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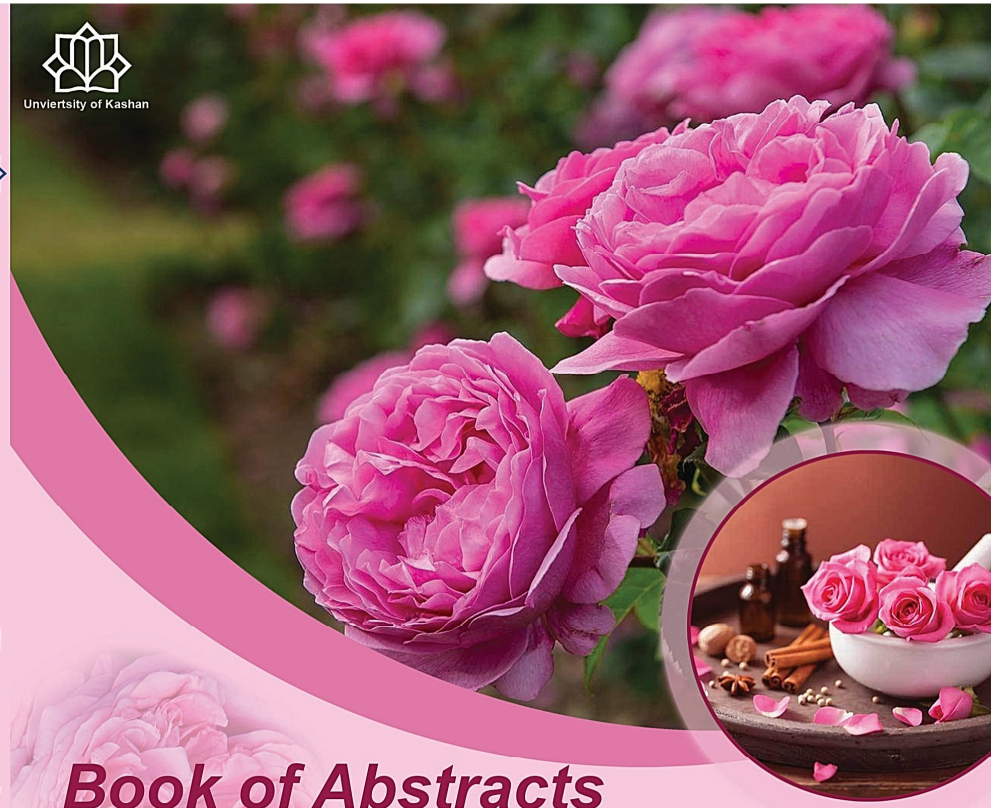

Book of Abstracts

Rosa damascena 2018

The First International Conference of *Rosa damascena*
3-5 November 2018, University of Kashan, Qamsar, Iran

In the name of God

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Rosa Damascena

2018

Effects of storage and time on essential oil components of *Rosa demascena*

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Abstract

Investigation effects of storage and time on essential oil components of *Rosa demascena*. Essential oils were obtained by hydrodistillation method. We used different vessel with glass, color glass and aluminum and investigated effect of storage as three and six months' time, Primary essential oils analyses by GC and Mss, so main components were identify as citronellol (33.5%), cis-p-menth -2-en-1-ol (7.3%) and geraniol (7.2%). Also main components in different containers kept for three months in simple glass, color and aluminum were: citronellol 44.9, 31.1 and 33.6 %. Also after six months storage of essences were citronellol 56, 50.9 and 55.7%. Which in normal temperature condition, refrigerator and freezer, and main percentage of compound citronellol were 31.1, 40.2 and 37.5%. Storage in three months in simple glass in refrigerator were suitable than others methods. Also storage in six months essence in simple glass and in normal temperature is better. In total compromising time, condition of storages show that time and containers can effect on essential oils and percentage of compound. So in this research we can selected good method will help economically and give a good benefit to industries.

Keywords: Storage, citronellol, Rosa demascena, simple glass and compound

Rosa × *damascene* cultivar cultivation and their uses in Iran

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Abstract

Rosa × *damascena*, known as Gole Mohammadi , rose hybrid, derived from Rosa gallica and Rosa moschata. The origin of Damask rose is the Middle East and some evidences indicate that the origin of rose water is Iran. Rose has been used for medicinal purposes including antibacterial, antioxidant, ant diabetic, and relaxant effect reported. The flowers and petals are renowned for their fine fragrance, and are commercially harvested for rose oil and rose water in Iran. In our research work, we have don lot of project on this plants and their cultivar. *Rosa* × *damascena* where cultivated in hedge rows. The rose's flowers are brought to cooperative for distillation and quality control. In this review we discuss important components of different cultivar of this plant and different hedro-distillation. Several components were isolated from flowers and petals of R. damascena including terpenes, glycosides, flavonoids, and anthocyanins. This plant also contains carboxylic acid, myrcene, which collected from the Tehran, Shiraz and Kashan regions. Among them, identified compounds were; β-citronellol, nonadecane, geraniol, and nerol were the major components of the oil. Iran has developed an industry producing rose oil. Perhaps due to the much flower and low labor cost, rose products from Iran are less expensive than those from other country. So rose due to contain several components such as terpenes, flavonoids, and anthocyanins that have beneficial effects on human health. They may be used to flavor, an herbal tea.

Keywords: Rosa × damascene, terpenes, glycosides, flavonoids, Rose water

Rose absolute, chemical composition, biological activity and industrial applications

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Abstract

Rosa damascena is commonly known as "Gole Mohammadi", and its petals are usually used for production of rosewater in Iran, while the essential oil, rose concrete and rose absolute are the most important products from rose petals in other countries. Rose absolute with broad applications in different industries are used in perfumes, aromatherapy, medicine and sanitary products. Unfortunately, No attention to rose absolute has been made in Iran as the origin of *R. damascena*. The world production of rose oil and rose absolute are about 3000 and 5000 Kg per year, respectively, while rose absolute has not been identified by Iranian producers. The aim of this article is to explain about the chemical composition, biological activity, the industrial applications and economical importance of rose absolute as main important product of rose petals. Also, the future aspects, and proposed approaches for rose absolute will be discussed.

Genetic relationships among some Iranian populations of *Rosa damascena* using ISSR and RAPD markers

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Abstract

Genetic variation within and among populations is the basis for survival of the populations both in short and long term. Thus, studying the plant genetic diversity is essential for any breeding program. *Rosa damascena* Mill., is an important species as a source of rose oil, and is one of the oldest rose species grown in Iran. The main rose oil producers in the world are Turkey, Bulgaria and Iran. They are obtaining the rose oil almost exclusively from the certain clones of *R. damascena*. This study was conducted to detect the genetic variability and relationships across 6 Damask rose populations from Kashan region (Barzuk, Niasar, Azeran, Aheste, Kheirabad and Kolpe) and one from Hamedan province (Bahar). Nine plants (on average) per population (in total 54 plants) were used for genotyping by 11 ISSR (Inter simple sequence repeat) and 9 RAPD (random amplified polymorphic DNA) markers. ISSR markers produced 91 bands, of which 41 were polymorphic (67%). Primer ISSR7 and ISSR24 detected the highest percentage of polymorphism, while for primer ISSR19 the lowest one was observed. RAPD markers produced 81 bands, of which 54 were polymorphic (66%). Primers R10 and R7 detected the highest percentage of polymorphism, while primer R4 was the lowest. UPGMA cluster analysis based on Jaccard similarity coefficient by ISSR markers revealed nine groups in the dendrogram and genetic similarity ranged between 0.61 to 0.98. By RAPD markers, nine clusters were also obtained and genetic similarity ranged between 0.57 to 0.97. In both marker types, differences between the plants within the populations were very low, however considerable genetic diversities detected between the evaluated populations. Aheste and Hamadan populations had the greatest difference and genetic distance. Hamadan samples had the closest relationship with individuals of Kolpe and Kheirabad. RAPD and ISSR markers provided useful tools for evaluating genetic diversity and genetic relationships of *R. damascena*. The knowledge of these diversities, found in this study, will allow a plant improvement of Damask rose related to pharmaceutical and industrial uses.

Keywords: *Rosa damascena*, Genetic relationships, Markers, ISSR, RAPD

Rosa Damascena oil improved sexual function and testosterone in male patients with opium use disorder under methadone maintenance therapy–results from a double-blind, randomized, placebo-controlled clinical trial

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Background. Some patients with opioid use disorder (OUD) are treated with methadone maintenance therapy (MMT). However, as with opioids, methadone has major side-effects; sexual dysfunction is a particularly distressing such effect. Rosa Damascena oil has been shown to reduce subjective sexual dysfunction in patients with major depressive disorders, but its influence on testosterone has not so far been tested. The aim of the present study was to investigate the influence of Rosa Damascena oil on sexual dysfunction and testosterone levels among male patients with OUD and undergoing MMT.

Methods. A total of 50 male patients (mean age: 40 years) diagnosed with OUD and receiving MMT were randomly assigned either to the Rosa Damascena oil (drops) or a placebo condition. At baseline, and four and eight weeks later, patients completed questionnaires covering sexual and erectile function. Blood samples to assess testosterone levels were taken at baseline and eight weeks later on completion of the study.

Results. Over time sexual dysfunction decreased, and testosterone increased in the Rosa Damascena oil, but not in the placebo condition. Sexual dysfunction scores and testosterone levels were not consistently related.

Conclusions. Results from this double-blind, randomized, and placebo-controlled clinical trial showed that Rosa Damascena oil improved sexual function and testosterone levels among males with OUD and undergoing MMT.

Keywords: Opium and opioid use disorder, Methadone maintenance therapy, Sexual dysfunction, *Rosa damascena* oil

Investigation of maintenance temperature and time after collecting of the flowers of on the qualitative and quantitative characteristics of aromatic compounds extracted from *Rosa damascena* Mill

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Introduction. Importance of plant uses in food and especially drug industry is not negligible. Beside these industries, perfume industry is also considered as one of the most thriving and economical profitable categories in which aromatic plants play an important role in it. One group of the most important components, used in perfumes is *Rosa damascena* Mill. derivatives and Kashan area has a main history in natural perfume production from this plant.

Methods. In this research, effects of maintenance temperature and time after collecting of the flowers of *Rosa damascena*, on the essential oil quality was investigated from the point of view of chemical constitution and physicochemical properties.

Results and Discussion. Essential oil yield and amount of the geraniol and nerol as two major components were significantly higher in the fresh picked flowers.

The results confirmed that both parameters have significant effect on the type and amount of the essential oil components; however, selection of the best condition depends on the type of application and expected properties.

Keywords: *Rosa damascena* Mill., Essential oil, Maintenance time effect, Maintenance temperature effect.

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Antimicrobial activity of *Rosa damascena* against oral infections: An overview

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Introduction. Oral diseases, including dental caries and periodontal diseases are among the most important infectious diseases in the world. There are several antibiotics for treatment / control of oral infections but some challenges such as their adverse side effects and development of antibiotic resistance induce scientists to survey for alternative methods. In recent decades, application of plant products for prevention and control of oral infectious has been progressively considered. *Rosa damascena* is one of species of *Rosaceae* family with beneficial health and therapeutic effects. It may be effective against a wide spectrum of microorganisms. In traditional medicine texts, preventive and therapeutic effects of this plant have mentioned. Moreover, some new evidences are emerging that indicating that it may be useful in control of oral infections. The major products of *Rosa damascena* are rose water, rose oil, dried flowers and hips. In this review article, scientific documents related to the role of *Rosa damascena* in the prevention and treatment of oral infectious diseases have been evaluated.

Methods. This study was conducted using library research method and databases searching.

Results and Discussion. Some evidences are emerging that *Rosa damascena* may be useful in the control of oral infections:

- Bacteriostatic or bactericidal and anti-adhesive effects of various extracts of *Rosa damascena* against cariogenic streptococci.
- Effect of rose water on decreasing the adhesion of the most common cariogenic bacteria
- Antimicrobial effect of *Rosa damascena* extract against endodontic pathogens.
- Effect of mouthwash containing *Rosa damascena* extract in the treatment of recurrent aphthous stomatitis.

Rosa damascena as a medicinal plant is capable of intervention against oral infectious diseases. The application of *Rosa damascena* and its products can decrease the need to antimicrobial agents. However, further studies for isolation and purification of bioactive compounds and their applications in different pharmaceutical formulations for control of oral infections as complementary medicine could be regarded. Therefore, this plant may be a valuable candidate for oral infections prevention, control and treatment.

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In vitro regeneration of shoots and ex vitro rooting of damask rose (Rosa damascena Mill*)*

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Introduction. One of the most important Rosa species is *R. damascena* Mill. of which some cultivars are used for oil production and others are cultivated throughout the world as garden roses (1). The experiment was performed to investigate the *in vitro* regeneration ability of damask rose (*Rosa damascena* Mill.) combined with *ex vitro* rooting as an efficient and cost-effective method for rapid and high-quality plant regeneration.

Methods. Single-node explants included lateral buds were taken from bushes and after sterilized. The nodes cultured on Murashige and Skoog (MS) medium supplemented with different concentrations of BAP (1, 1.5, 2, 2.5 and 5 mg/l), NAA (0 and 0.1 mg/l), GA_3 (0 and 0.1 mg/l) and coconut water (0 and 40 ml) in separated and combination with together. To evaluate *ex vitro* rooting, micro-shoots were treated with 3 mg/l IBA or 3 mg/l NAA solutions. The percentage of shoot regeneration and root formation recorded at the end of the experiment.

Results and Discussion. The results showed that the best multiplication rate, highest number of shoots per explants, and best growth of shoot and leaf growth was achieved in T9 medium containing the MS salts supplemented with 2.5 mg/l BAP and 0.1 mg/1 GA_3. The highest percentage of rooting (100%) was obtained in both rooting media (3 mg/l IBA or 3 mg/l NAA). The highest number of roots per explant and the highest root length were observed in explants treated with IBA and NAA, respectively.

The results showed that GA_3 had a significant effect on regeneration percentage of the *R. damascene*. The results of *ex vitro* rooting showed that this simple method has a good potential to induce healthy roots and could be an alternative of *in vitro* rooting which is labor-intensive. Overall results showed that the combination of *in vitro* regeneration and *ex vitro* rooting of *R. damascene* nodes could be used as an efficient micropropagation of elite cultivars of *R. damascene*.

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Morphological and essential oil characterization of different populations of *Rosa damascena* Mill. in Kashan

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Introduction. *Rosa damascena* Mill. from Rosaceae family, is a unique species. One of the major and popular growing regions of damask rose is Kashan and its rose essential oil has unique scent and global reputation.

Methods. In this study, 15 populations of *Rosa damascena* Mill. were collected from important rose oil production regions of Kashan, Iran. In order to evaluate morphological variation, 52 quantitative and 17 qualitative morphological characters were measured. The essential oil content (w/w) of flowers was assayed after extraction in Clevenger apparatus (1). The chemical composition of essential oil was analyzed by gas–chromatography coupled with mass spectrometry.

Results and Discussion. Cluster and Principal component analysis (PCA) of morphological characters showed that the fifteen populations could be divided into two major groups including five subgroups. The variance analysis showed significant differences ($P<0.01$) among populations of *Rosa damascena* for 28 morphological characters such as stem length, Leaf length and number of flowers per plant. *Rosa damascena* population from Azaran (valley) produced the highest content of absolute oil (0.019% w/w), while the lowest value of absolute oil (0.002% w/w) belonged to Eznaveh population. Correlation results showed that there is a significant relationship between some morphological characters and essential oil content. Stipule length had a significant positive correlation with the essential oil content, while a significant and positive correlation was observed for peduncle length and receptacle glandular length with the essential oil content.

Based on the resulted dendrogram from cluster analysis of chemical component data, fifteen *R. damascena* populations grouped into four clusters. A total of Sixty-five compounds were identified and quantified by GC–MS analysis in the rose oil.

The major components of the oil contained limonene (0.4–12.8%), 2-phenylethyl alcohol (1.0–1.3%), citronellol (16.2–57.8%), geraniol (0.9–14.1%), methyleugenol (0.5–2.5%), heptadecane (0.8–3.0%), 1-nonadecene (2.1–7.5%), nonadec-9-ene (14.9–30.2%), eicosane (1.0–3.3%), heneicosane (5.8–18.6%), tricosane (0.9–5.2%) and pentacosane (0.3–2.1%).

The essential oil of Josheghan was considered to have a high quality in terms of richness in citronellol, geraniol and 2-phenylethyl alcohol monoterpenes which has good potentials as antioxidant and strong fragrance in cosmetic and pharmaceutical industry.

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Phytochemical study of flowers of *Rosa damascena* Mill.

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Introduction. *Rosa damascena* Mill. is Perennial plant from family Rosaceae, indigenous to Europe and Middle East countries, Iran and Turkey. It is known as Gole Mohammadi. *R. damascena* is an ornamental plant and besides perfuming effect (Boskabady et al., 2011). Several components were isolated from flowers, petals and hips (seed-pot) of this species including terpenes, glycosides, flavonoids, and anthocyanins (Noriaki et al., 1998). *R. damascena* contains carboxylic acid, myrcene, vitamin C (Libster 2002) kaempferol and quercetin. Flowers also contain a bitter principle, tanning matter, fatty oil and organic acids (Loghmani-Khouzani et al., 2007). There more than 95 macro- and micro-components in the essential oil of *R. damascena* from the Kashan regions. Among them, eighteen compounds represented more than 95% of the total oil. The identified compounds were; β-citronellol (14.5-47.5%), nonadecane (10.5-40.5%), geraniol (5.5-18%), and nerol and kaempferol were the major components of the oil (Loghmani-Khouzani et al., 2007). Analyses of rose absolute showed that phenyl ethyl alcohol (78.38%), citronellol (9.91%), nonadecane (4.35%) and geraniol (3.71%) ethanol (0.00-13.43%), and heneicosane were the major compounds (Ulusoy et al., 2009). A new flavanone glycoside, butin 4′-O-(2″-O-β-D- apiofuranosyl)-β-D-glucopyranoside , together with liquiritin, liquiritin apioside, isoliquiritn apioside , davidioside , quercetin, kaempferol, kaempferol 3-O-β-D-glucopyranoside and kaempferol 3-O-α-L-arabinofuranoside were isolated from the flowers after industrial distillation of essential oil (Kumar et al., 2006).

Methods. Total phenol content was estimated as gallic acid equivalents (Dehghan Kashani et al., 2011).Phytochemical investigation of a methanolic and ethanolic extract of *R. damascena* flowers was carried out using GC-MS method.

Results and Discussion. Flavonol glycosides were extracted from petals of *Rosa damascena* Mill. after industrial distillation for essential oil recovery and characterized by high-performance liquid chromatography-electrospray ionization mass spectrometry. Among the 22 major compounds analyzed, only kaempferol and quercetin glycosides were detected. (Schieber et al., 2005).

R. damascena is one of the most important plants known for its perfuming. Its major products are rose water and essential oil. This plant contains several primary and secondary metabolite such as terpenes, glycosides, flavonoids, and anthocyanins that have beneficial effects on human health. The pharmacological effects of *R. damascene* are widespread.

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The Biodiversity study of species and varieties of *Rosa* L. genus from Kashan area

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Abstract

Rosa L. genus with more than 16 species in Iran and 200 species in the world, is one of the most famous genera of Rosaceae family. Most of the species belonging to this genus are spiny shrubbery with pennate leaves and flowers with five petals. Varieties, cultivars, species and many subspecies of this genus are planted commonly in different temperate and cold temperate regions of Iran today. Although most varieties and forms of roses are diverse in color and number of petals, flower size and landscape beauty, and most often they are used to beautify green space, nevertheless, species of wild of the *Rosa* L. genus are often It has five petals with a lot of flavors that are used today in different industries such as perfumery, cosmetics, sanitation, food and medicine. In addition, the *Rosa damascena*, which is considered as one of the hybrid species of this genus, was cultivated in the different regions of Iran, especially Kashan, due to its incredible and pleasant aroma. Rose garden (Golestan) Mountainous areas of Kashan is a typical example of the efforts of farmers in this area that have been farming since very far past. The purpose of this research is to identify species and different cultivars of rose genus in Kashan area. With field surveys in mountainous Rangelands as well as different rose gardens fields of Kashan, different plant specimens were collected and identified. The identified specimens are kept in Herbarium of Kashan Botanical Garden. Based on the results of this research, more than 7 species of rose were identified in different parts of Kashan. Species such as: *R. beggeriana* Schrenk, *R. canina* L., *R. persica* Michx. Ex Juss., *R. elymatica* Boiss. & Hausskn., are grow naturally in the mountain range of Karkas. Species for example: *R. foetida* J. Herrman, *R. maschata* J. Herrman are often ornamental in gardens, houses and parks. *Rosa damascena* has been grown as a hybrid species with a high number of petals, cultivated from past cultivars by farmers of different regions of Kashan in the form of large rose gardens. Due to the precious rose waters and essential oils of this hybrid species, Kashan's rose waters extract industry has been flourishing for hundreds of years in all the villages and mountain range Karkas. In addition, three varieties of flower of *Rosa damascena* are white, golden and pink in some of the rose gardens of Kashan area, along with the flower of *Rosa damascena*, is cultivated on a very limited level. The composition of the essential oils of these varieties is different from the flowers of *Rosa damascena*.

The comparison of essential oils chemical compounds of *Rosa damascena* Mill. three rose garden of Kashan area

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Abstract

The genus *Rosa* L., belong to the Rosaceae family, includes several shrub species that has been reported to date in more than 200 species in the world and only 16 species from Iran. The *Rosa damascena* is one of the hybrid species of this genus that has flowers from 40 to 80 petals. In this research, essential oils chemical compounds of *R. damascena* Mill. from three rose gardens of Kashan area have been studied. The flowers of this plant in the spring of 2017 were collected from Kashan rose gardens (950 m above sea level), Niasar (1320 m above sea level) and Qamsar (1890 m above sea level) and and subjected to volatile fraction were isolated by simultaneous steam distillation extraction (SDE). The analysis of the oils were performed by using GC and GC-MS. The main components of the essential oil of Kashan rose garden includes: citronelole and nerole (35.76%), geraniole (26.66%), nonadecane (12.25%), linalole (5.53%), and henicosane (4.11%), respectively. The main components of the essential oil of Niasar rose garden includes: citronelole and nerole (46.48%), geraniole (12.96%), nonadecane (12.71%), henicosane (4.27%), and linalole (1.64%), respectively. The main components of the essential oil of Qamsar rose garden includes: citronelole and nerole (46.19%), geraniole (22.69%), nonadecane (12.71%), linalole (3.74%), and benzene etanole (3.8%), respectively. The comparison of essential oils chemical compounds of *R. damascena* of different rose gardens showed that the combination of linalool in Kashan essential oil was more than Qasem and Niaser. The combination of benzene ethanol in the essential oils of Niasar and Qasrar was reported to be five times higher than in Kashan. The two combinations of citronelole and nerole in the Qmasar and Niasar oils were more than Kashan. The combination of nonadecanel in the essential oils of the three regions was almost the same. The combination of hanicozane in the essential oils of Kashan and Niasar were 4% and as a major component of the essential oil, while no trace of this composition was observed in the essential oil of Qamsar.

The construction of damask rose and rose water museum in the Kashan botanical garden

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Abstract

The origin of the *Rosa damascena* belonged to Iran. Therefore, the Iranians are the first people who have found out the properties of food, medical and cosmetic of damask rose from the too far away. Among the flowers, the flower of rose was more interested in Iranians and in the form of the word "Varda" has come in the Avesta several times. Considering the economic, social, cultural and tourism importance of the flower of rose and its products, the construction of "damask rose and rose water Museum" is necessary in Kashan Botanical Garden. Therefore, by collecting objects, instrument, various apparatus and equipment of extraction of rose water; from the ancient times so far, Not only can determine the gradual evolution of this industry, But also the construction of the rose water museum will be very an effective role in the development of ecotourism industry. In this research, it was tried to visit the traditional extraction of rose water workhouses, the production and supply of various aromatic water, odor and essential oil, was negotiated with the skillful and experienced people in the profession and were collected valuable information on distillation practices and the application of tools used in extraction of rose water. The results of this study showed that more than 8 types of traditional extraction of rose water apparatus, 18 types of rose water bottles, 28 types of rose water sprinkler, 10 types of heating systems, 35 types of odor bottles, 39 types of pitches (ewer) and 25 types of decanters from different parts of the country were Prepared and purchased. The documentary images were prepared for each of the objects. The properties of each objects and apparatus were recorded based on the exploration of scientific resources or discussions with experts. According to the results of this research, the most of the museum's works were owned by the owners of traditional extraction of rose water workhouses or local collectors of Kashan. Undoubtedly, due to the long history of traditional extraction of rose water industry in the region of Kashan and the existence of diverse museum's works, access to the related objects of the industry has more than other parts of the country.

Effects of two types of fertilizers on the extract's yield and phenolic compounds of *Rosa damascena* Mill

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Introduction. Rose scientific name is *Rosa damascene* Mill. The aim of this study was to evaluate the quality and quantity of phenolic compounds in this plant that treated by both manure and chemical fertilizers. Flavonoids and other phenolic compounds are widely distributed in plants, and various biological activities such as antioxidant, anti-microbial, anti-inflammatory agents have been reported in many studies.

Methods. The flowering seedlings of Rosa were subjected to the treatments for one year. So that the first plot was considered as control and was irrigated from any organic and chemical fertilizer. In the second and third plots, the flowers of Rosa were routinely rows, and in three rows three replicates, respectively, for one year, cattle manure of 350 g and 100 g of fertilizer. The chemical (phosphate fertilizer and urea combination of 2 to 1 Lordegan companies) were added along with the required water at the foot of each plant. The sampling of flowering plants in experimental plots was carried out in May of 2016 at the same time as the flowering season of 10 plant flowers randomly. After appropriate treatments (manure and chemical fertilizers) at 2 habitats and 3 replication extraction conducted by soaking in 70% ethanol. Then measurement of phenolic and flavonoids compounds has been done by spectrophotometry method.

