on Nutrient agar medium at 27 °C for 24 h. The purified bacteria suspension was read for experiment and Disk diffusion assay was performed to evaluate antibacterial activity of the plant extracts. The bacteria were cultured on nutrient agar sucrose medium as lawn growing. Six-mm dried disks were smeared with 200, 300 and 400 mg/ml plant extract and were placed on the desired medium. Distilled water was used as negative control and four replications were considered for the experiment. The desired petri dishes were incubated at 27 °C for 24 h. Inhibitory zone (IZ) of *Clavibacter michiganensis* subsp. *Michiganensis* smeared with 400 mg/ml myrtle extract was 1.12 cm (LSD, %50), which it had significant difference with other doses of myrtle and all doses of eucalyptus. *Xanthomonas perforans* controlled by 400 mg/ml myrtle extract with IZ=1.12 cm so that this treatment had significant difference with all treatments except 300 mg/ml myrtle extract. The highest IZ of *Curtobacterium flaccumfaciens* (1.00 cm) was observed in application of 300 mg/ml myrtle extract that it had significant difference with all treatments. *Xanthomonas euvesicatoria* controlled by 400 mg/ml myrtle extract so that this treatment had significant difference with all treatments except 300 and 400 mg/ml eucalyptus extracts. According to the results, *Myrtus communis* extract at concentration of 400 mg/ml had more inhibitory effect on the bacteria tested than *Eucalyptus camaldulensis*.

Keywords: Methanolic extract, *Myrtus communis*, *Eucalyptus camaldulensis*

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Cloning and Transferring White Spot Syndrome virus VP28 Gene into *Chlorella vulgaris* as a Recombinant Vaccine candidate in Aquaculture

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Despite the extensive control, White spot syndrome virus (WSSV) is still a major health problem and one of the most serious viral diseases affecting the cultured shrimp worldwide. So that a cost-effective method for the detection and prevention of this disease is essential. Microalgae have unique advantages, including a high growth rate, ease of cultivation, low growth costs and metabolic pathways that are similar to those of higher plants, leading to the same post-transcriptional and post-translational modifications that occur in higher plants [1]. Indeed, as photoautotrophic sunlight-driven cell factories, microalgae provide an efficient means of converting solar energy into biomass, producing fatty acids, lipids, vitamins, carbohydrates, antibiotics, antioxidants and proteins. In this study, the VP28 coding sequence from a WSSV isolate (Collected from Abadan region) transferred to Razi Vaccine & Serum Research Institute, Arak branch, was extracted, proliferated, cloned, sequenced and analyzed bioinformatically. The prime results shown the VP28 (615bp) codes 204 amino acids with 13 beta strands and 2 Alfa helix in structure. The VP28 was then inserted to a pCAMBIA1304 vector and transformed into a *Chlorella vulgaris* algae to express and produce recombinant VP28 protein as an immunogenic introducing shrimp immune system against white spot syndrome. The recombinant algae was extracted for plasmid and verified on agarose gel using PCR method and Plasmid digestion. Immunogenicity validation of the recombinant algae is under processing.

Keywords: WSSV, VP28, *Chlorella vulgaris*, *Microalgae*

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Isolation, Identification and Measurement in Available Compounds of *Ocimum Basilicum* L. Before and After Hormonotherapy by GA₃ (Plants phytohormones) by Gas Chromatography and Mass Spectrometry (GC/MS)

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The main objective of this study was to examine the influence of different concentrations of GA₃ hormone (Gibberellic acid) on the nature of the Essential Oil obtained from the *Ocimum Basilicum* L. using the spray method. In this project at first we prepared the concentrations 100, 50, 25 ppb for GA₃ hormone in the laboratory, the leaves of *Ocimum Basilicum* L. were sprayed on the plants aerial body separately at certain hours, we utilized ultra-pure distilled water as control, which was sprayed on the plant leaves at a specific time as well, then, we collected the treated plant after a rest period and dried it in the dark and in the process of air. Afterwards, we weighted the dried plant and took its essential oil separately by Clevenger apparatus. In order to identify and study the constituents, we injected the essential oil into the device "GC / MS." The results suggest that the hormone GA₃ leads to increase the main ingredients and increase in available compounds found in the essential oil reduce the components with smaller percentage within the essential oil. and they retain the major constituents, in addition, this hormone created the combinations, although in low amount, which the combinations cause the medical features of the plant and increasing the quality of Essential Oil.

Keywords: *Ocimum Basilicum* L., hormone therapy, Essential Oil, Clevenger

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The Hydro-alcoholic Extract of *Trachyspermum ammi* L. Sprague Attenuated Stress-Induced Irritable Bowel Syndrome in Animal Model

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Trachyspermum ammi (*T. ammi*) used for the treatment of various digestive disorders with considerable therapeutic effects such as anticholinergic and anti-oxidant activities [1]. This study aimed to evaluate the efficacy of the hydro-alcoholic extract of the fruits of *T. ammi* in an experimental model of irritable bowel syndrome (IBS). The rats were classified into seven groups, including sham (no stress), control (saline recipients), loperamide and fluoxetine (10 mg/kg/day) (positive controls), and the plant groups at the doses of 150, 250 and 500 mg/kg/day for 5 days under restrictive stress, 2 days before receiving the treatment. All medicines were given as gavage. The effect of the plant extract on gastric emptying and the transit of the small intestine was evaluated [2-3]. The levels of the inflammatory and oxidative related biomarkers, tumor necrosis factor alpha (TNF- α) and lipid peroxidation (LPO), also the myeloperoxidase (MPO) activity were measured. The gastric emptying and the transit of the small intestine were significantly reduced in all *T. ammi* treated groups, and no significant difference was observed at the dose of 500 mg/kg/day comparing with the loperamide group. The level of TNF- α and MPO activity decreased in the treatment groups compared with the control, and the LPO level was decreased at the concentration of 250 and 500 mg/kg/day compared with the control. The antioxidant levels significantly increased in the rats treated with *T. ammi* at the doses of 250 and 500 mg/kg/day. The severity of stress-induced IBS was reduced in a dose-dependent manner by the hydro-alcoholic extract of the fruits of *T. ammi*, confirming the effectiveness of this plant in the management of IBS.

Keywords: Irritable bowel syndrome (IBS), *Trachyspermum ammi*, Tumor necrosis

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The Study of Unsaturated Fatty Acids and Phenolic Component in Iranian Borage (*Echium amoenum*) in Different Accessions

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Human body is not able to produce some of the essential fatty acids and they can only be provided from food intake and supplements. Amongst them, omega-3 or alpha-linolenic acid (ALA), is one of the most crucial. Iranian borage is a potential source of many kinds of worthy fatty acids. The present study's focus is on the investigation of the phytochemical profile and the seed oil content of an endemic type of borage. In this paper, analysis of phytochemicals and seed oil content of *Echium amoenum*, in different habitats on Guilan has been investigated. Seeds were dried and transported to the laboratory for subsequent analysis. Regression model has been utilized to analyze fatty acids whereas in case of calculating simple correlation coefficients between measured traits, Pearson's correlation was applied. Fatty acids were analyzed by using regression model while Mean comparison was performed using LSD test at 5% probability levels. The highest proportions of phytochemicals were observed in highest altitude. Furthermore, gas chromatography (GC) was used to identify and also quantify the eleven different types of fatty acids. The results of analysis shown that 36% of seed oils contained alpha-linolenic acid (ALA) (39.99%), gamma linoleic acid (GLA) (20.86%), linolenic acid (LA) (20%) and oleic acid (OA) (15.36%). The analysis proof that Iranian borage contains around 90% unsaturated fatty acids, therefore it has valuable seed oil composition. Moreover, Peroxide number in the sample was 1.28, which indicates the appropriate method of extraction, storage and oil quality.

Keywords: vagal Omega3, Iranian borage, Gas Chromatography, Phytochemicals, Oil

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Comparison of Salicylic Acid Content in Two Populations of *Salix purpurea* and two Populations of *S. triandra*

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The bark and leaves of the willow trees contain salicylic acid and its derivatives which belong to phenolic compounds. Basically, the salicylic acid is derived from the word Salyks, the scientific name of the willow tree. Traditionally these compounds have been used as an analgesic, antipyretic and anti-inflammatory products. Although, in modern pharmacy synthetic salicylic acid is used today, but with the growing trend towards traditional medicine, these compounds have been considered for use in herbal medicine. Furthermore, salicylic acid, which is known as a plant growth regulator, is involved in many physiological processes (1). In this study, the leaves of two populations of *Salix purpurea* and two populations of *S. triandra* originated from different localities, were collected each of them in three replications in May 2013. The species and populations included *S. purpurea* (Markazi and Uromia populations) and *S. triandra* (Markazi & Uromia populations). The samples were dried at room temperature and ground. Then salicylic acid contents were extracted. The extraction was performed with Soxhlet apparatus. The extracts were analyzed with HPLC. The results showed that the amounts of salicylic acid in *S. purpurea* species was much more than *S. triandra* species, so that the populations of Markazi & Uromia *S. purpurea* had 1391 and 909 p.p.m salicylic acid content respectively, while Markazi & Uromia *S. triandra* populations had 62 and 24 p.p.m salicylic acid content respectively. It seems that the genotype effects on bioactive compounds more than the habitat.

Keywords: Salicylic acid, Willow, HPLC

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Biotechnological Production of Secondary Metabolites

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This book presents recent advances in biotechnology of medicinal plants for both undergrad and research students. Production of secondary metabolites and various methods for increasing their production have been introduced and discussed. Each chapter has been devoted to a specific type of metabolites and sheds light on the key elements that have an influence on the biosynthetic pathways. Updated literature and the results of the authors' experiences have been brought together to explain the advantages of the new techniques and the challenges ahead in this field. In the translation of the book, the English and Latin words and expressions have been substituted by well-known Farsi equivalents so that the ideas of the text are fluently conveyed to the Farsi readers. A chapter has been added to the beginning of the book which reviews the basic concepts necessary for better understanding of the chemistry and biochemistry of plant metabolites. Chemical structures of the metabolites have been reproduced in a lucid manner and descriptive notes are mentioned to make the text more comprehensible. While the full text is in Farsi alphabet, Latin names, and expressions have come at the footnotes of each page. This translation, in a reasonable number of chapters, provides Farsi speakers students and researchers with fundamental theoretical and practical information about the development of modern techniques of biotechnology for production of secondary metabolites of several medicinal plants.

Effects of Nutrients Spraying on Saffron Stigma Quality in a One-year-old Field

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Saffron medicinal plant has more than 150 volatile and aromatic compounds; main of them are crocin, picrocrocin and safranal. Saffron stigma quality is affected by many agronomic factors such as fertilization. But there are low scientific reports on the role of foliar nutrition on qualitative traits of stigma. Accordingly, in this study the effect of nutrient spraying (using a chemical fertilizer, containing 12% N, 8% P₂O₅, 4% K₂O, 2000 ppm Fe, 1000 ppm Zn, 1000 ppm Mn and 500 ppm Cu) was evaluated on stigma quality. The study was performed during 2015-16 based on a randomized complete block design, with three replications in a one-year-old field, in Sarayan faculty of agriculture, (University of Birjand), Iran. Corms were planted in early autumn 2015, nutrient spraying was applied two times during March 2016 and flower harvesting was done during autumn 2016. Stigmas were dried at shade and room temperature, then, their crocin, picrocrocin and safranal content was determined in February 2018, based on Iranian national standard method (No 259-2). Results showed that foliar nutrition significantly increased the content of crocin in stigma, while there was no-significant different between two experimental treatments in terms of safranal and picrocrocin content (Table 1). It has been reported that foliar nutrient application is a good strategy for increasing corms reserves for the next flowering period. Improving replacement corms growth will result in better flowering and quality in the coming flowering season.

Keywords: Crocin, Foliar nutrition, Medicinal plant, Picrocrocin, Safranal

Table 1. effect of foliar application of nutrients on stigma quality in saffron

Treatment	Crocin ($\lambda_{\frac{1\%}{1cm}}$)	Picrocrocin ($\lambda_{\frac{1\%}{1cm}}$)	Safranal ($\lambda_{\frac{1\%}{1cm}}$)
Foliar nutrition	196.1 ^a	96.9 ^a	62.7 ^a
No-foliar nutrition	162.6 ^b	94.5 ^a	58.3 ^a
Iranian standard	150-220	70-85	20-50

In each column means followed by the same letters aren't statistically different using LSD test at 5% level of probability.

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Determination of Total Phenolic and Flavonoid Content of Almond Green Hulls and Its Antioxidant Activity

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Almond (Al) (*Prunus dulcis*, belongs to the family *Rosaceae*) green hulls are waste materials that are generated annually in the almond harvest and recently have received increasing attentions owing to their antioxidant properties. The phenolic and flavonoids compounds were extracted from almond hulls under reflux condition at 50 °C using acetone as a solvent. Total phenolic and flavonoid content were 81.0 mg GAEs/g extract and 55 mg catechin/g extract which were determined by Folin–Ciocalteu colorimetric method and the aluminium chloride colorimetric method, respectively. The antioxidant property of extract was evaluated by DPPH assay. Almond hull extract demonstrated a concentration dependent scavenging activity by quenching DPPH radicals with SC₅₀ value of 25 µg/ml which was compared with ascorbic acid as positive control (SC₅₀ 0.03 µg/ml). In order to determine the type of phenol and flavonoid compounds, gas chromatography/mass spectroscopy (GC/MS) analysis was performed. According to the results obtained from GC/MS analysis, almond extract contains ferulic acid, p-coumaric acid, quercetin, mequinol, sinapinic acid, catechin and homovanillic acid. Regarding the high phenolic content of almond hull extract and its great antioxidant property it could be used for treating of oxidative stress-related diseases.

Keywords: Almond hull, DPPH, GC/MS, Antioxidant

Repellent Activity of some Medicinal Plant Extracts on *Spodoptera exigua*

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One of the important effects of plants extracts and essential oils on insect's behaviour is repellent activity that has a potential for utilization in pest management programs [1]. In this study, polar and non-polar extracts of some medicinal plants including *Ageratum houstonianum* (Mill.), *Xanthium strumarium* (L.), *Achillea millefolium*, *Marrubium vulgare*, *Ranunculus repens*, *Delphinium linearilobum* and *Cupressus arizonica* were prepared using maceration method. Choice test method was conducted for comparing repellent activity. A standard rectangle Plexiglas (27×11 cm) was used for tests. Artificial diet on the piece of filter paper containing 500 microliters of each extract in three concentrations (0.05, 0.025 and 0.125 mg/ml) were replaced in opposite position with non-treated artificial diet as control. Presence of 2nd larval instars of *Spodoptera exigua* around the test and control area were recorded each 1,6,24 and 48 hrs. The results revealed that with increasing the concentration of extracts repellent activity increased. The hexane extract of *A. houstonianum* showed non repellent activity. Acetone extract of *X. strumarium* completely repelled the insects specially in concentration of 0.05 mg/ml. Hexane extract of *X. strumarium* and ethyl acetate extract of *M. vulgare* showed 88.88 and 90.75% repellent activity after 48 hours respectively. Ethyl acetate extract of *A. millefolium* and ethanol extract of *D. linearilobum* showed 75 and 80.5% repellency against 2nd larval instars of *S. exiguae* respectively. In overall we think that medicinal plants with affecting the behaviour of insects could use in IPM programs in addition with their advantage of safety in use on environment.

Keywords: Hexane, Ethyl acetate, *Marrubium vulgare*, *Xanthium strumarium*

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Evaluation of, Genetic Variation, Compatibility, Essential Oil Content and Selection of the most Suitable Thyme Germplasm in the Species *Thymus daenensis*.

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In order to study the genetic diversity, adaptation and introduction of the most suitable germplasm, seeds of 10 accessions of *Th. daenensis* were evaluated from different regions of the Iran. For this purpose, seed purity, germination and seed viability were determined. The seeds were grown in Jiffy pots in greenhouses. The achieved *Th. daenensis* plants were grown at a distance of 75 centimeters and were spaced 1 meter from each other at the furrows in Saeed Abad Station of Tabriz. The experimental treatments were arranged as randomized complete block design with two replications. The irrigation regimes consisted of flood irrigation method. The highest and lowest percentage of plant establishment were allocated to the central province with 80% and the Lorestan Aleshtar province with 13%, respectively. The plants height varied between 8-30 cm, and maximum plant height were observed in Isfahan Daran samples and the minimum plant height belonged to Frieden and Shahmirzad accessions. In terms of essential oil content, the Markazi province and Khoramabad provinces were 2.41 and 1.775 percent receptively and were higher than the others. The fresh weight of the Daran samples was 3455 kg / ha and its dry weight was 1560 kg / ha and were higher than the others. Essential oil content in samples of Markazi, Fereydoun Shahr and Khoramabad were higher than other samples. The ward grouping showed that the samples do not follow the ecological conditions or the altitude of the habitats (climatic and geographical). Simple correlation coefficients between traits were observed in this species and showed that the percentage of essential oil had no significant correlation with any of the traits. The results show that *Th. daenensis* from a wide variety of morphological traits, phenology, physiology, and essential oil production. The top accessions introduced from the aspects of different characteristics can be selected according to the intended purpose, propagation and cultivation of actions could be taken.

Keywords: Thyme, Yield, Essential Oil, Genetic Diversity, Compatibility

Comparison of Density and Length of Stomata in Five Accessions in *Thymus kotschyanus*

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Stomata are small structures that exist in the epidermis of all aerial organs of plants, especially on the leaves and the stems, and control the exchange of the gases (carbon dioxide, oxygen, and vapor) with the atmosphere. Stomata are essential for photosynthesis and their function determines plants yield. Due to the special importance of their density and length, the leaves of five accessions of *Thymus kotschyanus* were studied in three replications. For the preparation of the epidermis, the collected samples were placed in alcohol 70% for four days. First, the trichomes of central area of the leaf, in the distilled water in a plate, were taken with a pence, until the surface of the leaf was seen without trichomes. To examine the lower epidermis, the upper epidermis was located in the field of vision, and the upper epidermis and mesophyll cells were isolated from the lower epidermis. Conversely, the lower epidermis was exposed to the upper epidermis. To view the stomata, a drop of distilled water was placed on the slide and then the epidermis was placed on the slide with a pencil or brush. The lamella was placed on specimen with a 45 degree angle. The sample was examined for the presence or absence of the stomata, stomatal type as well as length and density of them per unit area under the microscope. The results showed that the habitats had a significant difference in the density and the length of the stomata. On the lower surface, Kurdistan region with 202, and Qazvin region with 111, per unit area (mm²), had the highest and lowest density of stomata respectively, while on the upper surface, Kurdistan region had the highest number of the stomata, 156, and Kerman region with 72, had the lowest density. In the case of the length of the stomata, on the lower surface, the maximum length was 28 μ m, Qazvin region, and lowest length was 23 μ m, related to the West Azerbaijan region. On the upper surface, Zanjan with 27 and Kurdistan with 23 μ m had the highest and lowest stomatal length respectively.

Keywords: Stomata, Epiderm, *Thymus kotschyanus*



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Herbal Medicines in Aquaculture

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Nowadays, the uses of medicinal plants as health promoter are increasing. One of the uses of medicinal plants is such as immune stimulators. The most wellknown plants that use for this aim is Echinacea purpurea due to its effect on immune system so can protect the body against infections. We can formulated the herbal medicine for aquatic that including the Echinacea extract and we try it in clinical trial. In this trial a number of fingerlings of rainbow trout (*Oncorhynchus mykiss*) (n=1200) with a mean starting weight of 20 ± 2 g were cultured in the fish farming pools with a routine diet. The fishes were divided into two experimental groups, each was planned in triplicate. A group was received a diet containing a herbal treatment as following: standard diet/feed was mixed with immunofin at a ratio of 1.5 %). Also, there was a control group which their diet was not included with the herbal drug (negative control). The fishes were kept and cultured for 60 days. At the end of the study, the growth factors, immunological tests including measurements of serum level of lysozyme and bacteria killing potency of serum were measured. The results showed that the fishes treated with Immunofin (Echinacea) have gained a significantly better growth performance compared to the control group. Also, the level of lysozyme activity and serum bactericidal/killing potency were significantly increased in Immunofin-treated group in comparison to non-treated control group ($P < 0.05$).

Keywords: Aquaculture, Immunostimulator, Echinacea purpurea, Herbal medicine

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Effect of Drought Stress and Nitric Oxide (NO) on Some Yield Characteristics of Geranium (*Pelargonium graveolens* L heritier)

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Nitric oxide (NO) in signal transduction and biological and abiotic stress response that lead plants to inducing drought resistance [1]. In this study, to investigate the role of Nitric oxide on essential oil yield and vegetative structure of geranium plant, a factorial experiment with two factors, in A randomized complete block design was carried out at the greenhouse of the Horticultural Sciences Department of Zanjan University. The first treatment including drought stress in three levels of irrigation in terms of (control = 100% field capacity), (mild stress = 70% field capacity capacity) and (severe stress = 55% field capacity) in three replications and NO by sodium nitroprusside treatments designed at three levels (0=distilled water, 50 and 100 μ M). The results showed that the drought stress decreased yield but increased the essential oil, while Nitric oxide treatment increased plant vegetative and essential oil yields, indicating increased drought tolerance as a result of Nitric oxide application, so that the plants treated with 50 μ M Nitric oxide and mild drought= 70% field capacity capacity stress had the greatest effect on the balanced growth of the essential oil and the plant's vegetative yield. Use of Nitric oxide under mild and severe stress conditions improved some growth parameters and essential oil contents in Geranium.

Keywords: Essential Oil, Drought Stress, Sodium Nitroprusside, Field Capacity

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The Effects of Ethyl Acetate Extract of *Achillea millefolium* on Some Physiological Indexes of *Spodoptera exigua*

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Yarrow (*Achillea millefolium*) is a widely distributed medicinal plant throughout the world [1]. In this study we used ethyl acetate extract of foliage and flowers of this plant. Extraction carried out by maceration method. For solvent recovery rotary evaporator with 70°C and 120 RPM were used. Different studies showed that insect's growth and assimilation, changes with any disruption in digestive system of them [2]. In this study physiological indexes of nutrition, in the control and treated insects were compared. 5th larval instar of *S. exigua* feed with 0.025 gr/ml of extract incorporated in artificial diet. After 2 days weight gained by larva, ingested diet, excreta weight were recorded. Using these data some physiological indexes such as ECD, ECI, AD, CI, GR, CR and AF were calculated and compared with control treatment. Gross growth efficiency (ECD) decreased from 8.22% in control to 4.51 in extract treatments. Also net growth efficiency (ECI) decreased from 9.33% in control to 4.97 in treatment. The amount of approximate digestibility (AD) had non-significant differences in comparing with control. Consumption rate (CI) and growth rate decreased in comparing with control (0.54 and 0.025 in treatments vs. 0.6 and .053 in controls). Antifeedant index was positive (7.60) that indicate the decrease in efficiency of digestive system of insects ingested extract in their diet. The results indicates that ethyl acetate extract of *A. millefolium* affected important nutritional dependent physiological indexes and decreased the growth rate of *S. exigua* larva.

Keywords: Antifeedant, Approximate digestibility, Growth efficiency, Yarrow

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Comparison in Chemical Compositions of the Essential Oil from Leaves of *Lippia citriodora* Grown in Kashan, Iran on non-Polar, and Polar Columns by GC-FID

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Lemon verbena (*Aloysia citriodora*) is cultivated mainly due to the lemon-like aroma emitted from its leaves, which are utilized for the preparation of herbal tea reputed to have antispasmodic, antipyretic, sedative and digestive properties. The aim of the study was to investigate the content and chemical composition of essential oil of lemon verbena on non-polar, and polar columns by GC-FID [1, 2, 3, 4]. The qualitative analysis was focused on compounds in the essential oil of which seven compounds were identified as the major ones, and six compounds as the minor ones. The percentage of the main, and minor components on non-polar, and polar columns respectively were limonene (11.81, 11.80), 1,8-cineole (5.11, 5.19), neral (12.97, 13.94), geranial (16.88, 18.99), alpha-curcumene (4.50, 5.56), spathulenol (5.72, 5.82), caryophyllene oxide (7.99, 6.75), alpha-pinene (0.48, 0.51), sabinene (1.21, 0.86), 6-methyl-5-heptene-2-one (1.26, 1.32), myrcene (0.17, 0.15), para-cymene (0.10, 0.08), and alpha-terpineol (1.63, 1.38).

Keywords: Leaf essential oil, *Aloysia citriodora*, non-polar and polar columns, GC-FID

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Quantitative and Qualitative Study of Berberine Content in Root and Fruit of *Berberis vulgaris* for Industrial Scale Production

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Berberis has 500 species of shrubs distributed in the mountainous regions of the northern hemisphere, and in Iran there are 4 species of this shrub species. *Berberis vulgaris* is an acanaceous shrub with a height of 4 meters, with brown, red or yellowish leaves. This plant grows at above 1000 m above sea level, and is resistant to cold and drought. The species is widely distributed in Iran and is observed in mountainous regions of Azarbaijan, Mazandaran, Tehran, Khorasan, Arak and other areas. Root, stem and root skin, flower leaves and fruit are used as a drug. The most important alkaloids and compounds identified in the bark of branches, roots and fruits of this plant are berbamine, brolicin, oxyaconthine, bervulcine, berberrubine, tannins, tartaric acid, citric acid, Malic acid and some hydrocarbons. In this study, different organs of the plant were used to determine the berberine content in order to purification the berberine, 200 gr of dried fruit barberry and 200 gr of dried root, each with 2 L of alcohol solution %70, 60 C and 3 hours, were extracted. After filtration, the berberine content was determined by HPLC and the results showed that content of fruit and root were 8.75 and 0.16 mg kg⁻¹ respectively. Therefore, the root parts of plant are recommended for production on the industrial scale, for formulation in human, animal and poultry products.

Keywords: *Berberis vulgaris*, Berberine, Alkaloids, HPLC

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Antimicrobial Activities of the Essential Oil of *Achillea millefolium* L. in Iran

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Achillea millefolium L. is belongs to *Asteracea* family. The extract of this plant has antibacterial effects and can be used as an antimicrobial agent in the treatment of infections. *Achillea millefolium* L contains alkaloids, saponins and phenolic compounds such as flavonoids and phenolcarbonics. Anti-inflammatory, antimicrobial, cytotoxic and antioxidant properties of this plant are attributed to flavonoids. On the other hand, the technology of using nanoparticles is based on specific properties, such as the size and morphology of these particles has provided a new and valuable new feature. In terms of history, silver has an antiseptic effect. For this purpose, the effect of induction of silver nanoparticles on *Achillea millefolium* plant was investigated in three (0, 5, 20 and 60 ppm) concentrations at 48 hours intervals. The results showed that the silver nanoparticles, by changing the composition of essential oils, the antibacterial properties of the essential oils are increased double. The essential oil of control and treated *Achillea millefolium* with different concentrations of silver nanoparticles has a negative effect on growth of gram negative bacteria than positive. The zone of the lack of growth did not show any inhibitory effect on *Escherichia coli* bacteria and showed little effect on *Pseudomonas aeruginosa*. But in the case of *Bacillus subtilis* and *Staphylococcus aureus* bacteria had an inhibitory effect.

Keywords: *Achillea millefolium*, Secondary metabolites, Silver nanoparticles

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Antibiofilm Activity of Grape Seed Extract Against Gram Negative Bacterial Pathogens

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Biofilm producer Gram negative bacteria are the major public health problem. *In vitro* studies have described that the microbial biofilms are significantly more resistant to antimicrobial agents than their planktonic growth forms [1]. Current Investigation was performed to study the antibiofilm effect of Grape seed extract (GSE) on biofilm forming *Enterobacteriaceae*, *Pseudomonas aeruginosa* and *Acinetobacter baumannii* isolates. Thirty bacterial isolates were collected from clinical specimens. The bacterial identification was performed by the standard microbiological methods. The antimicrobial resistance pattern was determined by the Disk diffusion agar. After GSE extraction, the total poly phenolic content of GSE was detected by Folin Ciocalteu method. Detection of biofilm formation was performed by the microplate assay and crystal violet dye. For study of antibiofilm activity of GSE, biofilm inhibitory concentration (BIC) were detected previously described method. Different incidence of resistance was observed to different antibiotics. Mean BIC of GSE were 2000µg/mL for *Enterobacteriaceae* and 4000µg/mL for *Pseudomonas aeruginosa* after 72h incubation. GSE did not show detectable antibiofilm effects after 12h and 24h. A significant antibiofilm activity was not observed against *Acinetobacter baumannii*. The significant antibiofilm effects of GSE against *Enterobacteriaceae* and *Pseudomonas aeruginosa* make it a promising option for the development a new strategy for treatment of biofilm related infections. However, further studies should be clarified to elements in the GSE due to the special pharmacodynamic effect. The association between the antibiofilm activity of the GSE with the specific bacterial targets should be more investigate and the primary mechanisms of antibacterial activity, synergies and antagonisms effects with others antimicrobial component should be studied.

Keywords: Grape Seed Effect, Gram negative bacteria, Biofilms

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Antibiofilm Activity of Grape Seed Extract Against Methicillin Resistant *Staphylococcus aureus*

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Biofilm forming methicillin resistant *Staphylococcus aureus* (MRSA) are the virulent bacterial pathogens. MRSA can cause different type of infections particularly in the hospital settings. The ability of biofilm formation is an important virulence factor that influence on the pathogenicity and antimicrobial resistance [1]. *In vitro* studies have demonstrated that the MRSA biofilms are more resistant to antibiotics than their planktonic forms. Present study was carried to investigation the antibiofilm and antibacterial effect of Grape seed extract (GSE) MRSA isolates. Forty MRSA isolates were obtained from clinical samples. The clinical specimens were cultured on the Sheep Blood Agar plates. The bacterial colonies were identified by the microscopic characteristic and the standard microbiological process. The MRSA was screened by the cefoxitin (30 µg) disk and disk diffusion agar according to Clinical & Laboratory Standards Institute (CLSI). Biofilm forming isolates were screened by the microplate assay and crystal violet dye. The total poly phenolic content of GSE was detected by Folin Ciocalteu method. Antibacterial and antibiofilm effects of GSE were determined by the minimum inhibitory concentrations (MIC) and biofilm inhibitory concentration (BIC) as previously described. The MIC₅₀ and BIC₅₀ of GSE were 500µg/mL and 800 µg/mL, respectively against MRSA. The significant antibacterial and antibiofilm activity make GSE a promising option for the development a new strategy against MRSA. The mechanisms of antibiofilm and antimicrobial effect of the GSE and specific bacterial targets of GSE should be more investigate. GSE toxicity issue should be study *in vitro* and *in vivo* conditions.

Keywords: Grape Seed Effect, MRSA, Biofilms

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Effect of Salicylic Acid on Drought Stress Tolerance Improvement of Peppermint (*Mentha piperita* L.) in Greenhouse Conditions

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Peppermint (*Mentha piperita* L.), with numerous medicinal properties is one of the most important plant from Lamiaceae family that its essential oils are widely used in pharmaceutical, food, cosmetic and sanitary industries. Abiotic stresses, especially drought stress are one of the most important problems in arid and semi-arid regions. Application of salicylic acid (SA) as a phytohormone has been increased due to resistance to stresses such as drought. In order to evaluate the effects of drought stress and salicylic acid on peppermint morphological characteristics, an experiment was conducted as factorial based on completely randomized design with four replications in medicinal plants greenhouse of Agricultural and Natural Resources College of Arak University in 2017. Studied factors included drought stress (35%, 65%, and 95%) and salicylic acid (0, 50 mg/l, 100 mg/l and 150 mg/l). Results showed that drought stress, salicylic acid and their interaction had a significant effect on some traits. Based on the results, salicylic acid improved most morphological traits including main stem height, leaf length and width, internode length, fresh and dry weight of shoot by 14, 57, 71, 40, 61, 52 percent in comparison to control, respectively. Drought stress also had an increasing effect on traits such as fresh and dry weight of root and root volume. The most suitable result was obtained in interaction of 100 mg/l SA with 65% stress with the highest percentage (56.6%) and yield (0.17) of essential oil. According to the results, it seems that using salicylic acid can increase the resistance of peppermint to drought stress by increasing the growth and physiological characteristics.

Keywords: Salicylic acid, Drought stress, *Mentha piperita* L., Essential oil.

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Identification of Medicinal Plants in Siyosang Region, Mazandaran Province, Iran.

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This research is aimed at identification of medicinal plants in the Siyosang region. This research was carried out to introduce important useful plants and their medicinal characteristics in Siyosang indigenous region. Identification of plant is a very important process in usage of plants as a medicines. In this research we identified medicinal plants distributed in the Siyosang region. The correct and scientific identification of medicinal plants is very valuable, and prevents mistakes and misuse. The study area is located in Mazandaran province with an area of about 16358 hectares. The geographical area of this region is: longitude: 51° 51' 59" latitude: 36° 21' 26" N, longitude: 51° 47' 40" latitude: 36° 12' 5" S, longitude: 51° 47' 21" latitude: 36° 17' 24" W longitude: 51° 58' 14" latitude: 36° 18' 4" E. The boundary condition of the region: from the south of Baladeh, north of the Kalej village, east of the Mirkhamand village and west of the Varazan village. The lowest part of the area is 1900 m and its highest elevation is 3400 m above sea level. The average temperature is 10.5 ° C, the mean precipitation is 730 mm and the average humidity is 58%. The collection of plants in this area was made during 2018-2019. In the studies conducted in this paper, a number of local herbs are used by local people for their medicinal properties. Finally, there is a list of medicinal plants available to the general public for proper use. The medicinal species of this study are about 50 species [1]; here are the most important of their genera; the most common herbs belongs to family Lamiaceae: taxa *Marrubium*, *Dracocephalum*, *Mentha langifolium*, *Salvia*, *Thymus*, *Ziziphora*. Of the Asteraceae family: six genera *Artemisia*, *Eupatorium*. The conventional ethnomedicinal plants were mostly used as antipyretic, antiarrheal, antiinflammatory, laxative, blood purifiers and for toothache. For astringent ailments used from plants: *Gallium*, *Remux*, *Polygonum*, *Litromium*, *Lamim*, *Anola*. Antispasmodic plants include: *Galium*, *Mentha*. Kidney Stone Remedy Plant: *Polygonum*. Anti-inflammatory plants include: *Althea*, *Dracocephalum*, *Tucrium*, *Linaria*, *Lactuca*. Urinating plants include: *Linum*, *Inula*, *Malva*. toothache plant: *Thymus*. The plant samples are stored at Tehran herbarium (Kharazmi University).

Keywords: Siyosang, Medicinal Plants, Mazandaran

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Methyl Jasmonate Potentiated Pyruvic Acid Effect on the Production of Secondary Metabolites in King of Bitters Plant *Andrographis paniculata* Cell Culture

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Andrographis paniculata is the most important herb of the Acanthaceae family. It is used in the treatment of many diseases, including AIDS, hepatitis and cardiovascular disease for centuries in Asia [1]. The use of elicitors and precursors as a means of increasing the production of secondary metabolites in suspensions today is of great interest to researchers [2]. Therefore, in this study, the effect of methyl jasmonate as an elicitor and pyruvic acid as a precursor on *Andrographis paniculata* cell suspension culture was investigated. The experiment was conducted as a factorial experiment in a completely randomized design with 3 replications. Pyruvic acid was added to cell cultures at 4 concentrations (0, 0.01, 0.1 and 1 mM) and methyl jasmonate also at two concentrations (0 and 100 μM). Untreated cultures were considered as control. The results showed that the effect of methyl jasmonate and pyruvic acid and their interaction on growth, phenolics, flavonoids, and anthocyanins content, antioxidant capacity, phenylalanine ammonia lyase enzyme activity and andrographolide production was significant. By increasing concentration of methyl jasmonate and pyruvic acid with the exception of cell growth the other parameters increased significantly. A synergism mode was observed under the interaction effect of methyl jasmonate and pyruvic acid on parameters such as antioxidant capacity, phenylalanine ammonia lyase enzyme activity and andrographolide production compared to individual treatments. The highest amount of andrographolide (34.56 mg/g dry weight) was achieved at cultures concurrently treated with 1 mM of pyruvic acid and 100 μM of methyl jasmonate which was about 3.4, 1.5 and 13.8 times that of the cultures treated with pyruvic acid, methyl jasmonate and control cultures respectively.

Keywords: *Andrographis paniculata* L.; Secondary metabolite; Elicitation; Cell culture

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Effect of Pyruvic Acid as a Precursor on the Production of Andrographolide in *Andrographis paniculata* Cell Suspension Culture

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Andrographolide is an important diterpene extracted from *Andrographis paniculata* and has properties such as the treatment of AIDS, cancer of the liver and cardiovascular diseases [1]. The synthesis of phytochemicals in undifferentiated plant cells under *in vitro* conditions can be further induced with elicitors or by feeding precursors. For this the effect of pyruvic acid to increase secondary metabolites in tissue culture of *Andrographis paniculata* was investigated. This experiment was carried out in a completely randomized design with three replications. Pyruvic acid was added to cell suspension cultures at four concentrations (0, 0.01, 0.1 and 1 mM). The parameters measured were growth, andrographolide production, antioxidant potential, phenolics content, catalase, peroxidase, polyphenol oxidase, and phenylalanine ammonia lyase enzymes activity. The results showed that pyruvic acid with the exception of cell growth had a significant effect on the production of andrographolide, antioxidant potential, phenolics content and activity of catalase, peroxidase, polyphenol oxidase and phenylalanine ammonia lyase enzymes. By increasing concentration of pyruvic acid in culture medium with the exception of cell growth the other parameters increased significantly. The highest amount of andrographolide (9.65 mg/g dry weight) was obtained at cultures treated with 1 mM of pyruvic acid, which was about 4 times that of the control cultures. According to the results, the pyruvic acid used by the cells has been involved in increasing the production of metabolites such as andrographolide.

Keywords: *Andrographis paniculata* L., Andrographolide, Precursor, Pyruvic acid

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Effect of Gamma Radiation on Production of Anticancer Drug Taxol and Antioxidant Potential in Hazelnut (*Corylus avellana* L.) Tissue Culture

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Plant cell culture is now recognized as one of the alternative and renewable sources for the production of secondary metabolites [1]. Useful compounds of plant cell cultures are often secondary metabolites, which usually accumulate in very small amounts in plant cells. The use of elicitors can increase the production of secondary metabolites in cell cultures. Therefore, in this study, the effect of gamma radiation (0, 10, 20, 30 Gy) on hazelnut leaf derived callus culture was investigated in a completely randomized design with 4 replications. The parameters measured were callus growth, activity of catalase, peroxidase, polyphenol oxidase and phenylalanine ammonia lyase, antioxidant potential and taxol production. The results showed that the effect of gamma radiation with the exception of peroxidase activity on other parameters was significant. By increasing the dose of gamma radiation, the activity of the catalase, polyphenol oxidase and phenylalanine ammonia lyase enzymes increased significantly and at 30 Gy their activity was peaked. The production of taxol and antioxidant potential also increased significantly with increasing gamma radiation dose. The maximum amount of taxol measured at the 30 Gy dose (56.8 µg/l), which was four times more than that of the control culture. It seems that gamma radiation stimulated defence responses of cells and increased the production of secondary metabolites.

Keywords: Taxol, Gamma radiation, Tissue culture, Hazelnut, Secondary metabolite

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Effect of Different Hosts on Growth and some Phytochemical Compounds of Medicinal Dodder (*Cuscuta epithymum*)

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The dodder plant for the nutrition and development are absolutely dependent on the host plant and therefore have structural, physiological and biochemical relationships with it [1]. In order to investigate the host effect on growth, yield and production of some phytochemicals in eftimon dodder (*Cuscuta epithymum*) this study was carried out in a randomized complete block design with 3 replications. The treatments consisted of five host species (camelthorn (*Alhagi camelorum*), Syrian mesquite (*Prosopis farcta*), red-root amaranth (*Amaranthus retroflexus*), prickly lettuce (*Lactuca scariola*) and horseweed (*Conyza canadensis*)). The evaluated parameters included fresh and dry weight of dodder, seed yield, weight of one thousand seeds, phenolic compounds, flavonoids, quercetin, kaempferol, dulcitol, cuscutin and β-sitosterol. The results showed that host effect was significant on dry weight, seed yield and phenolic compounds, kaempferol, dulcitol, cuscutin and β-sitosterol. The highest dry weight and seed production were related to dodder grown on amaranth and camelthorn respectively. The highest amount of phenolics, kaempferol, cuscutin and β-sitosterol compounds was obtained in dodder grown on amaranth. The highest and lowest amounts of antioxidant capacity were measured with the amounts of 81.34 and 56.61% in the dodders grown on the amaranth and camelthorn hosts, respectively. In this research, it was observed that the dodder growth and production of active ingredients are influenced by host plants. In general, it is necessary to pay attention to the host for the effective usage of the medicinal dodder.

Keywords: Eftimon dodder, Host, Growth, Antioxidant capacity, Phytochemical compounds

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Investigation of the Composition of Leaves of two Species of *Hedera helix* and *Hedera pastuchovii* from Different Vegetative Regions of Iran

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The genus *Hedera* includes 15 different species of evergreen, creeping plants belonging to the Araliaceae family. More Ivy is used in the treatment of respiratory diseases as sputum and spasm. Ivy leaves contain between 2.5-8% of triterpen saponins. Among these materials, Hederacoside C is a major one and accounts for 4.8 to 7% of the total composition. After the initial study and identifying the species and varieties of the Ivy in Iran, they were sampled from the areas of Ilam, Noshahr, Sari, Mahallat, Khomein, Khansar, Golpayegan, Isfahan, Tehran, Karaj, Falavarjan, Kermanshah, Hamedan, Chalous, Marzanabad, Shiraz, Kerman, Gorgan and Shahrood roads (In September) were collected and dried under standard conditions. Based on the results of this study, it was found that the *Hedera pastuchovii* carries no Hederacoside C in comparison with *Hedera helix*. It was determined that in growing conditions, the leaves with older and larger age (Mahallat=19.87) and areas with suitable moisture conditions with less light (Noshahr=11.22, Chalous=10.27, and Marzanabad=9.97) can have a more effective ingredient. It was also found that *Hedera helix* in Ilam had a total of 3.53 of the active ingredient of Hederacoside C [1, 2].

Keywords: Ivy, *Hedera*, Hederacoside C

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Determination of Secondary Metabolites of *Heliotropium europaeum* L.

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Plants are major sources of useful secondary metabolites which are used in pharmaceutical, agrochemical, flavor and aroma industries. Bioactive compounds of plants are divided into three main categories: (a) terpenes and terpenoids (approximately 25,000 types), (b) alkaloids (approximately 12,000 types) and (c) phenolic compounds (approximately 8000 types). Several of the more potent and active substances are employed as isolated compounds, including many alkaloids such as morphine (pain killer), codeine (antitussive), papaverine (phosphodiesterase inhibitor), ephedrine (stimulant), ajmaline antirhythmic, quinine (antimalarial), reserpine (antihypertensive), galanthamine (acetylcholine esterase inhibitor), scopolamine (travel sickness), berberine (psoriasis), caffeine (stimulant), capsaicin (rheumatic pains), colchicines (gout), yohimbine (aphrodisiac), pilocarpine (glaucoma), and various types of cardiac glycosides heart insufficiency. The genus *Heliotropium* (Boraginaceae) comprises 47 species distributed in Iran. *Heliotropium europaeum* L. has been found in Azerbaijan, Fars, Golestan, Hamadan, Khorasan, Khuzestan, Kurdistan, Lorestan, Mazandaran, Qazvin, and Tehran Provinces of Iran. In Iranian traditional medicine, *H. europaeum* is used as antipyretic, cholagogue, emmenagogue, cardi tonic, and anthelmintic properties, in the treatment of headache and gout, and in external uses for the healing of wounds and treatment of warts. This plant has also carcinogenic and hepatotoxic effects. Some species of *Heliotropium* have been investigated for pyrrolizidine alkaloids and their *N*-oxides, sterols, flavonoids, and triterpenoids. In this study, *H. europaeum* was collected from the valleys of South Khorasan, Birjand and the secondary metabolites of aerial parts of the plant were measured by the spectrophotometric method.

Keywords: Secondary metabolites, *Heliotropium europaeum* L., Spectrophotometric

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Antifungal Activity of Different Concentrations of Harmal and Datura Extracts on Colony Growth and Spore Germination of *Botrytis cinerea*

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Essential oils and extracts of medicinal plants are one of the most important natural sources for control of pest and herbivores. The most important benefits of these plant compounds are the degradability of the nature of these compounds, which does not cause environmental pollution, nor does it have side effects for the main plant. The antifungal effect of *Peganum harmala* and *Datura stramonium* extracts on spore germination and colony growth of four isolates of *Botrytis cinerea* (the causal agent of gray mold in fruits and ornamental plants) was evaluated in this study. The study was conducted as completely randomized design for factorial experiments, in which 4 isolates of *B. cinerea* (isolated from strawberry, tomato, grape and Rose host plants), two plant extract (Harmal and Datura), 5 concentrations (0, 15, 30, 45 and 60 mg/ml) and 3 replicates for each treatment were used. The extracts of the plants were extracted, concentrated, sterilized and prepared as concentrations desired. Sterile PDA plates containing desired concentration of each plant extract were inoculated with a 5 mm diameter disc of each isolate colony and incubated at 24 °C and dark regime and the colony diameter was measured daily. The antifungal effect of Plant extracts on spore germination of *B. cinerea* were evaluated using micro-dilution technique. The study was conducted as described for colony growth but with 3 isolates of *B. cinerea* and 4 replicates for each treatment. Wells in micro plates were loaded with 10⁵ conidia of each *B. cinerea* isolates and 150 µl of each plant extracts. The controls includes one with spores and no extract and the other a blank without spore. Subsequent changes in optical density following spore germination in the wells was measured using an Elisa reader after 24 h incubation at 24°C and dark regime. The data were statistically analyzed with SAS software. The results indicated that the Harmal extract was more antifungal activity against colony growth of *B. cinerea* than Datura extract and 60 mg/ml concentration of Harmal extract had better performance than other treatments used in this study, 3 days after inoculation while Datura extract with 60 mg/ml concentration showed highest antifungal effectiveness against spore germination and had significant difference with the other treatments.

Keywords: Plant extracts, *Botrytis cinerea*, *Peganum harmala*, *Datura stramonium*

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Determination of Best Organ and Growth Stage for Accumulation of Diosgenin by Fenugreek

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Trigonella foenum-graecum L. (Fenugreek) is a plant from the family Fabaceae that grows anywhere around the world. Fenugreek is commonly used as a traditional food and medicine and is a rich source of steroidal sapogenins, mainly diosgenin that has anti-inflammatory activity and is used for the treatment of leukemia, hypercholesterolemia, climacteric syndrome and colon cancer. 3 different Iranian cultivares of fenugreek including Neyshabour, Alborz and Ardestan were used for this experiment. Concentration of Diosgenin was measured in leaves, stems, roots and seeds in 30, 50 and 70 day plants. The levels of this secondary metabolite were measured by UV-spectrophotometer. The result demonstrated that the concentration of this secondary metabolite varies in different organs and at different stages of growth. The highest content of diosgenin was produced by leaves at 50-day neyshabour cultivare plants.

Keywords: *Trigonella foenum-graecum* L., Diosgenin, UV-spectrophotometer

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Genetic Variation of *Plantago major* L. Genotypes Based on Morphological Traits in Six Regions of Caspian Sea

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Fleawort (*Plantago major* L.) is from *Plantaginaceae* and its seeds included mucilage which used in medicinal industries [1]. To evaluate the diversity of fleawort 21 morphological traits measured in samples from 6 region in south of Caspian Sea region (Mazandaran). Descriptive data showed highest diversity in leaf and root dry weight and spike weight with 100%. Which is important for Antibacterial uses of its leaves. However seed number per capsule showed 47% diversity that was interesting for breeders to increase mucilage volume. Number of seeds correlation with leaf weight, number and width and root weight were positive and significant. Also, negative correlation of seed number observed with root length and plant height. Factor analysis covered 82% of variances in 5 factor. First factor included vegetative traits and second one was reproductive traits that could be used to selection of elite genotypes. Cluster analysis separated samples with 100 differences in two major groups. Babol region was different and separated from others.