Results and Discussion. The results of phytochemical tests confirmed the presence of tannin, anthocyanin and flavonoids and absence of alkaloids in all treatments. Chemical fertilizer increased the flavonoids compounds manure fertilizer increased phenolic compounds.

Results indicated that the efficiency of different treatments-can effect of plant's extract efficiency and phenolic compounds that So far for this plant species has not been reported in the scientific literature. The number of phenolic compounds and the percentage of inhibition of free radicals in the antioxidant test has a direct relationship with each other. Therefore, in both tests, it can be seen that the sample used in manure is high in antioxidants and phenol content, and can be due to the absorption of materials that produce phenolic compounds, and so on. The antioxidant activity of the plant is involved. It also seems that different materials used in plant nutrition have direct effects on plant's compounds, especially secondary metabolites.

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Effects of two irrigation methods on phenolic compounds and antioxidant activity of *Rosa damascena* Mill

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Introduction. Phenolic compounds (flavonoids, tannins, and anthocyanins) are the most important natural antioxidants. *Rosa damascene* Mill. Is one of the most medicinal plants, which has been used in Iranian ancient and were cultivated traditionally in different parts of Iran. The present study was conducted to investigate the quantitative and qualitative properties of phenolic compounds and antioxidant activity of *Rosa damascene* Mill under two irrigation methods (drip and flood irrigation).

Methods. The Seedlings of *Rosa damascene* Mill were arranged in regular rows and respectively irrigated for one year with a drip and food irrigation system. The sampling of flowering plants in experimental plots was carried out in May 2016 at the same time as the flowering season from 10 plant flowers randomly. The total phenolic, flavonoid, alkaloids, tannin contents and the antioxidant activity were measured by spectrophotometry and DPPH methods respectively, then the all data were analyzed by using SPSS software version 19 and analysis of variance.

Results and Discussion. The results of the phytochemical test confirmed the presence of secondary compounds such as tannin, anthocyanin and flavonoids, and the absence of alkaloids in the extract of this species. Also, samples in drip irrigation treatment had the most antioxidant properties. The results of this research showed, by using management methods such as irrigation can be controlled the production, quantity and quality of secondary compounds in plants. In this study, the results of the phytochemical test confirmed the presence of secondary compounds such as tannin, anthocyanin and flavonoid and the absence of alkaloids. The number of phenolic compounds and the percentage of DPPH free radicals inhibition are also indicative of the relatively high antioxidant properties of this species. Results of the sample in the flood irrigation shows the smallest phenolic compounds and drip samples that have the most antioxidant properties. The adaptation of *Rosa damascene* Mill to our country's climate, the existence of a long-standing culture, production and consumption, the prosperity and demand of the global markets for Iranian products, and, consequently, employment are among the issues that require special attention to this plant species.

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The effect of temperature of thin layer drier on the anthocyanin components and antioxidative ability of *Rosa Damascena* Mill methanolic extract

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Inrtoduction. *Rosa Damascena* Mill is a Rosaceae family and one of the most important species of Rose. Products made from flowers such as essential oils, rose water, petals and dried buds are used in the perfumery, pharmaceutical and food industries. The processing of flowers has a significant impact on the quality and quantity of its ingredients. The flower of *Rosa Damascena* Mill contains flavonoids and anthocyanins with antioxidant activities. The purpose of this study was to investigate the effect of temperature drying of *Rosa Damascena* Mill petals in a thin layer dryer on the total amount of anthocyanins, flavonoids, and antioxidant activities.

Methods. Rosa Damascena Mill flowers were collected from Gonabad city and dried at a temperature of 35, 45 and 55 °C in a thin layer dryer with a hot air flow rate of 1.2 m/s. Total anthocyanin compounds, in terms of cyanidine 3-glucoside, total phenolic compounds, scavenging ability of free radicals (DPPH) and reducing power of FeIII (FRAP) of methanolic extracts of *Rosa Damascena* Mill petals were measured.

Results and Discussion. The results showed that the methanol extract of dried petals at 55 °C had the lowest IC50 (30.01 mg/ml) so had the highest antioxidant ability. At this temperature, the highest amount of phenolic compounds (equivalent to 777 mg gallic acid per gram of sample Dried) was also measured in methanolic extract. At 45°C the highest amount of trivalent iron regenerative capacity (1261 mmol Fe^{2+} $mass^{-1}$) and total anthocyanin (239 mg cyanidine-3- glucosid/gram of dried sample) were obtained.

Rosa Damascena Mill petal dried at 55°C is a good source of antioxidant material because of its high phenolic compounds and less IC50 and 45°C is the best temperature for extraction of Anthocyanin compounds and chelating agent antioxidants.

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Determining of challenges and solutions for *Rosa damascena* essential oil competitiveness in Kashan district using Porters' diamond model

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Introduction. The value of the essential oil is so high that it is likened to liquid gold. Therefore, due to the high potential of our country in the production of essential oils and the high value of this product, in this research, we tried to evaluate the problems and solutions of the competitiveness of the essential oil industry in Kashan area, a main cultivation area of Rosa damascena in Iran using Porter Diamond model. Problems of the mentioned industry and solutions proposed by experts from universities and industry are also considered.

Method. In order to collect information, a semi-structured interview has been used. At this stage, eight industry experts, a mix of academics and industry professionals, were interviewed. In the framework of the interview, the experts' opinions on the problems the suggested solutions for solving them were taken. The data analysis method is content analysis.

Results and Discussion. The results showed that during the interviews, industry experts pointed to 89 problems in the field of competitiveness of the mentioned industry. On the other hand, they have provided 98 solutions to improve competitiveness problems.

At the end of this research, solutions and suggestions are presented from the researcher's point of view.

Keywords: Competitiveness, Essential Oil Industry, Competitiveness of *Rosa damascena* Essential Oil, Kashan District.

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Evaluation of competitiveness for *Rosa damascena* essential oil, using Porters' diamond model (Case study: Iran, Kashan district)

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Introduction. Rosa damascena Mill. is a valuable medicinal and aromatic plant all over the world. The most important product of this plant is its essential oil. The importance of the mentioned material is so high that it is likened to liquid gold. In this research, we tried to evaluate the competitiveness of the essential oil industry in Kashan area as one of the most important cultivation area in Iran.

Method. The method of evaluation is Porter Diamond model and the data analysis method is content analysis, in which the relative frequency of expert opinion was calculated for each dimension of the six-dimensional Porter diamond model. Also, non-parametric Binominal and Friedman methods have been used to analyze factors and variables. In order to collect information a semi-structured interview has been used. At this stage, eight industry experts, a mix of academics and industry professionals, were interviewed.

Results and Discussion. The results of the research show that there are a lot of problems in each of the dimensions, and they acknowledge that there is no considerable problem in two categories of foreign dependence on materials and the presence of substitute products.

Based on the tests and analyzes, results from descriptive mean show that overall competitiveness and each of the competitiveness factors are less than average, and therefore, they are not in desirable condition. Only 6 variables of competitiveness from the total of 51, have a mean equal to or more than the average. These variables are: the lack of dependence on foreign raw materials, the existence of substitute products, the state of energy in industry, the impact of climate on quantity and quality of the product, the ease of launching new businesses and the presence of strong competitors.

The results of the binomial test confirmed the mentioned facts. In other words all of assumptions of the research have been rejected. Also the only variable which has a favorable status in the essential oil industry is no dependence on foreign raw materials.

Keywords: Competitiveness, Rosa damascena, Essential Oil Industry, Competitiveness of Rosa damascena Essential Oil, Kashan District

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Study of *Rosa damascene's* role in sustainable rural development

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Abstract

Historically plants have played an important role in human development. Through observation and experimentation, human beings have learnt that plants promote health and well-being. The use of these herbal remedies is not only cost effective but also safe and almost free from serious side effects. The village elders, farmers and tribal have tremendous knowledge about for health reasons started thousands of years ago and is still part of medical practices by people of various regions of Iran sub-continents as well as several other countries including China, India, Egypt, South America and other developing countries of world. The cultivation of Rosa damascene due to the diversity of jobs has a lot of entrepreneurship for the villagers. They can be easily managed along with other agricultural activities. The purpose of this study was to investigate the role of cultivation and processing of *Rosa damascene* in the development of entrepreneurship in rural community. The statistical population of this study was people working in *Rosa damascene* located in the village. Using Cochran's formula, 150 samples were selected. The sampling method was simple random sampling. The research method is descriptive-analytic. The library and field method (questionnaire) was used to collect data. The components of the study were analyzed using SPSS software. The results show that the cultivation of *Rosa damascene*, over the past five years, has led to an increase in household income between 30-40 percent. Developing processing technologies for new products can increase their revenues.

Keywords: Entrepreneurship, Rural community, Processing Technologies

Identification of Dirty notes in commercial rose (*Rosa damascena* Mill.) oils by GC-MS analysis

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Introduction. Rose water is the most product petals in Iran, which is produced in traditional workshops and factories. Rose oil is produced as second product (Mahboubi, 2015, Mahboubi et al, 2011). Many traditional producers, produced the rose oils in pots, which are used for other plant waters or essential oils. Therefore, their rose oils are containing the dirty notes in their chemical profiles, which makes difficult it to export.

Methods. Fifty different essential oils, which had been produced in Iran were subjected to Gas chromatography–mass spectrometry (GC–MS) analysis: The oil analysis was carried out using GC and GC/MS. The GC apparatus was Ms Model DSQ from Thermo company, capillary column of HP-5MS (30 m × 0.25 mm, film thickness 0.25 µm). The oven temperature program was initiated at 50 °C, held for 1 min, then raised up to 250 °C at a rate of 3 °C /min held for 10 min. Helium was used as the carrier gas at a flow rate 1.0 ml/min. The detector and injector temperatures were 250 °C, respectively. GC/MS analysis was conducted on a Ms model DSQ from Thermo with network mass selective detector with a capillary column the same as above, carrier gas helium with flow rate 1 ml/min with a split ratio equal to 1:50, injector and oven temperature program was identical to GC. The compounds of the oil were identified by comparison of their retention indices (RI), mass spectra fragmentation with those on the stored Wiley 7n.1 mass computer library, and NIST (National Institute of Standards and Technology) (Adams, 2001).

Results. 169 different chemical compounds were identified in 50 samples of rose oils. From these 169 compounds, 12 compounds were not the components of rose oil. They are including sabinene hydrate acetate, menthol, carene types, lavandulol, fenchyl alcohol, caratol, copaene, veridiflorol and isoledene.

Conclusion. These compounds could be comes from other products that distilled at the same distillation unit. Therefore, the use of suitable procedures for washing of instrument before extracting the rose oil could help to produce an essential oil with high quality.

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Experimental design approach in optimization of some effective variables on quantity and quality extraction of essential oil from *Rosa damascena* Mill

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Introduction. Experimental design that is one of the basic tools for optimization, consists of creating informed and targeted changes at the inputs in order to observe and test changes in outputs or results of a process.

In this study, central composite design that is one of the most used methods of experimental design, was applied for optimization of quantity (by the choice of extraction yield) and quality (by the choice of Citronellol/ Geraniol ratio as a response) of *Rosa damascene* essential oil, that its benefits and applications in deferent industrial such as perfumery, pharmaceutical, cosmetics and food was evident for all from past to yet.

Method. Method of essential oil extraction is hydro distillation by Clevenger apparatus. After study of scientific reports, it is found that two factors such as temperature and time of flower storage, have significant effects on the extraction yield and quality of essential oil.

Results and Discussion. Differences in obtained yields in different conditions from two mentioned factors and spectrum survey of each essential oil after injection to GC-MS, demonstrate definite effects of these factors on response. Finally, special conditions of optimum point for both responses were determined and found that to obtain highest extraction yield, for two mentioned factors, -5°C and 14 days, and to obtain best odor of essential oil, -1°C and 1 day for temperature and time, respectively, are desirable.

Also, because of Nerol and Citronellol spectrum interference, multivariate curve resolution - alternating least square method that is one of the chemometric tools, was used to separate overlapped peaks.

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Formulation of *Rosa damascena* nanoemulsion: A comparison between low energy and high energy method

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Introduction. Rose essential oil which made by extracting *Rosa* damascene, is helping to cure stress, insomnia and consider as aphrodisiacs. The tendency to use Rose essential oil is raised in various fields includes cosmetic, food and pharmaceutical [1].

Methods. In this study, the nanoemulsion of rose oil was formulated and compared in two ways including high energy and low energy approach. In both methods, non-ionic surfactants and co-solvents were used to make nanoemulsion. Nanoemulsions were prepared from a mixture of hydrogenated castor oil, span 20, propylene glycol, and polyethylene glycol 400 under dilution with water [2, 3] .

Results and Discussion

Physicochemical properties of nanoemulsions including particle size, turbidity, refractive index and stability were also studied. The amount of particle size for the low energy and high energy methods were 25.7 and 22.33 nm, respectively.

Using spontaneous and low energy method, nanoemulsion with small droplet can be achieved. The results obtained from this research may be useful for various fields including pharmaceutical, beverages and food industries.

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Using of analytical chemistry methods for distinguishing of frauds in Golab

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Introduction. Golab or *Rosa damascena* essential oil is an expensive natural food additives that is used in the types of traditional and industrial foods. *Rose pelargonium (Sweet-Rose geranium)* is the natural plant that its essential oil is not only similar to *Rosa damascene* essential oil but also cheaper than it and *Pakestanian Rose* is the synthetic compound with the same characteristics too, so may be adultrated to produce of Golab or *Rosa damascena* essential oil by some of the profiteers. We decided to distinguish and control of this frauds.

Methods. pH, acidity index, Iodic index was measured and also methods of instrumental analytical chemistry GC, UV, GC/MS was used.

Results and Discussion. Natural Golab had pH = 3.8-5, acidity index 1-5, high iodic index was the best index for distinguishing of natural Golab from synthetic or similarity natural compound. GC/MS results showed, the ratio of Citronelol/Geraniol was more than double in the froudulous Golab, there was the high amounts of Phenyl ethyl alcohol in the natural Golab and Nerol compound was in the natural Golab and was absent in the others.

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Sustainable economic approaches to the production and processing of *Rosa damascena* in Iran

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Introduction. Many of the development theorists, including the World Bank, have proposed a diversification approach and multi-sector economic activities in the village within the framework of the sustainable development model. The need for sustainable development and the stabilization of the rural economy is the existence of a diversification of economic activities that doing it will result in to the stability and sustainability of economic structures. Hence, this paper, by exploring existing resources, seeks to elucidate sustainable economic approaches with the goal of diversifying agricultural and rural economies. Iran is one of the pioneers of the world's leading the Rosa damascene production after Bulgaria and Turkey. However, at present, the amount of essential oil produced in Iran is less than one percent of the world's total.

Materials and Methods. The method of collecting data and statistics was in two ways: documentary and survey in 2017. The statistical population of this study was farmers who were cultivating Rosa damascena in Khorasan Razavi province. They were selected by using cluster sampling method. The obtained data has been analyzed using cost-benefit analysis and profitability analysis has been performed and interpreted. Despite the fact that the cultivation area of this flower in Bulgaria is almost half its cultivation area in Fars province, it produces 1,200 to 1,500 tons of essential oil per year. Based on the statistics of the Ministry of Agriculture of Iran in 1395, the area under cultivation of the Rosa damascene in Iran is 18131 hectares, of which 16085 hectares are in operation and annually produce 35193 tons of flower products. According to studies, the Rosa damascene can produce about 250 types of products, aiming at creating economic added value.

Results. The Rosa damascene can be a good alternative to hydrophilic products due to their specific ecological and physiological characteristics and drought tolerance. Therefore, it can be said that the Rosa damascene can be a strategic product for Iran, which is implanted in the direction of sustainable development. However, the lack of variety in the production of the Rosa damascene products and its packaging, as well as the high volume of rose water supplied to the market, is one of the challenges of the Rosa damascene flower industry. On the other hand, the sensitivity of rose water to heat, cold, light and microbial contamination, transportation and maintenance of rose water in high volumes, the possibility of making fake rose water, as well as the use of plastic containers for maintenance of rose water, is one of the problems of the industry of growing rose and preparation of rose water in Iran. At present, each gram of rose water essential oil produced in Bulgaria is sold at around $ 56 and sold in Australia at $ 59, indicating the need for the active production of the essential oil of rose water and its various products in Iran. From the advantages of the Rosa damascene flower, on the one hand, its good compatibility

with the climatic conditions of the country, and on the other hand, the low water requirement of this plant, which can be planted and propagated as an appropriate pattern, in rain fed conditions and in low land yield and sloping areas. The economic survey of roses shows that the Rosa damascene flower has a higher net profit than other crops and garden products and can become an important export product.

Antibacterial Activity of *Rosa damascena* Mill. Ethanolic and Methanolic Flower Extract

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Introduction. One of the most important species of Rosaceae family is *Rosa damascena* Mill., known as Gole Mohammadi in Iran (Boskabady et al., 2011). Botanical extracts have long been used to treat disease, and plant sourced materials play a major role in primary health care in many developing countries. Moreover, the screening of such plant extracts for antimicrobial activity has always been of great interest to scientists looking for new sources for drugs for the treatment of various disease (Arldogan et al., 2002). *R. damascena* is an ornamental plant and beside perfuming effect, several pharmacological properties including anti-HIV, antibacterial, antioxidant, antitussive, hypnotic, antidiabetic, and relaxant effect on tracheal chains have been reported for this plant (Boskabady et al., 2011).

Methods. To evaluate the antibacterial activities of six; three ethanolic and three methanolic extracts of *R. damascene* from different areas (two from Ghamsar Kashan, Esfahan province and one of Birjand, South Khorasan province); their activities were determined by Agar well method. *Klebsiella pneumoniae* as a gram-negative and *Enterococcus faecalis* as a gram-positive were used as standard test bacterial strains.

Results and Discussion. The findings showed that *R. damascena* has an antimicrobial activity. Although the methanolic extracts have slightly more effect rather than ethanolic. Indeed, gram-positive bacteria were more sensitive than gram-negative. Based on the results the methanolic extract of collected samples belonged to Birjand areas has the strongest effect among all of the others.

Antibacterial effect of major components of *R. damascena* extract was reported previously (Gochev et al., 2008). The previous studies also indicate that rose extract possess antibacterial activity against both gram-negative and gram-positive bacteria (Ulusoy et al., 2009). Antibacterial properties of this species can be attributed to its high phenylethyl alcohol content. The antimicrobial properties of alcohols have been known for a long time (Etschmann et al., 2002). In all, the studies showed that because of antibacterial effects of this species, it can be used as natural preservative additives in food industry and medicine production and antibacterial agent for disinfection of various surfaces.

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Microencapsulation of Rose essential oil using solvent evaporation method using *Ethyl cellulose* and *Eudragit* ®Copolymer as carriers

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Introduction. Because of disappearing of the effective roles of herbal essential oils over time, due to low vaporization temperature or chemical stability, many methods has been used to enhance stability and persistence of the essential oils in which controlled releasing of encapsulated essential oils is the most important one. The objective of this project was reducing the rate of evaporation of the Rose oil via microencapsulation.

Method. Microcapsules were prepared by the emulsification method via solvent evaporation technique and different polymers which were incorporated into microcapsule to control the release rate of essential oil (Rose oil). Ethyl cellouses (EC) and Eudragit® in the different ratio were selective as microcapsules wall material. The effect of the three variables: polymer concentration, the amount of emulsifying agent and type of solvent on loading capacity and encapsulation efficiency were studied.

Results and Discussion. Best results for formulation consist of %5 Eudragit polymer with a solvent/non solvent ratio of 1:2.5 and %1 percentage of stabilizing agent. Maximum efficiency is 76.7% and loading capacity of essential oil were reported 9-11%. Results showed release capacity in acidic and alkali conditions were 13.62% and 38.94% respectively and total release was about 52.6% for 4 hours.

The results demonstrated that polymer type, percentage of solvent, type of non-solvent and its percentage and percentage of emulsifier and agitation were found to be key factors effecting the encapsulation and release profile. The Eudragit® microcapsules was the most appropriate polymer, providing a high encapsulation efficiency.

Keywords: Essential oils, Microencapsulation, Controlled release, Eudragit®

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Effect of Salinity (NaCl) and salicylic acid treatment on some morphology and physiology characteristics of *Rosa damascena* (Kashan genotype)

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Abstract

Salinity is a major stress factor for plants in many parts of the world. It limits plant growth and metabolism. In this research, the effect of salinity stress on Kashan genotype of Damask rose was assessed in a factorial trial based on a completely randomized design, with four replications per treatment. Treatments included four levels of salinity (4, 8, and 12 ds m^{-1}) and salicylic acid spray (0 as control, 0.5, 1, and 2 mM). The results showed that with increasing the level of salinity, leaf fresh and dry weights decreased. Salinity stress increased root fresh weight. Furthermore, salicylic acid at 0.5 mM supported the highest shoot fresh weight. The highest level of leaf chlorophyll a and b was recorded for treatment 2mM salicylic acid at 0 ds m^{-1} Moreover, the highest stomatal conductance was observed in control and salinity 4 ds m^{-1} that were sprayed with 0.5 mM salicylic acid. According to mean comparisons, salicylic acid at 0.5 mM alleviated the stress symptoms.

Keywords: Stomatal conductance, chlorophyll, salicylic acid, *Rosa damascena*,

Study of *Rosa damascene*'s status on carbon sequestration in climate change condition

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Abstract

Climate change under the influence of excessive consumption of fossil fuels and global warming is the most important challenge facing humans today. The reduction of atmospheric carbon to reduce greenhouse gases and depositing it in the soil by plants (carbon sequestration) is one of the projects to control this challenge. On the other hand, Rosa damascena mill L., known as Gole Mohammadi in Iran is one of the most important Iranian herbs Suitable for most climate zones in Iran, which can be a great alternative to many non-fertile plants proposed for carbon sequestration. Rosa damascena R. damascena is an ornamental plant and beside perfuming effect, several pharmacological properties including anti-HIV, antibacterial, antioxidant, antitussive, hypnotic, antidiabetic, and relaxant effect on tracheal chains have been reported for this plant. Studies have identified several optimal tree species for carbon storage, and botanists continue to experiment with new hybrids. Surprisingly, we should avoid trees such as the willow, which store comparably little carbon and emit more harmful volatile organic compounds. When choosing trees to plant, consider: Fast growing trees store the most carbon during their first decades, often a tree's most productive period, Long-lived trees can keep carbon stored for generations without releasing it in decomposition, Large leaves and wide crowns enable maximum photosynthesis, Native species will thrive in your soil and best support local wildlife, Low-maintenance, disease-resistant species will do better without greenhouse-gas-producing fertilizers and equipment, Consider these reliable and versatile star-performers and finally the most important factor in choosing a plant is its economic and sustainable development. Rosa damascena has a special place in terms of all its ecological properties, as well as its pharmaceutical and economic role.

Keywords: Arid land, Sustainable development, Medicine plant

Effect of essential oil of *Rosa damascena* on human colon cancer cell line SW742.

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Introduction. Colon cancer is the second most common fatal malignancy. Owing to the existence of many side effects and problems related to common treatments such as surgery, chemotherapy and radiotherapy, alternative treatments are being investigated. Some herbal medicines have shown promising results against different types of cancers. Herbal medicines used have included the use naturally occurring essential oils.

In this study, we report the effect of the essential oil of *Rosa Damascena* on human colon cancer cell line (SW742) and human fibroblast cells.

Methods. The essential oil of *Rosa Damascena* was obtained by distillation and its effect on SW742 cell-line and fibroblast cells were investigated with cell culture. The cells were cultured and different volumes of essential oil were induced to the cells. After48hincubation, cell survival was measured and using statistical analysis, the findings were evaluated and reported.

Results. This study showed that soluble part of *Rosa Damascena* oil increases cell proliferation in high volumes and the non-soluble component decreases cell proliferation.

Conclusion. The effects of essential oils, such as *Rosa Damascena*, on cell proliferation require more thorough investigation.

Keywords: Cell survival; Colon cancer cell line (SW742); Essential oil; Human fibroblast cell; *Rosa Damascena*

Characterizing and detecting the authenticity of *Rosa damascena* commercial essential oils from Kashan, I. R. of Iran by GC/FID detection

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Introduction. The ISO 9842 rose oil standard requires the citronellol content to be within concentration ranges of 20% to 34% of the oil, nerol 5% to 12%, and geraniol 15% to 22%. The ratio among the three rose constituents, especially the sum of citronellol plus nerol, is important for rose oil quality and its marketing price. Therefore, this work was aimed at a detailed phytochemical characterization of commercial rose samples from the city of Kashan in the central part of Iran.

Methods. Seven commercial samples of Rosa damascena essential oil (A-G) of the same geographic origin extracted by hydro-distillation from fresh flowers were considered. The Varian CP-3800 GC/FID technique was applied for the phytochemical analysis of the samples.

Results. A total of 16 components were identified in the samples. The samples showed a chemical composition based on relatively high levels of aliphatic hydrocarbons totally referred to as stearopten or the solid portion of the rose oil. Citronellol (3.72–54.83%), Nerol (none-2.67%), and geraniol (0.58–15.98%), Heptadecane (0.33-2.30%), farnesol (0.01-1.85%), Nonadecene (1.50-5.58%), Nonadecane (5.47–18.16%), Eicosane (0.58-2.56%), Heneicosane (1.90-9.18%), were the main constituents of essential oils. Other constituents were found to be alpha-pinene (none-1.05%), Linalool (0.59-2.38%), cis-Rose oxide (0.09-0.54%), phenyl ethyl alcohol (1.15-54.70%), trans-Rose oxide (0.04-0.20), neral (none-0.65%), geranial (none-2.16%).

Conclusion. The results indicated that the content of citronellol plus nerol of samples C, D, and G although were above the upper limit of ISO 9842 turned out to be of better quality. Samples E, and F showed the highest amount of phenyl ethyl alcohols up to 35.6 and 54.7 % respectively. Although the contents of citronellol plus nerol of samples A, and B were within the range, the amounts of phenyl ethyl alcohols were 4.79 and 4.49 % as well.