Keywords: Diversity, Morphology, Correlation, Seed, Mucilage

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Feeding Deterreny of Ethanolic Extract from *Achillea wilhelmsii* Against Red Flour Beetle

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Achillea wilhelmsii C. Koch is a wild aromatic herb belonged to Asteraceae family with average size of 15-40 cm. This plant is widely found in different parts of Iran [2]. Many plant oils showed a broad spectrum of activity against pest insect ranging from insecticidal, antifeedant, repellent, oviposition deterrent and growth regulatory activities [1]. The effect of ethanolic extract from aerial parts of *A. wilhelmsii* were investigated on nutritional indices of red flour beetle, *Tribolium castaneum* (Herbst) adults. Flour disc bioassay was employed to assess the nutritional indices such as relative growth rate (RGR), relative consumption rate (RCR), efficiency of conversion of ingested food (ECI) and feeding deterrence index (FDI). Treatments were evaluated in the dark, at 27±1°C and 60±5 % RH. Concentrations of 0, 0.25, 0.5, 0.75, 1.0, 1.5 and 2.0 percent were prepared from each extract. One-way analysis of variance for comparing between different extract concentrations with Duncan's multiple range tests ($P < 0.05$) were used to determine differences between means. Results showed that relative growth rate, relative consumption rate and efficiency of conversion of ingested food decreased in *T. castaneum* adults as the concentration level was increased. While feeding deterrence index percent increased significantly as the concentration level increased. According to our findings, with increase of concentration of ethanolic extract, the feeding deterrent index increased at the same rate, also the efficiency of conversion of ingested food was decreased. Although at concentration 2%, feeding deterreny was 65.5% but ECI was decreased compared with the control by 23%. These results showed that the ethanolic extract, in addition to the feeding deterrence, affect considerably in post-ingestive toxicity. There was significant positive correlations ($P < 0.05$, $r^2 > 0.9$) between RGR and RCR or ECI, also there was significant negative correlation between RGR and FDI. Total mean values of relative growth rate, relative consumption rate, efficiency of conversion of ingested food and feeding deterrence index of this extract were 0.30 mg/mg/day, 0.52 mg/mg/day, 47.96% and 38.42%, respectively. Our results suggests that *A. wilhelmsii* ethanolic extract has feeding deterreny effect for stored product pest control.

Keywords: Ethanolic extract, Feeding deterrent index, Pest, *Achillea wilhelmsii*

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HKUST-1 Metal-Organic Framework for Dispersive Solid Phase Extraction of 2-methyl-4-chlorophenoxyacetic Acid (MCPA Herbicide) in Agricultural Products

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A method for the extraction of the herbicide 2-methyl-4-chlorophenoxy acetic acid (MCPA) from agricultural products was introduced. The metal organic framework (MOF) HKUST-1 (a copper (II) benzene-1, 3, 5-tricarboxylate) was used as a sorbent for efficient clean-up and pre concentration of MCPA. The effects of pH value, stirring time, amount of sorbent on extraction were optimized by central composite design. Ultrasonic waves were used for desorption procedure and its advantage was demonstrated for an increase in extraction recovery. Corona discharge ion mobility spectrometry (IMS) was then applied for fast and sensitive determination of MCPA. The method was validated in terms of sensitivity, recovery and reproducibility. Under the optimum conditions the calibration plot is linear between 0.035–0.200 µg L⁻¹. The detection limit is 10 ng L⁻¹, with relative standard deviations of <5%. Real samples (water, soil and agricultural product) were spiked and then analysed by this method, and the results revealed efficient solid phase extraction and recovery. The important advantages of this method are low sample amount, environmentally friendly method, due to low amount of HKUST-1 required and organic solvent, adequate timing (10 min for the overall extraction step and 1 min for the IMS determination, more less than chromatographic methods such as LC and GC), low operational costs, ease of use, and not required skilled operators, etc. However, the current method has some limitations for relatively large molecular structure due to their difficult ionization in the IMS drift cell.

Keywords: MCPA herbicide, Ion mobility spectrometry, Metal organic framework

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The Alcoholic Extract of *Narcissus jonquilla* Can Inhibit the Proliferation of BCPAP Thyroid Cancer Cell Line

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Narcissus jonquilla is bulbous flowering plant belongs to Amaryllidaceae family. Amaryllidaceous plants are a great source of alkaloids, which has a wide range of biological activities. In this study we evaluated the cytotoxic effects of alcoholic extract of *Narcissus jonquilla* on thyroid cancer cell line growth (1, 2). At first, the extract of *Narcissus jonquilla* was prepared and dissolved in distilled water and then its effect on BCPAP proliferation was measured by MTT assay at different concentration (20, 50, 100, 250, 500, 1000, 2000 µg/ml) for 24h and 48 h. Cell viability curves were drawn and the IC₅₀ values at 48 h were calculated. Our data showed that *Narcissus jonquilla* alcoholic extract can significantly inhibit the proliferation of BCPAP thyroid cancer cell line.

Keywords: Thyroid cancer, BCPAP cancer cell line, *Narcissus jonquilla*, Alcoholic extract

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Evaluating the Protective Effect of the Traditional mixed Extract of Medicinal Herbs (AM-173) on Hippocampus Oxidative Toxic Stress in Type 2 Diabetic Rats

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Diabetes mellitus (DM) is one of the most prevalent metabolic diseases. Cognitive impairment caused by diabetes is gaining more acceptance and attention. This study investigated the effects of a traditionally mixed extract of Iranian medicinal herbs (AM-173) on hippocampus oxidative toxic stress (OTS) in type 2 diabetic rats. Forty-two male Wistar rats were randomly divided into seven groups (n=6): Control group (C), Diabetic group (D), Diabetic + 100, 200 and 300 mg/ kg AM-173 (D + 100, 200 and 300 mg/kg AM-173), Diabetic + traditional extract (D + TE), Diabetic + Glibenclamide (D + G). Oxidative stress parameters were evaluated by standard methods. Oxidative stress status was improved in the treated (300 mg/kg AM-173 and TE) groups. Therefore, results indicated that AM-173 ameliorated hippocampus OTS in type 2 diabetic rats.

Keywords: Medicinal Herbs, Type 2 diabetes, Oxidative Stress

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Antimicrobial Effects of Ethanol and Water Extract of Scorzonera Paradoxa Against Bacterial Food Borne Pathogens and Starter Bacteria and Yeast

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Galuk refers to the native name of Scorzonera paradox which is a plant containing two or more leaves and is wild grown in the eastern parts of Iran. It grows within the period starting at about the mid March and ending the late April. The water and ethanolic extracts of scorzonera Paradox leaves were examined in order to measure antimicrobial activity using MIC and MBC. Antimicrobial Activity (staphylococcus aureus ATCC33591, Escherichia coli ATCC 25922, lactobacillus plantarum ATCC14917 and Saccharomyces cerevisiae) is discussed. Based on the obtained results, the MIC was set for E. coli, Staphylococcus aureus, Lacto Bacillus Plantarum and Saccharomyces cerevisiae 160 mg/ml (p <0.05). Also, the concentration of 320 mg/ml was set as the lowest MBC for Saccharomyces cerevisiae and lactobacillus plant arum and was absent in Escherichia coli and Staphylococcus aureus. Through the results of the study, we found that The water and ethanolic extracts of scorzonera Paradox leaves has relatively weak inhibitory effect on Escherichia coli, Staphylococcus aureus, lactobacillus plantarum, and Saccharomyces cerevisiae. We suggest that there is more room for investigation on the effective particles of the extracts of this plant.

Keywords: Antibacterial Effect, Extracts, Scorzonera Paradoxa

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Pomegranate *Punica granatum* L. Stem Bark Extract Inhibits Protein Modification by Methylglyoxal in Hyperglycemia Condition

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Methylglyoxal is a precursor of advanced glycation end products (AGEs). Interaction of methylglyoxal with L-alanine produces carbon-centered radicals that in reaction with oxygen produce superoxide radicals. It can be harmful in some other mechanisms especially in diabetic patients. It has been shown that some phytochemicals reduce methylglyoxal-mediated glycation content and subsequently, prevent significantly AGEs level. The assay was conducted to evaluate inhibitory effects of pomegranate stem bark methanolic extract on protein glycation stimulated by methylglyoxal (1). BSA (20 mg/ml) was glycated in presence of methylglyoxal (100 or 150 mM) with/without the different concentrations of extract (85, 170 and 250 µg/ml) or aminoguanidine (1 or 10 mM) as positive control. Sodium azide (NaN₃) in concentration of 0.2 g/L was added to mixture to assure an aseptic condition. The reaction mixtures were prepared using 0.1 M sodium phosphate buffer, pH 7.0 and then kept at 37 °C in incubator for three weeks. The Effect of extract and controls on formation of intermediate compound (the methylglyoxal-hydro-imidazolone protein adducts) was assessed by competitive ELISA Kit (Catalog number STA-811). The results showed that extract significantly decreased protein carbonyl content from 6.25 nM/mg protein in control to 4.8 nM/mg protein in extract at concentration of 250 µg/ml. In BSA+MGO system increasing of MGO concentration from 100 to 150 mM raised the protein carbonyl content from 4.56 to 6.25 nM/mg protein respectively. However, sample or positive control reduced it. Extract in 250 µg/ml showed significantly similar inhibitory effects compared to AG 1mM. Similarly, it lowered oxidation of thiol group, In BSA-MGO_{100mM}, system aminoguanidine 10 mM with 24.55% thiol loss showed the most inhibition activity against thiol oxidation followed by aminoguanidine 1mM 36.53 and pomegranate stem bark 36.78%. In conclusion the methanolic extract of pomegranate stem bark possesses antiglycation potential comparing to positive control.

Keywords: glycation, Maillards, Reaction, Diabetes, Extract, Pomegranate

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The Effect of Topical Piperine Combined with Narrowband UVB on Vitiligo Treatment: A Clinical Trial Study

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Vitiligo is the most common acquired hypopigmentary disease in the community. Piperine as an herbal ingredient derived from black pepper has strong impact on the melanocyte proliferation and adverse side effects less than synthetic drugs such as corticosteroids. For the first time, this study was aimed to evaluate the effect of topical piperine combined with narrowband ultraviolet B (NB-UVB) on vitiligo treatment. In this double-blind clinical trial, 63 patients with facial vitiligo were randomly divided into 2 groups: treated with piperine (case) and placebo (control). Also, both groups received NB-UVB phototherapy every other day for 3 months. In the case group, 10 patients have burning sensation on their skin areas (p value = .002). Also, redness of the treated areas was observed in 6 patients (p value = .028). Both side effects were temporary. Regarding repigmentation at time intervals of 1, 2, and 3 months after treatment, its level in the case group was significantly higher than the control group (p value < .001). Based on our findings, the combination therapy with NB-UVB/topical piperine has more influence on facial vitiligo than that of NB-UVB alone. It could be concluded that the simultaneous use of NB-UVB and topical piperine has a remarkable effect on treatment of vitiligo [1].

Keywords: pigmentation; piperine; topical treatment; UVB; vitiligo

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Assessment of Insulin Like Growth factor (IGF1) and Blood Glucose Levels in STZ-Induced Diabetic Rats After Administration of Aqueous Extract of Ficus Carcia

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Diabetes is a metabolic disorder which can cause many complications. Long term complications of diabetes consist of retinopathy, nephropathy, neuropathy and angiopathy and several others. 4.9 million deaths worldwide could be directly or indirectly attributed to diabetes. The goal of treatment in diabetes mainly concentrates on keeping blood sugar levels as close to normal as possible, without causing low blood sugar (1). This can usually be accomplished with a healthy diet, exercise, weight loss, and use of appropriate medications. In addition the use of some herbal medicine could have beneficial effects in patients. This study was designed to assess effects of aqueous extract of ficus carcia on blood glucose and IGF1 in streptozocine STZ-induced diabetic rats. 24 male Wistar rats were randomly divided in 4 groups. Normal, diabetic, diabetic treated with (500mg/kg/daily), diabetic treated with (1000 mg/kg/daily) of aqueous extract of ficus Carcia leaves. Blood Glucose was measured by Glucose oxidase –Peroxidase Method (Pars Azmun) and the quantitative determination of IGF1 was performed by use of IGF1-ELISA kit (ImmunoDiagnosticSystems. UK). One way ANOVA followed by the Tukey post hoc test was used for comparison between groups. In each group, blood glucose level was compared using repeated measure ANOVA. Analysis was done using SPSS software version 22. Blood glucose levels significantly increased in diabetic rats compared with controls ($P < 0.001$) and aqueous extract of ficus Carcia leaves decreased this levels ($P < 0.05$). Serum IGF-1 was significantly lower in diabetic rats than normal controls ($P < 0.05$). Although both concentrations of the aqueous extract of ficus Carcia leaves caused significant increase in serum IGF-1 in diabetic rats, there was more increase in IGF1 levels in 1000 mg/kg treated group. This study showed that aqueous extract of ficus carcia has anti-diabetic effects through reducing blood glucose and increasing IGF1. It seems this extract might be a good candidate as a supplementary substance for control glucose levels in diabetes.

Keywords: IGF1, diabetic rats, blood glucose, Ficus Carcia

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The Healing Effect of *Elaeagnus angustifolia* Extract on Acetic Acid-induced Ulcerative Gastritis in Rat

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Today, due to the limitations and side effects of modern medicine, the tendency to use traditional drugs to heal gastrointestinal ulcers has increased. Traditionally, *Elaeagnus angustifolia* is used to treat urinary tract infections, gastric disorders, diarrhea, vomiting, and abdominal bloating. The aim of the present study is to investigate the effect of *Elaeagnus angustifolia* extract on gastric ulcer induced by acetic acid in rats. For this purpose, 48 male rats weighing 250-200 grams were randomly divided into four groups. Rats were operated after 24 hours fasting and gastric ulcers were induced by injecting acetic acid (60%). Then all groups, including negative control (normal saline recipient), positive control (receiving omeprazole), and the two experimental groups (receiving *Elaeagnus angustifolia* extract of 100 mg/kg and 200 mg/kg mouse weight) were treated for 14 days. On day 4, 7, 10 and 14, three mice were euthanized from each group and their histological samples were taken for histopathological examination. In the histopathologic examination, wound healing indices were better in *Elaeagnus angustifolia* recipient groups (200 mg/kg) in comparison with the other groups. The mean number of neutrophils and macrophages in the treatment groups increased on the fourth day and in other days decreased significantly compared to the control group and the mean number of fibroblasts on the 4th and 7th days increased significantly and on other days, there was a significant decrease compared to the control group. The findings of this study indicate that the *Elaeagnus angustifolia* extract has a healing effect on the gastric ulcer caused by acetic acid in rats due to its compounds, and it is likely that it would leave its effect on increased angiogenesis, increased cell proliferation and antioxidant and anti-inflammatory effects by modulating the immune system [1].

Keywords: *Elaeagnus angustifolia*, Healing, Gastric ulcer, Rat

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Comparison of Total phenolic and Antioxidant Activity of *Cuminum cyminum* and *Carum carvil*

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Today, medicinal plants can be considered as a valuable source of antioxidant compounds, such as polyphenols, which can play an important role in absorbing and neutralizing free radicals [1]. *Carum carvi* L., belonging to the Apiaceae family, is one of the earliest cultivated herbs in Asia, Africa and Europe and was used traditionally in different populations for many medical complains [2]. *Cuminum cyminum* is another medicinal herb plant belonging to the Apiaceae family which has excellent antioxidant, antibacterial, antifungal and analgesic properties. Up to our knowledge, the comparison of total phenolic content and antioxidant activity of *Cuminum cyminum* and *Carum carvil* has not been reported yet and the study on these plants might be help to finding plants with higher antioxidant activities. Thus, the aim of this study was to compare total phenolic content and antioxidant activity of *Cuminum cyminum* and *Carum carvil*. The total phenolic contents and the antioxidant activity of the methanolic extracts were determined by Folin-Ciocalteu and the 2, 2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging assays, respectively. The results indicated that there was a significant difference in the total phenol content of *Cuminum cyminum* and *Carum carvil*, and the maximum amount of phenolic compounds obtained at methanolic extract of *Carum carvil*. Also, the methanolic extract of *Carum carvil* was found to be highly effective in scavenging DPPH radical as compared to *Cuminum cyminum*. This suggests that, *Carum carvil* is a highly effective free radical scavenger or hydrogen donor and contributes significantly to the antioxidant activity and the higher antioxidant activity of *Carum carvil* extract could be mainly due to the action of phenolic compounds existing in the methanolic extract studied.

Keywords: *Cuminum cyminum*; *Carum carvil*; antioxidant; phenolic compounds.

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A Comparative Study on Phenolic Acid Profiles in the Methanolic Extracts of *Cuminum cyminum* and *Carum carvil*

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Phenolic acids are plant metabolites widely spread throughout the plant kingdom. These compounds were belonged to phenolic groups which have many biological activities such as antioxidant activity, antimicrobial effect, modulation of detoxification enzymes, stimulation of the immune system, decrease of platelet aggregation and modulation of hormone metabolism and anticancer property [1]. *Carum carvi* and *Cuminum cyminum* are medicinal herb plants belonging to the Apiaceae family and are the earliest cultivated herbs in Asia, which have excellent antioxidant, antibacterial, antifungal and analgesic properties. Up to our knowledge, the comparison of phenolic acid contents of *Cuminum cyminum* and *Carum carvil* has not been reported yet. Thus, the present study was aimed to investigate the variations in phenolic acids content of *Cuminum cyminum* and *Carum carvil*. The phenolic acids of plants were extracted with methanol: acetic acid (9:1) by ultrasonic method and then were analysed for six individual phenolic acids (gallic acid, caffeic acid, rosmarinic acid, ferulic acid, salicylic acid, para-coumaric acid) by HPLC method. The results indicated that the methanolic extract of *Carum carvi* had high contents of gallic acid, and rosmarinic acid, while, the maximum level of caffeic acid, ferulic acid, and salicylic acid was related to the methanolic extract of *Cuminum cyminum*. Also, there was no significant difference in the amount of para-coumaric acid at *Cuminum cyminum* and *Carum carvil*. Our results showed that *Cuminum cyminum* and *Carum carvil* had different potential for the production of phenolic acids.

Keywords: *Cuminum cyminum*, *Carum carvil*, Phenolic acid, Extract

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The Effect of Dietary Supplementation of Marjoram and St John's wort Hydro-Alcoholic Extracts on Innate Immunity of Rainbow Trout *Oncorhynchus mykiss* in a Commercial Set Up

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Today one of the main concerns of aquaculture producers is supplying people's need for food. In this regard, due to the increasing amount of breeding, the incidence of disease in the fields has increased. Several studies have recommended the use of medicinal herbs to enhance the immune system of aquatic animals. The aim of this study was to investigate the effects of hydroalcoholic extracts of marjoram and *hypericum perforatum* on rainbow trout safety in commercial breeding conditions for 80 days. Treatments included control treatment, 3% marjoram, 3% *hypericum perforatum* and combination of both plants. The results of immunoglobulin assay, complement sub-path activity and serum lysozyme in different treatments were affected by diets ($P < 0.05$), which the lowest and the highest percentage of these parameters belonged to the control group and 3% marjoram ($P < 0.05$). Overall, the results of this study showed that the use of hydroalcoholic extracts of marjoram, significantly improve the intrinsic safety indicators of rainbow trout.

Keywords: *Origanum vulgare* L, *Hypericum perforatum*, Innate immunity

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Effect of Bastibaj, a Traditional Persian Formula, on Premature Ejaculation: A Pilot Clinical Trial

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Premature ejaculation (PE) is one of the main sexual problems among the male population. It is defined as ejaculation that always or nearly always occurs prior to or within about 1 minute of vaginal penetration, either present from the first sexual experience or following a new bothersome change in ejaculatory latency [1]. There is a folk treatment in one of the rural areas of Mashhad Ardehal, a small city near Kashan for this ailment. The treatment is a natural syrup (Bastibaj) which contains hydro alcoholic extracts of *Tribulus terrestris* L., *Rosa × damascena* Herrm, *Zingiber officinale* Roscoe, *Crocus sativus* L., and honey. The aim of this preliminary study was to evaluate the effect of the syrup on premature ejaculation. The study population was 17 outpatients admitted to Ahmadih traditional clinic, Tehran University of medical sciences. Each patient, visited by an expert physician, was diagnosed clinically based on the Premature Ejaculation Diagnostic Tool (PEDT). Inclusion criteria included male participants between 20 to 60 years old, PE more than 6 months, PEDT score more than 11, IELT more than 1 minute, no severe organic disease. Exclusion criteria included taking any chemical drug during the intervention, sexual contacts less than twice in 3 weeks. 17 male patients aged between 26-65 years old were eligible for the study according to the inclusion criteria. The patients enrolled in the study, filled out the written consent form and conditions of the research were explained. The medication (Bastibaj syrup) was administered for the patients 5 milliliters 3 times daily for 3 sequential weeks. The intravaginal ejaculatory latency time was recorded in all coitus. After the course of the intervention, the mean of IELTs before and after the intervention was compared via paired T-test. Results showed that the mean intravaginal ejaculatory latency time before the intervention (33.2 seconds) in comparison to after it (129.3 seconds) has been improved significantly ($P < 0.01$). According to the results, the study showed that the traditional remedy prescribed in this study, i.e. Bastibaj, can be effective in patients with premature ejaculation, and can prolong the intravaginal ejaculatory latency time significantly.

Keywords: Premature ejaculation, Traditional Persian Medicine, Herbal medicament

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The Effect of Dietary Supplementation of Marjoram and St John's Wort Hydro-Alcoholic Extracts on Growth Performance and Digestive Enzymes Activity of Rainbow Trout *Oncorhynchus mykiss* in a Commercial Set Up

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Effectiveness of dietary supplementation of medicinal plants on fish growth and digestive enzyme activity has been intensively studied. The present study was carried out to investigate the effect of Marjoram and St John's wort hydro-alcoholic extracts on growth performance and digestive enzymes activity of rainbow trout (*Oncorhynchus mykiss*) in a commercial facility for 80 days. Treatments included control group, supplementation of 3% Marjoram extract, 3% St John's wort extract or combination of both extracts. Final growth indices revealed that fish received 3% Marjoram extract significantly differed from other experimental groups in terms of condition factor (CF) ($P < 0.05$). However, dietary supplementation of 3% Marjoram extract resulted in 8.30% increase of SGR and 2.34% decrease of FCR. Digestive enzymes activity of fish (amylase, lipase and protease) significantly affected by dietary treatments ($P < 0.05$), to the extent that there were significant differences between those fish received 3% Marjoram extract and others in terms of digestive enzymes activity ($P < 0.05$). In conclusion, our results revealed that dietary supplementation of Marjoram hydro-alcoholic extract considerably improved growth performance and digestive enzymes activity of grower rainbow trout in a commercial farm condition.

Keywords: *Origanum vulgare L*, *Hypericum perforatum*, Natural growth promoters

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Comparison of the Cytotoxic Effects of Strawberry and Pineapple Fruits Extract against Skin Cancer (A375 Cell Line)

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Due to the limitations of current cancer therapy methods, it is preferred to apply complementary and alternative medicine. Using nanocomposites containing herbal cytotoxic compounds instead of common chemotherapy drugs, because of their beneficial properties against oxidative stress, can reduce many of the challenges about cancer treatment. The purpose of this study is comparison of the cytotoxic effects of strawberry and pineapple fruits extract against skin cancer (Melanoma). To gain the fruit extract, in this study, soaking method was performed using a solvent composed of water and alcohol. Melanoma cells (A375 cell line) was exposed to different concentrations of pineapple and strawberry fruit extracts and treated during 24, 48, 72 and 96 hours. Then their cytotoxicity was assessed using MTT assay. The findings indicated that the cytotoxicity in all concentrations and times, in both pineapple and strawberry extracts, is dose and time dependent but according to the concentration, the reaction of both extracts in the cytotoxicity induction is the opposite of each other. Pineapple extract, with increasing concentration and time, leads to a further reduction in survival percentage, but strawberry extract decreases viability by reducing the concentration. In conclusion, according to the findings, both extracts, due to their high antioxidant properties, are good candidates to exert cytotoxicity against cancer cells and are good supplements for cancer therapy.

Keywords: Cytotoxic, Strawberry, Pineapple, Skin cancer

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Protective Effect of Pretreatment with Watercress (*Nasturtium officinale*) Leaves Extract Against Cyclophosphamide-Induced Liver Toxicity in Wistar Rat

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Cyclophosphamide (CP) is commonly used to treat kidney diseases, systemic vasculitides and cancers. Acute adverse effects such as nausea, hair loss, vomiting and bone marrow suppression occurred. Hepatotoxicity is a serious problem during cyclophosphamide administration. Administering an antioxidant with CP might reduce liver damage. Watercress is an effective antioxidant compound. *Nasturtium officinale* (Watercress) is a vital medicinal plant belongs to cruciferae family which frequently grows in areas near to river in Iran. It has been traditionally consumed as a folk medicine in order to treatment of some disease such as bronchitis and diabetes. Thus, this study evaluated the protective effect of Watercress on CP-induced rat hepatotoxicity. Rats were subjected to oral pretreatment of different dose of watercress hydro alcoholic extract for 14 days, against hepatotoxicity induced by i.p. injection of CP (150 mg/kg b wt). Blood samples and liver tissue were taken for biochemical and immunological marker analysis. The expressions of tumor necrosis factor- α (TNF- α), interleukin-6 (IL-6) and cyclooxygenase-2 (COX-2) were analyzed by RealTime PCR. Hepatoprotective effects of herbal extract were associated with increase in malondialdehyde (MDA) and Ferric reducing antioxidant power (FRAP) enzyme activities. On the other hand, it can be able to down regulate the levels of inflammatory markers like TNF- α and IL-6. Therefore, our study revealed that Watercress extract may be represent a promising therapy to attenuate the CP induced oxidative stress, inflammation and hepatotoxicity via targeting TNF- α and IL-6 pathway.

Keywords: Oxidative stress, Cyclophosphamide, *Watercress*, Inflammation

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Evaluation of Hepatoprotective Effect of Watercress *Nasturtium officinale* Leaf Extract Against Paraquat-induced Hepatic Damage in Wistar Rats

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Paraquat (PQ) is a non-selective herbicide which has been used worldwide in agriculture and domestic for several years [1]. It has led to a variety of negative effects in non target species including humans. The present study was designed to evaluate the efficacy of the watercress leaves extract against PQ—induced liver damage in rats. Forty male Wistar rats were randomly divided into five experimental groups each containing eight rats. Group 1, the control group; group 2, rats that received paraquat only; and groups 3, 4, and 5 were treated with paraquat and watercress extract. Rats were sacrificed under anesthesia. Tissue and blood samples were taken for biochemical and histopathological analysis. In biochemical analysis, LFT, LDH, amylase and lipase enzyme activities were measured. One-way ANOVA test was used to compare the groups. In group 2, paraquat caused a notable increase in the level of serum ALT, AST, ALP and lipid profiles compared to control group. Hydroalcoholic extract of watercress significantly decreased the PQ-elevated activity of aminotransferase enzymes of both AST and ALT ($P < 0.05$). The oral administration of paraquat without treatment in group 2 led to lymphocyte cell infiltration in the liver tissue. The reduction of inflammatory cells was seen in groups treated with herbal extract. Our histopathological findings support biochemical studies. According to the basis of these results, oral administration of watercress extract may be useful to inhibit the effects of paraquat-induced liver damage and will have regulate AST and ALT levels.

Keywords: Wistar rat, Paraquat, *Watercress*, Histopathologic

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The Effect of Different Levels of Drought Stress, Salinity and Duration in Boiling Water on *Physalis alkekengi* L. Seed Germination

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Physalis (*Physalis alkekengi* L.) is one of the medicinal plants used in traditional medicine most parts of the world and also, in Iran. About 124 chemical ingredients have been characterized from different parts of this plant. pharmacological function, such as anti-inflammation, inhibition of tumor cell proliferation, antimicrobial activity, diuretic effect, anti-diabetes, anti-asthma, immunomodulation, and anti-oxidation [1]. The main aim of the present study is to investigate the effects of drought stress, salinity and duration in boiling water on seed germination percentage of *P. alkekengi*. This experiment was conducted in weed science laboratory of Sari Agricultural Sciences and Natural Resources University in 2019. Each experiment was carried out separately in a randomized complete design with four replications. Treatments were drought stress consisted of different levels of PEG including 0, -2.0, -0.6, -0.9 MPa, different levels of NaCl including 0, 40, 80, 160 and 320 mmol/L, and duration of placement in boiling water such as 5, 10, 30, 60 minutes. The results indicated that all treatments had a significant effect on germination percentage. Increasing osmotic stress caused a significant reduction in germination percentage. When, maximum germination was observed in control treatment (distilled water) and the lowest one was in -0.9 MPa treatment. A reduction in germination of *P. alkekengi* happened with increasing drought stress at the range from 0 to -0.9 MPa, which indicates that this species is very sensitive to the low potential of water. The rise of time duration of seed in boiling water (100 °C) also reduces the germination percentage of *P. alkekengi*. The highest germination percentage was observed after 5 minute treatment and also, in control which had no significant difference in germination percentage with 10 minute. The increment of time duration in boiling water more than 10 seconds, resulted in a significant decrease of germination. This fact demonstrates that low duration in boiling water of *P. alkekengi* seed increased the germination, while, more than 10 minute reduced the germination percentage. Moreover, different levels of sodium chloride prevented seed germination of *P. alkekengi*, and the only treatment in which germination observed was in control (distilled water).

Keywords: *P. alkekengi* L., Medicinal plants, Stress, Germination percentage

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Effect of Pretreatment B-Carotene on Germination and Some Growth Parameters in *Lepidium Sativum*

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Lepidium sativum is a medicinal plant that is useful in the treatment of asthma, coughs with expectoration, poultices for sprains, leprosy, skin disease [1]. β -carotene is a red/orange pigment found in many fresh fruits and vegetables [2]. Carotene is a carotenoid and an antioxidant. An antioxidant is a substance that inhibits the oxidation of other molecules. In this experiment, the effects of different concentration β -carotene (0, 0.5, 1mM) on germination and some growth parameters of *L. sativum* were investigated. For this purpose, seeds were placed in different concentrations of β -carotene for 3 hours and 30 minutes. Then, the seeds were transferred to petri-dish and after one week, the plants were harvested. The results showed that two concentrations of beta-carotene had a significant effect on germination percentage and the concentration of 1mM beta-carotene leading to an increase in stem and root length and fresh weight of the plantlets. The present study suggests that *L. sativum* seed priming could be promising technique to produce tolerant plants against various stresses.

Keywords: β -carotene; Germination; *Lepidium Sativum*; Length

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The Usage Pattern of Herbal Products, and Herb-Drug Interactions among Patients with Chronic Kidney Disease

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Chronic Kidney Disease (CKD) is a global public health problem with an increasing incidence, which is accompanied by a lot of complications. Like the other chronic disease, patients with CKD also may benefit from complementary and alternative medicine (CAM). One of the prevalently used CAM is herbal products that may have interactions with other drugs. In this study, we planned to determine the usage prevalence of herbal products and herb-drug interactions in CKD patients. A cross sectional study was conducted on 800 CKD and post-transplant patients in Isfahan, Iran that started from August 1394 and ended in May 1395. The population of this research were dialysis patients and kidney transplant patients in outpatient clinics during the period of study. Patients under difficult treatment condition and not able to answer were excluded from the study. Patients were subjected to an interview in order to fill the related checklist. Demographic and clinical characteristics of the patients, as well as the drugs or herbs used by the patients were recorded. Information extracted from the checklist, as well as the patients' files remain confidential. The results were analyzed by SPSS 17.0 statistical software and The Chi-square test was used to assess significant differences between groups. The mentioned data were analyzed with regard to their relationship with the use of herbal products and significant herb-drug interactions. In this patients (554 males and 246 females in the age range of 30-55 years), Hypertension (35.2%) was common cause of kidney failure where the diabetes mellitus (13%) took the second place. The most used unformulated herb was cowslip (*Echium amoenum*) (15.3%), while the most used formulated herb was anti-cough based on *Thymus vulgaris* (24.3%). In our study, Ginseng had the most interactions with prescription drugs. Discussion and conclusion: Usage of herbal products in patients with chronic illness could lead to fluctuations in drug effects. Due to the possibility of interactions occurrence in this population, health care team should inform the patients about herbal products safety and effects.

Keywords: Herbal products, Herb-drug interaction, Chronic kidney disease

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Jujube (*Ziziphus jujuba*) Aqueous Extract Protect Human Fibroblast Cells Against UVB-induced Photo-damage and Reduced MMP-2 and MMP-9 Expression

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Oxidative stress and UV-induced increase of matrix metalloproteinases (MMP) have been involved in various molecular mechanisms of DNA damage and modulation of gene expression in aging process (1). Because of the antioxidant capacity of jujube and green tea, we hypothesized that oxidative stress and UV-induced increase of matrix metalloproteinases (MMP) might be prevented *in vitro* in fibroblast cell in the presence of these herbal extracts. To determine the cytotoxicity of UVB, fibroblast cells were exposed to different doses of UVB (0-20mJ/cm²) in the presence of different concentrations of herbal extracts. Cell viability was determined using MTT assay. Total antioxidant capacity and free radical scavenging activity of cell culture media with or without herbal extracts were evaluated by FRAP and DPPH methods. The concentrations of MMP-2 and -9 in the supernatants were determined by ELISA method. The results showed that jujube extract in concentration of 8mg/ml and green tea in concentration of 0.5mg/ml for 24 h at 37°C post-UVB irradiation were capable of protecting fibroblast cells, with an almost 85 and 71% increase of viability observed in treated cells, respectively. Also, treatment of the fibroblast cells with jujube, and green tea extracts decreased MMP-2 and MMP-9 content in a concentration-dependent manner. These data suggest that jujube and green tea could be useful to attenuate solar UVB light-induced oxidative stress and premature skin aging.

Keywords: UVB, Jujube, Green tea, Oxidative stress, MMP



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Increased Production of Anti-Cancer Drug Taxol and the Change in the Pattern of Protein Banding of Hazelnut Cells (*Corylus Avellana*) under the Effect of Yeast Extract

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Taxol, a complex anti-cancer compound, is commonly produced in yew plant and recently in hazelnut and its cell culture [1]. Today, one of the renewable and environmental friendly sources for the production of taxol and its analogues is cell culture [2]. In this research, yeast extract (1% w/v) was treated on hazelnut cells and after 12, 24, 48, 72 h the cells were harvested. The parameters measured were growth, phenolic compounds, antioxidant capacity, Phenylalanine ammonia lyase enzyme activity, taxol production, and protein banding pattern. The experiment was conducted as a factorial in a completely randomized design with 3 replications. Untreated cultures were considered as control. The results showed that the growth of the cells was significantly higher in treatment with at 72 h compared to other cultures. It was also observed that with time, the production of taxol, phenolic compounds, antioxidant capacity, and Phenylalanine ammonia lyase enzyme activity increased significantly compared to control cultures. Maximum amount of taxol (12.35 µg/L) was obtained in treated at 72 h after treatment with, which was approximately 2 times higher than that of the control culture at the beginning of the experiment. The protein banding pattern showed an increase in light proteins with an increase in the duration of the experiment compared to the control sample.

Keywords: Yeast extract, Protein banding pattern, Taxol, Hazelnut, Cell culture

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Effect of Fungal Elicitor on Growth, Antioxidant Potential and Production of some Secondary Metabolites in Hazelnut (*Corylus Avellana*) Cell Suspension Culture

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Plant cell culture is now recognized as one of the renewable and alternative sources for the production of secondary metabolites [1]. Recent research has shown that hazelnut (*Corylus avellana*) and its cell culture also produce taxan, including taxol, which is approximately equal to the yew. Handling of cell culture media with elicitors is one of the important strategies for the induction of secondary metabolism and the production of valuable metabolites. In this research, the effect of various concentrations of fungal elicitor (yeast extract) in concentrations of 0, 0.5, 1 and 2 % (W/V) on growth, antioxidant potential and production of some secondary metabolites in hazelnut cell culture was investigated in a completely randomized design with 4 replications. The parameters measured were cell growth, total Phenolics, flavonoids and anthocyanins, antioxidant potential and taxol production. The results showed that the treatment with different concentrations of fungal elicitor significantly affected the growth and studied metabolites of hazelnut cells in suspension culture. Growth of cells was significantly higher in treatment with 2% concentration in comparison with other treatments. There was a significant difference between different concentrations of fungal elicitor in terms of growth, antioxidant potential and production of taxol. In general, application of different concentrations of fungal elicitor compared to control treatment increased cellular growth, levels of taxol, phenolics, flavonoids and anthocyanins significantly. The antioxidant potential was highest in the 1% concentration of fungal elicitor (70.08 %), which is 3 times more than that of the control culture. Maximum amount of taxol (44.53 µg/L) was obtained in 1% concentration of fungal elicitor in cell culture, which was 1.67 times more than that of the control culture. It seems that fungal elicitor stimulated defence responses of cells and increased the production of secondary metabolites.

Keywords: Hazelnut; Elicitation; Fungal elicitor; Taxol; Secondary metabolite

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Antioxidant Effect of *Sophora alopecuroides* Herb Extract in in vitro Model, Beta-carotene Coloring, DPPH, Thiocyanate, Regenerative Capacity and Measurement of Sunflower Oil Peroxide Value
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Sophora alopecuroides has a shrub and two other species of perennial and often invasive weeds and pasture plants. *Sophora alopecuroides* is a perennial herb which is of great importance because of its antibacterial properties. In this study, the antioxidant activity of hydroalcoholic extract of *Sophora alopecuroides* was investigated using in vitro non-extrinsic models, beta-carotene dyeing, DPPH (α , α -Diphenyl- β -picrylhydrazyl), Thiocyanate, regenerative capacity and sunflower oil peroxide value were evaluated and the extract activity was compared with the antioxidant activity of BHT, ascorbic acid and alfatucoprolol. The total amount of phenolic compounds in the extract was determined by spectrophotometry with the Folin-sialto method. The total phenolic and flavonoid compounds of *Sophora alopecuroides* were reported on the basis of aciclovir of tannic acid and epigallocatechin gallate, respectively. In DPPH system and regenerative capacity, plant extract was less active than ascorbic acid but the activity of extract of plant was higher than that of alfatucoprolol and BHT. Although in the model of Beta-carotene dyeing system, the antioxidant activity of BHT was higher than that of the extract, but this difference was not statistically significant ($p < 0.05$) and ascorbic acid was the least active in this model. The activity of different concentrations of *Sophora alopecuroides* extract in thiocyanate system was lower than BHT activity but was higher than that of alfatucoprolol. *Sophora alopecuroides* extract was more effective than BHT in delaying the oxidation of sunflower oil at 50 ± 4 °C for 15 days.

Keywords: Antioxidant, Extract, *Sophora alopecuroides*, Model system, Recovery

Synthesis of ZnO Nanoparticles Using *Astragalus tragacantha* Aqueous Extract and Evaluation of its Antibacterial Effects on some Human Pathogens

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Green production of nanoparticles is an environmentally friendly method in which natural solvents are used. Green nanoparticle synthesis methods have priority over physical, chemical and physical methods due to lower costs, time and energy. The purpose of this study is to synthesize zinc oxide nanoparticles in green and evaluate the antibacterial activity of these nanoparticles. In this experimental study, aqueous extract of *Astragalus tragacantha* was combined with 1: 1 molar sulfate solution 1: 1 and stored at room temperature for 15 minutes to make nanoparticles. Synthesis of zinc oxide nanoparticles was confirmed by spectrophotometric methods, mean diameter of nanoparticles, X-ray diffraction and electron microscopy (SEM). Then, the MIC of the oxidation nanoparticles was measured on standard strains of *Staphylococcus aureus* 1431PTCC, *Bacillus cereus* 1015PTCC and *Escherichia coli* 1399PTCC, *Pseudomonas aeruginosa* 1571PTCC. Absorption peak of zinc oxide nanoparticles was observed at 350 nm. The nanoparticles of ZnO were spherical in shape with a SEM technique and about 50-40 nm in size. The highest MIC was found on *Pseudomonas aeruginosa* with 2 mg / ml and the lowest MIC on *Bacillus cereus* with 4 mg / ml. In comparison, zinc oxide nanoparticles, *Astragalus tragacantha* extract and zinc sulfate had the highest antimicrobial activity for zinc oxide nanoparticles, and their MIC had a significant difference in their effect on the tested bacteria ($p > 0.05$). Based on the results of this study, the synthesized nanoparticles of zinc oxide and aqueous extracts of *Astragalus tragacantha* and zinc sulfate have antibacterial properties, but the most antimicrobial effects were observed by zinc oxide nanoparticles.

Keywords: *Astragalus tragacantha*, Antibacterial activity, Zinc nanoparticles



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Evaluation of Genetic Diversity of *Gundelia tournefortii* Using SCoT Marker

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Tumble thistle (*Gundelia tournefortii*) belongs to the family of Asteraceae (Compositae) and locally is known as “Kangar” in Iran. This plant is native to Iran, Turkey, Azarbaijan, Egypt, Cyprus, Jordan and some other countries of western Asia. *G. tournefortii* is a perennial herb that is important in medicine and food and is propagated through creeping root and seed. Investigating the compounds of the secondary metabolites of the *G. tournefortii* species showed that this species has antibacterial, antioxidant, anti-inflammatory, platelet-lowering and lipid-lowering effects. Regarding the occurrence of recent drought and the risk of extinction of this kind of medicinal plants and rangelands, it is necessary to study the genetic diversity of Tumble thistle in order to preserve and manage its genetic reserves. In this study, seed samples collected from three provinces of Kermanshah, Ilam and Lorestan were cultivated in rows with spacing of 50 cm between rows and 8 cm spacing between seeds in each row. The extraction of DNA from *Gundelia tournefortii* leaf samples was done with a slight variation by DeLaporta method (1983). Using SCoT molecular marker, genetic diversity of 85 genotypes belonging to 6 wildlife populations was investigated. Of the twelve primers used, 213 detectable bands were detected, showing 208 bands (97.21%) of polymorphism. Among the primers used, the highest polymorphic percentages of 100% were obtained for primers S1, S6, S14, S16, S24, S25, S29 and S35. Cluster analysis was used to group the samples using the Centroid method and decomposition to the principal coordinates based on the first two components. Dendrogram and distribution pattern of genotypes were plotted. In the dendrogram, the samples were grouped into three main groups. While in the analysis, the samples were divided into five distinct groups. Overall, the results of this study showed a high genetic diversity among the genotypes studied. Also, the results of this study indicated the high efficiency of SCoT marker in assessing the genetic diversity of the collected samples of tumble thistle.

Keywords: *Gundelia tournefortii*, Genetic diversity, SCoT markers

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Application of Zeolite in Arid Regions to Improve the Growth and Yield of *Ziziphora tenuior* L.

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Water is one of the most limiting factors in crop production worldwide. Zeolites are microporous, aluminosilicate minerals commonly used as commercial adsorbents and catalysts. This mineral is found almost in all regions of Iran. The most famous and abundant type of zeolites called clinoptilolite which has been discovered in 1890. Zeolite application into the soil leads to increase water retention capacity. In addition, zeolite acts as a chemical sieve allowing some ions to pass through while blocking others. In order to study the effects of water stress with zeolite application on growth and yield of *Ziziphora tenuior* L., a research was conducted in a poor and dry land with zeolite application at the rate of 0 and 9 ton ha⁻¹. The plants were harvested 90 days after imposing the treatments. The results demonstrated that zeolite application increased the yield and essential oil content. The highest essential oil content and yield per hectare were obtained 0.6 % and 5.40 kg, respectively, and 910 kg.ha⁻¹ plant dry weight with application of 9 ton ha⁻¹ zeolite. Zeolite application improves yield, growth and essential oil content of *Ziziphora tenuior* L. in poor, sandy and dry soils [1].

Keywords: Dry lands, Essential oil, Medicinal plants, Zeolite, Yield

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***In Vitro* Callus Culture of *Salix alba* L. (Salicaceae) for The Production of Salicylic Acid**

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The white willow (*Salix alba* L.), belongs to the Salicaceae family, is native to Europe and western and central Asia (1). The plant aerial parts contain a lipophilic monohydroxybenzoic acid called salicylic acid (SA) which is well-known as a plant hormone and an important active metabolite of aspirin (acetylsalicylic acid). SA is used in the production of some pharmaceuticals including 4-aminosalicylic acid, sandulpiride, and landetimide. Bismuth subsalicylate, a salt of bismuth and SA, is the active ingredient in stomach relief aids such as Pepto-Bismol, the main ingredient of Kaopectate and "displays anti-inflammatory action and also acts as an antacid and mild antibiotic"(2). In the present study, *in vitro* callus induction and establishment of callus culture of the plant for the production of SA were performed. Callus induction was achieved from young shoot tip and intermodal explants cultured on Murashig and Skoog (MS) medium (3) solely or in combination with 2,4-dichlorophenoxy acetic acid (2,4-D) and Kinetin (3 and 0.5 mg/L). The ratio of callogenesis (100%) was recorded and quantification of SA in cultured callus was performed by HPLC-PDA. The highest callus induction observed on the MS medium containing 2,4-d and Kinetin. HPLC results revealed that the callus culture of the plant capable to produce SA (1.6 mg/g DW). The results showed that the amount of SA in the *in vivo* plant was 3.2% higher than callus and in the *in vitro* plant was 1.6% higher than the *in vivo* plant. These prepared callus culture provided a useful material for further biotechnological strategies like cell suspension cultures and regulation of SA biosynthesis for enhanced production of valuable phenolic compound on a large scale.

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Extraction and Qualitative Phytochemical Screening of Hydroalcoholic Extract of Leaves of *Eriobotrya japonica* from Tonekabon - Iran

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Medicinal plants are abundantly available throughout the world. Medicinal plants are now more focused than ever because they have the capability of producing many benefits to society indeed to mankind, especially in the line of medicine. These natural compounds formed the foundation of modern prescription drug as we know Infectious diseases are the leading causes of death today *Eriobotrya japonica* (Thunb.) Lindl. (Loquat) (EJ) is a member of the Rosaceae family and has been used as a medicinal plant in China and Japan since ancient times. In this project, the leaves of *Eriobotrya japonica* were collected and hydroalcoholic extract prepared by Soxhlet method. The present study reveals that the phytochemicals analysis of nine different chemical compounds flavonoids (Alkaline Reagent Test), phenols (Ferric Chloride Test), coumarins (Sodium hydroxide Test), quinones (Sulfuric acid Test), terpenoids (Salkowski Test), tannins (Ferric Chloride Test), phlobatannins (HCl Test), cardiac glycosides (Keller-Killani test), and saponins (Foam Test) were tested in hydroalcoholic extract. The results of the phytochemical screening of a hydroalcoholic extract of leaves of *Eriobotrya japonica* showed that quinones, flavonoids, phenols, saponins, cardiac glycosides and coumarins were present. However, more investigations must be carried out to evaluate the mechanism of action of medicinal plants with different activities. In future the work on isolation of the compounds and establish a pharmacological agent for the treatment of different diseases is useful from the natural sources.

Keywords: *Eriobotrya japonica*, Hydroalcoholic extract, Phytochemicals analysis

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Saffron *Crocus sativus* L. Reduces Oxidative Stress in Patients after Acute Ischemic Stroke

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Stroke is caused by interruption of blood flow to a particular area of the brain leading to the loss of neurologic function and even death. Ischemic strokes make up 87% of all strokes. Oxidative stress plays a crucial role in the pathophysiology of neurological disorders. Saffron or *Crocus sativus* L. is the most valuable medicinal food product belonging to the Iridaceae family. Main constituents of saffron including safranal, crocetin and crocin has high antioxidant activity. The aim of the present study was to evaluate the neuroprotective effect of aqueous extract of saffron on serum oxidative stress biomarkers in acute ischemic stroke patients. 40 patients with ischemic stroke were randomly divided into the control and saffron groups. The control group received based on standard treatment recommended by guidelines. The saffron-treated group received routine care plus saffron capsules 200 mg twice per day, during the four days of hospitalization after the stroke. Fasting venous blood samples were collected from each patient at the time of hospitalization and 4 days later and serum for measurement of the oxidative stress biomarkers were prepared and evaluated. Results showed that saffron ameliorated the increased malondialdehyde, decreased glutathione and total antioxidant capacity levels and altered activity of antioxidant enzymes in ischemic stroke patients. These data suggest that saffron has antioxidant properties and may reduce oxidative stress by scavenging free radicals.

Keywords: Ischemic stroke, Saffron, Oxidative stress

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Preliminary Phytochemical Analysis of (Ethanol – Chloroform) Extract of Leaves of *Passiflora caerulea* from Tonekabon, Iran.

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Medicinal plants play a central role in traditional medicines and are precursors for the modern pharmaceuticals/Allopathic medicines. Most of the natural products found in medicinal plants are the compounds biosynthetically derived from primary metabolites such as amino acids, carbohydrates and fatty acids and are generally categorized as secondary metabolites. In recent years, a growing attention is paid to the biological activity and phytochemical profiles of crude extracts from various species of *Passiflora* in worldwide [1]. The aim of the present study was to investigate the bioactive compounds of ethanol – chloroform extract of leaves of *Passiflora caerulea* L. belonging to the family *Passifloraceae*. The leaves of *Passiflora caerulea* L. were collected from Tonekabon, Iran and ethanol-chloroform (70:30 v/v) extract prepared by maceration method. The present study revealed that the phytochemicals analysis of nine different chemical compounds terpenoids (Salkowski Test), flavonoids (Alkaline Reagent Test), phenols (Ferric Chloride Test), coumarins (sodium hydroxide Test), tannins (Ferric Chloride Test), phlobatannins (HCl Test), cardiac glycosides (Keller-Killani test), quinones (H₂SO₄ Test), and saponins (Foam Test) were tested in ethanol-chloroform extracts. The results of the phytochemical screening of ethanol-chloroform extract of leaves of *Passiflora caerulea* L. were flavonoids, phenols, quinones, tannins, saponins and cardiac glycosides presented. Thus, the ethanol–chloroform extract of leaves of *Passiflora caerulea* L. would be helpful for the preparation of pharmaceutically useful drugs to destroy pathogenic microbes.