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In vitro propagation of three genotype of *Rosa damascena* Mill

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Introduction. The *Rosa damascena* is one of the most important species of Rosaceae family mainly known for its perfuming. Its major products are rose water and essential oil importance in medicine, cosmetics and Food industry. Now, tissue culture technique plays an important role in propagation of this plant considering difficulties like deficiency of stock plants, time consuming and transferring diseases by vegetative propagation methods. Micro propagation is an in vitro culture technique which can produce plenty of intact plantlets in a short period of time.

Methods. In order to explant disinfection, different concentrations (0, 25, 50 and 75 mg/l) of Nano-silver (NS) were used in addition with 2.5 or 5% sodium hypochlorite (NaClO) for 2.5, 5 or 7 min. and 0.1 or 0.2% mercury chloride ($HgCl_2$) for 3 or 4 min. In order to improve proliferation new regenerated shoots originated of establishment stage were transferred to the medium containing different concentrations of benzyl amino purine (BAP) and thidiazorun (TDZ).

Results and Discussion. The best concentration for NaClO was 2.5% for 5 min and for $HgCl_2$ was 0/2% for 4 min. NS prevented of bacterial contamination and improved in vitro proliferation. The best proliferation treatment obtained of 1.5 mg/l BAP in modified Murashige and Skoog (MS) medium. High level of chlorophyll in *in vitro* leaves was observed in MS medium with 2.5 mg/l 2, 4-D. At rooting stage, the 1/2 MS consisting 2 mg/l IBA result in the highest percent of rooting (55%) and the maximum average root number (4.4) for plantlets

In conclusion, $HgCl_2$ is advised in low concentrations for preventing bacterial contamination and it is better to use NaClO for explant sterilization if there is no bacterial contamination, since $HgCl_2$ have adverse effects like decrease in nutrient absorption and bud burning of explants. NS is effective on decreasing internal contamination and improving shoot growth. 0.5 - 2 mg/l BAP was found appropriate for enhancing shoot proliferation in Damask rose. The best treatment to have high chlorophylls was 2.5 mg/l 2, 4-D and maximum percent of new shoots was observed in mMS medium containing 1.5 mg/l BAP. While rooting of shoots improved with half-strength MS medium containing of IBA at the concentration of 2 mg/l. Our present work provides a practical protocol for efficient axillary bud multiplication from three genotype of Rosa damascena Mill.

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An investigation and comparisons of essential oil and flower yield of different genotyoe of *Rosa damascena* in half industrial level on three local in Razavi Khorasan province

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Introduction. *Rosa damascena* Mill is one of the important of medicinal plant in Razavi Khorasan province. At present, cultivation of this plant is increasing and cultivation in different local of Khorasan province. The importance of this plant from various aspects of economic, pharmaceutical and sanitary and its adaptation to different environmental conditions has provided the basis for its cultivation, which can provide employment and decent income for the province's farmers. This research was carried out to evaluate the performance of flowers and essential oils of 11 superior genotypes of *Rosa damascena* in three different regions.

Methods. selected genotypes were cultivated in a randomized complete block design with three replications in three locations. From each genotype, 27 plants were cultivated in 3 regions with 3 * 3 m intervals and after the plant cultivation and different data including : number of flowers, flower and petal yield, percentage and yield of essential oil in different genotypes collection were recorded for all location .In the finally data were analyzed with SAS software.

Results and Discussion. The results of analysis of variance for the studied characteristics including number of flowers, flower and petal yield, percentage and yield of essential oil in cultivated areas and for different genotypes showed a significant difference at 1% level that showed indicating the genetic diversity of the studied genotypes. Comparison of the mean of flower yield and different traits was very different in the cultivated areas in the studied genotypes. In all three regions and years of cultivation, genotype of Fars 1 had the highest mean flower yield and Southern Khorasan, Isfahan 9 and 5 genotypes were also suitable. Permanent genotypes of flower and Kerman produced the lowest flower yield.

In all three regions and years of cultivation, genotype of Fars 1 had the highest mean flower yield, and Southern Khorasan, Isfahan 9 and Isfahan 5 genotypes were also suitable. Permanent genotypes of flower and Kerman produced the lowest flower yield.

The results of this research was consistent with the report of Tabaei Aghdaei and et al. (2009) and show that there are variation in flower yield in different genotypes of *Rosa damascena* and indicates the high genetic and yield in Rosa genotypes. The southern Khorasan 3 and Isfahan 5 genotypes were in the next rank of flowering performance per plant.

The highest essential oil yield of the Khorasan Razavi genotype at Gonabad station with 1.17 g / plant and the lowest yield of essential oil belonged to the permanent genotype of flower at the station of Jolgae Rokh and Golmakan at 0.047 g / plant.

Tabaei Aghdaei et al. (2011) conforms to variation in the essential oil content of different Mohammadi genotypes and indicates the high genetic potential and potential as a genetic reserve for the production of Mohammadi flower cultivars.

The results of this research are consistent with Tabaei Aghdaei and et al. (2010) researchs, which indicates the high potential of the Rosa genotypes for the production of essential oils and cultivar of this plant.

Keywords: *Rosa damascena Mill*, Yield, genotypes, Essential oil,

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Rosa damascena essential oils: a brief review about chemical constituents

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Abstract

Rosa damascena Mill as an ornamental plant is the hybrid between *R. gallica* and *R. Phoenicia*, and is the member of Rosaceae family with more than 200 species and 18,000 cultivars around the world. The main importance of Damask rose is due to its aromatic products including rose essential oil (EO), rose water, rose concrete, and rose absolute which can be used in food, perfume, cosmetic, and pharmaceutical industries. Moreover, *R. damascena* is traditionally applied for treatment of abdominal and chest pains, strengthening the heart, menstrual bleeding, digestive problems and constipation [1].

According to phytochemical studies on *R. damascene*, citronellol, geraniol, nerol, phenyl ethyl alcohol, nonadecane, nonadecene, eicosane, heneicosane, tricosane, α-guaiene, geranyl acetate and eugenol have been determined as the major compounds in rose EOs [2]. Based on the International Standard [3], citronellol (20-34%), nerol (5-12%), geroniol (15-22%), parrafins C_{17} (1-2.5%), parrafins C_{19} (8-15%) and parrafins C_{21} (3.0-5.5%) are the best criteria for producing a high quality rose EO. In other word, the citronellol/geranial ratio should be between 1.25-1.3%. However, the quantity and quality of rose EOs are influenced by different factors like edapho-climatic conditions, soil characteristics, harvest time, storage of plant material and method of extraction [4]. Therefore, in the present work, a brief review on the Damask rose EOs is described, focusing on the main factors responsible for the chemical variability and the strategies for enhancing the EO yield and its quality.

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Economics of *Rosa damascena* in Iran

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Abstract

Mohammadi is scientific *Rosa damascene* Mill. belongs to the genus *Rosa* and family Rosaceae. One of the most important aromatic plants of *Rosa* species in the world and is on of the most prominent plants in gardening history. It has a high genetic diversity in Iran and it is important for decorative, medicinal and export aspects. This species is a fixed duality of two species *R. galica* and *R. moscatag.* Flowering Mohammadi as one of the activities of a diversified agricultural sector plays an important role in creating employment and income generation and developing the economy in areas of the country with the potential and talent necessary for this activity. Nevertheless, less attention has been paid to economic development planning. Golmohammadi industry and commerce has been developing its industries in the world. Studies have shown that only the essential oil of Mohammadi flower, other than other products, is used in perfumes, pharmaceuticals, food, cosmetics and hygiene. The Iranian economy has been steadily supported by oil revenues since the 1950s. Since the fifties, the Iranian economy has been steadily supported by oil revenues, with the imbalance and harmony between economic sectors becoming apparent. ccording to international documents, the origin of Iranian rose and the origin of the production of aromatic oils and extracts of flowers and fresh leaves are mentioned. In the Zoroastrian education circle, the flowers of Rose, Nastaran and some plants are honored and in the book of Falahat and Agriculture, we have discussed the existence of various types of Roses in Fars. Abu Mansour Movaffagh in the tenth century, while defining the medicinal properties of the rose, has shown that the best flowers are Iranian roses.

Keywords: Essential oil, Industry and Trade, Rose water

Comparison of the main components of the esential oil from *Rosa damascena* flowers in different regions of Kashan area

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Introduction. Approximately 400 oil components have been identified in the rose oil. About 62–77% terpene compounds are found in oil's composition: hydrocarbons (monoterpenes up to 2% and sesquiterpenes 35%), oxygen-containing derivatives (monoterpenes 64–71% and sesquiterpenes 0.5–2%), fatty hydrocarbons and their oxygen derivates (18–25%), phenylpropanoids (3–5%), and others (0.5–2%) [1]. Rose oil composition is varied over the different conditions, for example harvesting period and ecological factors. In this study, comparison of chemical compositions of Rose oil from 11 different regions was done.

Method. The flowers of *R. damascene* were collected during the flowering period in July 2018 from 11 different regions of Kashan area, around Kashan (Isfahan province, Iran). 200 g each of the samples were individually subjected to hydrodistillation for3.5 h using a Clevenger-type apparatus [2]. After decanting and drying over anhydrous sodium sulphate, yellow coloured oils were recovered and analyzed with GC/MS.

Results and Discussion. Eleven samples of *Rosa damascena* were subjected to hydrodistillation using a Clevenger-type apparatus and the yellow coloured essential oils were analyzed by GC and GC/MS. The oils were characterized by a high content of Citronelol (from 14.09% in Sedeh area to 44.35% in Azaran area) and geraniol (from 2.25% in Azaran area to 15.29% in Chime area).

According to the results, although the selected area was not very wide, high differences were observed between components from different tested samples from different regions. This fact shows the importance of having enough attention to the type of the sample to use the oil for specific orders

Keywords: *Rosa damascene*, essential oil, hydrodistillation, GC/MS analysis

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Comparison of the main components of *Rose water* in different regions of Kashan area

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Introduction. *R. damascena* is traditionally used for treatment of abdominal and chest pains, strengthening the heart, menstrual bleeding, digestive problems and constipation. The antimicrobial, antioxidant, analgesic, anti-inflammatory, anti-diabetic and anti-depressant properties of *R. damascena* have been confirmed. *Rose water* is a hydrosol portion of the distillate of rose petals, a by-product of the production of rose oil for use in perfume. It is used to flavour food, as a component in some cosmetic and medical preparations, and for religious purposes throughout Europe and Asia [1].

Methods. The samples of *Rose water* were collected during in July 2018 from four areas (Ghamsar, Azaran, Kamoo, Sede), around Kashan (Isfahan province, Iran). 250 ml of the each sample were individually subjected to extraction with 33 ml of n-pentane as solvent using a Separator funnel apparatus. After evaporation of the solvent, yellow coloured oils were analyzed by Agilent HP-6890gas chromatograph equipped with an Agilent HP-5973 mass selective. Identification of components of essential oil was based on retention indices (RI) relative to n-alkanes and computer matching with the Wiley275.L and Wiley7n.L libraries [2].

Results and Discussion. Four samples of *Rosa water* from different areas around Kashan were subjected to extraction with n-pentane as solvent, the yellow coloured essential oils were analyzed by GC and GC/MS. The oils were characterized by a high content of Citronelol (16.97% - 29.09%), Geraniol (2.17% - 6.1%) and Phenylethyl alcohol (47.97% -63.01%)

As is clear from the results, there were very significant differences between three major components from four tested samples from different regions. So, it can be said that Rose oil composition is varied over different conditions, for example harvesting period and ecological factors.

Keywords: *Rosa damascene*, *Rose water*, GC/MS analysis, citronellol, geraniol, phenyl ethyl alcohol

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Encapsulation of *Rosa damascena* essential oil in solid liquid nanoparticles

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Introduction: Essential oil of *Rosa damascena*, besides having a unique fragrance, is very notable for having properties like antioxidant, free radical scavenging, anti-cancer, anti-inflammatory, anti-aging and anti-depressant. In order to protection of volatile and biodegradable materials, nanoencapsulation process can be used to enhance the durability and controlled release of the constituents under conditions of proper management.

Method. Due to the significance of stable protection of essential oil materials in the different commercial applications, for the first time in the present study nanocapsules containing essential oil of *Rosa damascena* has been encapsulated using SLN preparing Method. Nanocapsules size, polydispersity index and zeta potential, was measured using dynamic light scattering and GC-MS was implicated to determine the %EE quantitatively and qualitatively.

Results and Discussion. Results showed that the particles are spherical, the size of the particles are below 100 nm with negative zeta potential and encapsulation yield is 51%.

The SLN preparing method was able to capsulate components of the essential oil of *Rosa damascena* with a high efficiency.

Keywords: Solid liquid nanoparticles (SLN), Dynamic light scattering (DLS), GC-MS, Nanoencapsulation, Essential oil, *Rosa damascena*

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Effect of ultrasound waves on the size of nanoparticles of encapsulated *Rosa damascena* essential oils

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Introduction. Essential oils are natural products which have many interesting applications. Extraction of essential oils from plants is performed by classical and innovative methods. However, their volatility, low solubility in water, and susceptibility for oxidation limits their use. EOs encapsulation is one of the options to reduce these effects and to improve their biological activities. Due to the significance of stable protection of essential oil materials in the different commercial application, for the first time in the present study, essential of *Rosa damascena* has been encapsulated and the encapsulation efficiency (EE) has been evaluated quantitatively and qualitatively.

Method. The effect of ultrasound waves on decreasing nanoparticles size of nanocapsulated *Rosa damascena* essential oil was examined which confirmed the success of the ultrasonic-aided method for production of the stable nanoencapsulated particles, i.e. amount of surfactant, time of ultrasound exposure and ultrasonic power values on the stability and size of the nanoencapsulated particles was investigated.

Results. Nanocapsules size, polydispersity index and zeta potential have been measured by dynamic light scattering technique. Gas chromatography mass spectrometry (GC-MS) and scanning electron microscopy (SEM) were respectively used to investigate the %EE and the morphology of the nanocapsules. The results showed that the size of spherical particles with negative zeta potential is below 100nm. According to the obtained results, the ultrasound power and exposure time had a significant effect on the particle size and encapsulation efficiency.

Keywords: Nanoencapsulation, Particle size, Zeta potential, Polydispersity index, Ultrasound wave, Encapsulation efficiency, Essential oil, *Rosa damascena*

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Applications of waste rose petals (*Rosa damascene*) as by-product in industry

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Introduction. Large quantities of distilled petals are generated as the waste during distillation process every year in Iran. The waste rose petals are rich source of biomacromoleculs. Currently, almost all this waste is simply discarded. Therefore, it is important to investigate the alternative usage to achieve more effective and economical distillation process. In this study, we aimed to survey the applications of waste rose petals.

Results and Discussion. Baydar et al. reported that the polyphenolic compounds extracted from waste rose petals can be used as antioxidant supplements [1]. Flower residues from dyeing industry such as *Hibiscus rosa sinensis* and *Rosa rosa* dye wastes can be used for Pb^{2+}, Cd^{2+} and arsenic removal [2]. Waste biomass of red rose was used for Pb^{2+} and Co^{2+} removal [3]. The waste of *Rosa damascena* flowers was used as a source of natural dye for organic wool dyeing [4]. Pectic polysaccharides isolated from waste rose petals have the immunomodulating properties [5]. Pectic extract could also be used as flour in thermally treated food products because of its stability [6]. These findings reveals the promising applications of waste petals in different industries.

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Effect of the time of flowers picking up after sun rising on the quality and quantity of the essential oil of *Rosa damascena*

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Introduction. There are certainly many factors affecting the amount of essential oil and the type of compounds, and therefore the essential properties of aromatic plants. One of the factors that traditionally known that has an effect on the quality and amount of essential oil of the plant is the time of picking up the plant. In the case of the flower of *Rosa damascena*, it is believed that with the sunrise and afterwards, the quality and amount of essential oil in the flowers decreases.

Method. In this research we study the effect of time on the amount and type of essential oil compounds of *R. damascena* flowers. Analysis of the essential oils was carried out through the GC-MS apparatus.

Results and Discussion. Results showed that the amount and quality of essential oil from before sunrise until 9:00 am dropped slowly and then dropped sharply.

2 hours after sun rising Amount of aliphatic hydrocarbons are increased. On the other side, alcoholic and esteric compounds are decreased.

Keywords: Essential oil, *Rosa damascena*, GC-Mass.

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Rosa damascena as a holy ancient herb with novel application, Mohaddese Mahboubi, 2015, Journal of Traditional and Complementary Medicine: 6: 10-16.

Economics of Medicinal Plants

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Abstract

Recent years experiences show that emphasis of economy on income of petroleum selling results in instability of export income. Orientation of export policies may be changed for exporting non-oil goods including export of agricultural products to decrease dependence of Iran economy to export of petroleum and moving toward goals of resistance economy policy. Among agricultural products, herbs are the most important export items of agriculture which have great portion in creating added value in this sector and making foreign exchange. Study of statistics and previous years' time series information shows that export of these products has not suitable situation despite good rank of Iran in production and cultivation of herbs. This research is going to study position of Iran in global market of herbs emphasizing on damask rose and its comparison with various countries. Although recent years drought and contraband occurrence have result in fluctuation of production but expert views to chain of production to export cause increase of production and export. The most important challenges of herbs commerce and becoming undesirability of Iran position in foreign market of herbs are lack of technical knowledge in export, weakness of foreign marketing, weak support of government, high expenses of standardizing products for export, lack of cooperation between export trade unions and agencies in herb industry and their negative competition, incorrect recognition of aiming market, lack of having trade mark for many export items of herbs, political risks and decrease of bargaining power of foreign trade sector in foreign markets.

Keywords: Herbs, Export, Strategies, Market, Iran

Control management of blossom feeder scarab (*Epicometis hirta* Poda) and flower scarab (*Oxythyrea Sp.*) in gardens of Shahrood, Iran

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Introduction. One of the important insect pests of fruit trees in Semnan province are the blossom beetles, *Epicometis hirta* Poda and flower scarab (*Oxythyrea Sp.*) (Scarabaeidae. Col.). The larva develops in the soil, feeding on decomposed plant matter and it causes no damage. Adults cause destructive attack the reproductive parts of the fruit crops and many ornamental bushes as well as rosa damascena. The feeding usually results in the damage of the anthers and stigma which affects fruit setting and consequently reduces the yield. Controls of blossom beetles are difficult, as most insecticides cannot be applied during flowering without affecting honeybees or natural enemies. The mentioned pests are reported mostly in centre, north, northwest, northeast provinces of Iran.

Methods. The traps we tested were consisting of two parts. The upper one was a captured surface made by a plastic plate and shaped it as funnel. The lower part was a 3 litres bottle plus water and detergent whereas serves holding captured beetles. Three different trap colors consist of white, yellow and blue were investigated in a cherry orchard in Bastam, Shahrood region to find the most attractive color traps for the adult beetles (Schmera et al, 2004). We set up 30 traps (3 colours types with10 replication) in early April in 2014, one week before blossoming starts. We also tested a medicinal plant extraction (kod101) as bait that was placed to upper part of traps.

Results. The start of trapping in Bastam was in early April. We found that yellow, white and blue colours traps were no significant differences in capture of *E. hirta* in cheery orchard, but blue colour trap caught the most beetles (totals of mean 510, 485 and 393 beetles for blue, white and yellow traps, respectively). The results also showed that blue trap with medicinal plant extraction (kod101) as bait was significantly attracted beetles.

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The study of essential oils yield variation in *Rosa damascena* Mill. from different regions of Iran

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Introduction. *Rosa damascena* Mill. is one of the valuable species with a long history in Iran and some other countries. It is considered that the damask roses originated geographically and historically from ancient Persia (present–day Iran) and later spread throughout Europe and Northern Africa. In Iran and some of Eastern Europe countries distillate those flowers to extract Rosewater and essential oils to food and cosmetic markets of all over the world.

Method. We collected and investigated all species of Damask Rose that comes from different regions of Iran to Iran Golab Co. to perform Rosewater and isolation first and second essential oils and codify coordinate system to rank and price flowers from grade A to C.

Results and Discussion. The highest amount of oils yields of *R. Damascena* were recorded at Nashalj, Azeran and Alavi regions with 0.064%, 0.052% and 0.042%, respectively.

According to some parameters such as distant, picking up time, transportation and other factors the essential oils of *R. Damascena* will be changed. We solved this problem with codifying coordinate system to rank and price different flowers.

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Rosa Damascena

2018

Effects of storage and time on essential oil components of *Rosa demascena*

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Abstract

Investigation effects of storage and time on essential oil components of *Rosa demascena*. Essential oils were obtained by hydrodistillation method. We used different vessel with glass, color glass and aluminum and investigated effect of storage as three and six months' time, Primary essential oils analyses by GC and Mss, so main components were identify as citronellol (33.5%), cis-p-menth -2-en-1-ol (7.3%) and geraniol (7.2%). Also main components in different containers kept for three months in simple glass, color and aluminum were: citronellol 44.9, 31.1 and 33.6 %. Also after six months storage of essences were citronellol 56, 50.9 and 55.7%. Which in normal temperature condition, refrigerator and freezer, and main percentage of compound citronellol were 31.1, 40.2 and 37.5%. Storage in three months in simple glass in refrigerator were suitable than others methods. Also storage in six months essence in simple glass and in normal temperature is better. In total compromising time, condition of storages show that time and containers can effect on essential oils and percentage of compound. So in this research we can selected good method will help economically and give a good benefit to industries.

Keywords: Storage, citronellol, Rosa demascena, simple glass and compound

Rosa × *damascene* cultivar cultivation and their uses in Iran

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Abstract

Rosa × *damascena*, known as Gole Mohammadi , rose hybrid, derived from Rosa gallica and Rosa moschata. The origin of Damask rose is the Middle East and some evidences indicate that the origin of rose water is Iran. Rose has been used for medicinal purposes including antibacterial, antioxidant, ant diabetic, and relaxant effect reported. The flowers and petals are renowned for their fine fragrance, and are commercially harvested for rose oil and rose water in Iran. In our research work, we have don lot of project on this plants and their cultivar. *Rosa* × *damascena* where cultivated in hedge rows. The rose's flowers are brought to cooperative for distillation and quality control. In this review we discuss important components of different cultivar of this plant and different hedro-distillation. Several components were isolated from flowers and petals of R. damascena including terpenes, glycosides, flavonoids, and anthocyanins. This plant also contains carboxylic acid, myrcene, which collected from the Tehran, Shiraz and Kashan regions. Among them, identified compounds were; β-citronellol, nonadecane, geraniol, and nerol were the major components of the oil. Iran has developed an industry producing rose oil. Perhaps due to the much flower and low labor cost, rose products from Iran are less expensive than those from other country. So rose due to contain several components such as terpenes, flavonoids, and anthocyanins that have beneficial effects on human health. They may be used to flavor, an herbal tea.

Keywords: Rosa × damascene, terpenes, glycosides, flavonoids, Rose water

Rose absolute, chemical composition, biological activity and industrial applications

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Abstract

Rosa damascena is commonly known as "Gole Mohammadi", and its petals are usually used for production of rosewater in Iran, while the essential oil, rose concrete and rose absolute are the most important products from rose petals in other countries. Rose absolute with broad applications in different industries are used in perfumes, aromatherapy, medicine and sanitary products. Unfortunately, No attention to rose absolute has been made in Iran as the origin of *R. damascena*. The world production of rose oil and rose absolute are about 3000 and 5000 Kg per year, respectively, while rose absolute has not been identified by Iranian producers. The aim of this article is to explain about the chemical composition, biological activity, the industrial applications and economical importance of rose absolute as main important product of rose petals. Also, the future aspects, and proposed approaches for rose absolute will be discussed.

Genetic relationships among some Iranian populations of *Rosa damascena* using ISSR and RAPD markers

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Abstract

Genetic variation within and among populations is the basis for survival of the populations both in short and long term. Thus, studying the plant genetic diversity is essential for any breeding program. *Rosa damascena* Mill., is an important species as a source of rose oil, and is one of the oldest rose species grown in Iran. The main rose oil producers in the world are Turkey, Bulgaria and Iran. They are obtaining the rose oil almost exclusively from the certain clones of *R. damascena*. This study was conducted to detect the genetic variability and relationships across 6 Damask rose populations from Kashan region (Barzuk, Niasar, Azeran, Aheste, Kheirabad and Kolpe) and one from Hamedan province (Bahar). Nine plants (on average) per population (in total 54 plants) were used for genotyping by 11 ISSR (Inter simple sequence repeat) and 9 RAPD (random amplified polymorphic DNA) markers. ISSR markers produced 91 bands, of which 41 were polymorphic (67%). Primer ISSR7 and ISSR24 detected the highest percentage of polymorphism, while for primer ISSR19 the lowest one was observed. RAPD markers produced 81 bands, of which 54 were polymorphic (66%). Primers R10 and R7 detected the highest percentage of polymorphism, while primer R4 was the lowest. UPGMA cluster analysis based on Jaccard similarity coefficient by ISSR markers revealed nine groups in the dendrogram and genetic similarity ranged between 0.61 to 0.98. By RAPD markers, nine clusters were also obtained and genetic similarity ranged between 0.57 to 0.97. In both marker types, differences between the plants within the populations were very low, however considerable genetic diversities detected between the evaluated populations. Aheste and Hamadan populations had the greatest difference and genetic distance. Hamadan samples had the closest relationship with individuals of Kolpe and Kheirabad. RAPD and ISSR markers provided useful tools for evaluating genetic diversity and genetic relationships of *R. damascena*. The knowledge of these diversities, found in this study, will allow a plant improvement of Damask rose related to pharmaceutical and industrial uses.

Keywords: *Rosa damascena*, Genetic relationships, Markers, ISSR, RAPD

Rosa Damascena oil improved sexual function and testosterone in male patients with opium use disorder under methadone maintenance therapy–results from a double-blind, randomized, placebo-controlled clinical trial

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Background. Some patients with opioid use disorder (OUD) are treated with methadone maintenance therapy (MMT). However, as with opioids, methadone has major side-effects; sexual dysfunction is a particularly distressing such effect. Rosa Damascena oil has been shown to reduce subjective sexual dysfunction in patients with major depressive disorders, but its influence on testosterone has not so far been tested. The aim of the present study was to investigate the influence of Rosa Damascena oil on sexual dysfunction and testosterone levels among male patients with OUD and undergoing MMT.