Keywords: *Passiflora caerulea* L., Maceration, Phytochemical screening, Flavonoids

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Investigating the Protective Effect of Silymarin Powder on Methanol Toxicity in Kidney of Rats by Light Microscope

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Kidneys are important vital organs of the body that carry out various actions, such as maintaining homeostasis, Detoxification and disposal of toxic and drug metabolites. Renal toxicity is a disorder that occurs due to poisoning of toxic chemicals and drugs. Many internal and external toxins cause renal dysfunction and create different renal toxicity by different mechanisms. (1) Silybum marianum is a mixture of biological active flavonolignans, the strongest of which is silibin (Sometimes called silibinin). Silibin seems to have antioxidant, anti-poisoning, anti-inflammatory and anti-fibrotic properties (2). The aim of this study was to evaluate the histopathology of kidney tissue in male rats subjected to methanol toxicity and the protective effect of Silybum marianum powder. Eighty adult male rats were divided into four groups: control group, experimental group I (received 4 mg / kg methanol by intraperitoneal injection for one month), experimental group II (4 mg / kg methanol by intraperitoneal injection to One month and 250 mg / kg of Silybum marianum powder for orally for one month), experimental group III (4 g / kg methanol by intraperitoneal injection for one month and 500 mg / kg powder of Silybum marianum for orally for one month). At the end of the experiment, the kidneys were removed; kidney sections were staining by H&E and studied by light microscope. The results of the kidney screening in the control group for glomerular and tubular structure observed normal. In group I; observed, glomeruli necrosis, increased inflammatory cells around glomeruli, atrophy and protein casts, and in group II and III, glomerular necrosis was mild and scattered necrosis and the number of inflammatory cells around the glomeruli decreased significantly, and ultimately, the renal tubules were normalized. In this present study, considering pathological findings, silymarin appears to be able to greatly reduce the methanol induced renal toxicity.

Keywords: Silymarin, Kidney, Methanol, Wistar Rat, Light Microscope

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Analgesic Effect of Hull of *Pistacia vera* mill in Mice

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Pistacia vera, a member of Anacardiaceae family, has been used for inflammation and analgesia in traditional medicine. In this study, the antinociceptive effects as well as acute toxicity of the aqueous and ethanolic extracts of hull of *P. vera* were investigated in mice. The antinociceptive activity was studied using hotplate and tail flick tests in male mice. *P. vera* extract by dose of 25, 50 and 100 mg/kg prepared for treatment group. All extracts injected intraperitoneal (IP) and pain responses records 30, 60 and 120 minutes after treatment. Normal saline used as negative control and morphine sulfate used as positive control. The LD₅₀ values of the infusion and maceration extracts were 0.8 g/Kg and 0.79 g/Kg, respectively. The aqueous and ethanolic maceration extracts of hull of the *P. vera* at the doses of 25, 50 and 100 mg/Kg (IP), showed antinociceptive effects. The pretreatment of naloxone (2 mg/Kg, SC) inhibited the activities of extracts in hotplate test. The ethanolic extract was as effective as morphine 5 mg/kg in both pain tests. The aqueous and ethanolic extracts of hull of *P. vera* mill demonstrated central and peripheral antinociceptive activities dose-dependently and the central effect may be mediated by opioid system.

Keywords: *Pistacia vera*, Pain, Analgesia



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Polyphenol Composition and Antioxidant Activity of *Celosia Cristata* at Different Parts of Plant

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Medicinal plants have a special value in biology, medicine and veterinary in terms of prevention and treatment of disease. In recent years, the use of medicinal plants is increasing because of its beneficial effects, low cost, lack of side effects as well as its compatibility with environments [1]. Medicinal plants can be considered as a valuable source of antioxidant compounds, such as polyphenols, which can play an important role in absorbing and neutralizing free radicals [1]. *Celosia cristata* L. (Amaranthaceae) have edible leaves and flowers. The flower of *C. cristata* has been used as a food additive in Korea for a long time [2]. Up to now, the comparison of total phenolic and flavonoid content as well as antioxidant activity of *C. cristata* from different parts (shoots, flowers and leaves) has not been reported yet. So, the aim of this study was to evaluate the total phenolic and total flavonoid content as well as the antioxidant activity of aqueous extract from different parts of *C. cristata* (shoot, flower and leaves). According to results, the highest total phenolic content was observed in the leaves (6.09 mg GAE/g extract) and flowers (6.05 mg GAE/g extract) followed shoots (1.75 mg GAE/g extract). In addition, the flowers contained significantly higher total phenolic content (5.5 mg QE/g extract), followed by the leaves and shoots. Also, study on the antioxidant activity showed that the aqueous extract of leaves of *C. cristata* contained the highest antioxidant activity ($IC_{50} = 37.7 \mu\text{g/mL}$), while the extract of shoot possessed the lowest antioxidant activity ($IC_{50} = 740.0 \mu\text{g/mL}$). So, high correlations were observed in antioxidant capacities as well as total phenolic and flavonoid content of *C. cristata*.

Keywords: *Celosia cristata*, Polyphenol, Antioxidant, Aqueous extract

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Effect of Zeolite Application on Yield and Root Growth of Aloevera under Drought Stress

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Aloe vera is one of the most economically important medicinal plants in many countries which used in food, cosmetics and pharmaceutical industries. In order to study the effects of different levels of water deficit stress (irrigation after depleting 20, 40, 60 and 80% of soil water content) and zeolite (0, 4 and 8 g kg⁻¹ soil) were arranged in a split-plot in time based on a randomized complete block design with four replications. The plants were harvested 270 days after imposing the treatments. The results indicated that the maximum root fresh (170.81 g per plant) and dry weight (37.95 g per plant) were obtained when the plants were irrigated after depleting 20% of the FC where 8 g zeolite was applied. Also, the highest plant weight (2027 g per plant) was observed 270 days after imposing the treatments when plants were irrigated after depleting 40% of the FC and treated with 8 g zeolite. Application of zeolite could improve *Aloe vera* root growth and yield even under drought stress conditions [1,2].

Keywords: Zeolite, Root, *Aloe vera*, Water stress.

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Ethnobotanical Study of Medicinal Plants in Meybod (Yazd Province)

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The use of herbal plants is an important part of herbal medicine, the combination of this medicine with modern one makes it more important. In order to know more about citizens of Meybod, from the two groups of herbalist and Consumers which were more closely related to the present study, a separate questionnaire was prepared. The number of attributes in the Meybod city (according to the declaration, 20) was attributable to the total number of cases. Accountability questionnaire (100) was carried out by randomly selected clients. In order to describe the data, due to their frequency and homogeneity of repetitions, a method was used. The use of Excel software was used to examine which was carried out in 1397 in the cities of Meybod. The purpose of the herbalist Questionnaire: The amount of skill and how to get the knowledge and counselling, the combination of plants, also the amount of people referring to the attributes; their knowledge, manner of use and the properties of herbalism and consumer satisfaction, also supply sources of medicine, how to supply raw materials and the future of the Herbalist's career. And in the Consumer Questionnaire: The level of their understanding of the using herbs, the level of herbal effectiveness against the chemical drugs. their level of knowledge about counselling to others. the level of satisfaction with the performance of the antlers. Adult skill levels are good in recognizing planting and in good health counselling, it is necessary to make or combine herbal remedies. The most common way of acquiring skills among them has been self-study and experimentation. Consumers do not have much knowledge of the plants they buy and consider the use of herbs to be modest to low. According to customers' purchases, the most sold drugs were Borago, Descurainia, lavender. The income of most Sticks is currently welcomed by average customers and is not very satisfying. But anticipation of the majority of the attributes of their income and the acceptance of customers in the future is high. In terms of awareness and understanding of how consumers use herbs, only 10% of the people have good information about them. According to consumers, the effectiveness of herbs is about 44% moderate and about 32%. Consumers are satisfied with the function of the remedies and the consumption of medicinal plants.

Keywords: Traditional medicine, Herbs, Herbs, Awareness rate

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Study of Compatibility and Essential Oil Yield in Populations Different Species of *Thymus kotschyanus*

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In this study, 20 accessions of *Thymus Kotschyanus* from different regions of the country were evaluated for compatibility and essential oil yield. The seeds were grown in Jiffy pots in greenhouses. The achieved *Th. daenensis* plants were grown at a distance of 75 centimeters and were spaced 1 meter from each other at the furrows in Saeed Abad Station of Tabriz. The statistical design was a randomized complete block design with two replications meanwhile the irrigated method was flood irrigation and the height of the sampling area varied from 1300-2400. Among the planted 30 seeds in Jiffy pots, the maximum germination percentage of seeds were observed in Uremia sample and was equal to 100% and the minimum germination percentage was 67% in Qazvin accessions. In terms of the percentage of essential oils, samples from West Azarbaijan and Tehran were 1.9% and was higher than the others. The fresh and dry weight of samples from Tehran and Sanandaj was superior to others. Essential oil content in samples from Tehran, Zarand, Kerman, Qazvin, and Zanjan was higher in other species. In total, the collected accessions from Tehran were more favorable than others. The cluster analysis were done using ward method and all 20 genotypes were placed in 4 clusters. This grouping does not follow the elevation of location, climatic and geographical conditions. Dry biomass weight had a significant positive correlation with essential oil content ($r = 0.462^*$) and fresh weight with essential oil content ($r = 0.566^*$). The results of this study showed that in the accessions of *Thymus kotschyanus*, morphology, physiology, and phenology have sufficient diversity for selection, and according to the objectives of selecting the suitable cultivating area, it is possible to propagate and develop their cultivation.

Keywords: Thyme, Consistency, Cluster, Solidarity, *Thymus kotschyanus*



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Effects of Foliar Spray of Nanoparticles of FeSO₄ with Chitosan Coating on Photosynthetic Pigments of Ajonan *Carumcopticum* under Saline Condition

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After dryness, salinity is the most common and most tense stress in the world. Currently, about 20% of the world's lands face a salinity problem, which is expected to increase saline levels in the future [2]. One of the suitable solutions for decreasing or modifying the effect of salinity is the application of iron particles in the form of nanoparticles. Nanoparticles have a smaller diameter than the pore wall diameter of the cell wall. Therefore, they can easily enter the plant through leaf pores through the apertures or hairstocks, and they can be transported to different tissues [1]. Due to the presence of chlorophyll in the chlorophyll structure, the iron spray can improve the performance by increasing the efficiency of photosynthesis. This study was carried out to investigate the effects of foliar spray of nanoparticles of FeSO₄ with chitosan coating on photosynthetic pigments of Ajonan under saline condition. This Factorial experiment was conducted in a completely randomized design with 3 replications, Treatments were included salinity in four levels (no-salt, salinity 25, 50 and 75mMNaCl) and nanoparticles of FeSO₄ with Chitosan Coating (without nano, application of 5, 10 and 15 μM concentrations). The results showed that chlorophyll a, b and carotenoids decreased with increasing salinity level and Application of chitosan coating of iron nano-oxide with the increasing amount of plant photosynthetic pigments could modify the effects of salinity.

Keywords: Nanoparticles, FeSO₄, Ajonan, photosynthetic pigment

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Untargeted Data Dependent Metabolic Profiling and Combined In-silico MS/MS Dereplication with Molecular Networking Approach for Annotation of Phytochemical Constituents of Iranian *Glaucium* Species

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The genus of *Glaucium*, Papaveraceae family, are a rich source of different classes of isoquinoline alkaloids with various pharmacological activities. This study focused on isolation and identification of phytochemical constituents of three Iranian *Glaucium* species: *G. corniculatum*, *G. fimbriigerum* and *G. grandiflorum* based on information obtained from preliminary untargeted data dependent metabolic profiling, molecular networking and in silico dereplication [1]. Sequential extraction was performed and chromatographic separation was achieved on a UPLC I-class system interfaced to a Q-Exactive Focus mass spectrometer. Molecular networks were created using the GNPS platform (<http://gnps.ucsd.edu>) after pre-processing the HRMS/MS data by Mzmine 2.32. Output data from GNPS were visualized using Cytoscape 3.4.0 software. The annotation of the molecular networks was performed by spectral matching against an *In-Silico* MS/MS DataBase. The spectral scores were taxonomically pondered using occurrence of the hits in *Glaucium* species and Papaveraceae family as a weight. This resulted in the annotation of several characteristic alkaloids. The large scale isolation and purification of the methanolic extract by combination of fractionation by high speed counter current chromatography and preparative reversed phase chromatography resulted in the identification of various alkaloids such as glaucine, predicentrine, *N*-metyllindcaprine, bulbocapnine, corydine, and *N*-methyl-β-canadine. Their structures were established by extensive spectroscopic methods, including 1D (¹H NMR) and 2D-NMR (COSY, HSQC and HMBC) as well as HRMS.

Keywords: Glaucium, Molecular Networking, In-Silico dereplication

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Evaluation of Essential Oil Percentage of *Oliveria decumbens* Vent. in Some Habitates of Iran

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Oliveria decumbens Vent belongs to Apiaceae family is an endemic plant of flora iranica that grows in high temperature areas of south and west of Iran [1]. In traditional Iranian medicine, this plant is used to treat indigestion, diarrhea, abdominal pain, fever and infectious diseases. The aerial part of this plant has a significant amount of essential oil that contains oxygen monoterpenes. Thymol (47.1%), carvacrol (23.3%), gametripheone (18.9%) and paracymon (8.7%) are the main components of this plant, all of which are antioxidants. The main components of essential oil observed were m-Thymol (34.80%), Thymol (34.36%), Myristicin (20.88%) recorded meticulously in the form of MAHD (Microwave-assisted hydro distillation) (%) percentage from the *O. decumbens* Vent. Essential oil storage is affected by several factors such as location, weather conditions, season. Also, essential oil content may be affected by the effects of water stress, origin, chemotip, chemical polymorphism, and the stage in which the plant material is collected. In order to compare the essential oil percentage of *O. decumbens* Vent., this plant was collected at full flowering stage from six areas from three provinces of Khuzestan, Ilam and Fars in June and July 2017. This experiment was conducted in a completely randomized design with 6 regional treatments from 3 provinces of Khuzestan, Ilam and Fars (from Ramshir, Eshkaft Salman, Tang-e-Poulad, Gachhezarmaniramechar, Ilam and Kazeroun), and each treatment was carried out with 3 replications. Essential oil of dried flowers was extracted by using Klevenger's apparatus by distillation with water for 3 hours. According to the results of the mean comparison, Eshkaft Salman region with 6.953% essential oil showed the highest percentage of essential oil, after which Ilam (5.592%) and Gachhezarmaniramechar (5.440%) than other areas. The highest percentage of essential oil. Since this plant has a high percentage of essential oils, therefore, in future experiments, the comparison of the essential oil compositions of these areas will be reported and the best region will be introduced.

Keywords: Medicinal Plant, *Oliveria decumbens* vent., Essential Oil, antioxidant

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Pharmacophore Base and 3D-QSAR Modeling Integrated with Virtual Screening to Discover Natural Product Inhibitors for Potential Treatment of Human Fungal Pathogens

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Fungal infections are the most common diseases that daily involve many people in the world. There are millions of different fungal species on Earth, but only about 300 of these are known to make health problem. The *Candida* species is one of the widespread fungal infections in human. Despite many antifungal drugs in the market, the drug resistance, due to abuse these antifungal drugs, has driven the need for the synthesis of drugs with novel mechanisms of action. Also many potential drugs, such as azoles, with the sufficiently wide effect on fungal pathogens, have their side effects because of inhibition of human CYP enzymes. In this study 3D pharmacophore, with the aim of discovering new potential antifungal lead, was generated based on thirty-three active compounds with MIC₅₀<32 from previously reported articles. A three-dimensional quantitative structure-activity relationship (3D-QSAR) model was developed and validated to be employed in the virtual screening protocol. The best three features pharmacophore model, Hypo1, includes one hydrogen bond acceptor, one hydrophobic feature and one hydrogen bond donor which has low RMS (1.03), as well as it shows a high goodness of fit and enrichment factor, has been used as a 3D query for virtual screening to gain potential inhibitors from a data set of 10000s natural phenolic compounds downloaded from PubChem. The hit compounds were subsequently subjected to molecular docking studies for their binding to the X-ray structure of the *Candida* species (*C. albicans*, *C. glabrata*, *C. tropicalis*, *C. krusei*, *C. parapsilosis*) protein receptor involved in ergosterol synthase 14- α demethylase (cyp51). ADME properties of these compounds calculated by Qikprop. For all molecular modeling, the Small-Molecular Drug Discovery Suite 2015-2 (Schrodinger, LLC, New York, NY, 2016) was used. Finally, twenty-five hits, showed great docking score much more than caspofungin and fluconazole (as positive controls) and good ADMET properties. It is hoped that the outcome of this investigation can shed light on the molecular characteristics and mechanism of the binding of these analogs to ergosterol synthase 14- α demethylase enzyme and identifies new promising inhibitors which have the potential to be developed into drugs; thus significantly contributing to the design and optimization of therapeutic strategies against human fungal pathogens.

Keywords: Pharmacophore, Virtual screening, 3DQSAR, Natural products



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Hepatoprotective Effect of Extract of *Taraxacum Syriacum* Boiss Against Acetaminophen Intoxication in Rats

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Acetaminophen (APAP) is an effective analgesic and antipyretic drug that is widely used in different countries. It is safe at therapeutic doses, while its overdose can cause acute liver injury and liver failure. In this study was designed to investigate the effects of the ethanol extract of root of *Taraxacum Syriacum* (TS) on APAP-induced hepatotoxicity. 24 rats were divided into four groups: Control group, APAP group received via oral 1000 mg/kg of APAP, APAP-TS groups received 1000 mg/kg of APAP before 100 or 200 mg/kg of TS. Liver tissue for measurement of the oxidative stress biomarkers was removed and evaluated. Results showed that TS extract ameliorated the increased malondialdehyde, decreased glutathione levels and altered activity of antioxidant enzymes in rats after acetaminophen intoxication. These data suggest that TS has beneficial effects against APAP-mediated toxic effects in liver through inhibiting oxidative stress, attenuating lipid peroxidation [1,2].

Keywords: Hepatoprotective, *Taraxacum Syriacum* Boiss, Acetaminophen

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Photosynthesis and Growth Indices of Henna *Lawsonia inermis* L. Ecotypes at different Planting Density

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Henna (*Lawsonia inermis* L.) is a perennial plant with high value in terms of having medicinal properties and industrial applications. This study was carried out as a factorial experiment based on complete randomized block design to investigate the effect of four plant densities (25, 33, 50 and 100 plants m⁻²) and three ecotypes (Shahdad, Roodbar and Bam) on growth indices, net photosynthesis, stomatal conductance and transpiration rate of henna. The results showed that the highest average of CGR belonged to Shahdad ecotype while there was no significant difference between Roodbar and Bam ecotypes in this case. Shahdad ecotype with the RGR of 0.018 g.g. day had the highest average of this trait. The maximum value of stomatal conductance was recorded for Shahdad ecotype (234.6 mmol m⁻² s⁻¹), that was not significantly different with Bam ecotypes (229.6 mmol m⁻² s⁻¹). Results showed that the maximum of CGR was recorded for 100 plants m⁻² density. Increase in CGR at the higher densities could be due to the increased number of plants per unit area producing a higher leaf area index. In this research LAI increased with increasing in planting density and the highest average of this trait was obtained from 100 plants m⁻². LAD and BMD were affected significantly by planting density (P<0.01). The results of mean comparisons showed that average of LAD and BMD decreased with increasing in plant density from 50 to 100 plants m⁻². The same result was obtained for net photosynthesis, transpiration rate and stomatal conductance. Low net photosynthesis in 100 plants m⁻² density could be due to high competition between plants for light and food absorption, increase in shading and consequently increasing in respiration. The results showed that total dry yield and leaf dry yield were significantly affected by planting densities. The highest and lowest values of mentioned traits belonged to densities of 100 and 25 plants m⁻² respectively. Generally between ecotypes evaluated in terms of performance, there was no difference in Kerman weather conditions. Also the highest yield was belonged to 100 plants m⁻² density. It should be noted that henna is a perennial plant and this planting density for the first year is economically justified but for more than one year old plants, according to changes in body size of the plant, research on the appropriate density seems to be necessary.

Keywords: CGR, Ecotype, Row spacing, Stomatal conductance, Yield



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Qualitative Determination of Phytochemical Contents of Extract of *Allium ampeloprasum* and *Melissa officinalis*

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Various phytochemical compounds have been endowed from plant source example on these phytochemicals are terpenoids, lignins, tannins, stilbenes, alkaloids, flavonoids, quinones, amines, coumarins and other secondary metabolites which are rich in pharmacological activities [1]. The aim of this study were to evaluate the phytochemical activity of aqueous – methanol extract of leaves of *Allium ampeloprasum* belonging to the family Alliaceae and evaluate the bioactive compounds of methanol-ethanol extract of leaves of *Melissa officinalis* belonging to the family *lamiaceae*. The leaves of *Allium ampeloprasum* were collected from chalus, Iran and aqueous – methanol extract prepared by Digestion method. Also, the leaves of *Melissa officinalis* were collected from Ramsar, Iran and methanol-ethanol extract prepared by microwave assisted extraction (MAE) method. The present study reveals that the phytochemicals analysis of nine different chemical compounds terpenoids, flavonoids, phenols, coumarins, tannins, phlobatannins, cardiac glycosides, quinones and saponins were tested. The results of the phytochemical screening of a aqueous – methanol extract of leaves of *Allium ampeloprasum* showed that flavonoids, phenols, quinones, saponins, cardiac glycosides, coumarins and tannins were present. Also, the results of the phytochemical screening of methanol-ethanol extract of leaves of *Melissa officinalis* showed that phenols, coumarins, terpenoids, cardiac glycosides and quinones, were present. Therefore, *Allium ampeloprasum* and *Melissa officinalis* might represent a new phytoconstituents and antioxidant source with stable, biologically active components that can establish a scientific base for modern medicine.

Keywords: *Allium ampeloprasum*, *Melissa officinalis*, Digestion method, MAE

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Assessing Effect of Climatic-Management Factors on Yield and Growth Characteristics of Henna *Lawsonia inermis* L.

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Nowadays there is a global attention to medicinal plants and their role in the production of drugs with no side effects. Henna with the scientific name of *Lawsonia inermis* L. is a perennial plant having high value in terms of medicinal properties and industrial application. Reports of various studies show that no experiment have been done on the eco-physiological properties of henna in Iran. Kerman province with the first position in Hana production has a special importance in this regard. This study was carried out in Kerman province in 2015. In this survey climatic characteristics of cultivated area, physico-chemical analysis of soil, performance data, phenological stages and also information on irrigation were investigated. Finally, the relationship between climatic-management characteristics and performance was studied through multiple regressions. The results showed that the henna in Kerman province is distributed in Shahdad, Roodbar, Bam and Kahnooj. The area under cultivation in these regions ranged from a minimum of 3 hectares with a yield average of 1.4 t.ha⁻¹ in Shahdad and a maximum of 7500 hectares with a yield average of 6.5 t.ha⁻¹ in the Roodbar. The results of this study showed that over 93% of henna cultivation area in Kerman province belongs to Roodbar. The highest and lowest of water use efficiency were belonged to Roodbar (0.46) and Shahdad (0.17) respectively. The total growth period, on average, varied between 190 to 220 days in the studied areas. Climatic zoning of habitat areas were dry climate according to Domarten dryness index. The mean annual precipitation of habitats were 7.72 mm, 33.6% relative humidity, 632 m altitude and the mean temperature was 26.5 ° C. Soil of habitats largely had sandy-loam texture with an pH of 8.19, 3.84 dS/m electrical conductivity and 0.06-0.12% organic matter. The results of regression analysis showed that nitrogen, rainfall and relative humidity are the most important soil and climate characteristics that affect henna performance, respectively. Availability of nitrogen has a great importance because of their role in the production of proteins, nucleic acids and chlorophyll synthesis. Rainfall is one of the most important climatic factors that can be more effective in yield production through the influence of moisture and soil temperature. In general, due to the importance of medicinal plants, it is necessary to study the various ecophysiological aspects of henna, providing a solution for optimized management and consequently extending area under cultivation in the local areas of the country.

Keywords: Climate, Distribution, Henna, Kerman, Phenology



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Germination Response of *Bunium persicum* to Different Thermal Conditions

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Considering the importance of germination on plants' domestication processes, cardinal temperatures' determinations appear to be a major step. Black cumin (*Bunium persicum*) is an advantageous medicinal plant which is forced into the endangered plants group because of inappropriate management practices and the lack of any published information about the cardinal temperatures effects on this species germination. In order to investigate germination response of Black cumin to different temperatures, an experiment was conducted with four ecotypes of *Bunium persicum* (including, CE₂, CE₄, CE₈, and CE₉ ecotypes) from different parts of Iran at nine levels of temperature (4, 8, 12, 16, 18, 20, 24, 28, and 32 °C). Three models were fitted to determine the germination responses to temperature and comparing the efficiency of each model. Results indicated different correlations among the observed and simulated germination rate values for all ecotypes. Calculated values by the Intersected-line model (ISL) revealed the values from 0.35 to 3.33 °C for the base, 16.19 to 22.14 °C for the optimal, and 29.74 to 31.52 °C for the maximum temperatures. Fitted Quadratic Polynomial Model (QPN) showed significant correlation between the observed and simulated values for CE₈ and CE₉ ecotypes, but not for CE₂ and CE₄. According to the results of the five parameters of the beta model, cardinal temperatures for the evaluated ecotypes are similar to the calculated values with Quadratic Polynomial Model to some extent. Generally, ecotypes from the elevated habitats showed lower base, optimal, and maximum temperatures.

Keywords: *Bunium persicum*, Ecotypes, Germination, Temperature

Quantitative and Qualitative Assessment of Fennels *Foeniculumvulgare* Mill. under Different Steam-Distillation Duration Times

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Fennel (*Foeniculumvulgare* Mill.), is an aromatic as well as medicinal plant, The most important compound in essential oil is E-anethole which has determining role in quality of essential oil. The other chemical compounds of the essential oils are Fenchone, Limonene, Estragole, α -Pinene and Anisaldehyde [1]. Extraction time is an effective factor on content and composition of essential oils. The aim of this study was evaluation the effect of steam-distillation duration (90, 120, 180, 240 minutes) on essential oil content and composition of fennel. Analysis of variance showed that stem-distillation time has a significant effect on essential oil content and composition in fennel seed. The highest essential oil content (5.6%) was measured in 240 minutes and the lowest (5.09%) was found in 90 min existed. The essential oil of *Foeniculum vulgare* was characterized by gas chromatography (GC) and gas chromatography/mass spectrometry (GC-MS). In total 14 compounds were identified in the oil that the main characteristic of the oil is the high content of the E-anethole, Fenchone, α -Pinene. The amount and percentage of major E-Anethole fennel essential oils are combined in different periods were different. Maximum E-Anethole content (74.82 percent) was observed in 180 min and the lowest (50.52 percent) at 90 min respectively. This may be critical for the quality control of essential oils from *F. vulgare*. Our findings determined the appropriate steam distillation time of essential oil for fennel fruit to obtain the most suitable quantity and quality time is 120 minutes.

Keywords: Fennel, Steam Distillation, Gas Chromatography, Chemical Compounds

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Effect of Plant Biostimulant on Essential Oil, Chlorophylls and Carotenoid Content in Mentha under Salin Condition

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Plant biostimulants are organic materials that impact several metabolic procedures and when applied in small quantities, improve the plant growth and development [1]. In general, they stimulate metabolic processes for more yields in plants. This study investigated the Mentha essential oil and its photosynthetic pigment under use of biostimulants for the possible reduction in use of chemical fertilizers under salinity condition. This experiment was conducted on the basis of completely randomized design with three replications. The treatments included commercial formulations of aminoforte, kadostim, fosnutren, humiforte and control, salinity was in four levels (no-salt, salinity 25, 50 and 75 mM NaCl). The results showed that chlorophyll a, b, carotenoids and essential oil decreased with increasing salinity level and application of biostimulants can increase amount of plant photosynthetic pigments and essential oil than control.

Keywords: Biostimulants, Essential oil, Carotenoid, Chlorophylls

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The Effects of Hydroalcoholic Extract of *Curcuma longa* and Animal Butter Ghee on Skin Wound Healing in Rat: a Histopathological and Histochemical Study

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The present study was conducted to determine the histopathologic effects of *Curcuma longa* and Ghee on the wound healing in rats. In this study, 60 rats were randomly divided into 5 groups; namely, positive control (treatment with phenytoin ointment), negative control (without treatment), treatment group with *Curcuma longa* extract, treatment group with Ghee, and treatment group with a combination compound (combination of *Curcuma longa* extract and Ghee). Under general anesthesia, a circular wound of full thickness with a diameter of 10 mm square was created at the back of the rat, then, under went examinations for two weeks. In this study, the animals were examined on days 4, 7, 10, and 14 in terms of area of ulcers. After assessing the amount of contraction of the wound, three mice were euthanized in each group and skin samples were taken for histopathological examination. To study endothelial cells, macrophages and neutrophil densities H & E staining and to study the density of collagen fibers, Masson trichrome and Van-Gieson staining were used. The results of this study showed that the percentage of wound healing on days 4 and 7 was better in the treatment group with Ghee and *Curcuma longa* extract in comparison with the other groups. The concentration of inflammatory cells on days 4, 7 and 10 of the negative control group was significantly more than the three groups of treatment with *Curcuma longa* extract, Ghee, and the compound substance. Moreover, the density of collagen fibers, fibroblast cells, and endothelium in the groups of *Curcuma longa* extract and Ghee was significantly higher than the negative control group. This study shows that wound treatment with *Curcuma longa* extract and Ghee accelerates the process of repairing skin ulcers.

Keywords: *Curcuma longa*, Ghee, Wound Healing, Rat



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Nitric Oxide Increased the some Secondary Metabolites, Antioxidant Potential and Proliferation in *in vitro*-cultured Medicinal Plant Caper *Capparis spinosa*

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Nitric oxide as a signal molecule participates in several growth and developmental processes and regulates important physiological processes in plants [1]. In this work, sodium nitroprusside (SNP) was utilized as the donor of nitric oxide to investigate the effects of exogenous nitric oxide on growth, antioxidant activity and some secondary metabolite production of *in vitro*-cultured *Capparis spinosa* plants. The shoot explants were treated with different concentrations of SNP (0, 0.0625, 0.125 and 0.25 μ M). The experiment was conducted in a randomized complete design with 4 replications. After 2 months from the date of treatment, the treated specimens were examined. The results showed that nitric oxide was effective in stimulating new branches and biochemical traits, and in the treatment of 0.25 μ M, the most stimulation was observed in morphological and biochemical traits. There was a significant difference between the effect of different concentrations of nitric oxide on the amount of proliferation and the highest level of proliferation was achieved at 0.25 μ M of nitric oxide concentration. It was also observed that with increasing nitric oxide concentration, the content of biochemicals such as phenolic compounds, carotenoids, flavonoids, anthocyanins, chlorophyll content, rhamnase, glucose, mannose and protein and antioxidant potential increased significantly. Therefore, in order to achieve the desired proliferation of the caper and the contents of the some secondary metabolites, it is better to use concentration of 0.25 μ M nitric oxide. It seems that nitric oxide elicited caper tissue culture and increased the secondary metabolite production.

Keywords: Caper; Tissue culture, Secondary metabolite, Proliferation, Nitric oxide

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Determination of Antibiotics Resistance Patterns of E.Coli Isolated from Broiler Flocks in Ardabil Province, Northwest of Iran

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Colibacillosis is one of the most important of bacterial diseases in poultry industry with huge economic losses that is caused by *Escherichia coli* [2]. Antimicrobial therapy is an important tool in reducing colibacillosis infection, but the indiscriminate use of antibiotics in poultry farms can lead to the emergence of resistance and inefficacy of antimicrobials [1]. The purpose of this study was to determine the antibiotic resistance rate of 178 *E.coli* isolated from broiler flocks with colibacillosis infection in ardabil province, northwest of Iran. The Antibiotic resistance rate of isolates was determined by Kirby Bauer disc diffusion method. The highest resistance was to Flomequine (98.3%), Tylosin (97.2%), Oxytetracycline (97.2%), Chlortetracycline (95.5%), Difloxacin, (89.3%), Doxycycline (81.5%) and Sulphamethoxazole+ terimethoprim (71.9%). The lowest levels of resistance were for Chloramphenicol, (22.5%), Gentamycin (7.3%) and Fosbac (5.1%). The results of this study show the high frequency of resistance to antimicrobial agents commonly used in the Iranian poultry industry. So National monitoring programs is strongly needed for antimicrobial resistance and rational use of antibiotics.

Keywords: E coli, Antibiotic resistance, Broiler flocks, Ardabil

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Essential Oil Analysis of three Different Accessions of *Eryngium thyrsoideum* Boiss. from Iran

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Eryngium thyrsoideum Boiss. known as “Boughnagh or Zul-e-Garzany” is a spiny and perennial species from Apiaceae family distributed in Turkey, Iraq and also in northwest, west and center of Iran. There is not any published pharmacological activity on this species but in the other *Eryngium* species, there is some data on their health benefits such as, anti-diabetes, diarrhea, anti-inflammatory, antispasmodic, analgesic, antifungal and anticoagulant. In Iran the floral water of some *Eryngium* species are used for lowering the blood glucose level. In this study, three different growing locations were selected to evaluate the essential oil content and compositions of *E. thyrsoideum*. These three different locations were Alamut (Al) (Qazvin province), Salavatabad (Sv) (Sanandaj, Kurdistan province) and Paygelan (Py) (Marivan, Kurdistan province) with 1700, 1780 and 1840m altitude above the sea level, respectively. The shade dried plant materials were hydrodistilled by Clevenger-type apparatus for 3 h. Analysis of essential oils were carried out by gas chromatography-mass spectrometry (GC-MS) and quantified by GC-FID. The yield of essential oil for all samples were 0.06, 0.07 and 0.04% W/W for Al, Sv and Py, respectively. The main components were 2,3,6-trimethyl benzaldehyde (18.2%, 30% and 9.6%), 2,4,6-trimethyl benzaldehyde (2.9%, 3.6% and 0.8%), germacrene D (2.4%, 5.3% and 10.4%), ethyl linoleate (7.2%, 4.5% and 7.2%), sesquicineole (0.6%, 2.6% and 4.9%) and *trans*-caryophyllene (5.5%, 1.6% and 2.0%) for Al, Sv and Py, respectively. According to the results, the yield of essential oil and compositions of the Zul-e-Garzani were significantly affected by growing locations. To the best of our knowledge, this is the first report of chemical composition of *E. thyrsoideum* essential oil from Iran [1, 2].

Keywords: *Eryngium thyrsoideum* Boiss., Volatile oil, Wild samples, GC/MS

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Chemical Composition of Essential Oils in *Eryngium billardieri* F. Delaroché from Three Different Regions in Iran

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Eryngium billardieri F. Delaroché known as “Boughnagh or Zul”, a native, spiny and perennial plant from Apiaceae family, distributed in north, northwest, centre and northeast of Iran. There are some believes among the Iranian people, that the floral water of this plant has antidiabetic activity. The literature review also showed some activity against inflammatory and spasmodic illnesses some *Eryngium* species. In this study, the plant samples were collected from different locations in different provinces of Iran and studied to determine the influence of environmental factors on content and compositions of essential oils of this plant. The studied regions were Ganj Nameh (GN) from Alvand mountains of Hamedan province, Damavand city, around the Lar’s dam (DL) from Tehran province and Razghan (RZ) in Markazi province, with 2800, 2450, 1750 m altitude above the sea level, respectively. The shade dried plant materials were hydrodistilled by Clevenger for 4 h. Essential oils were carried out by gas chromatography-mass spectrometry (GC-MS) and quantified by GC-FID. The essential oil content for all samples were 0.12%, 0.02% and 0.35% W/W for GN, DL and RZ, respectively. The main components were sesquicineole (20.7%, 2.8% and 33.6%), β -sesquiphellandrene (10.3%, 39.3% and 0.4%), 2,3,6-trimethyl benzaldehyde (17.2%, 4.6% and 3.1%), *cis*-chrysanthenyl acetate (7.1%, 0.6% and 0.2%), and α -pinene (1.0%, 0.03% and 0.03%), for GN, DL and RZ, respectively. According to the results, the essential oil content and compositions of the *E. billardieri* F. Delaroché significantly affected by growing locations. These results confirmed the reports based on affecting of environmental factors effects on the quantity and quality of active substances in the medicinal plants [1, 2].

Keywords: *Eryngium billardieri*, Volatile oil, GC/MS, Wild accessions

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Effect of Chemical Characteristics of Soil on Total Phenol and Flavonoid Content of *Clematis Iapahanica* in Bavanat and Mehriz Regions of Fars and Yazd Provinces

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Clematis ispanhanica is a less known herbal species which grows in various parts of Iran. This study investigates the relationship between secondary metabolites (total phenol and flavonoid) and chemical parameters of soil in regions of Mehriz with arid climate and Bavanat with semi-arid climates located in Yazd and Fars provinces, respectively. Sampling was done randomly with 5 replicates from plant leaves at three phenological stages (vegetative growth, flowering and seed formation). Using methanol extract, total phenol and flavonoid were measured via Folin-Ciocalteu and aluminum chloride, respectively. Ten soil samples were collected from each depths of 0-10 and 10-30 cm in each region. Independent and paired T-tests were carried out to compare the two depths in both regions. Effects of region, phenological stage and interaction of region× phenological stage on secondary metabolites was done using factorial design. The results showed that the effect of region on secondary metabolites (total phenol and flavonoid) was significant. Comparison of means was performed using one-way ANOVA and Duncan test. The results demonstrated that the highest total Phenol and Flavonoid were related in Bavanat region, respectively. Independent T-test results for soil depth of two regions showed that electrical conductivity (EC), Soil pH and nitrogen (N) were the most important soil factors influencing secondary metabolites in both regions. The results of the following study showed that *Clematis ispanhanica* species has higher secondary metabolites in Bavanat region. Thus, secondary metabolites of a species remains mainly unaffected by soil characteristics of soil and other factors such as climate probably play a more effective role in changing secondary metabolites [1, 2].

Keywords: Phenol, Flavonoid, Chemical parameters of soil, *Clematis ispanhanica*

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New Chemotype of *Thymus kostchyanus* Collected from East Azerbaijan Province and Its Phytochemical and Antioxidant Properties

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In the present period, due to the increase in population and the need to provide their health and also because of the side effects of using chemical drugs, the use of medicinal plants has increased. *Thymus kostchyanus* L. is one of the most important medicinal plants that due to the two major compounds of thymol and carvacrol, it has unique antioxidant and antimicrobial properties. In this study was evaluated, essential oil composition, antioxidant activity (with two methods, DPPH and FRAP), and phenolic and flavonoid contents of *T. kostchyanus*. The amount of total phenol, total flavonoid, antioxidant activity by DPPH and FRAP assays were measured as 29.32 mg GAE/g DW, 6.59 mg Que/g DW, 84.44 % and 93/108 mM Fe⁺⁺/g DW respectively. *T. kostchyanus* collected from Shabestar region could be identified as a new thymol chemotype (60.48 %). According to the results, it is known that the *T. kostchyanus*, due to its high antioxidant capacity as well as the amounts of phenolic compounds, can be as an effective compound against the activity of free radicals, and a good alternative for the chemical drugs to provide human health.

Keywords: *Thymus kostchyanus*, Antioxidant activity, Phenolic compounds, Free radicals



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Phytochemical and Antioxidant Activity of Endemic *Satureja sahandica*

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The genus *Satureja* represents sixteen species in the flora of Iran which nine of them are endemic. Sahandian savory (*Satureja sahandica*) is an endemic perennial aromatic plant growing in the North West of Iran. In this study, the antioxidant activity of methanolic extract was investigated by DPPH assay at different concentrations (0, 25, 50 and 75 µL) and different periods of time (15 and 30 min), as well as the total phenol and flavonoid contents were measured by Folin-Ciocalteu and aluminum chloride reagents, respectively. The results showed that antioxidant activity increased as increasing concentration and time. The highest antioxidant activity was observed in concentration of 75 µL within 30 min (84.29%). The amount of total phenol and flavonoid content were measured as 4.79 mg GAE/g DW and 0.99 mg Que/g DW, respectively. As conclusion, results showed that flavonoids and phenolic compounds had a key role in the antioxidant activity and more studies are needed for the isolation and purification of specific active components of this plant.

Keywords: Antioxidant, Phenols, Flavonoids, *Satureja sahendica*, Phytochemical

Antioxidant Activity of The Essential Oils of some Endemic Medicinal Plants from Urmia

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Medicinal plants produce components that defend cells against degenerative effects of reactive oxygen species during oxidative stress and metabolism. In this study, antioxidant activity of the essential oils of four endemic medicinal plants from Urmia including yarrows (*Achillea millefolium*), salvia (*Salvia hydrangea*), chamomile (*Anthemis widemanniana*) and thyme (*Thymus kotshyanus*) were assessed. Antioxidant capacity of the studied species were conducted by two different methods: DPPH and FRAP assays. The antioxidant activity of *A. millefolium*, *S. hydrangea*, *A. widemanniana* and *T. kotshyanus* by DPPH assay was reported as 20.85 %, 19.67 %, 25.61 %, and 33.38 %, respectively. Also, the antioxidant activity of *A. millefolium*, *S. hydrangea*, *A. widemanniana* and *T. kotshyanus* by FRAP assay was reported as 19.79, 18.49, 11.89, and 8.91 mM Fe⁺⁺/g, respectively. The obtained results can provide new natural antioxidant resources for using in food and pharmaceutical industries.

Keywords: Medicinal plants, Antioxidant activity, DPPH, Free radicals, FRAP



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Antioxidant Activity and Phenolic Compounds of *Nepeta fissa* by HPLC-MS/MS

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In this research, phenolic compounds and antioxidant activity of endemic *Nepeta fissa* were studied. The major phenolic acid, flavonoid, and anthraquinone in the analyzed *Nepeta* extracts with HPLC-MS/MS were ferulic acid (5.87 mg/g), Kaempferol (0.1 mg/g), and emodin (0.22 mg/g), respectively. As well as, total phenolic and flavonoid contents, and antioxidant capacity by DPPH and FRAP assay were obtained as 43.07 mg GAE/g dw, 3.77 mg q/g DW, 43.54 %, and 1.15 $\mu\text{mol Fe}^{++}/\text{g dw}$, respectively. These results showed that *Nepeta fissa* is promising sources of natural antioxidants and other bioactive compounds beneficial to be used in the pharmaceutical industries.

Keywords: *Nepeta*, Antioxidan activity, Phenolic compounds, Ferulic acid

Antioxidant Activity, Total Phenol and Flavonoid Contents some Aromatic and Medicinal Plants

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Recently, scientific interest in phytochemical compounds has burgeoned. Different medicinal plants are rich sources of biologically-active substances such as phenolic compounds and antioxidants. In this study, antioxidant activity and total phenol and flavonoid contents of some medicinal plants including *Lippia citriodora*, *foeniculum vulgare*, and *Ferulago angulate* were assessed. Antioxidant capacity and total phenol and flavonoid contents of the studied species were conducted by DPPH and FRAP assays, Folin–Ciocalteu and aluminum chloride reagents, respectively. The highest total phenolic (8.55 mg GAE g⁻¹ DW) and flavonoid contents (5.18 mg Qu/g DW), were obtained in *Ferulago angulate* and *Lippia citriodora*, respectively. As well as, highest antioxidant capacity in both assays DPPH (82.06 %) and FRAP (86.22 $\mu\text{M Fe}^{++}/\text{g dw}$) was reported in *Ferulago angulate*. The obtained results can provide new natural antioxidant resources for using in food and pharmaceutical industries.

Keywords: Medicinal plants, Antioxidant activity, DPPH, Free radicals, FRAP



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Callus Production and Regeneration of *Papaver fugax*

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Papavear fugax from *Meconidium* section of *Papaver* is a biannual herbaceous plant with a height of 20-60 cm and a very fragile stem especially in the lower parts. Its fruit is a capsule of 16-14 mm in length and 4-4 mm in diameter. Mecambrine, fugapavine, roemerine, pronuciferine, protopine, thebaine, normuciferine and salutaridine alkaloids found in this species. It was reported that the amount of codeine in the stems of *P. fugax* is far more than *P. orientale* and *P. bracteatum*. So, biotechnological studies especially *in vitro* culture of this plant and *in vitro* production of its metabolites would be of importance. In this research callus production and regeneration of this species from leaf explants under *in vitro* conditions were investigated on MS medium supplemented with different levels of Kin, BAP, NAA and 2,4-D at 16-h photoperiod and 20 °C. Analysis of variance showed significant ($p < 0.01$) differences between different culture media for callus induction rate, callus weight, shoot and root induction rate. Results showed that the proper medium for callogenesis of leaf explants was MS medium supplemented with 1 mg/l NAA and 1 mg/l or 0.5 mg/l BAP. The highest callus fresh weight was obtained in MS medium supplemented with 1 mg/l NAA 1 mg/l BAP, and optimal medium for shoot regeneration was MS supplemented with 1 mg/l NAA and 1 mg/l Kin. By studying the plant rooting on MS medium supplemented with different levels of IAA and Kin or BAP, the highest root induction rate was obtained on MS supplemented with 1 mg/l IAA and 1 mg/l Kin.

Keywords: Callus induction, *In vitro* culture, *Papaver fugax*, Phytohormones

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Effect of Ultrasound on Germination, Growth and Production of Trigonellin in Fenugreek *Trigonella foenum graecum L.*

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Fenugreek (*Trigonella foenum-graecum L.*) is an annual plant, belonging to the legume family and is native to Iran. This plant is one of the most important medicinal plants in the world due to the production of alkaloids, steroids, saponin and high therapeutic power [1]. This study was conducted to evaluate the effect of ultrasound on germination of seeds, growth and production of trigonellin in fenugreek plant. Experiment was performed in a completely randomized design with 3 replications. Ultrasound (40 KHz) was treated on seeds for 0, 5 and 10 minutes. Untreated seeds were considered as control. The measured parameters were root length, leaf number, root fresh weight, shoot fresh weight, chlorophyll a, chlorophyll b, carotenoid, total phenolics, flavonoids, anthocyanins, antioxidant potential, vitamin C, lipids peroxidation, hydrogen peroxide, protein, phenylalanine ammonia lyase (PAL) activity and trigonellin content. The results showed that ultrasound had a significant effect on all measured parameters. Mean comparison also showed that the ultrasound (5 minutes) significantly increased in germination index, germination rate, fresh weight, root length, shoot length, leaf length, leaf area, leaf number, root fresh weight, shoot fresh weight, total phenolics, flavonoids, antioxidants, vitamin C, and trigonellin content compared to the control. In 10 minute ultrasound treatment, the mean of protein, enzyme, PAL has a significant effect on control treatment and has increased the yield of traits. In contrast, in 10 min ultrasound treatment, the amount of protein and PAL activity increased significantly compared to the control, but there was a significant decrease in the anthocyanin content, germination rate, root and shoot length compared to the control. These responses seem to be due to the sensitivity of the seeds of the fenugreek medicinal plant to ultrasound.

Keywords: Fenugreek, Ultrasound, Germination, Growth, Trigonellin

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Selection and Introduction of New, without Thorn, Rich and Colorful Genotypes from *Rosa damascena* Mill. and Its Development and Processing.

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Rosa damascena Mill. is one of the most valuable and famous medicinal herbs in the world. Its flower is the most valued part that is used as dry or wet flower, bud in the manufacture of jams. Its products, especially essential oils and rose water, are frequently used in pharmaceutical, cosmetic and food industries, and has a special place in Iran's exports. A large variety of valuable cultivars and genotypes of *R. damascena* have been identified in Azerbaijan, which have a high quality, marketability and performance in world. The genotypes were identified for a variety of purposes and contained thorns, low thorns, and high thorn Ghazi Jahan cultivars, with early, medium and late maturing and large flowers with different shades of red, pink, light red, white, cream and yellow colors. These genotypes are different in terms of performance, flower size, peduncle, fragrance, essential oils number and size of petals. Native Ghazi Jahan varieties and lines, with and without low thorn plants with a yield of more than 15 tons per hectare, small peduncle and large petals with more less thorns compared to native thorny cultivars. The other Atashi Ghazi Jahan line has a yield of 8 to 10 tons per hectare, under appropriate agronomic and management during planting and harvesting. This study postulate that breeding of a new colorful genotypes from *R. damascena* that differs from local *R. damascena* genotypes will introduce variety of products and different compounds and variety of new products, such as bud, flower, dry, essential oils for health, cosmetics, pharmaceutical and food industries. In addition to modifying, introducing new genotypes and cultivars, it is required that the use of natural genetic diversity, with modern monitoring and control on gardens, ongoing research on new genetic, management and modern agronomic techniques, improvement of traditional methods; a complete chain of production, processing, packaging, export and purchasing of the product will be established.