Methods. A total of 50 male patients (mean age: 40 years) diagnosed with OUD and receiving MMT were randomly assigned either to the Rosa Damascena oil (drops) or a placebo condition. At baseline, and four and eight weeks later, patients completed questionnaires covering sexual and erectile function. Blood samples to assess testosterone levels were taken at baseline and eight weeks later on completion of the study.

Results. Over time sexual dysfunction decreased, and testosterone increased in the Rosa Damascena oil, but not in the placebo condition. Sexual dysfunction scores and testosterone levels were not consistently related.

Conclusions. Results from this double-blind, randomized, and placebo-controlled clinical trial showed that Rosa Damascena oil improved sexual function and testosterone levels among males with OUD and undergoing MMT.

Keywords: Opium and opioid use disorder, Methadone maintenance therapy, Sexual dysfunction, *Rosa damascena* oil

Investigation of maintenance temperature and time after collecting of the flowers of on the qualitative and quantitative characteristics of aromatic compounds extracted from *Rosa damascena* Mill

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Introduction. Importance of plant uses in food and especially drug industry is not negligible. Beside these industries, perfume industry is also considered as one of the most thriving and economical profitable categories in which aromatic plants play an important role in it. One group of the most important components, used in perfumes is *Rosa damascena* Mill. derivatives and Kashan area has a main history in natural perfume production from this plant.

Methods. In this research, effects of maintenance temperature and time after collecting of the flowers of *Rosa damascena*, on the essential oil quality was investigated from the point of view of chemical constitution and physicochemical properties.

Results and Discussion. Essential oil yield and amount of the geraniol and nerol as two major components were significantly higher in the fresh picked flowers.

The results confirmed that both parameters have significant effect on the type and amount of the essential oil components; however, selection of the best condition depends on the type of application and expected properties.

Keywords: *Rosa damascena* Mill., Essential oil, Maintenance time effect, Maintenance temperature effect.

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Antimicrobial activity of *Rosa damascena* against oral infections: An overview

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Introduction. Oral diseases, including dental caries and periodontal diseases are among the most important infectious diseases in the world. There are several antibiotics for treatment / control of oral infections but some challenges such as their adverse side effects and development of antibiotic resistance induce scientists to survey for alternative methods. In recent decades, application of plant products for prevention and control of oral infectious has been progressively considered. *Rosa damascena* is one of species of *Rosaceae* family with beneficial health and therapeutic effects. It may be effective against a wide spectrum of microorganisms. In traditional medicine texts, preventive and therapeutic effects of this plant have mentioned. Moreover, some new evidences are emerging that indicating that it may be useful in control of oral infections. The major products of *Rosa damascena* are rose water, rose oil, dried flowers and hips. In this review article, scientific documents related to the role of *Rosa damascena* in the prevention and treatment of oral infectious diseases have been evaluated.

Methods. This study was conducted using library research method and databases searching.

Results and Discussion. Some evidences are emerging that *Rosa damascena* may be useful in the control of oral infections:

- Bacteriostatic or bactericidal and anti-adhesive effects of various extracts of *Rosa damascena* against cariogenic streptococci.
- Effect of rose water on decreasing the adhesion of the most common cariogenic bacteria
- Antimicrobial effect of *Rosa damascena* extract against endodontic pathogens.
- Effect of mouthwash containing *Rosa damascena* extract in the treatment of recurrent aphthous stomatitis.

Rosa damascena as a medicinal plant is capable of intervention against oral infectious diseases. The application of *Rosa damascena* and its products can decrease the need to antimicrobial agents. However, further studies for isolation and purification of bioactive compounds and their applications in different pharmaceutical formulations for control of oral infections as complementary medicine could be regarded. Therefore, this plant may be a valuable candidate for oral infections prevention, control and treatment.

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In vitro regeneration of shoots and ex vitro rooting of damask rose (Rosa damascena Mill*)*

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Introduction. One of the most important Rosa species is *R. damascena* Mill. of which some cultivars are used for oil production and others are cultivated throughout the world as garden roses (1). The experiment was performed to investigate the *in vitro* regeneration ability of damask rose (*Rosa damascena* Mill.) combined with *ex vitro* rooting as an efficient and cost-effective method for rapid and high-quality plant regeneration.

Methods. Single-node explants included lateral buds were taken from bushes and after sterilized. The nodes cultured on Murashige and Skoog (MS) medium supplemented with different concentrations of BAP (1, 1.5, 2, 2.5 and 5 mg/l), NAA (0 and 0.1 mg/l), GA_3 (0 and 0.1 mg/l) and coconut water (0 and 40 ml) in separated and combination with together. To evaluate *ex vitro* rooting, micro-shoots were treated with 3 mg/l IBA or 3 mg/l NAA solutions. The percentage of shoot regeneration and root formation recorded at the end of the experiment.

Results and Discussion. The results showed that the best multiplication rate, highest number of shoots per explants, and best growth of shoot and leaf growth was achieved in T9 medium containing the MS salts supplemented with 2.5 mg/l BAP and 0.1 mg/1 GA_3. The highest percentage of rooting (100%) was obtained in both rooting media (3 mg/l IBA or 3 mg/l NAA). The highest number of roots per explant and the highest root length were observed in explants treated with IBA and NAA, respectively.

The results showed that GA_3 had a significant effect on regeneration percentage of the *R. damascene*. The results of *ex vitro* rooting showed that this simple method has a good potential to induce healthy roots and could be an alternative of *in vitro* rooting which is labor-intensive. Overall results showed that the combination of *in vitro* regeneration and *ex vitro* rooting of *R. damascene* nodes could be used as an efficient micropropagation of elite cultivars of *R. damascene*.

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Morphological and essential oil characterization of different populations of *Rosa damascena* Mill. in Kashan

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Introduction. *Rosa damascena* Mill. from Rosaceae family, is a unique species. One of the major and popular growing regions of damask rose is Kashan and its rose essential oil has unique scent and global reputation.

Methods. In this study, 15 populations of *Rosa damascena* Mill. were collected from important rose oil production regions of Kashan, Iran. In order to evaluate morphological variation, 52 quantitative and 17 qualitative morphological characters were measured. The essential oil content (w/w) of flowers was assayed after extraction in Clevenger apparatus (1). The chemical composition of essential oil was analyzed by gas–chromatography coupled with mass spectrometry.

Results and Discussion. Cluster and Principal component analysis (PCA) of morphological characters showed that the fifteen populations could be divided into two major groups including five subgroups. The variance analysis showed significant differences ($P<0.01$) among populations of *Rosa damascena* for 28 morphological characters such as stem length, Leaf length and number of flowers per plant. *Rosa damascena* population from Azaran (valley) produced the highest content of absolute oil (0.019% w/w), while the lowest value of absolute oil (0.002% w/w) belonged to Eznaveh population. Correlation results showed that there is a significant relationship between some morphological characters and essential oil content. Stipule length had a significant positive correlation with the essential oil content, while a significant and positive correlation was observed for peduncle length and receptacle glandular length with the essential oil content.

Based on the resulted dendrogram from cluster analysis of chemical component data, fifteen *R. damascena* populations grouped into four clusters. A total of Sixty-five compounds were identified and quantified by GC–MS analysis in the rose oil.

The major components of the oil contained limonene (0.4–12.8%), 2-phenylethyl alcohol (1.0–1.3%), citronellol (16.2–57.8%), geraniol (0.9–14.1%), methyleugenol (0.5–2.5%), heptadecane (0.8–3.0%), 1-nonadecene (2.1–7.5%), nonadec-9-ene (14.9–30.2%), eicosane (1.0–3.3%), heneicosane (5.8–18.6%), tricosane (0.9–5.2%) and pentacosane (0.3–2.1%).

The essential oil of Josheghan was considered to have a high quality in terms of richness in citronellol, geraniol and 2-phenylethyl alcohol monoterpenes which has good potentials as antioxidant and strong fragrance in cosmetic and pharmaceutical industry.

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Phytochemical study of flowers of *Rosa damascena* Mill.

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Introduction. *Rosa damascena* Mill. is Perennial plant from family Rosaceae, indigenous to Europe and Middle East countries, Iran and Turkey. It is known as Gole Mohammadi. *R. damascena* is an ornamental plant and besides perfuming effect (Boskabady et al., 2011). Several components were isolated from flowers, petals and hips (seed-pot) of this species including terpenes, glycosides, flavonoids, and anthocyanins (Noriaki et al., 1998). *R. damascena* contains carboxylic acid, myrcene, vitamin C (Libster 2002) kaempferol and quercetin. Flowers also contain a bitter principle, tanning matter, fatty oil and organic acids (Loghmani-Khouzani et al., 2007). There more than 95 macro- and micro-components in the essential oil of *R. damascena* from the Kashan regions. Among them, eighteen compounds represented more than 95% of the total oil. The identified compounds were; β-citronellol (14.5-47.5%), nonadecane (10.5-40.5%), geraniol (5.5-18%), and nerol and kaempferol were the major components of the oil (Loghmani-Khouzani et al., 2007). Analyses of rose absolute showed that phenyl ethyl alcohol (78.38%), citronellol (9.91%), nonadecane (4.35%) and geraniol (3.71%) ethanol (0.00-13.43%), and heneicosane were the major compounds (Ulusoy et al., 2009). A new flavanone glycoside, butin 4′-O-(2″-O-β-D- apiofuranosyl)-β-D-glucopyranoside , together with liquiritin, liquiritin apioside, isoliquiritn apioside , davidioside , quercetin, kaempferol, kaempferol 3-O-β-D-glucopyranoside and kaempferol 3-O-α-L-arabinofuranoside were isolated from the flowers after industrial distillation of essential oil (Kumar et al., 2006).

Methods. Total phenol content was estimated as gallic acid equivalents (Dehghan Kashani et al., 2011).Phytochemical investigation of a methanolic and ethanolic extract of *R. damascena* flowers was carried out using GC-MS method.

Results and Discussion. Flavonol glycosides were extracted from petals of *Rosa damascena* Mill. after industrial distillation for essential oil recovery and characterized by high-performance liquid chromatography-electrospray ionization mass spectrometry. Among the 22 major compounds analyzed, only kaempferol and quercetin glycosides were detected. (Schieber et al., 2005).

R. damascena is one of the most important plants known for its perfuming. Its major products are rose water and essential oil. This plant contains several primary and secondary metabolite such as terpenes, glycosides, flavonoids, and anthocyanins that have beneficial effects on human health. The pharmacological effects of *R. damascene* are widespread.

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The Biodiversity study of species and varieties of *Rosa* L. genus from Kashan area

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Abstract

Rosa L. genus with more than 16 species in Iran and 200 species in the world, is one of the most famous genera of Rosaceae family. Most of the species belonging to this genus are spiny shrubbery with pennate leaves and flowers with five petals. Varieties, cultivars, species and many subspecies of this genus are planted commonly in different temperate and cold temperate regions of Iran today. Although most varieties and forms of roses are diverse in color and number of petals, flower size and landscape beauty, and most often they are used to beautify green space, nevertheless, species of wild of the *Rosa* L. genus are often It has five petals with a lot of flavors that are used today in different industries such as perfumery, cosmetics, sanitation, food and medicine. In addition, the *Rosa damascena*, which is considered as one of the hybrid species of this genus, was cultivated in the different regions of Iran, especially Kashan, due to its incredible and pleasant aroma. Rose garden (Golestan) Mountainous areas of Kashan is a typical example of the efforts of farmers in this area that have been farming since very far past. The purpose of this research is to identify species and different cultivars of rose genus in Kashan area. With field surveys in mountainous Rangelands as well as different rose gardens fields of Kashan, different plant specimens were collected and identified. The identified specimens are kept in Herbarium of Kashan Botanical Garden. Based on the results of this research, more than 7 species of rose were identified in different parts of Kashan. Species such as: *R. beggeriana* Schrenk, *R. canina* L., *R. persica* Michx. Ex Juss., *R. elymatica* Boiss. & Hausskn., are grow naturally in the mountain range of Karkas. Species for example: *R. foetida* J. Herrman, *R. maschata* J. Herrman are often ornamental in gardens, houses and parks. *Rosa damascena* has been grown as a hybrid species with a high number of petals, cultivated from past cultivars by farmers of different regions of Kashan in the form of large rose gardens. Due to the precious rose waters and essential oils of this hybrid species, Kashan's rose waters extract industry has been flourishing for hundreds of years in all the villages and mountain range Karkas. In addition, three varieties of flower of *Rosa damascena* are white, golden and pink in some of the rose gardens of Kashan area, along with the flower of *Rosa damascena*, is cultivated on a very limited level. The composition of the essential oils of these varieties is different from the flowers of *Rosa damascena*.

The comparison of essential oils chemical compounds of *Rosa damascena* Mill. three rose garden of Kashan area

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Abstract

The genus *Rosa* L., belong to the Rosaceae family, includes several shrub species that has been reported to date in more than 200 species in the world and only 16 species from Iran. The *Rosa damascena* is one of the hybrid species of this genus that has flowers from 40 to 80 petals. In this research, essential oils chemical compounds of *R. damascena* Mill. from three rose gardens of Kashan area have been studied. The flowers of this plant in the spring of 2017 were collected from Kashan rose gardens (950 m above sea level), Niasar (1320 m above sea level) and Qamsar (1890 m above sea level) and and subjected to volatile fraction were isolated by simultaneous steam distillation extraction (SDE). The analysis of the oils were performed by using GC and GC-MS. The main components of the essential oil of Kashan rose garden includes: citronelole and nerole (35.76%), geraniole (26.66%), nonadecane (12.25%), linalole (5.53%), and henicosane (4.11%), respectively. The main components of the essential oil of Niasar rose garden includes: citronelole and nerole (46.48%), geraniole (12.96%), nonadecane (12.71%), henicosane (4.27%), and linalole (1.64%), respectively. The main components of the essential oil of Qamsar rose garden includes: citronelole and nerole (46.19%), geraniole (22.69%), nonadecane (12.71%), linalole (3.74%), and benzene etanole (3.8%), respectively. The comparison of essential oils chemical compounds of *R. damascena* of different rose gardens showed that the combination of linalool in Kashan essential oil was more than Qasem and Niaser. The combination of benzene ethanol in the essential oils of Niasar and Qasrar was reported to be five times higher than in Kashan. The two combinations of citronelole and nerole in the Qmasar and Niasar oils were more than Kashan. The combination of nonadecanel in the essential oils of the three regions was almost the same. The combination of hanicozane in the essential oils of Kashan and Niasar were 4% and as a major component of the essential oil, while no trace of this composition was observed in the essential oil of Qamsar.

The construction of damask rose and rose water museum in the Kashan botanical garden

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Abstract

The origin of the *Rosa damascena* belonged to Iran. Therefore, the Iranians are the first people who have found out the properties of food, medical and cosmetic of damask rose from the too far away. Among the flowers, the flower of rose was more interested in Iranians and in the form of the word "Varda" has come in the Avesta several times. Considering the economic, social, cultural and tourism importance of the flower of rose and its products, the construction of "damask rose and rose water Museum" is necessary in Kashan Botanical Garden. Therefore, by collecting objects, instrument, various apparatus and equipment of extraction of rose water; from the ancient times so far, Not only can determine the gradual evolution of this industry, But also the construction of the rose water museum will be very an effective role in the development of ecotourism industry. In this research, it was tried to visit the traditional extraction of rose water workhouses, the production and supply of various aromatic water, odor and essential oil, was negotiated with the skillful and experienced people in the profession and were collected valuable information on distillation practices and the application of tools used in extraction of rose water. The results of this study showed that more than 8 types of traditional extraction of rose water apparatus, 18 types of rose water bottles, 28 types of rose water sprinkler, 10 types of heating systems, 35 types of odor bottles, 39 types of pitches (ewer) and 25 types of decanters from different parts of the country were Prepared and purchased. The documentary images were prepared for each of the objects. The properties of each objects and apparatus were recorded based on the exploration of scientific resources or discussions with experts. According to the results of this research, the most of the museum's works were owned by the owners of traditional extraction of rose water workhouses or local collectors of Kashan. Undoubtedly, due to the long history of traditional extraction of rose water industry in the region of Kashan and the existence of diverse museum's works, access to the related objects of the industry has more than other parts of the country.

Effects of two types of fertilizers on the extract's yield and phenolic compounds of *Rosa damascena* Mill

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Introduction. Rose scientific name is *Rosa damascene* Mill. The aim of this study was to evaluate the quality and quantity of phenolic compounds in this plant that treated by both manure and chemical fertilizers. Flavonoids and other phenolic compounds are widely distributed in plants, and various biological activities such as antioxidant, anti-microbial, anti-inflammatory agents have been reported in many studies.

Methods. The flowering seedlings of Rosa were subjected to the treatments for one year. So that the first plot was considered as control and was irrigated from any organic and chemical fertilizer. In the second and third plots, the flowers of Rosa were routinely rows, and in three rows three replicates, respectively, for one year, cattle manure of 350 g and 100 g of fertilizer. The chemical (phosphate fertilizer and urea combination of 2 to 1 Lordegan companies) were added along with the required water at the foot of each plant. The sampling of flowering plants in experimental plots was carried out in May of 2016 at the same time as the flowering season of 10 plant flowers randomly. After appropriate treatments (manure and chemical fertilizers) at 2 habitats and 3 replication extraction conducted by soaking in 70% ethanol. Then measurement of phenolic and flavonoids compounds has been done by spectrophotometry method.

Results and Discussion. The results of phytochemical tests confirmed the presence of tannin, anthocyanin and flavonoids and absence of alkaloids in all treatments. Chemical fertilizer increased the flavonoids compounds manure fertilizer increased phenolic compounds.

Results indicated that the efficiency of different treatments-can effect of plant's extract efficiency and phenolic compounds that So far for this plant species has not been reported in the scientific literature. The number of phenolic compounds and the percentage of inhibition of free radicals in the antioxidant test has a direct relationship with each other. Therefore, in both tests, it can be seen that the sample used in manure is high in antioxidants and phenol content, and can be due to the absorption of materials that produce phenolic compounds, and so on. The antioxidant activity of the plant is involved. It also seems that different materials used in plant nutrition have direct effects on plant's compounds, especially secondary metabolites.

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Effects of two irrigation methods on phenolic compounds and antioxidant activity of *Rosa damascena* Mill

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Introduction. Phenolic compounds (flavonoids, tannins, and anthocyanins) are the most important natural antioxidants. *Rosa damascene* Mill. Is one of the most medicinal plants, which has been used in Iranian ancient and were cultivated traditionally in different parts of Iran. The present study was conducted to investigate the quantitative and qualitative properties of phenolic compounds and antioxidant activity of *Rosa damascene* Mill under two irrigation methods (drip and flood irrigation).

Methods. The Seedlings of *Rosa damascene* Mill were arranged in regular rows and respectively irrigated for one year with a drip and food irrigation system. The sampling of flowering plants in experimental plots was carried out in May 2016 at the same time as the flowering season from 10 plant flowers randomly. The total phenolic, flavonoid, alkaloids, tannin contents and the antioxidant activity were measured by spectrophotometry and DPPH methods respectively, then the all data were analyzed by using SPSS software version 19 and analysis of variance.

Results and Discussion. The results of the phytochemical test confirmed the presence of secondary compounds such as tannin, anthocyanin and flavonoids, and the absence of alkaloids in the extract of this species. Also, samples in drip irrigation treatment had the most antioxidant properties. The results of this research showed, by using management methods such as irrigation can be controlled the production, quantity and quality of secondary compounds in plants. In this study, the results of the phytochemical test confirmed the presence of secondary compounds such as tannin, anthocyanin and flavonoid and the absence of alkaloids. The number of phenolic compounds and the percentage of DPPH free radicals inhibition are also indicative of the relatively high antioxidant properties of this species. Results of the sample in the flood irrigation shows the smallest phenolic compounds and drip samples that have the most antioxidant properties. The adaptation of *Rosa damascene* Mill to our country's climate, the existence of a long-standing culture, production and consumption, the prosperity and demand of the global markets for Iranian products, and, consequently, employment are among the issues that require special attention to this plant species.

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The effect of temperature of thin layer drier on the anthocyanin components and antioxidative ability of *Rosa Damascena* Mill methanolic extract

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Inrtoduction. *Rosa Damascena* Mill is a Rosaceae family and one of the most important species of Rose. Products made from flowers such as essential oils, rose water, petals and dried buds are used in the perfumery, pharmaceutical and food industries. The processing of flowers has a significant impact on the quality and quantity of its ingredients. The flower of *Rosa Damascena* Mill contains flavonoids and anthocyanins with antioxidant activities. The purpose of this study was to investigate the effect of temperature drying of *Rosa Damascena* Mill petals in a thin layer dryer on the total amount of anthocyanins, flavonoids, and antioxidant activities.

Methods. Rosa Damascena Mill flowers were collected from Gonabad city and dried at a temperature of 35, 45 and 55 °C in a thin layer dryer with a hot air flow rate of 1.2 m/s. Total anthocyanin compounds, in terms of cyanidine 3-glucoside, total phenolic compounds, scavenging ability of free radicals (DPPH) and reducing power of FeIII (FRAP) of methanolic extracts of *Rosa Damascena* Mill petals were measured.

Results and Discussion. The results showed that the methanol extract of dried petals at 55 °C had the lowest IC50 (30.01 mg/ml) so had the highest antioxidant ability. At this temperature, the highest amount of phenolic compounds (equivalent to 777 mg gallic acid per gram of sample Dried) was also measured in methanolic extract. At 45°C the highest amount of trivalent iron regenerative capacity (1261 mmol Fe^{2+} $mass^{-1}$) and total anthocyanin (239 mg cyanidine-3- glucosid/gram of dried sample) were obtained.

Rosa Damascena Mill petal dried at 55°C is a good source of antioxidant material because of its high phenolic compounds and less IC50 and 45°C is the best temperature for extraction of Anthocyanin compounds and chelating agent antioxidants.

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Determining of challenges and solutions for *Rosa damascena* essential oil competitiveness in Kashan district using Porters' diamond model

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Introduction. The value of the essential oil is so high that it is likened to liquid gold. Therefore, due to the high potential of our country in the production of essential oils and the high value of this product, in this research, we tried to evaluate the problems and solutions of the competitiveness of the essential oil industry in Kashan area, a main cultivation area of Rosa damascena in Iran using Porter Diamond model. Problems of the mentioned industry and solutions proposed by experts from universities and industry are also considered.

Method. In order to collect information, a semi-structured interview has been used. At this stage, eight industry experts, a mix of academics and industry professionals, were interviewed. In the framework of the interview, the experts' opinions on the problems the suggested solutions for solving them were taken. The data analysis method is content analysis.

Results and Discussion. The results showed that during the interviews, industry experts pointed to 89 problems in the field of competitiveness of the mentioned industry. On the other hand, they have provided 98 solutions to improve competitiveness problems.

At the end of this research, solutions and suggestions are presented from the researcher's point of view.

Keywords: Competitiveness, Essential Oil Industry, Competitiveness of *Rosa damascena* Essential Oil, Kashan District.

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Evaluation of competitiveness for *Rosa damascena* essential oil, using Porters' diamond model (Case study: Iran, Kashan district)

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Introduction. Rosa damascena Mill. is a valuable medicinal and aromatic plant all over the world. The most important product of this plant is its essential oil. The importance of the mentioned material is so high that it is likened to liquid gold. In this research, we tried to evaluate the competitiveness of the essential oil industry in Kashan area as one of the most important cultivation area in Iran.

Method. The method of evaluation is Porter Diamond model and the data analysis method is content analysis, in which the relative frequency of expert opinion was calculated for each dimension of the six-dimensional Porter diamond model. Also, non-parametric Binominal and Friedman methods have been used to analyze factors and variables. In order to collect information a semi-structured interview has been used. At this stage, eight industry experts, a mix of academics and industry professionals, were interviewed.

Results and Discussion. The results of the research show that there are a lot of problems in each of the dimensions, and they acknowledge that there is no considerable problem in two categories of foreign dependence on materials and the presence of substitute products.

Based on the tests and analyzes, results from descriptive mean show that overall competitiveness and each of the competitiveness factors are less than average, and therefore, they are not in desirable condition. Only 6 variables of competitiveness from the total of 51, have a mean equal to or more than the average. These variables are: the lack of dependence on foreign raw materials, the existence of substitute products, the state of energy in industry, the impact of climate on quantity and quality of the product, the ease of launching new businesses and the presence of strong competitors.

The results of the binomial test confirmed the mentioned facts. In other words all of assumptions of the research have been rejected. Also the only variable which has a favorable status in the essential oil industry is no dependence on foreign raw materials.

Keywords: Competitiveness, Rosa damascena, Essential Oil Industry, Competitiveness of Rosa damascena Essential Oil, Kashan District

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Study of *Rosa damascene's* role in sustainable rural development

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Abstract

Historically plants have played an important role in human development. Through observation and experimentation, human beings have learnt that plants promote health and well-being. The use of these herbal remedies is not only cost effective but also safe and almost free from serious side effects. The village elders, farmers and tribal have tremendous knowledge about for health reasons started thousands of years ago and is still part of medical practices by people of various regions of Iran sub-continents as well as several other countries including China, India, Egypt, South America and other developing countries of world. The cultivation of Rosa damascene due to the diversity of jobs has a lot of entrepreneurship for the villagers. They can be easily managed along with other agricultural activities. The purpose of this study was to investigate the role of cultivation and processing of *Rosa damascene* in the development of entrepreneurship in rural community. The statistical population of this study was people working in *Rosa damascene* located in the village. Using Cochran's formula, 150 samples were selected. The sampling method was simple random sampling. The research method is descriptive-analytic. The library and field method (questionnaire) was used to collect data. The components of the study were analyzed using SPSS software. The results show that the cultivation of *Rosa damascene*, over the past five years, has led to an increase in household income between 30-40 percent. Developing processing technologies for new products can increase their revenues.

Keywords: Entrepreneurship, Rural community, Processing Technologies

Identification of Dirty notes in commercial rose (*Rosa damascena* Mill.) oils by GC-MS analysis

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Introduction. Rose water is the most product petals in Iran, which is produced in traditional workshops and factories. Rose oil is produced as second product (Mahboubi, 2015, Mahboubi et al, 2011). Many traditional producers, produced the rose oils in pots, which are used for other plant waters or essential oils. Therefore, their rose oils are containing the dirty notes in their chemical profiles, which makes difficult it to export.

Methods. Fifty different essential oils, which had been produced in Iran were subjected to Gas chromatography–mass spectrometry (GC–MS) analysis: The oil analysis was carried out using GC and GC/MS. The GC apparatus was Ms Model DSQ from Thermo company, capillary column of HP-5MS (30 m × 0.25 mm, film thickness 0.25 µm). The oven temperature program was initiated at 50 °C, held for 1 min, then raised up to 250 °C at a rate of 3 °C /min held for 10 min. Helium was used as the carrier gas at a flow rate 1.0 ml/min. The detector and injector temperatures were 250 °C, respectively. GC/MS analysis was conducted on a Ms model DSQ from Thermo with network mass selective detector with a capillary column the same as above, carrier gas helium with flow rate 1 ml/min with a split ratio equal to 1:50, injector and oven temperature program was identical to GC. The compounds of the oil were identified by comparison of their retention indices (RI), mass spectra fragmentation with those on the stored Wiley 7n.1 mass computer library, and NIST (National Institute of Standards and Technology) (Adams, 2001).

Results. 169 different chemical compounds were identified in 50 samples of rose oils. From these 169 compounds, 12 compounds were not the components of rose oil. They are including sabinene hydrate acetate, menthol, carene types, lavandulol, fenchyl alcohol, caratol, copaene, veridiflorol and isoledene.

Conclusion. These compounds could be comes from other products that distilled at the same distillation unit. Therefore, the use of suitable procedures for washing of instrument before extracting the rose oil could help to produce an essential oil with high quality.

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Experimental design approach in optimization of some effective variables on quantity and quality extraction of essential oil from *Rosa damascena* Mill

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Introduction. Experimental design that is one of the basic tools for optimization, consists of creating informed and targeted changes at the inputs in order to observe and test changes in outputs or results of a process.

In this study, central composite design that is one of the most used methods of experimental design, was applied for optimization of quantity (by the choice of extraction yield) and quality (by the choice of Citronellol/ Geraniol ratio as a response) of *Rosa damascene* essential oil, that its benefits and applications in deferent industrial such as perfumery, pharmaceutical, cosmetics and food was evident for all from past to yet.

Method. Method of essential oil extraction is hydro distillation by Clevenger apparatus. After study of scientific reports, it is found that two factors such as temperature and time of flower storage, have significant effects on the extraction yield and quality of essential oil.

Results and Discussion. Differences in obtained yields in different conditions from two mentioned factors and spectrum survey of each essential oil after injection to GC-MS, demonstrate definite effects of these factors on response. Finally, special conditions of optimum point for both responses were determined and found that to obtain highest extraction yield, for two mentioned factors, -5°C and 14 days, and to obtain best odor of essential oil, -1°C and 1 day for temperature and time, respectively, are desirable.

Also, because of Nerol and Citronellol spectrum interference, multivariate curve resolution - alternating least square method that is one of the chemometric tools, was used to separate overlapped peaks.

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Formulation of *Rosa damascena* nanoemulsion: A comparison between low energy and high energy method

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Introduction. Rose essential oil which made by extracting *Rosa* damascene, is helping to cure stress, insomnia and consider as aphrodisiacs. The tendency to use Rose essential oil is raised in various fields includes cosmetic, food and pharmaceutical [1].

Methods. In this study, the nanoemulsion of rose oil was formulated and compared in two ways including high energy and low energy approach. In both methods, non-ionic surfactants and co-solvents were used to make nanoemulsion. Nanoemulsions were prepared from a mixture of hydrogenated castor oil, span 20, propylene glycol, and polyethylene glycol 400 under dilution with water [2, 3] .

Results and Discussion

Physicochemical properties of nanoemulsions including particle size, turbidity, refractive index and stability were also studied. The amount of particle size for the low energy and high energy methods were 25.7 and 22.33 nm, respectively.

Using spontaneous and low energy method, nanoemulsion with small droplet can be achieved. The results obtained from this research may be useful for various fields including pharmaceutical, beverages and food industries.

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Using of analytical chemistry methods for distinguishing of frauds in Golab

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Introduction. Golab or *Rosa damascena* essential oil is an expensive natural food additives that is used in the types of traditional and industrial foods. *Rose pelargonium (Sweet-Rose geranium)* is the natural plant that its essential oil is not only similar to *Rosa damascene* essential oil but also cheaper than it and *Pakestanian Rose* is the synthetic compound with the same characteristics too, so may be adultrated to produce of Golab or *Rosa damascena* essential oil by some of the profiteers. We decided to distinguish and control of this frauds.

Methods. pH, acidity index, Iodic index was measured and also methods of instrumental analytical chemistry GC, UV, GC/MS was used.

Results and Discussion. Natural Golab had pH = 3.8-5, acidity index 1-5, high iodic index was the best index for distinguishing of natural Golab from synthetic or similarity natural compound. GC/MS results showed, the ratio of Citronelol/Geraniol was more than double in the froudulous Golab, there was the high amounts of Phenyl ethyl alcohol in the natural Golab and Nerol compound was in the natural Golab and was absent in the others.

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Sustainable economic approaches to the production and processing of *Rosa damascena* in Iran

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Introduction. Many of the development theorists, including the World Bank, have proposed a diversification approach and multi-sector economic activities in the village within the framework of the sustainable development model. The need for sustainable development and the stabilization of the rural economy is the existence of a diversification of economic activities that doing it will result in to the stability and sustainability of economic structures. Hence, this paper, by exploring existing resources, seeks to elucidate sustainable economic approaches with the goal of diversifying agricultural and rural economies. Iran is one of the pioneers of the world's leading the Rosa damascene production after Bulgaria and Turkey. However, at present, the amount of essential oil produced in Iran is less than one percent of the world's total.

Materials and Methods. The method of collecting data and statistics was in two ways: documentary and survey in 2017. The statistical population of this study was farmers who were cultivating Rosa damascena in Khorasan Razavi province. They were selected by using cluster sampling method. The obtained data has been analyzed using cost-benefit analysis and profitability analysis has been performed and interpreted. Despite the fact that the cultivation area of this flower in Bulgaria is almost half its cultivation area in Fars province, it produces 1,200 to 1,500 tons of essential oil per year. Based on the statistics of the Ministry of Agriculture of Iran in 1395, the area under cultivation of the Rosa damascene in Iran is 18131 hectares, of which 16085 hectares are in operation and annually produce 35193 tons of flower products. According to studies, the Rosa damascene can produce about 250 types of products, aiming at creating economic added value.

Results. The Rosa damascene can be a good alternative to hydrophilic products due to their specific ecological and physiological characteristics and drought tolerance. Therefore, it can be said that the Rosa damascene can be a strategic product for Iran, which is implanted in the direction of sustainable development. However, the lack of variety in the production of the Rosa damascene products and its packaging, as well as the high volume of rose water supplied to the market, is one of the challenges of the Rosa damascene flower industry. On the other hand, the sensitivity of rose water to heat, cold, light and microbial contamination, transportation and maintenance of rose water in high volumes, the possibility of making fake rose water, as well as the use of plastic containers for maintenance of rose water, is one of the problems of the industry of growing rose and preparation of rose water in Iran. At present, each gram of rose water essential oil produced in Bulgaria is sold at around $ 56 and sold in Australia at $ 59, indicating the need for the active production of the essential oil of rose water and its various products in Iran. From the advantages of the Rosa damascene flower, on the one hand, its good compatibility

with the climatic conditions of the country, and on the other hand, the low water requirement of this plant, which can be planted and propagated as an appropriate pattern, in rain fed conditions and in low land yield and sloping areas. The economic survey of roses shows that the Rosa damascene flower has a higher net profit than other crops and garden products and can become an important export product.

Antibacterial Activity of *Rosa damascena* Mill. Ethanolic and Methanolic Flower Extract

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Introduction. One of the most important species of Rosaceae family is *Rosa damascena* Mill., known as Gole Mohammadi in Iran (Boskabady et al., 2011). Botanical extracts have long been used to treat disease, and plant sourced materials play a major role in primary health care in many developing countries. Moreover, the screening of such plant extracts for antimicrobial activity has always been of great interest to scientists looking for new sources for drugs for the treatment of various disease (Arldogan et al., 2002). *R. damascena* is an ornamental plant and beside perfuming effect, several pharmacological properties including anti-HIV, antibacterial, antioxidant, antitussive, hypnotic, antidiabetic, and relaxant effect on tracheal chains have been reported for this plant (Boskabady et al., 2011).

Methods. To evaluate the antibacterial activities of six; three ethanolic and three methanolic extracts of *R. damascene* from different areas (two from Ghamsar Kashan, Esfahan province and one of Birjand, South Khorasan province); their activities were determined by Agar well method. *Klebsiella pneumoniae* as a gram-negative and *Enterococcus faecalis* as a gram-positive were used as standard test bacterial strains.

Results and Discussion. The findings showed that *R. damascena* has an antimicrobial activity. Although the methanolic extracts have slightly more effect rather than ethanolic. Indeed, gram-positive bacteria were more sensitive than gram-negative. Based on the results the methanolic extract of collected samples belonged to Birjand areas has the strongest effect among all of the others.

Antibacterial effect of major components of *R. damascena* extract was reported previously (Gochev et al., 2008). The previous studies also indicate that rose extract possess antibacterial activity against both gram-negative and gram-positive bacteria (Ulusoy et al., 2009). Antibacterial properties of this species can be attributed to its high phenylethyl alcohol content. The antimicrobial properties of alcohols have been known for a long time (Etschmann et al., 2002). In all, the studies showed that because of antibacterial effects of this species, it can be used as natural preservative additives in food industry and medicine production and antibacterial agent for disinfection of various surfaces.

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Microencapsulation of Rose essential oil using solvent evaporation method using *Ethyl cellulose* and *Eudragit* ®Copolymer as carriers

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Introduction. Because of disappearing of the effective roles of herbal essential oils over time, due to low vaporization temperature or chemical stability, many methods has been used to enhance stability and persistence of the essential oils in which controlled releasing of encapsulated essential oils is the most important one. The objective of this project was reducing the rate of evaporation of the Rose oil via microencapsulation.

Method. Microcapsules were prepared by the emulsification method via solvent evaporation technique and different polymers which were incorporated into microcapsule to control the release rate of essential oil (Rose oil). Ethyl cellouses (EC) and Eudragit® in the different ratio were selective as microcapsules wall material. The effect of the three variables: polymer concentration, the amount of emulsifying agent and type of solvent on loading capacity and encapsulation efficiency were studied.

Results and Discussion. Best results for formulation consist of %5 Eudragit polymer with a solvent/non solvent ratio of 1:2.5 and %1 percentage of stabilizing agent. Maximum efficiency is 76.7% and loading capacity of essential oil were reported 9-11%. Results showed release capacity in acidic and alkali conditions were 13.62% and 38.94% respectively and total release was about 52.6% for 4 hours.

The results demonstrated that polymer type, percentage of solvent, type of non-solvent and its percentage and percentage of emulsifier and agitation were found to be key factors effecting the encapsulation and release profile. The Eudragit® microcapsules was the most appropriate polymer, providing a high encapsulation efficiency.

Keywords: Essential oils, Microencapsulation, Controlled release, Eudragit®

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Effect of Salinity (NaCl) and salicylic acid treatment on some morphology and physiology characteristics of *Rosa damascena* (Kashan genotype)

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Abstract

Salinity is a major stress factor for plants in many parts of the world. It limits plant growth and metabolism. In this research, the effect of salinity stress on Kashan genotype of Damask rose was assessed in a factorial trial based on a completely randomized design, with four replications per treatment. Treatments included four levels of salinity (4, 8, and 12 ds m^{-1}) and salicylic acid spray (0 as control, 0.5, 1, and 2 mM). The results showed that with increasing the level of salinity, leaf fresh and dry weights decreased. Salinity stress increased root fresh weight. Furthermore, salicylic acid at 0.5 mM supported the highest shoot fresh weight. The highest level of leaf chlorophyll a and b was recorded for treatment 2mM salicylic acid at 0 ds m^{-1} Moreover, the highest stomatal conductance was observed in control and salinity 4 ds m^{-1} that were sprayed with 0.5 mM salicylic acid. According to mean comparisons, salicylic acid at 0.5 mM alleviated the stress symptoms.

Keywords: Stomatal conductance, chlorophyll, salicylic acid, *Rosa damascena*,

Study of *Rosa damascene*'s status on carbon sequestration in climate change condition

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Abstract

Climate change under the influence of excessive consumption of fossil fuels and global warming is the most important challenge facing humans today. The reduction of atmospheric carbon to reduce greenhouse gases and depositing it in the soil by plants (carbon sequestration) is one of the projects to control this challenge. On the other hand, Rosa damascena mill L., known as Gole Mohammadi in Iran is one of the most important Iranian herbs Suitable for most climate zones in Iran, which can be a great alternative to many non-fertile plants proposed for carbon sequestration. Rosa damascena R. damascena is an ornamental plant and beside perfuming effect, several pharmacological properties including anti-HIV, antibacterial, antioxidant, antitussive, hypnotic, antidiabetic, and relaxant effect on tracheal chains have been reported for this plant. Studies have identified several optimal tree species for carbon storage, and botanists continue to experiment with new hybrids. Surprisingly, we should avoid trees such as the willow, which store comparably little carbon and emit more harmful volatile organic compounds. When choosing trees to plant, consider: Fast growing trees store the most carbon during their first decades, often a tree's most productive period, Long-lived trees can keep carbon stored for generations without releasing it in decomposition, Large leaves and wide crowns enable maximum photosynthesis, Native species will thrive in your soil and best support local wildlife, Low-maintenance, disease-resistant species will do better without greenhouse-gas-producing fertilizers and equipment, Consider these reliable and versatile star-performers and finally the most important factor in choosing a plant is its economic and sustainable development. Rosa damascena has a special place in terms of all its ecological properties, as well as its pharmaceutical and economic role.

Keywords: Arid land, Sustainable development, Medicine plant

Effect of essential oil of *Rosa damascena* on human colon cancer cell line SW742.

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Introduction. Colon cancer is the second most common fatal malignancy. Owing to the existence of many side effects and problems related to common treatments such as surgery, chemotherapy and radiotherapy, alternative treatments are being investigated. Some herbal medicines have shown promising results against different types of cancers. Herbal medicines used have included the use naturally occurring essential oils.

In this study, we report the effect of the essential oil of *Rosa Damascena* on human colon cancer cell line (SW742) and human fibroblast cells.

Methods. The essential oil of *Rosa Damascena* was obtained by distillation and its effect on SW742 cell-line and fibroblast cells were investigated with cell culture. The cells were cultured and different volumes of essential oil were induced to the cells. After48hincubation, cell survival was measured and using statistical analysis, the findings were evaluated and reported.

Results. This study showed that soluble part of *Rosa Damascena* oil increases cell proliferation in high volumes and the non-soluble component decreases cell proliferation.

Conclusion. The effects of essential oils, such as *Rosa Damascena*, on cell proliferation require more thorough investigation.

Keywords: Cell survival; Colon cancer cell line (SW742); Essential oil; Human fibroblast cell; *Rosa Damascena*

Characterizing and detecting the authenticity of *Rosa damascena* commercial essential oils from Kashan, I. R. of Iran by GC/FID detection

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Introduction. The ISO 9842 rose oil standard requires the citronellol content to be within concentration ranges of 20% to 34% of the oil, nerol 5% to 12%, and geraniol 15% to 22%. The ratio among the three rose constituents, especially the sum of citronellol plus nerol, is important for rose oil quality and its marketing price. Therefore, this work was aimed at a detailed phytochemical characterization of commercial rose samples from the city of Kashan in the central part of Iran.

Methods. Seven commercial samples of Rosa damascena essential oil (A-G) of the same geographic origin extracted by hydro-distillation from fresh flowers were considered. The Varian CP-3800 GC/FID technique was applied for the phytochemical analysis of the samples.

Results. A total of 16 components were identified in the samples. The samples showed a chemical composition based on relatively high levels of aliphatic hydrocarbons totally referred to as stearopten or the solid portion of the rose oil. Citronellol (3.72–54.83%), Nerol (none-2.67%), and geraniol (0.58–15.98%), Heptadecane (0.33-2.30%), farnesol (0.01-1.85%), Nonadecene (1.50-5.58%), Nonadecane (5.47–18.16%), Eicosane (0.58-2.56%), Heneicosane (1.90-9.18%), were the main constituents of essential oils. Other constituents were found to be alpha-pinene (none-1.05%), Linalool (0.59-2.38%), cis-Rose oxide (0.09-0.54%), phenyl ethyl alcohol (1.15-54.70%), trans-Rose oxide (0.04-0.20), neral (none-0.65%), geranial (none-2.16%).

Conclusion. The results indicated that the content of citronellol plus nerol of samples C, D, and G although were above the upper limit of ISO 9842 turned out to be of better quality. Samples E, and F showed the highest amount of phenyl ethyl alcohols up to 35.6 and 54.7 % respectively. Although the contents of citronellol plus nerol of samples A, and B were within the range, the amounts of phenyl ethyl alcohols were 4.79 and 4.49 % as well.

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In vitro propagation of three genotype of *Rosa damascena* Mill

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Introduction. The *Rosa damascena* is one of the most important species of Rosaceae family mainly known for its perfuming. Its major products are rose water and essential oil importance in medicine, cosmetics and Food industry. Now, tissue culture technique plays an important role in propagation of this plant considering difficulties like deficiency of stock plants, time consuming and transferring diseases by vegetative propagation methods. Micro propagation is an in vitro culture technique which can produce plenty of intact plantlets in a short period of time.

Methods. In order to explant disinfection, different concentrations (0, 25, 50 and 75 mg/l) of Nano-silver (NS) were used in addition with 2.5 or 5% sodium hypochlorite (NaClO) for 2.5, 5 or 7 min. and 0.1 or 0.2% mercury chloride ($HgCl_2$) for 3 or 4 min. In order to improve proliferation new regenerated shoots originated of establishment stage were transferred to the medium containing different concentrations of benzyl amino purine (BAP) and thidiazorun (TDZ).

Results and Discussion. The best concentration for NaClO was 2.5% for 5 min and for $HgCl_2$ was 0/2% for 4 min. NS prevented of bacterial contamination and improved in vitro proliferation. The best proliferation treatment obtained of 1.5 mg/l BAP in modified Murashige and Skoog (MS) medium. High level of chlorophyll in *in vitro* leaves was observed in MS medium with 2.5 mg/l 2, 4-D. At rooting stage, the 1/2 MS consisting 2 mg/l IBA result in the highest percent of rooting (55%) and the maximum average root number (4.4) for plantlets

In conclusion, $HgCl_2$ is advised in low concentrations for preventing bacterial contamination and it is better to use NaClO for explant sterilization if there is no bacterial contamination, since $HgCl_2$ have adverse effects like decrease in nutrient absorption and bud burning of explants. NS is effective on decreasing internal contamination and improving shoot growth. 0.5 - 2 mg/l BAP was found appropriate for enhancing shoot proliferation in Damask rose. The best treatment to have high chlorophylls was 2.5 mg/l 2, 4-D and maximum percent of new shoots was observed in mMS medium containing 1.5 mg/l BAP. While rooting of shoots improved with half-strength MS medium containing of IBA at the concentration of 2 mg/l. Our present work provides a practical protocol for efficient axillary bud multiplication from three genotype of Rosa damascena Mill.

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An investigation and comparisons of essential oil and flower yield of different genotyoe of *Rosa damascena* in half industrial level on three local in Razavi Khorasan province

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Introduction. *Rosa damascena* Mill is one of the important of medicinal plant in Razavi Khorasan province. At present, cultivation of this plant is increasing and cultivation in different local of Khorasan province. The importance of this plant from various aspects of economic, pharmaceutical and sanitary and its adaptation to different environmental conditions has provided the basis for its cultivation, which can provide employment and decent income for the province's farmers. This research was carried out to evaluate the performance of flowers and essential oils of 11 superior genotypes of *Rosa damascena* in three different regions.

Methods. selected genotypes were cultivated in a randomized complete block design with three replications in three locations. From each genotype, 27 plants were cultivated in 3 regions with 3 * 3 m intervals and after the plant cultivation and different data including : number of flowers, flower and petal yield, percentage and yield of essential oil in different genotypes collection were recorded for all location .In the finally data were analyzed with SAS software.

Results and Discussion. The results of analysis of variance for the studied characteristics including number of flowers, flower and petal yield, percentage and yield of essential oil in cultivated areas and for different genotypes showed a significant difference at 1% level that showed indicating the genetic diversity of the studied genotypes. Comparison of the mean of flower yield and different traits was very different in the cultivated areas in the studied genotypes. In all three regions and years of cultivation, genotype of Fars 1 had the highest mean flower yield and Southern Khorasan, Isfahan 9 and 5 genotypes were also suitable. Permanent genotypes of flower and Kerman produced the lowest flower yield.

In all three regions and years of cultivation, genotype of Fars 1 had the highest mean flower yield, and Southern Khorasan, Isfahan 9 and Isfahan 5 genotypes were also suitable. Permanent genotypes of flower and Kerman produced the lowest flower yield.

The results of this research was consistent with the report of Tabaei Aghdaei and et al. (2009) and show that there are variation in flower yield in different genotypes of *Rosa damascena* and indicates the high genetic and yield in Rosa genotypes. The southern Khorasan 3 and Isfahan 5 genotypes were in the next rank of flowering performance per plant.

The highest essential oil yield of the Khorasan Razavi genotype at Gonabad station with 1.17 g / plant and the lowest yield of essential oil belonged to the permanent genotype of flower at the station of Jolgae Rokh and Golmakan at 0.047 g / plant.

Tabaei Aghdaei et al. (2011) conforms to variation in the essential oil content of different Mohammadi genotypes and indicates the high genetic potential and potential as a genetic reserve for the production of Mohammadi flower cultivars.

The results of this research are consistent with Tabaei Aghdaei and et al. (2010) researchs, which indicates the high potential of the Rosa genotypes for the production of essential oils and cultivar of this plant.

Keywords: *Rosa damascena Mill*, Yield, genotypes, Essential oil,

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Rosa damascena essential oils: a brief review about chemical constituents

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Abstract

Rosa damascena Mill as an ornamental plant is the hybrid between *R. gallica* and *R. Phoenicia*, and is the member of Rosaceae family with more than 200 species and 18,000 cultivars around the world. The main importance of Damask rose is due to its aromatic products including rose essential oil (EO), rose water, rose concrete, and rose absolute which can be used in food, perfume, cosmetic, and pharmaceutical industries. Moreover, *R. damascena* is traditionally applied for treatment of abdominal and chest pains, strengthening the heart, menstrual bleeding, digestive problems and constipation [1].

According to phytochemical studies on *R. damascene*, citronellol, geraniol, nerol, phenyl ethyl alcohol, nonadecane, nonadecene, eicosane, heneicosane, tricosane, α-guaiene, geranyl acetate and eugenol have been determined as the major compounds in rose EOs [2]. Based on the International Standard [3], citronellol (20-34%), nerol (5-12%), geroniol (15-22%), parrafins C_{17} (1-2.5%), parrafins C_{19} (8-15%) and parrafins C_{21} (3.0-5.5%) are the best criteria for producing a high quality rose EO. In other word, the citronellol/geranial ratio should be between 1.25-1.3%. However, the quantity and quality of rose EOs are influenced by different factors like edapho-climatic conditions, soil characteristics, harvest time, storage of plant material and method of extraction [4]. Therefore, in the present work, a brief review on the Damask rose EOs is described, focusing on the main factors responsible for the chemical variability and the strategies for enhancing the EO yield and its quality.

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Economics of *Rosa damascena* in Iran

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Abstract

Mohammadi is scientific *Rosa damascene* Mill. belongs to the genus *Rosa* and family Rosaceae. One of the most important aromatic plants of *Rosa* species in the world and is on of the most prominent plants in gardening history. It has a high genetic diversity in Iran and it is important for decorative, medicinal and export aspects. This species is a fixed duality of two species *R. galica* and *R. moscatag.* Flowering Mohammadi as one of the activities of a diversified agricultural sector plays an important role in creating employment and income generation and developing the economy in areas of the country with the potential and talent necessary for this activity. Nevertheless, less attention has been paid to economic development planning. Golmohammadi industry and commerce has been developing its industries in the world. Studies have shown that only the essential oil of Mohammadi flower, other than other products, is used in perfumes, pharmaceuticals, food, cosmetics and hygiene. The Iranian economy has been steadily supported by oil revenues since the 1950s. Since the fifties, the Iranian economy has been steadily supported by oil revenues, with the imbalance and harmony between economic sectors becoming apparent. ccording to international documents, the origin of Iranian rose and the origin of the production of aromatic oils and extracts of flowers and fresh leaves are mentioned. In the Zoroastrian education circle, the flowers of Rose, Nastaran and some plants are honored and in the book of Falahat and Agriculture, we have discussed the existence of various types of Roses in Fars. Abu Mansour Movaffagh in the tenth century, while defining the medicinal properties of the rose, has shown that the best flowers are Iranian roses.

Keywords: Essential oil, Industry and Trade, Rose water

Comparison of the main components of the esential oil from *Rosa damascena* flowers in different regions of Kashan area

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Introduction. Approximately 400 oil components have been identified in the rose oil. About 62–77% terpene compounds are found in oil's composition: hydrocarbons (monoterpenes up to 2% and sesquiterpenes 35%), oxygen-containing derivatives (monoterpenes 64–71% and sesquiterpenes 0.5–2%), fatty hydrocarbons and their oxygen derivates (18–25%), phenylpropanoids (3–5%), and others (0.5–2%) [1]. Rose oil composition is varied over the different conditions, for example harvesting period and ecological factors. In this study, comparison of chemical compositions of Rose oil from 11 different regions was done.

Method. The flowers of *R. damascene* were collected during the flowering period in July 2018 from 11 different regions of Kashan area, around Kashan (Isfahan province, Iran). 200 g each of the samples were individually subjected to hydrodistillation for3.5 h using a Clevenger-type apparatus [2]. After decanting and drying over anhydrous sodium sulphate, yellow coloured oils were recovered and analyzed with GC/MS.