Keywords: *Rosa damascena*, Thorn, Ghazi Jahan, Genetic diversity, Various colors

The Effect of Different Levels of Dietary Metabolizable Energy and Ginger Rhizome Powder on Egg Internal Characteristics of Laying Hens

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The most part of feed consumed by poultry is used for energy production to provide maintenance and growth requirements. Energy is the main nutrient affecting feed intake in poultry [1]. However, it has been shown that many strains of laying hens can not control their feed intake according to energy requirements [2]. Energy is the main factor controlling egg production rate in laying hens [1]. The energy deficiency during peak of egg production will cause severe reduction in egg production percentage so the utilization of high energy diets is recommended. The increasing dietary energy level is feasible via addition of oils and fats to diet. The dietary oil and fat sources may subject to oxidation and production of free radicals which increase the oxidation of egg yolk fats and reduce egg quality. Therefore, the addition of antioxidants to the diet is necessary [1]. Ginger with the scientific name of *Zingiber officinale* is a traditional Chinese spice and phytogetic plant. The ginger rhizome contains several compounds which have antioxidant activity. The utilization of dietary ginger rhizome powder (GRP) supplement increases superoxide dismutase and glutathione peroxidase activities and decreases malondialdehyde production which can be considered as a factor reducing oils and fats peroxidation. In the present study, 144 Hy-line W-36 laying hens were assigned in a 3×3 factorial arrangement with completely randomized design to 9 treatment, 4 replicates and 4 hens in each replication. The factors of interest included different dietary metabolizable energy (ME) levels (2875, 2950 and 3025 kcal/kg) and different dietary GRP levels (0, 0.5 and 1 percent). At the end of each week, two eggs were randomly selected from each experimental unit and the egg internal characteristics including albumen ratio, albumen index, Haugh unit, yolk ratio, yolk index and yolk color index were measured. The data were analyzed using GLM procedure of SAS. Comparison of means was conducted by Duncan's multiple range test. The results of this study showed that the albumen ratio, Haugh unit and yolk index highly significantly ($P<0.01$) decreased and yolk ratio highly significantly ($P<0.01$) increased as dietary ME level increased. The albumen index, Haugh unit and yolk index highly significantly ($P<0.01$) increased when dietary GRP level increased. The effect of experimental treatments was significant ($P<0.05$) on all egg internal characteristics. According to the results of the current study, it seems that the utilization of GRP in the diet may improve egg internal quality.

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The Effect of Different Levels of Dietary Metabolizable Energy and Turmeric Rhizome Powder on Egg Internal Characteristics of Laying Hens

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The main portion of feed consumed by poultry is used for energy production in order to providing maintenance and growth requirements. Energy is the main factor controlling feed consumption in poultry. However, it has been reported that many strains of laying hens can not regulate their feed consumption according to energy requirements. Energy is the primary nutrient affecting egg production percentage in laying hens [1]. The energy insufficiency during the peak of egg production will lead severe decrease in egg production rate so the use of high energy diets is recommended. The increasing dietary energy level is possible via inclusion of oils and fats to diet. The dietary oil and fat sources may expose to oxidation and production of free radicals which increase the oxidation of egg yolk fats and decrease egg quality [1]. Turmeric with the scientific name of *Curcuma longa* is a perennial plant from the family *Zingiberaceae*. The turmeric rhizome contains several compounds with antioxidant activity such as Tetra hydrocurcuminoids, Curcumin, Demethoxy curcumin and Bisdemethoxycutcurmin. The utilization of dietary turmeric rhizome powder (TRP) supplement increases the expression of hepatic genes of superoxide dismutase, glutathione peroxidase and epoxide hydrolase which can be considered as a factor reducing oils and fats peroxidation. In the current study, 144 Hy-line W-36 laying hens were assigned in a 3×3 factorial arrangement with completely randomized design to 9 treatment, 4 replicates and 4 hens in each replication. The factors of interest included different dietary metabolizable energy (ME) levels (2875, 2950 and 3025 kcal/kg) and different dietary TRP levels (0, 0.5 and 1 percent). At the end of each week, two eggs were randomly selected from each experimental unit and the egg internal characteristics including albumen ratio, albumen index, Haugh unit, yolk ratio, yolk index and yolk color index were measured. The data were analyzed using GLM procedure of SAS. Comparison of means was conducted by Duncan's multiple range test. The results of this study indicated that the albumen ratio, albumen index, Haugh unit, yolk index and yolk color index highly significantly ($P<0.01$) decreased and yolk ratio highly significantly ($P<0.01$) increased when dietary ME level increased. The albumen index, Haugh unit, yolk ratio and yolk index highly significantly ($P<0.01$) increased as dietary TRP level increased. The effect of experimental treatments was highly significant ($P<0.01$) on all egg internal characteristics.

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Investigation of Antifungal Activity of *Laurus nobilis* L. (Lauraceae) Extract

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In medicine, the use of extracts and compounds with biological properties of plants species is compounded and their antimicrobial compounds are one of the most valuable sources in medicine. As a result of the spread of infectious diseases, it is necessary to identify more of these extracts and compounds. Antimicrobial compounds with an herbal source have countless therapeutic capabilities. They are not only effective in the treatment of infectious diseases, but also at the same time reduce the many side effects often associated with antimicrobial compounds. The family of Lauraceae, Woody and shrub or tree-shaped leaves with simple leaves and its effective ingredients are widely used in the treatment of infectious diseases. At the beginning of the leaves and stems of the *Laurus* plant, an ethanolic extract was prepared with the aid of a Soxhlet apparatus. The antifungal effects of *Laurus* extract were investigated using *pour plate* method in PDA medium and Minimal Fungicidal Concentration (MFC) on *Aspergillus niger*. *A. niger* did not grow in 50 mg / ml ethanolic extract of *L. nobilis*. Therefore, ethanolic extract of *Laurus* at 50 mg / ml concentrations has a fungicidal effect. Based on the results, the ethanolic extract of *L. nobilis* has a significant antifungal effect on the *A. niger*. However, for clinical applications of this extract, clinical trials are necessary.

Keywords: *Aspergillus niger*, *Laurus nobilis*, MFC, MIC

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Flavonoids from Aerial Parts of *Ferulago trifida* Boiss.

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Ferulago trifida Boiss. is one of the nine *Ferulago* species represented in flora of Iran. This species is a perennial plant with up to 1.5 m in height which grows as an endemic plant in northwest of Iran [1]. *Ferulago* species has various medicinal potentials same as antioxidant and antimicrobial [2]. Phytochemical investigation of the methanol extracts obtained from the aerial parts of *F. trifida* on silica gel (normal and reversed phases) and Sephadex LH-20 columns resulted in the isolation of two Flavonoids. The structure of the isolated compounds were characterised as Narcissin and Rutin using 1H-NMR, 13C-NMR and EI-MS spectral analysis, as well as by comparison with those reported in literature.

Keywords: *Ferulago trifida* Boiss, Apiaceae, Flavonoid

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Flavonoids from Aerial Parts of *Scutellaria platystegia* L.

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Scutellaria (Lamiaceae) includes about 350 species commonly known as skullcaps [1] Modern pharmacology research has confirmed that the extracts or monomeric compounds of the genus *Scutellaria* posses antitumor, hepatoprotective, antioxidant, antiinflammatory, anticonvulsant, antibacterial and antiviral effects. The chemical compounds of the genus *Scutellaria* have been studied since 1889. In 1910. Goldschmiedt and Lerner isolated the first flavonoid scutellarein from *Scutellaria altissima* in Vietnam. Since then, more than 295 compounds have been obtained from 35 species. Phenolic compounds (Flavonoids, Phenylethanoid glycosides) and Terpene compounds (Iridoid glycosides, Diterpenes and Triterpenoids) are the two main groups of constituents. Phytochemical investigation of the butanol extracts obtained from the aerial parts of *S. platystegia* on silica gel normal and Sephadex LH-20 columns resulted in the isolation of three Flavonoids. The structure of the isolated compounds were characterised as Apigenin, Luteolin and kaempferol using 1H-NMR spectral analysis, as well as by comparison with those reported in literature.

Keywords: *Scutellaria platystegia* L; Lamiaceae; Flavonoid.

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Investigation of the Physicochemical and Pharmacognostical Properties of Anzaroot (The manna of *Astragalus sarcocola*) According to the World Health Organization (WHO)

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Anzaroot is a manna produced from *Astragalus sarcocola* (family Leguminosae) that widely distributed in Fars, Kerman, Baluchestan and Hormozgan in Iran. Since the study of the physicochemical properties and quality control (QC) of herbal materials results in the validation and standardization for clinical uses, it is necessary to carry out World Health Organization (WHO) guidelines for Anzaroot which has consistently indication in traditional medicine. Anzaroot was identified and determined exact scientific name by a systematic specialist after purchasing from a reliable herbal Markets in Sari. According to the Global Health Organization (WHO), Morphological studies including macroscopic and microscopic, moisture content, foreign matter, ash, swelling index and foaming index, solubility in different solvents, sucrose content, reducing sugars, total flavonoid and heavy metal have been determined. Anzaroot is a very bitter, crisp and fragile manna and non-stick in dry state, which is seen as a separate binary grains under the microscope. The moisture content, foreign matter, sucrose content, total ash and water-soluble ash were reported 5.25 ± 0.62 , 2.8 ± 0.5 , 12.09 ± 0.04 , 9.8 ± 1.5 and 2.9 ± 0.55 , respectively. It has significant foaming index, 72% Solubility in water and less than 50% in 96% ethanol and not swelling index. The levels of lead, mercury, cadmium and zinc were 0.0006, 0.0002, 0.0007 and 0.003 ppm and total flavonoid content was reported 1.861 micrograms of quercetin per gram of dry weight. This study, based on physicochemical and pharmacognostical properties of Anzaroot of Iran, and its diverse therapeutic properties, such as the common cold, contusion, and bone fracture in traditional medicine, can be a novel idea for the discovery or development of pharmaceutical products.

Keywords: Anzaroot, *Astragalus sarcocola*, Physicochemical properties

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Phytochemical Investigation and Antioxidant Activity of Hexane Extract from Roots of *Teucrium hircanicum* L.

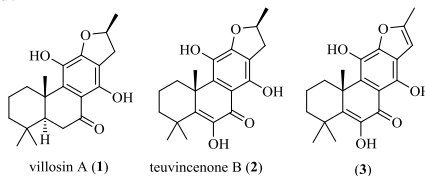
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Medicinal plants and phytochemical products used to treat various diseases have been used in traditional medicine around the world. Herbal extracts are now important sources for the development of medicines against various diseases. The genus *Teucrium* belongs to Labiatae has more than 340 species distributed in Southeast Asia, Central and South America, the Mediterranean, and the Middle East area [1]. Plants of this genus are perennial and sometimes bushes. In Iran, 19 species of this genus have been reported, mainly in the Iranian-Turanian region. The plants from this genus are distributed in most parts of Iran such as *T. persicum* is available only at highlands in the southern regions. *Teucrium hircanicum* L. an indigenous plant grows in the northern part of Iran [2]. In this research, the phytochemical study of hexane extract from roots of *T. hircanicum* was investigated by column chromatography over silica gel, reverse phase, and 1D and 2D NMR spectroscopy. Three abietane type diterpenoids isolated, purified and the structures were secured by various spectroscopic methods (NMR, MS, IR, UV). The identified compounds were: villosin A (1), teuvincenone (2). Finally, the antioxidant and antibacterial activity of the purified compounds was also evaluated.



Keywords: *Teucrium hircanicum*, Phytochemical, Diterpenoids, Biological activity

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Damask Rose (*Rosa Damascena* Mill) Production in Iran; Water Requirement, Salinity Tolerance and Yield

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Iran is the largest producer of damask rose (*Rosa Damascena* Mill.) in the world with more than 70% of the global cultivation area. The areas under cultivation of damask rose in this country is about 15 thousand hectares, which are mainly located in foothills of Fars, Isfahan, Kerman, East Azarbaijan, Kermanshah and Yazd provinces. Its sustainability against the droughts and adverse environmental conditions as well as high economic values of this crop have caused to be cultivated in many areas of the country [1]. This paper was aimed to give an overview on damask rose production in Iran, emphasizing on its water requirement, salinity tolerance, yield and water productivity in different parts of the country. Based on the existing literatures, this crop can tolerate soil water electrical conductivities of 6-7 dS.m⁻¹. However, a decline of 25-35 percent of yield has been reported for irrigation water salinities of 2 dS.m⁻¹ and more. In Kashan region, for instance, salinities of two water sources used for irrigation of damask rose have been 2.5 and 3.1 dS.m⁻¹. In this region, fresh yields of 2000 to 2500 kg.ha⁻¹ have reported to be common and economic. Surprisingly, damask rose tolerance to salinity varies from a variety to another variety. Of which, domestic varieties (e.g. Kashan variety) have more slinty tolerance than other varieties. Based on the existing literatures, water use efficiency of damask rose is 18.2 g.L⁻¹ and its net water requirement is around 46.0 liters per shrub. Also, seasonal cumulative evapotranspiration of damask rose for an arid region with reference ET_o of 1247 mm, has been around 111 mm. As a case study, we measured the yield, seasonal applied water and water use efficiency of a 3-years old damask rose garden in Yazd province, located in central part of Iran. Salinity of irrigation water was around 2.0 dS.m⁻¹, applied with a surface drip system. Measurements showed that the average fresh yield per shrub was to about 437 g, equivalent to 1400 kg.ha⁻¹. In this case, seasonal applied water was 640 m³.ha⁻¹, while its water productivity was to about 2.1 kg.m⁻³. In other words, considering low water requirement, high water productivity and the economical gain of damask rose in Iran, it seems that this plant can be introduced in the cropping patterns of arid, saline and water scarce regions.

Keywords: Salinity, Water Use Efficiency, Economical Gain, Cropping Pattern

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Investigating of some Morphological and Yield Characteristics of Damask Rose (*Rosa damascene* Mill.) under the Effect of Manure and Compost

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In order to investigate the effect of compost and cow manure on morphological characteristics of *Rosa damascene*, a field experiment was conducted based on completely randomized block design with 3 replications at Sirjan, Iran, during 2016-2017 growing season. Treatments included: 1- Compost (30 t.ha-1) 2- Compost (25 t.ha-1) 3- Compost (20 t.ha-1) 4- Manure (20 t.ha-1) 5- Manure (15 t.ha-1) 6- Manure (10 t.ha-1) and 7- control (without any fertilizer) [1]. The morphological traits such as height, canopy area, number of branch, number of leaf, leaf length, leaf width, leaf wet weight and leaf dry weight were measured. The results indicated that there was a significant difference between the treatments and the control treatment in the most of the studied traits. Increasing the use of organic fertilizers and manure caused increasing the morphological traits of Damask rose. The greatest plant height, canopy area, number of branch and number of leaf were observed in Manure (20 t.ha-1), 93 cm, 14050 cm², 15.3 and 28 number, respectively. Manure treatment of 20 t.ha-1 resulted in an increase of 3.5 percent and 68.4 percent compared to treatment of 30 t.ha-1 compost and control (without any fertilizer), respectively. According to the results of this experiment, indicated that plants treated with 20 and 30 t.ha-1 manure and compost had the most effect on increasing the growth of plants. The results of correlation analysis revealed significant positive correlation between canopy area with leaf length, leaf width, leaf wet weight and leaf dry weight, plant height, number of branch and number of leaf of plant. Also, the highest canopy area correlation was obtained with the number of branch (r=0.86**) and plant height (r=0.76**). In general, application of 20 and 30 t.ha-1 of manure and compost had an effective role in increasing seedlings growth Damask rose, respectively.

Keywords: Organic Fertilizer, Medicinal Plants, Growth

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Analysis of *Tussilago Farfara* Smoke by GC/MS: a Phytochemical Approach to a Traditional Remedy

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The medicinal applications for plant-derived smoke, outnumber to all other uses. Plant-derived smoke is used in diverse cultures and regions of the world for various purposes including incense, medicine, for food conservation or as insect repellent. Around 1500 plant species are known to be used to produce smoke for various uses. Among these plants, *tussilago farfara* known as coltsfoot has been introduced in Canon the famous book of Avicenna a Persian polymath, for chronic dry cough and various pulmonary diseases and shortness of breath. In fact, the leaves are smoked like tobacco, as a domestic remedy for asthma. *T. farfara* distributed in wet mountainous regions of the world and can also be found in Tehran, Azerbaijan and Northern provinces of Iran. In this study the leaves and flowers of *T. farfara* were collected from Chalous Road of Iran. The smoke of leaves and flowers was separately prepared by a home made glassware trapping the smoke in methanol and then methanol were evaporated. In general, three grams of plant material was burned and the smoke was dissolved and trapped in 100 ml of methanol. The yield of dry materials for leaves and flower's smoke was 14 and 24 mg/g DW plant, respectively. The trapped and dried material from the smoke of coltsfoot was filtered and injected to the GC/MS for analysis and identification of its constituents. 30 compound representing the 98 percent of smoke was identified and the phenol, *O*-cresol and hydroquinone with 19.8 %, 7.2 % and 4.8 % respectively were the major compounds in the flower. Also the major components in the leaves of coltsfoot are phenol, hydroquinone and catechol with 19.0 %, 18.9 % and 6.3 %, respectively [1, 2].

Keywords: *Tussilago farfara*, Smoke, GC/MS, phenol, trapping

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The Study of the Effect of Shilajit_Hydro Methanolic Extract on Differentiation of Human Mesenchymal Cells into Osteoblast

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Shilajit is the substance is black-brown in color, is found in openings and fractures adjacent to the underground oil reserves and the height of the mountains. traditionally it has been used to treat fractures. In the present study, we investigated the effect of Shilajit. Hydro methanolic extract on mesenchymal stem cells and their differentiation into osteoblast. Mesenchymal stem cell, supporting hematopoietic stem cells in bone marrow, can regenerate tissues such as bone, cartilage, muscle, tendon and fatty tissue. In this experimental study, bone marrow cells were prepared from Pasteur Institute and were treated with 150 and 250 µm concentration of Shilajit. cytotoxicity of Shilajit extract was measured by MTT assay (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide). Differentiation effects were investigated by alizarin red staining after 21 days and alkaline phosphates (ALP) activity after 14 days. The results showed after 24 hours, cell proliferation was significantly increased and did not have any toxic effects on the cells. alkaline phosphatase activity was more than control in the treatment, indicating the onset of differentiation in the cells. alizarin red staining showed Shilajit. Hydro methanolic extract increased osteogenic differentiation. according to the findings of this study, used of Shilajit Hydro methanolic extract effectively enhance BMSCs differentiation.

Keywords: Mesenchymal stem cells, Osteoblast, Shilajit, Differentiation



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Chemical Composition and Antioxidant Activity of *Paulownia* Clon *in Vitro* 112 Leaf Extracts

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Oxytree (*Paulownia* Clon *in Vitro* 112) is a cultivar, obtained by cross-breed of *Paulownia elongata* and *Paulownia fortunei*. It is able to very quickly adapt to new climate conditions (can withstand temperatures in the range of -25° - +45° C) and it arouses interest due to fast-growing (up to 3 meters yearly). The wood of Oxytree is considered hard, without knags, and the plant can be harvested at least thrice throughout the lifespan. It does not reproduce generatively – it is not an expansive species [1]. The largest Oxytree plantations are found in Spain, Romania, and Hungary. In Poland, the first plantings were carried out in 2015. The *Paulownia* spp. are not regarded as a regular medicinal plant, but different parts of this plants (leaves, wood, bark, flowers, fruits, roots and seeds) have been used for the treatment of many ailments and diseases. It is used in traditional medicine for the treatment of infectious diseases, such as gonorrhoea and erysipelas. It has a wide spectrum of bioactivities, including neuroprotective, antioxidant, antibacterial, antiphlogistic, antiviral and cytotoxic activities. The leaves are known to contain ursolic acid (triterpenoid) and matteucinol (flavonoid); the bark comprises pawlownin, sesamin (lignans), syringin (sinapyl alcohol glucoside), fruits are a source of alkaloids, flavonoids and other compounds with antioxidant activity, in flowers were found flavonoids such as apigenin, quercetin, apigenin-7-*O*-glucoside, quercetin-3-*O*-glucoside, 3'-methoxyluteolin-7-*O*-glucoside and triclin-7-*O*-glucoside. The aim of the current study was the optimization of extraction conditions for obtaining the highest yield of constituents with antioxidant properties. The effect of solvent type and an organic solvent to water ratio, extraction temperature and extraction time were tested using an automated pressurized liquid extraction apparatus (Dionex ASE 200). The extracts were evaporated under reduced pressure and the yield of the extractables was determined by weight. Accurately weighted samples were re-dissolved, their composition was determined using UPLC-DAD-MS chromatograph. The antioxidant properties were determined using a DPPH assay, while the total phenolic content was determined by the Folin–Ciocalteu method.

Acknowledgment: This work was financed from a National Science Centre grant 2016/23/B/NZ9/03427.

Keywords: *Paulownia*, Oxytree, DPPH, Iridoids, Hydroxytyrosol, Triterpenoids

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Phytochemical Composition and Anti-adhesive Properties of Phenolic Fraction and Non-polar Fraction from *Elaeagnus rhamnoides* L. A. Nelson Leaves

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Sea buckthorn (*Elaeagnus rhamnoides* L.) A. Nelson is a thorny shrub or a small tree belonging to the family *Elaeagnaceae*, native to Eurasia. Its fruit and other organs have been used in traditional medicine, especially in China, Tibet, and Mongolia. Preparations made from this plant find also application in conventional medicine and the cosmetic industry. Extracts from sea buckthorn leaves or their constituents have been shown to have antioxidant, anti-inflammatory, antiviral, and antimicrobial properties. They are also known to improve the functioning of cardiovascular system [1]. Due to the broad scientific interest in sea buckthorn, phytochemical composition of its leaves have been well characterized. Despite this fact, it still seems to remain incomplete. The aim of the work was to investigate the composition of the chemical phenolic fraction and non-polar fraction from the sea buckthorn leaves, by UHPLC-ESI-HRMS/MS. Another goal was to determine the effect of the tested fractions on blood platelet adhesion to two different adhesive proteins (fibrinogen and collagen) by *in vitro* tests. Platelets perform a central role in haemostasis, but inappropriate platelet activation can lead to development of atherosclerotic diseases and thrombosis. Modulation of platelet activation processes using plant natural products may be helpful in prevention and treatment of cardiovascular diseases. UHPLC-MS/MS analyses showed that ellagitannins, flavonoids (non-acylated and acylated) and triterpenoid saponins were major constituents of the phenolic fraction of sea buckthorn leaf extract, while triterpenoids and triterpenoid saponins were dominant constituents of the non-polar fraction. In addition, the performed *in vitro* experiments showed the inhibitory effect of the phenolic fraction and the non-polar fraction from sea buckthorn on the adhesion of platelets stimulated with thrombin to fibrinogen and to collagen.

Acknowledgment: This work was financed from a National Science Centre grant 2015/19/B/NZ9/03164

Keywords: *Elaeagnus rhamnoides*, Sea buckthorn, Phenolic compounds, Triterpenoids

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Influence of Different Plant Growth Regulators and Media on Rooting of Iranian Thyme Stem Cutting *Zataria multiflora*

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Iranian thyme (*Zataria multiflora*) known as Avishan-e- Shirazi in Persian is a *perennial* shrub *belonging* to the Labiatae family. It is a valuable medicinal herb used to treat bronchitis, lung infections, colds, flu, mucus and dry coughs, irritable bowel syndrome and *vaginitis*. *Despite its high application potential in various industries*, it has restricted distribution in Iran, Afghanistan and Pakistan. Iranian thyme propagated by seed and softwood cutting. In this research, effects of plant growth regulators (PGRs) and media on the propagation of *Z. multiflora* through stem cutting were studied. The cuttings were treated with IBA or IAA at concentrations 0, 100, 250, 500, 1000 ppm. They planted in different media: sandy (M1), blowy sand (M2), sandy plus perlite (M3), sandy plus compost and perlite (M4) under greenhouse conditions. The pots were arranged in a randomized block design by three replications. Percentage of rooted cuttings, root number per cutting, root length, fresh and dry weight of roots, length of shoots, shoot dry weight were recorded after 2 months. Data were analyzed by SPSS 18 and comparison among means done by Duncan's multiple range tests. The results showed that the IBA and IAA had a significant positive impact on the propagation of Iranian thyme cuttings, root establishment, rooting, fresh and dry weight of roots. The highest rooting was observed with 500 mg/ml of IBA or IAA treatment. The effect of culture media on the survival of cuttings showed that the highest survival of the cuttings occurred in the M3 environment. Also, the highest rooting percentage was observed in M3 media but Stem length, root dry weight, shoot fresh weight and shoot dry weight were significantly higher in M4 substrate than in other culture media.