Results and Discussion. Eleven samples of *Rosa damascena* were subjected to hydrodistillation using a Clevenger-type apparatus and the yellow coloured essential oils were analyzed by GC and GC/MS. The oils were characterized by a high content of Citronelol (from 14.09% in Sedeh area to 44.35% in Azaran area) and geraniol (from 2.25% in Azaran area to 15.29% in Chime area).

According to the results, although the selected area was not very wide, high differences were observed between components from different tested samples from different regions. This fact shows the importance of having enough attention to the type of the sample to use the oil for specific orders

Keywords: *Rosa damascene*, essential oil, hydrodistillation, GC/MS analysis

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Comparison of the main components of *Rose water* in different regions of Kashan area

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Introduction. *R. damascena* is traditionally used for treatment of abdominal and chest pains, strengthening the heart, menstrual bleeding, digestive problems and constipation. The antimicrobial, antioxidant, analgesic, anti-inflammatory, anti-diabetic and anti-depressant properties of *R. damascena* have been confirmed. *Rose water* is a hydrosol portion of the distillate of rose petals, a by-product of the production of rose oil for use in perfume. It is used to flavour food, as a component in some cosmetic and medical preparations, and for religious purposes throughout Europe and Asia [1].

Methods. The samples of *Rose water* were collected during in July 2018 from four areas (Ghamsar, Azaran, Kamoo, Sede), around Kashan (Isfahan province, Iran). 250 ml of the each sample were individually subjected to extraction with 33 ml of n-pentane as solvent using a Separator funnel apparatus. After evaporation of the solvent, yellow coloured oils were analyzed by Agilent HP-6890gas chromatograph equipped with an Agilent HP-5973 mass selective. Identification of components of essential oil was based on retention indices (RI) relative to n-alkanes and computer matching with the Wiley275.L and Wiley7n.L libraries [2].

Results and Discussion. Four samples of *Rosa water* from different areas around Kashan were subjected to extraction with n-pentane as solvent, the yellow coloured essential oils were analyzed by GC and GC/MS. The oils were characterized by a high content of Citronelol (16.97% - 29.09%), Geraniol (2.17% - 6.1%) and Phenylethyl alcohol (47.97% -63.01%)

As is clear from the results, there were very significant differences between three major components from four tested samples from different regions. So, it can be said that Rose oil composition is varied over different conditions, for example harvesting period and ecological factors.

Keywords: *Rosa damascene*, *Rose water*, GC/MS analysis, citronellol, geraniol, phenyl ethyl alcohol

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Encapsulation of *Rosa damascena* essential oil in solid liquid nanoparticles

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Introduction: Essential oil of *Rosa damascena*, besides having a unique fragrance, is very notable for having properties like antioxidant, free radical scavenging, anti-cancer, anti-inflammatory, anti-aging and anti-depressant. In order to protection of volatile and biodegradable materials, nanoencapsulation process can be used to enhance the durability and controlled release of the constituents under conditions of proper management.

Method. Due to the significance of stable protection of essential oil materials in the different commercial applications, for the first time in the present study nanocapsules containing essential oil of *Rosa damascena* has been encapsulated using SLN preparing Method. Nanocapsules size, polydispersity index and zeta potential, was measured using dynamic light scattering and GC-MS was implicated to determine the %EE quantitatively and qualitatively.

Results and Discussion. Results showed that the particles are spherical, the size of the particles are below 100 nm with negative zeta potential and encapsulation yield is 51%.

The SLN preparing method was able to capsulate components of the essential oil of *Rosa damascena* with a high efficiency.

Keywords: Solid liquid nanoparticles (SLN), Dynamic light scattering (DLS), GC-MS, Nanoencapsulation, Essential oil, *Rosa damascena*

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Effect of ultrasound waves on the size of nanoparticles of encapsulated *Rosa damascena* essential oils

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Introduction. Essential oils are natural products which have many interesting applications. Extraction of essential oils from plants is performed by classical and innovative methods. However, their volatility, low solubility in water, and susceptibility for oxidation limits their use. EOs encapsulation is one of the options to reduce these effects and to improve their biological activities. Due to the significance of stable protection of essential oil materials in the different commercial application, for the first time in the present study, essential of *Rosa damascena* has been encapsulated and the encapsulation efficiency (EE) has been evaluated quantitatively and qualitatively.

Method. The effect of ultrasound waves on decreasing nanoparticles size of nanocapsulated *Rosa damascena* essential oil was examined which confirmed the success of the ultrasonic-aided method for production of the stable nanoencapsulated particles, i.e. amount of surfactant, time of ultrasound exposure and ultrasonic power values on the stability and size of the nanoencapsulated particles was investigated.

Results. Nanocapsules size, polydispersity index and zeta potential have been measured by dynamic light scattering technique. Gas chromatography mass spectrometry (GC-MS) and scanning electron microscopy (SEM) were respectively used to investigate the %EE and the morphology of the nanocapsules. The results showed that the size of spherical particles with negative zeta potential is below 100nm. According to the obtained results, the ultrasound power and exposure time had a significant effect on the particle size and encapsulation efficiency.

Keywords: Nanoencapsulation, Particle size, Zeta potential, Polydispersity index, Ultrasound wave, Encapsulation efficiency, Essential oil, *Rosa damascena*

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Applications of waste rose petals (*Rosa damascene*) as by-product in industry

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Introduction. Large quantities of distilled petals are generated as the waste during distillation process every year in Iran. The waste rose petals are rich source of biomacromoleculs. Currently, almost all this waste is simply discarded. Therefore, it is important to investigate the alternative usage to achieve more effective and economical distillation process. In this study, we aimed to survey the applications of waste rose petals.

Results and Discussion. Baydar et al. reported that the polyphenolic compounds extracted from waste rose petals can be used as antioxidant supplements [1]. Flower residues from dyeing industry such as *Hibiscus rosa sinensis* and *Rosa rosa* dye wastes can be used for Pb^{2+}, Cd^{2+} and arsenic removal [2]. Waste biomass of red rose was used for Pb^{2+} and Co^{2+} removal [3]. The waste of *Rosa damascena* flowers was used as a source of natural dye for organic wool dyeing [4]. Pectic polysaccharides isolated from waste rose petals have the immunomodulating properties [5]. Pectic extract could also be used as flour in thermally treated food products because of its stability [6]. These findings reveals the promising applications of waste petals in different industries.

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Effect of the time of flowers picking up after sun rising on the quality and quantity of the essential oil of *Rosa damascena*

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Introduction. There are certainly many factors affecting the amount of essential oil and the type of compounds, and therefore the essential properties of aromatic plants. One of the factors that traditionally known that has an effect on the quality and amount of essential oil of the plant is the time of picking up the plant. In the case of the flower of *Rosa damascena*, it is believed that with the sunrise and afterwards, the quality and amount of essential oil in the flowers decreases.

Method. In this research we study the effect of time on the amount and type of essential oil compounds of *R. damascena* flowers. Analysis of the essential oils was carried out through the GC-MS apparatus.

Results and Discussion. Results showed that the amount and quality of essential oil from before sunrise until 9:00 am dropped slowly and then dropped sharply.

2 hours after sun rising Amount of aliphatic hydrocarbons are increased. On the other side, alcoholic and esteric compounds are decreased.

Keywords: Essential oil, *Rosa damascena*, GC-Mass.

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Economics of Medicinal Plants

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Abstract

Recent years experiences show that emphasis of economy on income of petroleum selling results in instability of export income. Orientation of export policies may be changed for exporting non-oil goods including export of agricultural products to decrease dependence of Iran economy to export of petroleum and moving toward goals of resistance economy policy. Among agricultural products, herbs are the most important export items of agriculture which have great portion in creating added value in this sector and making foreign exchange. Study of statistics and previous years' time series information shows that export of these products has not suitable situation despite good rank of Iran in production and cultivation of herbs. This research is going to study position of Iran in global market of herbs emphasizing on damask rose and its comparison with various countries. Although recent years drought and contraband occurrence have result in fluctuation of production but expert views to chain of production to export cause increase of production and export. The most important challenges of herbs commerce and becoming undesirability of Iran position in foreign market of herbs are lack of technical knowledge in export, weakness of foreign marketing, weak support of government, high expenses of standardizing products for export, lack of cooperation between export trade unions and agencies in herb industry and their negative competition, incorrect recognition of aiming market, lack of having trade mark for many export items of herbs, political risks and decrease of bargaining power of foreign trade sector in foreign markets.

Keywords: Herbs, Export, Strategies, Market, Iran

Control management of blossom feeder scarab (*Epicometis hirta* Poda) and flower scarab (*Oxythyrea Sp.*) in gardens of Shahrood, Iran

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Introduction. One of the important insect pests of fruit trees in Semnan province are the blossom beetles, *Epicometis hirta* Poda and flower scarab (*Oxythyrea Sp.*) (Scarabaeidae. Col.). The larva develops in the soil, feeding on decomposed plant matter and it causes no damage. Adults cause destructive attack the reproductive parts of the fruit crops and many ornamental bushes as well as rosa damascena. The feeding usually results in the damage of the anthers and stigma which affects fruit setting and consequently reduces the yield. Controls of blossom beetles are difficult, as most insecticides cannot be applied during flowering without affecting honeybees or natural enemies. The mentioned pests are reported mostly in centre, north, northwest, northeast provinces of Iran.

Methods. The traps we tested were consisting of two parts. The upper one was a captured surface made by a plastic plate and shaped it as funnel. The lower part was a 3 litres bottle plus water and detergent whereas serves holding captured beetles. Three different trap colors consist of white, yellow and blue were investigated in a cherry orchard in Bastam, Shahrood region to find the most attractive color traps for the adult beetles (Schmera et al, 2004). We set up 30 traps (3 colours types with10 replication) in early April in 2014, one week before blossoming starts. We also tested a medicinal plant extraction (kod101) as bait that was placed to upper part of traps.

Results. The start of trapping in Bastam was in early April. We found that yellow, white and blue colours traps were no significant differences in capture of *E. hirta* in cheery orchard, but blue colour trap caught the most beetles (totals of mean 510, 485 and 393 beetles for blue, white and yellow traps, respectively). The results also showed that blue trap with medicinal plant extraction (kod101) as bait was significantly attracted beetles.

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The study of essential oils yield variation in *Rosa damascena* Mill. from different regions of Iran

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Introduction. *Rosa damascena* Mill. is one of the valuable species with a long history in Iran and some other countries. It is considered that the damask roses originated geographically and historically from ancient Persia (present–day Iran) and later spread throughout Europe and Northern Africa. In Iran and some of Eastern Europe countries distillate those flowers to extract Rosewater and essential oils to food and cosmetic markets of all over the world.

Method. We collected and investigated all species of Damask Rose that comes from different regions of Iran to Iran Golab Co. to perform Rosewater and isolation first and second essential oils and codify coordinate system to rank and price flowers from grade A to C.

Results and Discussion. The highest amount of oils yields of *R. Damascena* were recorded at Nashalj, Azeran and Alavi regions with 0.064%, 0.052% and 0.042%, respectively.

According to some parameters such as distant, picking up time, transportation and other factors the essential oils of *R. Damascena* will be changed. We solved this problem with codifying coordinate system to rank and price different flowers.

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Rosa Damascena

2018

Effects of storage and time on essential oil components of *Rosa demascena*

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Abstract

Investigation effects of storage and time on essential oil components of *Rosa demascena*. Essential oils were obtained by hydrodistillation method. We used different vessel with glass, color glass and aluminum and investigated effect of storage as three and six months' time, Primary essential oils analyses by GC and Mss, so main components were identify as citronellol (33.5%), cis-p-menth -2-en-1-ol (7.3%) and geraniol (7.2%). Also main components in different containers kept for three months in simple glass, color and aluminum were: citronellol 44.9, 31.1 and 33.6 %. Also after six months storage of essences were citronellol 56, 50.9 and 55.7%. Which in normal temperature condition, refrigerator and freezer, and main percentage of compound citronellol were 31.1, 40.2 and 37.5%. Storage in three months in simple glass in refrigerator were suitable than others methods. Also storage in six months essence in simple glass and in normal temperature is better. In total compromising time, condition of storages show that time and containers can effect on essential oils and percentage of compound. So in this research we can selected good method will help economically and give a good benefit to industries.

Keywords: Storage, citronellol, Rosa demascena, simple glass and compound

Rosa × *damascene* cultivar cultivation and their uses in Iran

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Abstract

Rosa × *damascena*, known as Gole Mohammadi , rose hybrid, derived from Rosa gallica and Rosa moschata. The origin of Damask rose is the Middle East and some evidences indicate that the origin of rose water is Iran. Rose has been used for medicinal purposes including antibacterial, antioxidant, ant diabetic, and relaxant effect reported. The flowers and petals are renowned for their fine fragrance, and are commercially harvested for rose oil and rose water in Iran. In our research work, we have don lot of project on this plants and their cultivar. *Rosa* × *damascena* where cultivated in hedge rows. The rose's flowers are brought to cooperative for distillation and quality control. In this review we discuss important components of different cultivar of this plant and different hedro-distillation. Several components were isolated from flowers and petals of R. damascena including terpenes, glycosides, flavonoids, and anthocyanins. This plant also contains carboxylic acid, myrcene, which collected from the Tehran, Shiraz and Kashan regions. Among them, identified compounds were; β-citronellol, nonadecane, geraniol, and nerol were the major components of the oil. Iran has developed an industry producing rose oil. Perhaps due to the much flower and low labor cost, rose products from Iran are less expensive than those from other country. So rose due to contain several components such as terpenes, flavonoids, and anthocyanins that have beneficial effects on human health. They may be used to flavor, an herbal tea.

Keywords: Rosa × damascene, terpenes, glycosides, flavonoids, Rose water

Rose absolute, chemical composition, biological activity and industrial applications

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Abstract

Rosa damascena is commonly known as "Gole Mohammadi", and its petals are usually used for production of rosewater in Iran, while the essential oil, rose concrete and rose absolute are the most important products from rose petals in other countries. Rose absolute with broad applications in different industries are used in perfumes, aromatherapy, medicine and sanitary products. Unfortunately, No attention to rose absolute has been made in Iran as the origin of *R. damascena*. The world production of rose oil and rose absolute are about 3000 and 5000 Kg per year, respectively, while rose absolute has not been identified by Iranian producers. The aim of this article is to explain about the chemical composition, biological activity, the industrial applications and economical importance of rose absolute as main important product of rose petals. Also, the future aspects, and proposed approaches for rose absolute will be discussed.

Genetic relationships among some Iranian populations of *Rosa damascena* using ISSR and RAPD markers

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Abstract

Genetic variation within and among populations is the basis for survival of the populations both in short and long term. Thus, studying the plant genetic diversity is essential for any breeding program. *Rosa damascena* Mill., is an important species as a source of rose oil, and is one of the oldest rose species grown in Iran. The main rose oil producers in the world are Turkey, Bulgaria and Iran. They are obtaining the rose oil almost exclusively from the certain clones of *R. damascena*. This study was conducted to detect the genetic variability and relationships across 6 Damask rose populations from Kashan region (Barzuk, Niasar, Azeran, Aheste, Kheirabad and Kolpe) and one from Hamedan province (Bahar). Nine plants (on average) per population (in total 54 plants) were used for genotyping by 11 ISSR (Inter simple sequence repeat) and 9 RAPD (random amplified polymorphic DNA) markers. ISSR markers produced 91 bands, of which 41 were polymorphic (67%). Primer ISSR7 and ISSR24 detected the highest percentage of polymorphism, while for primer ISSR19 the lowest one was observed. RAPD markers produced 81 bands, of which 54 were polymorphic (66%). Primers R10 and R7 detected the highest percentage of polymorphism, while primer R4 was the lowest. UPGMA cluster analysis based on Jaccard similarity coefficient by ISSR markers revealed nine groups in the dendrogram and genetic similarity ranged between 0.61 to 0.98. By RAPD markers, nine clusters were also obtained and genetic similarity ranged between 0.57 to 0.97. In both marker types, differences between the plants within the populations were very low, however considerable genetic diversities detected between the evaluated populations. Aheste and Hamadan populations had the greatest difference and genetic distance. Hamadan samples had the closest relationship with individuals of Kolpe and Kheirabad. RAPD and ISSR markers provided useful tools for evaluating genetic diversity and genetic relationships of *R. damascena*. The knowledge of these diversities, found in this study, will allow a plant improvement of Damask rose related to pharmaceutical and industrial uses.

Keywords: *Rosa damascena*, Genetic relationships, Markers, ISSR, RAPD

Rosa Damascena oil improved sexual function and testosterone in male patients with opium use disorder under methadone maintenance therapy–results from a double-blind, randomized, placebo-controlled clinical trial

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Background. Some patients with opioid use disorder (OUD) are treated with methadone maintenance therapy (MMT). However, as with opioids, methadone has major side-effects; sexual dysfunction is a particularly distressing such effect. Rosa Damascena oil has been shown to reduce subjective sexual dysfunction in patients with major depressive disorders, but its influence on testosterone has not so far been tested. The aim of the present study was to investigate the influence of Rosa Damascena oil on sexual dysfunction and testosterone levels among male patients with OUD and undergoing MMT.

Methods. A total of 50 male patients (mean age: 40 years) diagnosed with OUD and receiving MMT were randomly assigned either to the Rosa Damascena oil (drops) or a placebo condition. At baseline, and four and eight weeks later, patients completed questionnaires covering sexual and erectile function. Blood samples to assess testosterone levels were taken at baseline and eight weeks later on completion of the study.

Results. Over time sexual dysfunction decreased, and testosterone increased in the Rosa Damascena oil, but not in the placebo condition. Sexual dysfunction scores and testosterone levels were not consistently related.

Conclusions. Results from this double-blind, randomized, and placebo-controlled clinical trial showed that Rosa Damascena oil improved sexual function and testosterone levels among males with OUD and undergoing MMT.

Keywords: Opium and opioid use disorder, Methadone maintenance therapy, Sexual dysfunction, *Rosa damascena* oil

Investigation of maintenance temperature and time after collecting of the flowers of on the qualitative and quantitative characteristics of aromatic compounds extracted from *Rosa damascena* Mill

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Introduction. Importance of plant uses in food and especially drug industry is not negligible. Beside these industries, perfume industry is also considered as one of the most thriving and economical profitable categories in which aromatic plants play an important role in it. One group of the most important components, used in perfumes is *Rosa damascena* Mill. derivatives and Kashan area has a main history in natural perfume production from this plant.

Methods. In this research, effects of maintenance temperature and time after collecting of the flowers of *Rosa damascena*, on the essential oil quality was investigated from the point of view of chemical constitution and physicochemical properties.

Results and Discussion. Essential oil yield and amount of the geraniol and nerol as two major components were significantly higher in the fresh picked flowers.

The results confirmed that both parameters have significant effect on the type and amount of the essential oil components; however, selection of the best condition depends on the type of application and expected properties.

Keywords: *Rosa damascena* Mill., Essential oil, Maintenance time effect, Maintenance temperature effect.

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Antimicrobial activity of *Rosa damascena* against oral infections: An overview

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Introduction. Oral diseases, including dental caries and periodontal diseases are among the most important infectious diseases in the world. There are several antibiotics for treatment / control of oral infections but some challenges such as their adverse side effects and development of antibiotic resistance induce scientists to survey for alternative methods. In recent decades, application of plant products for prevention and control of oral infectious has been progressively considered. *Rosa damascena* is one of species of *Rosaceae* family with beneficial health and therapeutic effects. It may be effective against a wide spectrum of microorganisms. In traditional medicine texts, preventive and therapeutic effects of this plant have mentioned. Moreover, some new evidences are emerging that indicating that it may be useful in control of oral infections. The major products of *Rosa damascena* are rose water, rose oil, dried flowers and hips. In this review article, scientific documents related to the role of *Rosa damascena* in the prevention and treatment of oral infectious diseases have been evaluated.

Methods. This study was conducted using library research method and databases searching.

Results and Discussion. Some evidences are emerging that *Rosa damascena* may be useful in the control of oral infections:

- Bacteriostatic or bactericidal and anti-adhesive effects of various extracts of *Rosa damascena* against cariogenic streptococci.
- Effect of rose water on decreasing the adhesion of the most common cariogenic bacteria
- Antimicrobial effect of *Rosa damascena* extract against endodontic pathogens.
- Effect of mouthwash containing *Rosa damascena* extract in the treatment of recurrent aphthous stomatitis.

Rosa damascena as a medicinal plant is capable of intervention against oral infectious diseases. The application of *Rosa damascena* and its products can decrease the need to antimicrobial agents. However, further studies for isolation and purification of bioactive compounds and their applications in different pharmaceutical formulations for control of oral infections as complementary medicine could be regarded. Therefore, this plant may be a valuable candidate for oral infections prevention, control and treatment.

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In vitro regeneration of shoots and ex vitro rooting of damask rose (Rosa damascena Mill*)*

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Introduction. One of the most important Rosa species is *R. damascena* Mill. of which some cultivars are used for oil production and others are cultivated throughout the world as garden roses (1). The experiment was performed to investigate the *in vitro* regeneration ability of damask rose (*Rosa damascena* Mill.) combined with *ex vitro* rooting as an efficient and cost-effective method for rapid and high-quality plant regeneration.

Methods. Single-node explants included lateral buds were taken from bushes and after sterilized. The nodes cultured on Murashige and Skoog (MS) medium supplemented with different concentrations of BAP (1, 1.5, 2, 2.5 and 5 mg/l), NAA (0 and 0.1 mg/l), GA_3 (0 and 0.1 mg/l) and coconut water (0 and 40 ml) in separated and combination with together. To evaluate *ex vitro* rooting, micro-shoots were treated with 3 mg/l IBA or 3 mg/l NAA solutions. The percentage of shoot regeneration and root formation recorded at the end of the experiment.

Results and Discussion. The results showed that the best multiplication rate, highest number of shoots per explants, and best growth of shoot and leaf growth was achieved in T9 medium containing the MS salts supplemented with 2.5 mg/l BAP and 0.1 mg/1 GA_3. The highest percentage of rooting (100%) was obtained in both rooting media (3 mg/l IBA or 3 mg/l NAA). The highest number of roots per explant and the highest root length were observed in explants treated with IBA and NAA, respectively.

The results showed that GA_3 had a significant effect on regeneration percentage of the *R. damascene*. The results of *ex vitro* rooting showed that this simple method has a good potential to induce healthy roots and could be an alternative of *in vitro* rooting which is labor-intensive. Overall results showed that the combination of *in vitro* regeneration and *ex vitro* rooting of *R. damascene* nodes could be used as an efficient micropropagation of elite cultivars of *R. damascene*.

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Morphological and essential oil characterization of different populations of *Rosa damascena* Mill. in Kashan

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Introduction. *Rosa damascena* Mill. from Rosaceae family, is a unique species. One of the major and popular growing regions of damask rose is Kashan and its rose essential oil has unique scent and global reputation.

Methods. In this study, 15 populations of *Rosa damascena* Mill. were collected from important rose oil production regions of Kashan, Iran. In order to evaluate morphological variation, 52 quantitative and 17 qualitative morphological characters were measured. The essential oil content (w/w) of flowers was assayed after extraction in Clevenger apparatus (1). The chemical composition of essential oil was analyzed by gas–chromatography coupled with mass spectrometry.

Results and Discussion. Cluster and Principal component analysis (PCA) of morphological characters showed that the fifteen populations could be divided into two major groups including five subgroups. The variance analysis showed significant differences ($P<0.01$) among populations of *Rosa damascena* for 28 morphological characters such as stem length, Leaf length and number of flowers per plant. *Rosa damascena* population from Azaran (valley) produced the highest content of absolute oil (0.019% w/w), while the lowest value of absolute oil (0.002% w/w) belonged to Eznaveh population. Correlation results showed that there is a significant relationship between some morphological characters and essential oil content. Stipule length had a significant positive correlation with the essential oil content, while a significant and positive correlation was observed for peduncle length and receptacle glandular length with the essential oil content.

Based on the resulted dendrogram from cluster analysis of chemical component data, fifteen *R. damascena* populations grouped into four clusters. A total of Sixty-five compounds were identified and quantified by GC–MS analysis in the rose oil.

The major components of the oil contained limonene (0.4–12.8%), 2-phenylethyl alcohol (1.0–1.3%), citronellol (16.2–57.8%), geraniol (0.9–14.1%), methyleugenol (0.5–2.5%), heptadecane (0.8–3.0%), 1-nonadecene (2.1–7.5%), nonadec-9-ene (14.9–30.2%), eicosane (1.0–3.3%), heneicosane (5.8–18.6%), tricosane (0.9–5.2%) and pentacosane (0.3–2.1%).

The essential oil of Josheghan was considered to have a high quality in terms of richness in citronellol, geraniol and 2-phenylethyl alcohol monoterpenes which has good potentials as antioxidant and strong fragrance in cosmetic and pharmaceutical industry.

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Phytochemical study of flowers of *Rosa damascena* Mill.

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Introduction. *Rosa damascena* Mill. is Perennial plant from family Rosaceae, indigenous to Europe and Middle East countries, Iran and Turkey. It is known as Gole Mohammadi. *R. damascena* is an ornamental plant and besides perfuming effect (Boskabady et al., 2011). Several components were isolated from flowers, petals and hips (seed-pot) of this species including terpenes, glycosides, flavonoids, and anthocyanins (Noriaki et al., 1998). *R. damascena* contains carboxylic acid, myrcene, vitamin C (Libster 2002) kaempferol and quercetin. Flowers also contain a bitter principle, tanning matter, fatty oil and organic acids (Loghmani-Khouzani et al., 2007). There more than 95 macro- and micro-components in the essential oil of *R. damascena* from the Kashan regions. Among them, eighteen compounds represented more than 95% of the total oil. The identified compounds were; β-citronellol (14.5-47.5%), nonadecane (10.5-40.5%), geraniol (5.5-18%), and nerol and kaempferol were the major components of the oil (Loghmani-Khouzani et al., 2007). Analyses of rose absolute showed that phenyl ethyl alcohol (78.38%), citronellol (9.91%), nonadecane (4.35%) and geraniol (3.71%) ethanol (0.00-13.43%), and heneicosane were the major compounds (Ulusoy et al., 2009). A new flavanone glycoside, butin 4′-O-(2″-O-β-D- apiofuranosyl)-β-D-glucopyranoside , together with liquiritin, liquiritin apioside, isoliquiritn apioside , davidioside , quercetin, kaempferol, kaempferol 3-O-β-D-glucopyranoside and kaempferol 3-O-α-L-arabinofuranoside were isolated from the flowers after industrial distillation of essential oil (Kumar et al., 2006).

Methods. Total phenol content was estimated as gallic acid equivalents (Dehghan Kashani et al., 2011).Phytochemical investigation of a methanolic and ethanolic extract of *R. damascena* flowers was carried out using GC-MS method.

Results and Discussion. Flavonol glycosides were extracted from petals of *Rosa damascena* Mill. after industrial distillation for essential oil recovery and characterized by high-performance liquid chromatography-electrospray ionization mass spectrometry. Among the 22 major compounds analyzed, only kaempferol and quercetin glycosides were detected. (Schieber et al., 2005).

R. damascena is one of the most important plants known for its perfuming. Its major products are rose water and essential oil. This plant contains several primary and secondary metabolite such as terpenes, glycosides, flavonoids, and anthocyanins that have beneficial effects on human health. The pharmacological effects of *R. damascene* are widespread.

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The Biodiversity study of species and varieties of *Rosa* L. genus from Kashan area

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Abstract

Rosa L. genus with more than 16 species in Iran and 200 species in the world, is one of the most famous genera of Rosaceae family. Most of the species belonging to this genus are spiny shrubbery with pennate leaves and flowers with five petals. Varieties, cultivars, species and many subspecies of this genus are planted commonly in different temperate and cold temperate regions of Iran today. Although most varieties and forms of roses are diverse in color and number of petals, flower size and landscape beauty, and most often they are used to beautify green space, nevertheless, species of wild of the *Rosa* L. genus are often It has five petals with a lot of flavors that are used today in different industries such as perfumery, cosmetics, sanitation, food and medicine. In addition, the *Rosa damascena*, which is considered as one of the hybrid species of this genus, was cultivated in the different regions of Iran, especially Kashan, due to its incredible and pleasant aroma. Rose garden (Golestan) Mountainous areas of Kashan is a typical example of the efforts of farmers in this area that have been farming since very far past. The purpose of this research is to identify species and different cultivars of rose genus in Kashan area. With field surveys in mountainous Rangelands as well as different rose gardens fields of Kashan, different plant specimens were collected and identified. The identified specimens are kept in Herbarium of Kashan Botanical Garden. Based on the results of this research, more than 7 species of rose were identified in different parts of Kashan. Species such as: *R. beggeriana* Schrenk, *R. canina* L., *R. persica* Michx. Ex Juss., *R. elymatica* Boiss. & Hausskn., are grow naturally in the mountain range of Karkas. Species for example: *R. foetida* J. Herrman, *R. maschata* J. Herrman are often ornamental in gardens, houses and parks. *Rosa damascena* has been grown as a hybrid species with a high number of petals, cultivated from past cultivars by farmers of different regions of Kashan in the form of large rose gardens. Due to the precious rose waters and essential oils of this hybrid species, Kashan's rose waters extract industry has been flourishing for hundreds of years in all the villages and mountain range Karkas. In addition, three varieties of flower of *Rosa damascena* are white, golden and pink in some of the rose gardens of Kashan area, along with the flower of *Rosa damascena*, is cultivated on a very limited level. The composition of the essential oils of these varieties is different from the flowers of *Rosa damascena*.

The comparison of essential oils chemical compounds of *Rosa damascena* Mill. three rose garden of Kashan area

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Abstract

The genus *Rosa* L., belong to the Rosaceae family, includes several shrub species that has been reported to date in more than 200 species in the world and only 16 species from Iran. The *Rosa damascena* is one of the hybrid species of this genus that has flowers from 40 to 80 petals. In this research, essential oils chemical compounds of *R. damascena* Mill. from three rose gardens of Kashan area have been studied. The flowers of this plant in the spring of 2017 were collected from Kashan rose gardens (950 m above sea level), Niasar (1320 m above sea level) and Qamsar (1890 m above sea level) and and subjected to volatile fraction were isolated by simultaneous steam distillation extraction (SDE). The analysis of the oils were performed by using GC and GC-MS. The main components of the essential oil of Kashan rose garden includes: citronelole and nerole (35.76%), geraniole (26.66%), nonadecane (12.25%), linalole (5.53%), and henicosane (4.11%), respectively. The main components of the essential oil of Niasar rose garden includes: citronelole and nerole (46.48%), geraniole (12.96%), nonadecane (12.71%), henicosane (4.27%), and linalole (1.64%), respectively. The main components of the essential oil of Qamsar rose garden includes: citronelole and nerole (46.19%), geraniole (22.69%), nonadecane (12.71%), linalole (3.74%), and benzene etanole (3.8%), respectively. The comparison of essential oils chemical compounds of *R. damascena* of different rose gardens showed that the combination of linalool in Kashan essential oil was more than Qasem and Niaser. The combination of benzene ethanol in the essential oils of Niasar and Qasrar was reported to be five times higher than in Kashan. The two combinations of citronelole and nerole in the Qmasar and Niasar oils were more than Kashan. The combination of nonadecanel in the essential oils of the three regions was almost the same. The combination of hanicozane in the essential oils of Kashan and Niasar were 4% and as a major component of the essential oil, while no trace of this composition was observed in the essential oil of Qamsar.

The construction of damask rose and rose water museum in the Kashan botanical garden

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Abstract

The origin of the *Rosa damascena* belonged to Iran. Therefore, the Iranians are the first people who have found out the properties of food, medical and cosmetic of damask rose from the too far away. Among the flowers, the flower of rose was more interested in Iranians and in the form of the word "Varda" has come in the Avesta several times. Considering the economic, social, cultural and tourism importance of the flower of rose and its products, the construction of "damask rose and rose water Museum" is necessary in Kashan Botanical Garden. Therefore, by collecting objects, instrument, various apparatus and equipment of extraction of rose water; from the ancient times so far, Not only can determine the gradual evolution of this industry, But also the construction of the rose water museum will be very an effective role in the development of ecotourism industry. In this research, it was tried to visit the traditional extraction of rose water workhouses, the production and supply of various aromatic water, odor and essential oil, was negotiated with the skillful and experienced people in the profession and were collected valuable information on distillation practices and the application of tools used in extraction of rose water. The results of this study showed that more than 8 types of traditional extraction of rose water apparatus, 18 types of rose water bottles, 28 types of rose water sprinkler, 10 types of heating systems, 35 types of odor bottles, 39 types of pitches (ewer) and 25 types of decanters from different parts of the country were Prepared and purchased. The documentary images were prepared for each of the objects. The properties of each objects and apparatus were recorded based on the exploration of scientific resources or discussions with experts. According to the results of this research, the most of the museum's works were owned by the owners of traditional extraction of rose water workhouses or local collectors of Kashan. Undoubtedly, due to the long history of traditional extraction of rose water industry in the region of Kashan and the existence of diverse museum's works, access to the related objects of the industry has more than other parts of the country.

Effects of two types of fertilizers on the extract's yield and phenolic compounds of *Rosa damascena* Mill

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Introduction. Rose scientific name is *Rosa damascene* Mill. The aim of this study was to evaluate the quality and quantity of phenolic compounds in this plant that treated by both manure and chemical fertilizers. Flavonoids and other phenolic compounds are widely distributed in plants, and various biological activities such as antioxidant, anti-microbial, anti-inflammatory agents have been reported in many studies.

Methods. The flowering seedlings of Rosa were subjected to the treatments for one year. So that the first plot was considered as control and was irrigated from any organic and chemical fertilizer. In the second and third plots, the flowers of Rosa were routinely rows, and in three rows three replicates, respectively, for one year, cattle manure of 350 g and 100 g of fertilizer. The chemical (phosphate fertilizer and urea combination of 2 to 1 Lordegan companies) were added along with the required water at the foot of each plant. The sampling of flowering plants in experimental plots was carried out in May of 2016 at the same time as the flowering season of 10 plant flowers randomly. After appropriate treatments (manure and chemical fertilizers) at 2 habitats and 3 replication extraction conducted by soaking in 70% ethanol. Then measurement of phenolic and flavonoids compounds has been done by spectrophotometry method.

Results and Discussion. The results of phytochemical tests confirmed the presence of tannin, anthocyanin and flavonoids and absence of alkaloids in all treatments. Chemical fertilizer increased the flavonoids compounds manure fertilizer increased phenolic compounds.

Results indicated that the efficiency of different treatments-can effect of plant's extract efficiency and phenolic compounds that So far for this plant species has not been reported in the scientific literature. The number of phenolic compounds and the percentage of inhibition of free radicals in the antioxidant test has a direct relationship with each other. Therefore, in both tests, it can be seen that the sample used in manure is high in antioxidants and phenol content, and can be due to the absorption of materials that produce phenolic compounds, and so on. The antioxidant activity of the plant is involved. It also seems that different materials used in plant nutrition have direct effects on plant's compounds, especially secondary metabolites.

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Effects of two irrigation methods on phenolic compounds and antioxidant activity of *Rosa damascena* Mill

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Introduction. Phenolic compounds (flavonoids, tannins, and anthocyanins) are the most important natural antioxidants. *Rosa damascene* Mill. Is one of the most medicinal plants, which has been used in Iranian ancient and were cultivated traditionally in different parts of Iran. The present study was conducted to investigate the quantitative and qualitative properties of phenolic compounds and antioxidant activity of *Rosa damascene* Mill under two irrigation methods (drip and flood irrigation).

Methods. The Seedlings of *Rosa damascene* Mill were arranged in regular rows and respectively irrigated for one year with a drip and food irrigation system. The sampling of flowering plants in experimental plots was carried out in May 2016 at the same time as the flowering season from 10 plant flowers randomly. The total phenolic, flavonoid, alkaloids, tannin contents and the antioxidant activity were measured by spectrophotometry and DPPH methods respectively, then the all data were analyzed by using SPSS software version 19 and analysis of variance.

Results and Discussion. The results of the phytochemical test confirmed the presence of secondary compounds such as tannin, anthocyanin and flavonoids, and the absence of alkaloids in the extract of this species. Also, samples in drip irrigation treatment had the most antioxidant properties. The results of this research showed, by using management methods such as irrigation can be controlled the production, quantity and quality of secondary compounds in plants. In this study, the results of the phytochemical test confirmed the presence of secondary compounds such as tannin, anthocyanin and flavonoid and the absence of alkaloids. The number of phenolic compounds and the percentage of DPPH free radicals inhibition are also indicative of the relatively high antioxidant properties of this species. Results of the sample in the flood irrigation shows the smallest phenolic compounds and drip samples that have the most antioxidant properties. The adaptation of *Rosa damascene* Mill to our country's climate, the existence of a long-standing culture, production and consumption, the prosperity and demand of the global markets for Iranian products, and, consequently, employment are among the issues that require special attention to this plant species.

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The effect of temperature of thin layer drier on the anthocyanin components and antioxidative ability of *Rosa Damascena* Mill methanolic extract

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Inrtoduction. *Rosa Damascena* Mill is a Rosaceae family and one of the most important species of Rose. Products made from flowers such as essential oils, rose water, petals and dried buds are used in the perfumery, pharmaceutical and food industries. The processing of flowers has a significant impact on the quality and quantity of its ingredients. The flower of *Rosa Damascena* Mill contains flavonoids and anthocyanins with antioxidant activities. The purpose of this study was to investigate the effect of temperature drying of *Rosa Damascena* Mill petals in a thin layer dryer on the total amount of anthocyanins, flavonoids, and antioxidant activities.

Methods. Rosa Damascena Mill flowers were collected from Gonabad city and dried at a temperature of 35, 45 and 55 °C in a thin layer dryer with a hot air flow rate of 1.2 m/s. Total anthocyanin compounds, in terms of cyanidine 3-glucoside, total phenolic compounds, scavenging ability of free radicals (DPPH) and reducing power of FeIII (FRAP) of methanolic extracts of *Rosa Damascena* Mill petals were measured.

Results and Discussion. The results showed that the methanol extract of dried petals at 55 °C had the lowest IC50 (30.01 mg/ml) so had the highest antioxidant ability. At this temperature, the highest amount of phenolic compounds (equivalent to 777 mg gallic acid per gram of sample Dried) was also measured in methanolic extract. At 45°C the highest amount of trivalent iron regenerative capacity (1261 mmol Fe^{2+} $mass^{-1}$) and total anthocyanin (239 mg cyanidine-3- glucosid/gram of dried sample) were obtained.

Rosa Damascena Mill petal dried at 55°C is a good source of antioxidant material because of its high phenolic compounds and less IC50 and 45°C is the best temperature for extraction of Anthocyanin compounds and chelating agent antioxidants.

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Determining of challenges and solutions for *Rosa damascena* essential oil competitiveness in Kashan district using Porters' diamond model

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Introduction. The value of the essential oil is so high that it is likened to liquid gold. Therefore, due to the high potential of our country in the production of essential oils and the high value of this product, in this research, we tried to evaluate the problems and solutions of the competitiveness of the essential oil industry in Kashan area, a main cultivation area of Rosa damascena in Iran using Porter Diamond model. Problems of the mentioned industry and solutions proposed by experts from universities and industry are also considered.

Method. In order to collect information, a semi-structured interview has been used. At this stage, eight industry experts, a mix of academics and industry professionals, were interviewed. In the framework of the interview, the experts' opinions on the problems the suggested solutions for solving them were taken. The data analysis method is content analysis.

Results and Discussion. The results showed that during the interviews, industry experts pointed to 89 problems in the field of competitiveness of the mentioned industry. On the other hand, they have provided 98 solutions to improve competitiveness problems.

At the end of this research, solutions and suggestions are presented from the researcher's point of view.

Keywords: Competitiveness, Essential Oil Industry, Competitiveness of *Rosa damascena* Essential Oil, Kashan District.

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Evaluation of competitiveness for *Rosa damascena* essential oil, using Porters' diamond model (Case study: Iran, Kashan district)

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Introduction. Rosa damascena Mill. is a valuable medicinal and aromatic plant all over the world. The most important product of this plant is its essential oil. The importance of the mentioned material is so high that it is likened to liquid gold. In this research, we tried to evaluate the competitiveness of the essential oil industry in Kashan area as one of the most important cultivation area in Iran.

Method. The method of evaluation is Porter Diamond model and the data analysis method is content analysis, in which the relative frequency of expert opinion was calculated for each dimension of the six-dimensional Porter diamond model. Also, non-parametric Binominal and Friedman methods have been used to analyze factors and variables. In order to collect information a semi-structured interview has been used. At this stage, eight industry experts, a mix of academics and industry professionals, were interviewed.

Results and Discussion. The results of the research show that there are a lot of problems in each of the dimensions, and they acknowledge that there is no considerable problem in two categories of foreign dependence on materials and the presence of substitute products.

Based on the tests and analyzes, results from descriptive mean show that overall competitiveness and each of the competitiveness factors are less than average, and therefore, they are not in desirable condition. Only 6 variables of competitiveness from the total of 51, have a mean equal to or more than the average. These variables are: the lack of dependence on foreign raw materials, the existence of substitute products, the state of energy in industry, the impact of climate on quantity and quality of the product, the ease of launching new businesses and the presence of strong competitors.

The results of the binomial test confirmed the mentioned facts. In other words all of assumptions of the research have been rejected. Also the only variable which has a favorable status in the essential oil industry is no dependence on foreign raw materials.

Keywords: Competitiveness, Rosa damascena, Essential Oil Industry, Competitiveness of Rosa damascena Essential Oil, Kashan District

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Study of *Rosa damascene's* role in sustainable rural development

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Abstract

Historically plants have played an important role in human development. Through observation and experimentation, human beings have learnt that plants promote health and well-being. The use of these herbal remedies is not only cost effective but also safe and almost free from serious side effects. The village elders, farmers and tribal have tremendous knowledge about for health reasons started thousands of years ago and is still part of medical practices by people of various regions of Iran sub-continents as well as several other countries including China, India, Egypt, South America and other developing countries of world. The cultivation of Rosa damascene due to the diversity of jobs has a lot of entrepreneurship for the villagers. They can be easily managed along with other agricultural activities. The purpose of this study was to investigate the role of cultivation and processing of *Rosa damascene* in the development of entrepreneurship in rural community. The statistical population of this study was people working in *Rosa damascene* located in the village. Using Cochran's formula, 150 samples were selected. The sampling method was simple random sampling. The research method is descriptive-analytic. The library and field method (questionnaire) was used to collect data. The components of the study were analyzed using SPSS software. The results show that the cultivation of *Rosa damascene*, over the past five years, has led to an increase in household income between 30-40 percent. Developing processing technologies for new products can increase their revenues.

Keywords: Entrepreneurship, Rural community, Processing Technologies

Identification of Dirty notes in commercial rose (*Rosa damascena* Mill.) oils by GC-MS analysis

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Introduction. Rose water is the most product petals in Iran, which is produced in traditional workshops and factories. Rose oil is produced as second product (Mahboubi, 2015, Mahboubi et al, 2011). Many traditional producers, produced the rose oils in pots, which are used for other plant waters or essential oils. Therefore, their rose oils are containing the dirty notes in their chemical profiles, which makes difficult it to export.

Methods. Fifty different essential oils, which had been produced in Iran were subjected to Gas chromatography–mass spectrometry (GC–MS) analysis: The oil analysis was carried out using GC and GC/MS. The GC apparatus was Ms Model DSQ from Thermo company, capillary column of HP-5MS (30 m × 0.25 mm, film thickness 0.25 µm). The oven temperature program was initiated at 50 °C, held for 1 min, then raised up to 250 °C at a rate of 3 °C /min held for 10 min. Helium was used as the carrier gas at a flow rate 1.0 ml/min. The detector and injector temperatures were 250 °C, respectively. GC/MS analysis was conducted on a Ms model DSQ from Thermo with network mass selective detector with a capillary column the same as above, carrier gas helium with flow rate 1 ml/min with a split ratio equal to 1:50, injector and oven temperature program was identical to GC. The compounds of the oil were identified by comparison of their retention indices (RI), mass spectra fragmentation with those on the stored Wiley 7n.1 mass computer library, and NIST (National Institute of Standards and Technology) (Adams, 2001).

Results. 169 different chemical compounds were identified in 50 samples of rose oils. From these 169 compounds, 12 compounds were not the components of rose oil. They are including sabinene hydrate acetate, menthol, carene types, lavandulol, fenchyl alcohol, caratol, copaene, veridiflorol and isoledene.

Conclusion. These compounds could be comes from other products that distilled at the same distillation unit. Therefore, the use of suitable procedures for washing of instrument before extracting the rose oil could help to produce an essential oil with high quality.

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Experimental design approach in optimization of some effective variables on quantity and quality extraction of essential oil from *Rosa damascena* Mill

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Introduction. Experimental design that is one of the basic tools for optimization, consists of creating informed and targeted changes at the inputs in order to observe and test changes in outputs or results of a process.

In this study, central composite design that is one of the most used methods of experimental design, was applied for optimization of quantity (by the choice of extraction yield) and quality (by the choice of Citronellol/ Geraniol ratio as a response) of *Rosa damascene* essential oil, that its benefits and applications in deferent industrial such as perfumery, pharmaceutical, cosmetics and food was evident for all from past to yet.

Method. Method of essential oil extraction is hydro distillation by Clevenger apparatus. After study of scientific reports, it is found that two factors such as temperature and time of flower storage, have significant effects on the extraction yield and quality of essential oil.

Results and Discussion. Differences in obtained yields in different conditions from two mentioned factors and spectrum survey of each essential oil after injection to GC-MS, demonstrate definite effects of these factors on response. Finally, special conditions of optimum point for both responses were determined and found that to obtain highest extraction yield, for two mentioned factors, -5°C and 14 days, and to obtain best odor of essential oil, -1°C and 1 day for temperature and time, respectively, are desirable.

Also, because of Nerol and Citronellol spectrum interference, multivariate curve resolution - alternating least square method that is one of the chemometric tools, was used to separate overlapped peaks.

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Formulation of *Rosa damascena* nanoemulsion: A comparison between low energy and high energy method

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Introduction. Rose essential oil which made by extracting *Rosa* damascene, is helping to cure stress, insomnia and consider as aphrodisiacs. The tendency to use Rose essential oil is raised in various fields includes cosmetic, food and pharmaceutical [1].

Methods. In this study, the nanoemulsion of rose oil was formulated and compared in two ways including high energy and low energy approach. In both methods, non-ionic surfactants and co-solvents were used to make nanoemulsion. Nanoemulsions were prepared from a mixture of hydrogenated castor oil, span 20, propylene glycol, and polyethylene glycol 400 under dilution with water [2, 3] .

Results and Discussion

Physicochemical properties of nanoemulsions including particle size, turbidity, refractive index and stability were also studied. The amount of particle size for the low energy and high energy methods were 25.7 and 22.33 nm, respectively.

Using spontaneous and low energy method, nanoemulsion with small droplet can be achieved. The results obtained from this research may be useful for various fields including pharmaceutical, beverages and food industries.

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Using of analytical chemistry methods for distinguishing of frauds in Golab

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Introduction. Golab or *Rosa damascena* essential oil is an expensive natural food additives that is used in the types of traditional and industrial foods. *Rose pelargonium (Sweet-Rose geranium)* is the natural plant that its essential oil is not only similar to *Rosa damascene* essential oil but also cheaper than it and *Pakestanian Rose* is the synthetic compound with the same characteristics too, so may be adultrated to produce of Golab or *Rosa damascena* essential oil by some of the profiteers. We decided to distinguish and control of this frauds.

Methods. pH, acidity index, Iodic index was measured and also methods of instrumental analytical chemistry GC, UV, GC/MS was used.

Results and Discussion. Natural Golab had pH = 3.8-5, acidity index 1-5, high iodic index was the best index for distinguishing of natural Golab from synthetic or similarity natural compound. GC/MS results showed, the ratio of Citronelol/Geraniol was more than double in the froudulous Golab, there was the high amounts of Phenyl ethyl alcohol in the natural Golab and Nerol compound was in the natural Golab and was absent in the others.

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Sustainable economic approaches to the production and processing of *Rosa damascena* in Iran

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Introduction. Many of the development theorists, including the World Bank, have proposed a diversification approach and multi-sector economic activities in the village within the framework of the sustainable development model. The need for sustainable development and the stabilization of the rural economy is the existence of a diversification of economic activities that doing it will result in to the stability and sustainability of economic structures. Hence, this paper, by exploring existing resources, seeks to elucidate sustainable economic approaches with the goal of diversifying agricultural and rural economies. Iran is one of the pioneers of the world's leading the Rosa damascene production after Bulgaria and Turkey. However, at present, the amount of essential oil produced in Iran is less than one percent of the world's total.

Materials and Methods. The method of collecting data and statistics was in two ways: documentary and survey in 2017. The statistical population of this study was farmers who were cultivating Rosa damascena in Khorasan Razavi province. They were selected by using cluster sampling method. The obtained data has been analyzed using cost-benefit analysis and profitability analysis has been performed and interpreted. Despite the fact that the cultivation area of this flower in Bulgaria is almost half its cultivation area in Fars province, it produces 1,200 to 1,500 tons of essential oil per year. Based on the statistics of the Ministry of Agriculture of Iran in 1395, the area under cultivation of the Rosa damascene in Iran is 18131 hectares, of which 16085 hectares are in operation and annually produce 35193 tons of flower products. According to studies, the Rosa damascene can produce about 250 types of products, aiming at creating economic added value.

Results. The Rosa damascene can be a good alternative to hydrophilic products due to their specific ecological and physiological characteristics and drought tolerance. Therefore, it can be said that the Rosa damascene can be a strategic product for Iran, which is implanted in the direction of sustainable development. However, the lack of variety in the production of the Rosa damascene products and its packaging, as well as the high volume of rose water supplied to the market, is one of the challenges of the Rosa damascene flower industry. On the other hand, the sensitivity of rose water to heat, cold, light and microbial contamination, transportation and maintenance of rose water in high volumes, the possibility of making fake rose water, as well as the use of plastic containers for maintenance of rose water, is one of the problems of the industry of growing rose and preparation of rose water in Iran. At present, each gram of rose water essential oil produced in Bulgaria is sold at around $ 56 and sold in Australia at $ 59, indicating the need for the active production of the essential oil of rose water and its various products in Iran. From the advantages of the Rosa damascene flower, on the one hand, its good compatibility

with the climatic conditions of the country, and on the other hand, the low water requirement of this plant, which can be planted and propagated as an appropriate pattern, in rain fed conditions and in low land yield and sloping areas. The economic survey of roses shows that the Rosa damascene flower has a higher net profit than other crops and garden products and can become an important export product.

Antibacterial Activity of *Rosa damascena* Mill. Ethanolic and Methanolic Flower Extract

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Introduction. One of the most important species of Rosaceae family is *Rosa damascena* Mill., known as Gole Mohammadi in Iran (Boskabady et al., 2011). Botanical extracts have long been used to treat disease, and plant sourced materials play a major role in primary health care in many developing countries. Moreover, the screening of such plant extracts for antimicrobial activity has always been of great interest to scientists looking for new sources for drugs for the treatment of various disease (Arldogan et al., 2002). *R. damascena* is an ornamental plant and beside perfuming effect, several pharmacological properties including anti-HIV, antibacterial, antioxidant, antitussive, hypnotic, antidiabetic, and relaxant effect on tracheal chains have been reported for this plant (Boskabady et al., 2011).

Methods. To evaluate the antibacterial activities of six; three ethanolic and three methanolic extracts of *R. damascene* from different areas (two from Ghamsar Kashan, Esfahan province and one of Birjand, South Khorasan province); their activities were determined by Agar well method. *Klebsiella pneumoniae* as a gram-negative and *Enterococcus faecalis* as a gram-positive were used as standard test bacterial strains.