Keywords: *Zataria multiflora*, Rooting, Plant growth regulators, Media

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Comparison of Chemical Composition of Essential Oils and Floral Water in the Leaves, Roots and Flowering Organs of *Ferula gummosa* Boiss.

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Ferula gummosa boiss. From Apiaceae family is an Iranian medicinal and aromatic plant which has been used as an antiepileptic remedy in Iranian traditional medicine, distributed in north, northeast and central parts of Iran. It has also multiple industrial applications especially in perfumery. Most of these valuable metabolites are extracted from a yellowish white oleo-gum called Galbanum and it is harvested from the plant's roots through the process of tapping. It's increasing market demand and the high price of the oleo-gum cause the overharvesting and unfortunately reduced the plants regeneration and caused the danger of extinction. In This study, the metabolites in essential oil and floral water of different organs of this plant was evaluated. The samples were collected from nashalj, near Kashan from Isfahan province with 2100 meters altitude from sea level. Leaves, roots and flowering organs were collected and shade dried and then were hydro distilled by Clevenger for 4 h. The essential oil as a nonsoluble part of volatile oil over the water was separated and the floral water was gathered by boiling the same parts and collecting the cooled steam after removing the essential oil. The floral water was partitioned with ethylacetate and both samples were analyzed by GC-FID and GC-MS. The main components in the essential oils of leaves, roots and flowering parts of *ferula gummosa* were β -Pinene 15.0, 41.0 and 20.0%, α -Pinene 2.6, 2.0 and 2.1%, Myrcene 3.2, 1.3 and 2.0%, δ -3-Carene 5.3, 0.1 and 4.2% respectively, while the major compounds in floral water of leaves were *trans*-Pinocarveol 2.6%, *endo*-Fenchyl acetate 2.3% and Allohimalol 6.3%. The main components in floral water of roots were α -Bulnesene 4.7%, Himachalol 4.8%, Intermeol 5.4%. Besides Bornyl acetate 4.3%, Hedycaryol 12%, Intermedeol 4.2% were the major components in floral water of flowering part [1].

Keywords: *Ferula gummosa*, Galbanum, Essential oil, oleo-gum, GC/MS

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Antibacterial Effect of *Prosopis farcta* Extract Against Common Food-borne Pathogenic Bacteria

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Prosopis farcta (known as Kohorak in Persian) is a member of *Fabaceae* and sub-family of *Mimosoideae* that widely distributed in the dry and semi-dry tropical and sub-tropical areas of America, south-western Asia and northern Africa [1]. The aim of the present study was to investigate antibacterial effect of *Prosopis farcta* extract against common food-borne pathogenic bacteria including *Staphylococcus aureus*, *Bacillus subtilis*, *Bacillus cereus*, *Listeria monocytogenes*, *Salmonella typhimurium* and *Escherichia coli* O157:H7 with using broth micro-dilution and agar disk diffusion methods [2]. The Minimum Inhibitory/Bactericidal Concentration (MIC/MBC) values of the extract did not differ between gram negative and positive bacteria. *S. aureus*, *B. subtilis*, *S. typhimurium* and *E. coli* O157:H7 had similar sensitivity to the extract, *L. monocytogenes* and *B. cereus* showed more sensitivity.

Keywords: Antibacterial, *Prosopis farcta* extract, Food-borne pathogens

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***In-vitro* Antibacterial Effect of Chia Seed Mucilage**

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Innovative bioactive coating have been recently developed for food preservation. The aim of this study was to evaluate antibacterial activity of chia seed mucilage against some common food-borne pathogens [1]. Disk diffusion method was used in order to evaluate antibacterial activity of the mucilage against *Staphylococcus aureus*, *Bacillus subtilis*, *Bacillus cereus*, *Listeria monocytogenes*, *Salmonella typhimurium* and *Escherichia coli* O157:H7 [2]. The analysis was performed using SPSS 16.0. The descending order antibacterial effects were as follows: *S. aureus* > *L. monocytogenes* > *B. subtilis* > *B. cereus* > *S. typhimurium* > *E. coli* O157:H7. This mucilage had considerable antibacterial activity, indicating potential for application as active packaging in food industry.

Keywords: Antibacterial, Chia seed mucilage

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***In vitro* Study of Inhibitory Effects of Hydroalcoholic Extract of *Allium jesdianum* on Calcium Oxalate Crystallization**

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Allium is a genus of the Liliaceae family. Different pharmacological activities of this genus have been reported such as anticarcinogenic, antibiotic, anticoagulant, antiatherogenic, anti-hyperlipidaemic, antihypertensive, immune system, heptapic system activity [1]. *Allium jesdianum* is an endemic species that grows on the 1800-2600 meters altitudes of Zagros Mountains. Native people of this region believe that aerial parts of this plant is useful for abdominal pain, rheumatic pain and urinary stones [2]. Different pharmacological activities of this plant, such as inhibitory of COX-1 /COX-2 enzyme, antifungal, nephroprotective effect and anti-platelet aggregation were investigated. Kidney stone disease is a crystal concretion formed usually within the kidneys. About 12% of the world's population is affected by this disease. The most common type of kidney stone is calcium oxalate. Generally, it is believed that Kidney stone is a complex process consists of several steps including supersaturation, nucleation, growth, aggregation, and retention of urinary stone constituents with in tubular cells. The aim of this study was to investigate the effect of hydroalcoholic extract of the aerial parts of the plant on the urolithiasis. Calcium oxalate crystals are found in monohydrate (COM) and dihydrate (COD) form. The extract reduced the number of COM crystals while increased COD crystals, and crystalline deposits decreased, significantly. Also in presence of extract the size of the crystals was smaller than the control group, thus inhibited crystals growth. Due to the stronger affinity of the COM for binding to renal tubular cells than COD, it is likely that COM has a higher potential risk for stone formation. The results showed an inhibitory effect of *A. jesdianum* extract on calcium oxalate crystal growth and aggregation in human urine. According to the therapeutic effects of this plant, we decided to isolation, purification and structural characterization of its bioactive compounds. This process is ongoing.

Keywords: *Allium jesdianum*, Kidney stone, Calcium oxalate, Phytochemical

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Evaluation of the Effects of Seed Dormancy Breaking Treatments on Seed Germination of Some Medicinal Tree and Shrub Species

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Seed may be considered to be the most important factor in plant regeneration and conservation of genetic reserves, especially in sever environmental conditions. Due to the fact that seeds of most tree and shrub species are usually dormant, it is necessary to investigate and determine the most appropriate seed dormancy breaking treatments to regenerate plant species. In this research, application of some seed dormancy breaking treatments were evaluated on 16 species of 9 genres of medicinal trees and shrubs, all of which are Iranian endemic, and the best treatments resulting the highest seed germination percentages were determined. In general, the highest germination percentages were obtained for the treatments of 1 month cold stratification in *Amygdalus* species, 5 months warm stratification and then 5 months cold stratification in *Tilia platyphyllos* species, scarification and then 8 hours soaking in warm water at 45°C in *Astragalus glycyphyllos* species, 6 weeks cold stratification in *Berberis* species, leaching for 24 hours and then cold stratification for 3 weeks in *Capparis spinosa* species, 1 day soaking in warm water at 45°C and then 3 months cold stratification in *Celtis* species, scarification, 1 day soaking in warm water at 45°C and then 6 weeks cold stratification in *Cotoneaster* species, leaching for 24 hours, scarification, 1 month warm stratification and then 2 months cold stratification in *Viburnum lantana* species, and finally, 1 month cold stratification in *Prunus divaricata* species.

Keywords: Seed dormancy breaking, Seed germination, Regeneration, Trees

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Evaluation of Compatibility and Essential Oil Yield in Populations Different Species of *Thymus Kotschyanus*

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In this study, 20 accessions of *Thymus kotschyanus* from different regions of the Iran were evaluated for compatibility and essential oil yield. The seeds were grown in Jiffy pots in greenhouses. The achieved *T. kotschyanus* plants were grown at a distance of 75 cm and spaced 1 meter from each other on furrows at Saeed Abad Agricultural Research Station of Tabriz. The statistical design was a randomized complete block design with two replications. Meanwhile the flood irrigation method was employed to water the plants and the height of the sampling area varied from 1300-2400 AMSL. The 30 seeds were planted in Jiffy pots. The maximum germination percentage of the seeds was observed in Uremia sample and was equal to 100% and the minimum germination percentage was 67% in Qazvin accessions. The samples from West Azarbaijan and Tehran had 1.9% essential oils and was higher compared to other accessions. The fresh and dry weight of samples from Tehran and Sanandaj were superior compared to other accessions or samples. Essential oil content in samples from Tehran, Zarand, Kerman, Qazvin, and Zanjan was higher compared to samples from other accessions. In total, the collected accessions from Tehran were more favorable compared to others. The cluster analysis were done using ward method and all 20 genotypes were placed in 4 clusters. This grouping did not follow the elevation of locations along with climatic and geographical conditions. Dry biomass weight had a significant positive correlation with essential oil content ($r = 0.462^*$) and fresh weight with essential oil content ($r = 0.566^*$). The results of this study showed that in the accessions of *T. kotschyanus*, morphology, physiology, and phenology have sufficient diversity for selection, and according to the objectives of selecting the suitable cultivating area, it is possible to propagate and develop their cultivation.

Keywords: Thyme, Cluster, Solidarity, *Thymus kotschyanus*

Structure–Radioconjugation Activity Relationship Study of some Flavonoid Compounds

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Over 4,000 different flavonoids have been identified within the major flavonoid classes which include flavonols, flavones, flavanones, catechins, anthocyanidins, isoflavones, dihydroflavonols, and chalcones. Flavonoids are potent antioxidants, free radical scavengers [1], and metal chelators [2]. The purpose of this study was to label a number of flavonoids with ^{99m}Tc in order to determine the relationship between the structure and the ability of the radioconjugation. ^{99m}Tc due to its ideal properties such as suitable γ energy (140 keV), short half-life (6 h), low cost, availability and high specificity is widely used radionuclide. The study was performed on eight flavone and flavonol compounds including Calycopterin; Xanthomicrol; Eupatorin; Demethoxylnobiletin; Apigenin; Quercetin; Circiliol and Luteolin. Radioconjugate was prepared with ^{99m}Tc in the presence of SnCl₂.2H₂O as a reducing agent. For each compound, labeling was optimized, and radiochemical analysis was determined by thin layer chromatography (TLC) and high performance liquid chromatography (HPLC). The results (Table1) indicated that structural requirements for the ^{99m}Tc labeling of these compounds include two hydroxyl groups in carbon position S R₆ and R₇.

Keywords: Flavones; ^{99m}Tc, Labeling; Structure- Radioconjugating

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Table 1: Activity of Radioconjugated Flavonoids

NO	Flavonoid	position of protons	position of OH substitutions	position of OCH ₃ substitutions	Activity Percent
1	Calycopterin	R ₆	R ₇ ; R ₄	R ₁ ; R ₂ ; R ₃ ; R ₅	~0%
2	Xanthomicrol	R ₅ ; R ₆	R ₇ ; R ₄	R ₁ ; R ₂ ; R ₃	~1%
3	Eupatorin	R ₁ ; R ₅	R ₄ ; R ₆	R ₂ ; R ₃ ; R ₇	~3%
4	Demethoxylnobiletin	R ₅	R ₄	R ₁ ; R ₂ ; R ₃ ; R ₆ ; R ₇	~8%
5	Apigenin	R ₁ ; R ₃ ; R ₅ ; R ₆	R ₂ ; R ₄ ; R ₇	–	~12%
6	Quercetin	R ₁ ; R ₃	R ₂ ; R ₄ ; R ₅ ; R ₆ ; R ₇	–	~85%
7	Circiliol	R ₁ ; R ₃ ; R ₅	R ₄ ; R ₆ ; R ₇	R ₂	~95%
8	Luteolin	R ₁ ; R ₃ ; R ₅	R ₂ ; R ₄ ; R ₆ ; R ₇	–	~95%



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Bioevaluation of Flavonoid Xanthomicrol as a Tumor Radiotracer Through Conjugation with ^{99m}Tc-Chelator

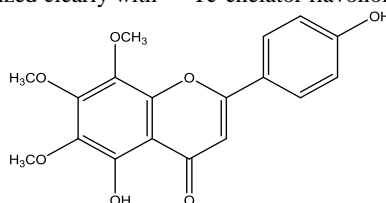
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Many flavonoids have been demonstrated to have *in vitro* cytotoxic activity against various cell lines and have therefore been proposed as anticancer drugs or precursors of such agents. However, a large number of the studied flavonoids have nonselective cytotoxic activity against many cell lines, malignant or otherwise [1]. Xanthomicrol is a trimethoxylated flavone isolated as a major compound from Iranian endemic plant, *Dracocephalum kotschyii* Boiss. It has showed selective cytotoxic activity against some cell lines with little effect on human fetal foreskin fibroblast cells used as normal, nonmalignant control [2]. This study aimed to develop ^{99m}Tc-Labeled xanthomicrol using ethylenedicycstein as a chelatore and evaluate its labeling efficiency and potential use as a tumor imaging agent. ^{99m}Tc-chelator was conjugated to xanthomicrol with dibromoethan and then labeled with ^{99m}Tc using tin chloride as a reducing agent. *In vitro* stability was analyzed by radio-chromatography. *In vivo* bioevaluation and imaging studies of ^{99m}Tc-chelator flavonoid were performed in rat induced C6 glioma tumor at different time point post injection. The results indicated that labeled xanthomicrol as a radiotracer in tumor-bearing rats has high absorption in tumor. Scintigraphy confirmed that tumors could be visualized clearly with ^{99m}Tc-chelator flavonoid.



The structure of Xanthomicrol

Keywords: Xanthomicrol; Chelator; ^{99m}Tc; Labeling; tumor; Imaging

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The Effect Administration of Aqueous Extract of *Trigonella Foenum-grasesum* Seeds on Increased Immunity Levels in Broiler Chickens Ross 308 Against Newcastle Disease

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Newcastle is an economic and public health concern. Many herds are infected in Iran by Newcastle virus. Regarding the side effects of chemical drugs, in recent years efforts have been made to replace medicinal plants. Fenugreek is one of the medicinal plants [1]. According to history of extensive use of fenugreek and its high therapeutic value, in this study the effect of fenugreek on Newcastle disease was investigated. For this research, 250 commercial broiler chicks were divided in to 5 equal groups :1- Control group: based diet + normal water; 2- Positive control: base diet + Immunofine® 1cc/1 lit water; 3, 4 and 5 groups: 1, 2 and 3 mL of aqueous extract of fenugreek seeds were added to one liter of drinking water. The aqueous extract of fenugreek seeds was prepared by Soxhlet method. In the first 3 days, the extract was added in the drinking water. Extracts were added to the water for 3 days before and 3 days after each vaccination as well. Live vaccines were not added until 24 hours after vaccination. At the age of one and 40 days, 8 birds from each group, were exposed to Newcastle virus. At the end of the study, the level of antibody against Newcastle virus was evaluated by HI method. Blood samples were taken from each group; A hemagglutination inhibition (HI) test was performed on serum samples. The mean titer of all sampled in the fourth group was significantly higher than control group as the protective titer (p<0.001). In conclusion, it seems that aqueous extract of *Trigonella Foenum-grasesum* head a positive effect on immunity levels in broiler chickens against Newcastle disease.

Keywords: *Trigonella Foenum-grasesum*, Immunity, Broiler Chickens, Newcastle

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Optimization and Development of Curcumin as Poor Water Solubility, by Solid Dispersion Method

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Poor water solubility and physicochemical properties with low bioavailability continue to pose major challenges in developing a curcumin formulation for clinical efficacy. Dissolution behavior according to solid dispersion is one of the best technique. A very important process for Research & Development in any pharmaceutical industry is technique for optimizing the drug formula. Previously we used curcumin extract with 0.8% in the preparation of syrup whereas according to this method it has been reached upper than 30% with optimization method. This process is not only critical but also difficult as it involves various formulation parameters to be modulated all in the same process. This technique can be used to obtain a homogeneous distribution of a small amount of drugs at solid state, to stabilize unstable drugs, to dispense liquid or even gaseous compound. All stages of laboratory process have been done in SGA (Salamat Gostar Artiman) pharmaceutical Co, Ltd. (Iran, Tehran). In this present study, curcumin was formulated and optimized by solid dispersion method with use of effective polymers in the pharmaceutical process like: PEG 6000, PEG 4000 which ultimately causes improved the bioavailability of curcumin. Curcumin – PEG, SD (solid dispersion) in different ratios (1:3, 1:5, 1:10) were prepared according fusion method. Process was optimized by Response Surface Methodology (RSM), Central Composite Design (CCD), Moreover dissolution rate and physicochemical characterizations based on differential scanning calorimetry (DSC) and FTIR were used. Preparation of the physical mixtures, Preparation of the solid dispersions and Solubility study were employed. and dissolution of curcumin SD were significantly greater than those observed for physical mixture and intact curcumin, also the increasing in curcumin was linear with respect to the weight fraction of the polymers at 1:10 CUR-PEG 4000. Improving bioavailability and some drug properties was observed due to amorphous curcumin that has been mentioned for DSC results. DSC thermogram of PEG 4000 showed an endothermic peak around 51 °c. The process used RSM for optimization and further scaled up to produce curcumin with more purity. The results showed that solvent-solid ratio, temperature, time, ethanolic strength are the most effective factors on the yield of curcumin. The second order model obtained for curcumin yield revealed a coefficient of determination (R^2) of 83.44%. The linear, square and interaction Terms were significant at $p < 0.05$ while lack of fit was non-significant at $p > 0.05$. A successful effort towards formulating, optimizing and scaling up PEG-CUR by using solid dispersion technique was demonstrated.

Keywords: Curcumin, Optimization, Polyethylene glycol (PEG), Response surface

GC-MS Based Essential Oil Profiling of Lavender Essential Oils at Before and After Flowering Stage

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Lavandula angustifolia Mill. with common English name of Lavender belongs to the family Lamiaceae and have been used either dried or as an essential oil for centuries, for a variety of therapeutic and cosmetic purposes. The oil is traditionally believed to be antibacterial, anti-fungal, carminative, sedative, anti-depressive and effective for Burns and insect bites [1]. In this study, GC-MS based essential oil profiling of Lavender essential oils at before and after flowering stage cultivated in Shahid Beheshti University were performed. The results of the analysis leads to the identification of 45 and 35 components in the essential oils obtained before and after flowering stages of the lavender, respectively. While, limonene (8.1%) and 1,8-cineole (6.4%) comprised altogether 14.5% at before flowering, their percentages (2.2%) have been significantly decreased after flowering stage. Contrary, linalool (1.9%) and linalyl acetate (0.4%) was found in lower amounts in the essential oils of lavender at before flowering stage compared with flowering stage that contained high amount of linalool (34.7%) and linalyl acetate (17.8%). Although most of the identified compounds are found in both stages but there were some quantitative significant differences between two phenological stage.

Keywords: *Lavandula*, Essential oil, Linalool, Iran

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***Lactuca scariola* as Provider of Alkaloids to Make Molecularly Imprinted Detection Matrix**

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Alkaloids are a category of naturally occurring organic compounds that mostly contain fundamental nitrogen atoms. Alkaloids have a large range of pharmacological activities antihyperglycemic, antiasthma, anticancer and including antimalarial activities. Hyoscyamine is a tropane alkaloid. It is the levorotary isomer of atropine and thus sometimes known as levo-atropine. A molecularly imprinted polymer (MIP) is a polymer that has been processed using the molecular imprinting technique which leaves cavities in the polymer matrix with an affinity for a chosen "template" molecule. These polymers have dependency for the original molecule and have been used in usage such as chemical separations, catalysis, or molecular sensors [1]. *Lactuca scariola* L. is a common weedy yearlong species found in disturbed and ruderal sites. It is a cosmopolitan species, at times prevailing in communities (Mucina, 1978), and is found at mid-latitudes all over Europe, Britain, North Africa, West Asia, and North America [2]. Based on molecularly imprinted photonic polymer (MIP) that composed the colloidal-crystal with molecular imprinting method, a novel label-free colorimetric chemosensor for convenient and fast efficient detection of hyoscyamine with great sensitivity and specificity was developed. The plant was collected from Firouz-Abad, Fars Province in 2019. The voucher specimen was deposited in Drug Design Unit Herbarium. Different parts of the plant were collected and the extract was prepared using percolation. The unique three-dimensional, highly-ordered photonic hydrogels would be obviously bound in response to the specific atropine molecular recognition process and the response would be directly transferred into visually perceptible optical signal (change in color) that could be detected by the naked eye. The intelligent chemosensor was successfully employed to assign the trace plane hyoscyamine in plant sample, providing a quick and impressive alternative for semi quantitative detection of hyoscyamine.

Keywords: Alkaloid, Molecularly imprinted photonic polymer, *Lactuca scariola*

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Effect of Seaweed Fertilizer Foliar Application on Growth Parameters and Qualitative Characteristics of Hyssop *Hyssopus officinalis* L.

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In order to investigate the effect seaweed fertilizer on growth characteristics, qualitative and quantitative yield of Hyssop (*Hyssopus officinalis* L.), an experiment was conducted in a randomized complete block design with four treatments (0, 2.5, 5 and 10 ml.l⁻¹) and three replications in research farm of agricultural college, Tarbiat Modares University of Tehran, during 2017. The organic fertilizer used in this experiment was Bioalgax Seaweed (made from *Ascophyllum nodosum*). Evaluated traits were plant height, leaf area, stem diameter, flower length, fresh and dry weight, chlorophyll content index, percentage and essence yield. The results showed that seaweed fertilizer had a significant effect on all studied traits except flower length and stem diameter and the highest of plant height (49.66 cm), fresh weight (103.22 g), dry weight (22.89 g), leaf area (0.77 cm²) and the amount of chlorophyll content (61.83) were obtained in seaweed fertilizer treatments. Also, the highest percentage of essential oil (0.58%) and yield (2.12 g/m²) were obtained from 10 milliliter/liter of seaweed fertilizer. According to the results of this study, the application of seaweed fertilizer can improve the morphological characteristics and quantitative and qualitative yield of hyssop.

Keywords: Hyssop, Seaweed fertilizer, Dry matter yield, Essential oil content

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Synthesis of New Triazole Tethered Derivatives of Nor-Codeine and Evaluation of Their Analgesic Properties

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Natural compounds are organic substances that are produced by nature [1]. These secondary metabolites are derived from living organisms like bacteria, fungi and plants usually have biological activities. Human societies have used these compounds for different therapeutic goals, so they play a key role in discovery of new drugs and are important sources of drug lead and hit compounds. Alkaloids are a large group of metabolites that have curative properties in mammals such as human and today many of drugs belong to alkaloids. Codeine or 3-methylmorphine is a best-known prescribed antitussive and analgesic alkaloids that extracted from *Papaver somniferum* [2]. Isolation of codeine was first done by Pierre Robiquet in 1832 but nowadays most of the commercial codeine is synthesized by *O*-demethylation of morphine. Its remarkable biological activities (sedative, painkiller) combined with lack of toxicity has made codeine as a suitable lead compound for the synthesis of new derivatives. Here a series of 1,4-disubstituted 1,2,3-triazole derivatives of nor-codeine were synthesized by *N*-demethylation of codeine followed by propargylation and alkyne-azide cycloaddition reaction. All compounds were evaluated for their analgesic activity by *in-vitro* radioligand binding assay method. Seven compounds out of all twenty products were selected for *in-vivo* tail flick experiments. Most of the synthesized compounds showed promising analgesic activity in which compound **16f** with ED₅₀ of 22.44 nano mol/Kg revealed a better activity even more than codeine (31.83 nano mol/Kg) as a commercial drug.

Keywords: Codeine, Click chemistry, 1,2,3-Triazole, Radioligand Binding Assay, Tail Flick.

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