Results and Discussion. The findings showed that *R. damascena* has an antimicrobial activity. Although the methanolic extracts have slightly more effect rather than ethanolic. Indeed, gram-positive bacteria were more sensitive than gram-negative. Based on the results the methanolic extract of collected samples belonged to Birjand areas has the strongest effect among all of the others.

Antibacterial effect of major components of *R. damascena* extract was reported previously (Gochev et al., 2008). The previous studies also indicate that rose extract possess antibacterial activity against both gram-negative and gram-positive bacteria (Ulusoy et al., 2009). Antibacterial properties of this species can be attributed to its high phenylethyl alcohol content. The antimicrobial properties of alcohols have been known for a long time (Etschmann et al., 2002). In all, the studies showed that because of antibacterial effects of this species, it can be used as natural preservative additives in food industry and medicine production and antibacterial agent for disinfection of various surfaces.

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Microencapsulation of Rose essential oil using solvent evaporation method using *Ethyl cellulose* and *Eudragit* ®Copolymer as carriers

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Introduction. Because of disappearing of the effective roles of herbal essential oils over time, due to low vaporization temperature or chemical stability, many methods has been used to enhance stability and persistence of the essential oils in which controlled releasing of encapsulated essential oils is the most important one. The objective of this project was reducing the rate of evaporation of the Rose oil via microencapsulation.

Method. Microcapsules were prepared by the emulsification method via solvent evaporation technique and different polymers which were incorporated into microcapsule to control the release rate of essential oil (Rose oil). Ethyl cellouses (EC) and Eudragit® in the different ratio were selective as microcapsules wall material. The effect of the three variables: polymer concentration, the amount of emulsifying agent and type of solvent on loading capacity and encapsulation efficiency were studied.

Results and Discussion. Best results for formulation consist of %5 Eudragit polymer with a solvent/non solvent ratio of 1:2.5 and %1 percentage of stabilizing agent. Maximum efficiency is 76.7% and loading capacity of essential oil were reported 9-11%. Results showed release capacity in acidic and alkali conditions were 13.62% and 38.94% respectively and total release was about 52.6% for 4 hours.

The results demonstrated that polymer type, percentage of solvent, type of non-solvent and its percentage and percentage of emulsifier and agitation were found to be key factors effecting the encapsulation and release profile. The Eudragit® microcapsules was the most appropriate polymer, providing a high encapsulation efficiency.

Keywords: Essential oils, Microencapsulation, Controlled release, Eudragit®

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Effect of Salinity (NaCl) and salicylic acid treatment on some morphology and physiology characteristics of *Rosa damascena* (Kashan genotype)

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Abstract

Salinity is a major stress factor for plants in many parts of the world. It limits plant growth and metabolism. In this research, the effect of salinity stress on Kashan genotype of Damask rose was assessed in a factorial trial based on a completely randomized design, with four replications per treatment. Treatments included four levels of salinity (4, 8, and 12 ds m^{-1}) and salicylic acid spray (0 as control, 0.5, 1, and 2 mM). The results showed that with increasing the level of salinity, leaf fresh and dry weights decreased. Salinity stress increased root fresh weight. Furthermore, salicylic acid at 0.5 mM supported the highest shoot fresh weight. The highest level of leaf chlorophyll a and b was recorded for treatment 2mM salicylic acid at 0 ds m^{-1} Moreover, the highest stomatal conductance was observed in control and salinity 4 ds m^{-1} that were sprayed with 0.5 mM salicylic acid. According to mean comparisons, salicylic acid at 0.5 mM alleviated the stress symptoms.

Keywords: Stomatal conductance, chlorophyll, salicylic acid, *Rosa damascena*,

Study of *Rosa damascene*'s status on carbon sequestration in climate change condition

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Abstract

Climate change under the influence of excessive consumption of fossil fuels and global warming is the most important challenge facing humans today. The reduction of atmospheric carbon to reduce greenhouse gases and depositing it in the soil by plants (carbon sequestration) is one of the projects to control this challenge. On the other hand, Rosa damascena mill L., known as Gole Mohammadi in Iran is one of the most important Iranian herbs Suitable for most climate zones in Iran, which can be a great alternative to many non-fertile plants proposed for carbon sequestration. Rosa damascena R. damascena is an ornamental plant and beside perfuming effect, several pharmacological properties including anti-HIV, antibacterial, antioxidant, antitussive, hypnotic, antidiabetic, and relaxant effect on tracheal chains have been reported for this plant. Studies have identified several optimal tree species for carbon storage, and botanists continue to experiment with new hybrids. Surprisingly, we should avoid trees such as the willow, which store comparably little carbon and emit more harmful volatile organic compounds. When choosing trees to plant, consider: Fast growing trees store the most carbon during their first decades, often a tree's most productive period, Long-lived trees can keep carbon stored for generations without releasing it in decomposition, Large leaves and wide crowns enable maximum photosynthesis, Native species will thrive in your soil and best support local wildlife, Low-maintenance, disease-resistant species will do better without greenhouse-gas-producing fertilizers and equipment, Consider these reliable and versatile star-performers and finally the most important factor in choosing a plant is its economic and sustainable development. Rosa damascena has a special place in terms of all its ecological properties, as well as its pharmaceutical and economic role.

Keywords: Arid land, Sustainable development, Medicine plant

Effect of essential oil of *Rosa damascena* on human colon cancer cell line SW742.

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Introduction. Colon cancer is the second most common fatal malignancy. Owing to the existence of many side effects and problems related to common treatments such as surgery, chemotherapy and radiotherapy, alternative treatments are being investigated. Some herbal medicines have shown promising results against different types of cancers. Herbal medicines used have included the use naturally occurring essential oils.

In this study, we report the effect of the essential oil of *Rosa Damascena* on human colon cancer cell line (SW742) and human fibroblast cells.

Methods. The essential oil of *Rosa Damascena* was obtained by distillation and its effect on SW742 cell-line and fibroblast cells were investigated with cell culture. The cells were cultured and different volumes of essential oil were induced to the cells. After48hincubation, cell survival was measured and using statistical analysis, the findings were evaluated and reported.

Results. This study showed that soluble part of *Rosa Damascena* oil increases cell proliferation in high volumes and the non-soluble component decreases cell proliferation.

Conclusion. The effects of essential oils, such as *Rosa Damascena*, on cell proliferation require more thorough investigation.

Keywords: Cell survival; Colon cancer cell line (SW742); Essential oil; Human fibroblast cell; *Rosa Damascena*

Characterizing and detecting the authenticity of *Rosa damascena* commercial essential oils from Kashan, I. R. of Iran by GC/FID detection

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Introduction. The ISO 9842 rose oil standard requires the citronellol content to be within concentration ranges of 20% to 34% of the oil, nerol 5% to 12%, and geraniol 15% to 22%. The ratio among the three rose constituents, especially the sum of citronellol plus nerol, is important for rose oil quality and its marketing price. Therefore, this work was aimed at a detailed phytochemical characterization of commercial rose samples from the city of Kashan in the central part of Iran.

Methods. Seven commercial samples of Rosa damascena essential oil (A-G) of the same geographic origin extracted by hydro-distillation from fresh flowers were considered. The Varian CP-3800 GC/FID technique was applied for the phytochemical analysis of the samples.

Results. A total of 16 components were identified in the samples. The samples showed a chemical composition based on relatively high levels of aliphatic hydrocarbons totally referred to as stearopten or the solid portion of the rose oil. Citronellol (3.72–54.83%), Nerol (none-2.67%), and geraniol (0.58–15.98%), Heptadecane (0.33-2.30%), farnesol (0.01-1.85%), Nonadecene (1.50-5.58%), Nonadecane (5.47–18.16%), Eicosane (0.58-2.56%), Heneicosane (1.90-9.18%), were the main constituents of essential oils. Other constituents were found to be alpha-pinene (none-1.05%), Linalool (0.59-2.38%), cis-Rose oxide (0.09-0.54%), phenyl ethyl alcohol (1.15-54.70%), trans-Rose oxide (0.04-0.20), neral (none-0.65%), geranial (none-2.16%).

Conclusion. The results indicated that the content of citronellol plus nerol of samples C, D, and G although were above the upper limit of ISO 9842 turned out to be of better quality. Samples E, and F showed the highest amount of phenyl ethyl alcohols up to 35.6 and 54.7 % respectively. Although the contents of citronellol plus nerol of samples A, and B were within the range, the amounts of phenyl ethyl alcohols were 4.79 and 4.49 % as well.

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In vitro propagation of three genotype of *Rosa damascena* Mill

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Introduction. The *Rosa damascena* is one of the most important species of Rosaceae family mainly known for its perfuming. Its major products are rose water and essential oil importance in medicine, cosmetics and Food industry. Now, tissue culture technique plays an important role in propagation of this plant considering difficulties like deficiency of stock plants, time consuming and transferring diseases by vegetative propagation methods. Micro propagation is an in vitro culture technique which can produce plenty of intact plantlets in a short period of time.

Methods. In order to explant disinfection, different concentrations (0, 25, 50 and 75 mg/l) of Nano-silver (NS) were used in addition with 2.5 or 5% sodium hypochlorite (NaClO) for 2.5, 5 or 7 min. and 0.1 or 0.2% mercury chloride ($HgCl_2$) for 3 or 4 min. In order to improve proliferation new regenerated shoots originated of establishment stage were transferred to the medium containing different concentrations of benzyl amino purine (BAP) and thidiazorun (TDZ).

Results and Discussion. The best concentration for NaClO was 2.5% for 5 min and for $HgCl_2$ was 0/2% for 4 min. NS prevented of bacterial contamination and improved in vitro proliferation. The best proliferation treatment obtained of 1.5 mg/l BAP in modified Murashige and Skoog (MS) medium. High level of chlorophyll in *in vitro* leaves was observed in MS medium with 2.5 mg/l 2, 4-D. At rooting stage, the 1/2 MS consisting 2 mg/l IBA result in the highest percent of rooting (55%) and the maximum average root number (4.4) for plantlets

In conclusion, $HgCl_2$ is advised in low concentrations for preventing bacterial contamination and it is better to use NaClO for explant sterilization if there is no bacterial contamination, since $HgCl_2$ have adverse effects like decrease in nutrient absorption and bud burning of explants. NS is effective on decreasing internal contamination and improving shoot growth. 0.5 - 2 mg/l BAP was found appropriate for enhancing shoot proliferation in Damask rose. The best treatment to have high chlorophylls was 2.5 mg/l 2, 4-D and maximum percent of new shoots was observed in mMS medium containing 1.5 mg/l BAP. While rooting of shoots improved with half-strength MS medium containing of IBA at the concentration of 2 mg/l. Our present work provides a practical protocol for efficient axillary bud multiplication from three genotype of Rosa damascena Mill.

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An investigation and comparisons of essential oil and flower yield of different genotyoe of *Rosa damascena* in half industrial level on three local in Razavi Khorasan province

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Introduction. *Rosa damascena* Mill is one of the important of medicinal plant in Razavi Khorasan province. At present, cultivation of this plant is increasing and cultivation in different local of Khorasan province. The importance of this plant from various aspects of economic, pharmaceutical and sanitary and its adaptation to different environmental conditions has provided the basis for its cultivation, which can provide employment and decent income for the province's farmers. This research was carried out to evaluate the performance of flowers and essential oils of 11 superior genotypes of *Rosa damascena* in three different regions.

Methods. selected genotypes were cultivated in a randomized complete block design with three replications in three locations. From each genotype, 27 plants were cultivated in 3 regions with 3 * 3 m intervals and after the plant cultivation and different data including : number of flowers, flower and petal yield, percentage and yield of essential oil in different genotypes collection were recorded for all location .In the finally data were analyzed with SAS software.

Results and Discussion. The results of analysis of variance for the studied characteristics including number of flowers, flower and petal yield, percentage and yield of essential oil in cultivated areas and for different genotypes showed a significant difference at 1% level that showed indicating the genetic diversity of the studied genotypes. Comparison of the mean of flower yield and different traits was very different in the cultivated areas in the studied genotypes. In all three regions and years of cultivation, genotype of Fars 1 had the highest mean flower yield and Southern Khorasan, Isfahan 9 and 5 genotypes were also suitable. Permanent genotypes of flower and Kerman produced the lowest flower yield.

In all three regions and years of cultivation, genotype of Fars 1 had the highest mean flower yield, and Southern Khorasan, Isfahan 9 and Isfahan 5 genotypes were also suitable. Permanent genotypes of flower and Kerman produced the lowest flower yield.

The results of this research was consistent with the report of Tabaei Aghdaei and et al. (2009) and show that there are variation in flower yield in different genotypes of *Rosa damascena* and indicates the high genetic and yield in Rosa genotypes. The southern Khorasan 3 and Isfahan 5 genotypes were in the next rank of flowering performance per plant.

The highest essential oil yield of the Khorasan Razavi genotype at Gonabad station with 1.17 g / plant and the lowest yield of essential oil belonged to the permanent genotype of flower at the station of Jolgae Rokh and Golmakan at 0.047 g / plant.

Tabaei Aghdaei et al. (2011) conforms to variation in the essential oil content of different Mohammadi genotypes and indicates the high genetic potential and potential as a genetic reserve for the production of Mohammadi flower cultivars.

The results of this research are consistent with Tabaei Aghdaei and et al. (2010) researchs, which indicates the high potential of the Rosa genotypes for the production of essential oils and cultivar of this plant.

Keywords: *Rosa damascena Mill*, Yield, genotypes, Essential oil,

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Rosa damascena essential oils: a brief review about chemical constituents

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Abstract

Rosa damascena Mill as an ornamental plant is the hybrid between *R. gallica* and *R. Phoenicia*, and is the member of Rosaceae family with more than 200 species and 18,000 cultivars around the world. The main importance of Damask rose is due to its aromatic products including rose essential oil (EO), rose water, rose concrete, and rose absolute which can be used in food, perfume, cosmetic, and pharmaceutical industries. Moreover, *R. damascena* is traditionally applied for treatment of abdominal and chest pains, strengthening the heart, menstrual bleeding, digestive problems and constipation [1].

According to phytochemical studies on *R. damascene*, citronellol, geraniol, nerol, phenyl ethyl alcohol, nonadecane, nonadecene, eicosane, heneicosane, tricosane, α-guaiene, geranyl acetate and eugenol have been determined as the major compounds in rose EOs [2]. Based on the International Standard [3], citronellol (20-34%), nerol (5-12%), geroniol (15-22%), parrafins C_{17} (1-2.5%), parrafins C_{19} (8-15%) and parrafins C_{21} (3.0-5.5%) are the best criteria for producing a high quality rose EO. In other word, the citronellol/geranial ratio should be between 1.25-1.3%. However, the quantity and quality of rose EOs are influenced by different factors like edapho-climatic conditions, soil characteristics, harvest time, storage of plant material and method of extraction [4]. Therefore, in the present work, a brief review on the Damask rose EOs is described, focusing on the main factors responsible for the chemical variability and the strategies for enhancing the EO yield and its quality.

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Economics of *Rosa damascena* in Iran

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Abstract

Mohammadi is scientific *Rosa damascene* Mill. belongs to the genus *Rosa* and family Rosaceae. One of the most important aromatic plants of *Rosa* species in the world and is on of the most prominent plants in gardening history. It has a high genetic diversity in Iran and it is important for decorative, medicinal and export aspects. This species is a fixed duality of two species *R. galica* and *R. moscatag.* Flowering Mohammadi as one of the activities of a diversified agricultural sector plays an important role in creating employment and income generation and developing the economy in areas of the country with the potential and talent necessary for this activity. Nevertheless, less attention has been paid to economic development planning. Golmohammadi industry and commerce has been developing its industries in the world. Studies have shown that only the essential oil of Mohammadi flower, other than other products, is used in perfumes, pharmaceuticals, food, cosmetics and hygiene. The Iranian economy has been steadily supported by oil revenues since the 1950s. Since the fifties, the Iranian economy has been steadily supported by oil revenues, with the imbalance and harmony between economic sectors becoming apparent. ccording to international documents, the origin of Iranian rose and the origin of the production of aromatic oils and extracts of flowers and fresh leaves are mentioned. In the Zoroastrian education circle, the flowers of Rose, Nastaran and some plants are honored and in the book of Falahat and Agriculture, we have discussed the existence of various types of Roses in Fars. Abu Mansour Movaffagh in the tenth century, while defining the medicinal properties of the rose, has shown that the best flowers are Iranian roses.

Keywords: Essential oil, Industry and Trade, Rose water

Comparison of the main components of the esential oil from *Rosa damascena* flowers in different regions of Kashan area

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Introduction. Approximately 400 oil components have been identified in the rose oil. About 62–77% terpene compounds are found in oil's composition: hydrocarbons (monoterpenes up to 2% and sesquiterpenes 35%), oxygen-containing derivatives (monoterpenes 64–71% and sesquiterpenes 0.5–2%), fatty hydrocarbons and their oxygen derivates (18–25%), phenylpropanoids (3–5%), and others (0.5–2%) [1]. Rose oil composition is varied over the different conditions, for example harvesting period and ecological factors. In this study, comparison of chemical compositions of Rose oil from 11 different regions was done.

Method. The flowers of *R. damascene* were collected during the flowering period in July 2018 from 11 different regions of Kashan area, around Kashan (Isfahan province, Iran). 200 g each of the samples were individually subjected to hydrodistillation for3.5 h using a Clevenger-type apparatus [2]. After decanting and drying over anhydrous sodium sulphate, yellow coloured oils were recovered and analyzed with GC/MS.

Results and Discussion. Eleven samples of *Rosa damascena* were subjected to hydrodistillation using a Clevenger-type apparatus and the yellow coloured essential oils were analyzed by GC and GC/MS. The oils were characterized by a high content of Citronelol (from 14.09% in Sedeh area to 44.35% in Azaran area) and geraniol (from 2.25% in Azaran area to 15.29% in Chime area).

According to the results, although the selected area was not very wide, high differences were observed between components from different tested samples from different regions. This fact shows the importance of having enough attention to the type of the sample to use the oil for specific orders

Keywords: *Rosa damascene*, essential oil, hydrodistillation, GC/MS analysis

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Comparison of the main components of *Rose water* in different regions of Kashan area

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Introduction. *R. damascena* is traditionally used for treatment of abdominal and chest pains, strengthening the heart, menstrual bleeding, digestive problems and constipation. The antimicrobial, antioxidant, analgesic, anti-inflammatory, anti-diabetic and anti-depressant properties of *R. damascena* have been confirmed. *Rose water* is a hydrosol portion of the distillate of rose petals, a by-product of the production of rose oil for use in perfume. It is used to flavour food, as a component in some cosmetic and medical preparations, and for religious purposes throughout Europe and Asia [1].

Methods. The samples of *Rose water* were collected during in July 2018 from four areas (Ghamsar, Azaran, Kamoo, Sede), around Kashan (Isfahan province, Iran). 250 ml of the each sample were individually subjected to extraction with 33 ml of n-pentane as solvent using a Separator funnel apparatus. After evaporation of the solvent, yellow coloured oils were analyzed by Agilent HP-6890gas chromatograph equipped with an Agilent HP-5973 mass selective. Identification of components of essential oil was based on retention indices (RI) relative to n-alkanes and computer matching with the Wiley275.L and Wiley7n.L libraries [2].

Results and Discussion. Four samples of *Rosa water* from different areas around Kashan were subjected to extraction with n-pentane as solvent, the yellow coloured essential oils were analyzed by GC and GC/MS. The oils were characterized by a high content of Citronelol (16.97% - 29.09%), Geraniol (2.17% - 6.1%) and Phenylethyl alcohol (47.97% -63.01%)

As is clear from the results, there were very significant differences between three major components from four tested samples from different regions. So, it can be said that Rose oil composition is varied over different conditions, for example harvesting period and ecological factors.

Keywords: *Rosa damascene*, *Rose water*, GC/MS analysis, citronellol, geraniol, phenyl ethyl alcohol

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Encapsulation of *Rosa damascena* essential oil in solid liquid nanoparticles

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Introduction: Essential oil of *Rosa damascena*, besides having a unique fragrance, is very notable for having properties like antioxidant, free radical scavenging, anti-cancer, anti-inflammatory, anti-aging and anti-depressant. In order to protection of volatile and biodegradable materials, nanoencapsulation process can be used to enhance the durability and controlled release of the constituents under conditions of proper management.

Method. Due to the significance of stable protection of essential oil materials in the different commercial applications, for the first time in the present study nanocapsules containing essential oil of *Rosa damascena* has been encapsulated using SLN preparing Method. Nanocapsules size, polydispersity index and zeta potential, was measured using dynamic light scattering and GC-MS was implicated to determine the %EE quantitatively and qualitatively.

Results and Discussion. Results showed that the particles are spherical, the size of the particles are below 100 nm with negative zeta potential and encapsulation yield is 51%.

The SLN preparing method was able to capsulate components of the essential oil of *Rosa damascena* with a high efficiency.

Keywords: Solid liquid nanoparticles (SLN), Dynamic light scattering (DLS), GC-MS, Nanoencapsulation, Essential oil, *Rosa damascena*

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Effect of ultrasound waves on the size of nanoparticles of encapsulated *Rosa damascena* essential oils

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Introduction. Essential oils are natural products which have many interesting applications. Extraction of essential oils from plants is performed by classical and innovative methods. However, their volatility, low solubility in water, and susceptibility for oxidation limits their use. EOs encapsulation is one of the options to reduce these effects and to improve their biological activities. Due to the significance of stable protection of essential oil materials in the different commercial application, for the first time in the present study, essential of *Rosa damascena* has been encapsulated and the encapsulation efficiency (EE) has been evaluated quantitatively and qualitatively.

Method. The effect of ultrasound waves on decreasing nanoparticles size of nanocapsulated *Rosa damascena* essential oil was examined which confirmed the success of the ultrasonic-aided method for production of the stable nanoencapsulated particles, i.e. amount of surfactant, time of ultrasound exposure and ultrasonic power values on the stability and size of the nanoencapsulated particles was investigated.

Results. Nanocapsules size, polydispersity index and zeta potential have been measured by dynamic light scattering technique. Gas chromatography mass spectrometry (GC-MS) and scanning electron microscopy (SEM) were respectively used to investigate the %EE and the morphology of the nanocapsules. The results showed that the size of spherical particles with negative zeta potential is below 100nm. According to the obtained results, the ultrasound power and exposure time had a significant effect on the particle size and encapsulation efficiency.

Keywords: Nanoencapsulation, Particle size, Zeta potential, Polydispersity index, Ultrasound wave, Encapsulation efficiency, Essential oil, *Rosa damascena*

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Applications of waste rose petals (*Rosa damascene*) as by-product in industry

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Introduction. Large quantities of distilled petals are generated as the waste during distillation process every year in Iran. The waste rose petals are rich source of biomacromoleculs. Currently, almost all this waste is simply discarded. Therefore, it is important to investigate the alternative usage to achieve more effective and economical distillation process. In this study, we aimed to survey the applications of waste rose petals.

Results and Discussion. Baydar et al. reported that the polyphenolic compounds extracted from waste rose petals can be used as antioxidant supplements [1]. Flower residues from dyeing industry such as *Hibiscus rosa sinensis* and *Rosa rosa* dye wastes can be used for Pb^{2+}, Cd^{2+} and arsenic removal [2]. Waste biomass of red rose was used for Pb^{2+} and Co^{2+} removal [3]. The waste of *Rosa damascena* flowers was used as a source of natural dye for organic wool dyeing [4]. Pectic polysaccharides isolated from waste rose petals have the immunomodulating properties [5]. Pectic extract could also be used as flour in thermally treated food products because of its stability [6]. These findings reveals the promising applications of waste petals in different industries.

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Effect of the time of flowers picking up after sun rising on the quality and quantity of the essential oil of *Rosa damascena*

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Introduction. There are certainly many factors affecting the amount of essential oil and the type of compounds, and therefore the essential properties of aromatic plants. One of the factors that traditionally known that has an effect on the quality and amount of essential oil of the plant is the time of picking up the plant. In the case of the flower of *Rosa damascena*, it is believed that with the sunrise and afterwards, the quality and amount of essential oil in the flowers decreases.

Method. In this research we study the effect of time on the amount and type of essential oil compounds of *R. damascena* flowers. Analysis of the essential oils was carried out through the GC-MS apparatus.

Results and Discussion. Results showed that the amount and quality of essential oil from before sunrise until 9:00 am dropped slowly and then dropped sharply.

2 hours after sun rising Amount of aliphatic hydrocarbons are increased. On the other side, alcoholic and esteric compounds are decreased.

Keywords: Essential oil, *Rosa damascena*, GC-Mass.

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Economics of Medicinal Plants

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Abstract

Recent years experiences show that emphasis of economy on income of petroleum selling results in instability of export income. Orientation of export policies may be changed for exporting non-oil goods including export of agricultural products to decrease dependence of Iran economy to export of petroleum and moving toward goals of resistance economy policy. Among agricultural products, herbs are the most important export items of agriculture which have great portion in creating added value in this sector and making foreign exchange. Study of statistics and previous years' time series information shows that export of these products has not suitable situation despite good rank of Iran in production and cultivation of herbs. This research is going to study position of Iran in global market of herbs emphasizing on damask rose and its comparison with various countries. Although recent years drought and contraband occurrence have result in fluctuation of production but expert views to chain of production to export cause increase of production and export. The most important challenges of herbs commerce and becoming undesirability of Iran position in foreign market of herbs are lack of technical knowledge in export, weakness of foreign marketing, weak support of government, high expenses of standardizing products for export, lack of cooperation between export trade unions and agencies in herb industry and their negative competition, incorrect recognition of aiming market, lack of having trade mark for many export items of herbs, political risks and decrease of bargaining power of foreign trade sector in foreign markets.

Keywords: Herbs, Export, Strategies, Market, Iran

Control management of blossom feeder scarab (*Epicometis hirta* Poda) and flower scarab (*Oxythyrea Sp.*) in gardens of Shahrood, Iran

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Introduction. One of the important insect pests of fruit trees in Semnan province are the blossom beetles, *Epicometis hirta* Poda and flower scarab (*Oxythyrea Sp.*) (Scarabaeidae. Col.). The larva develops in the soil, feeding on decomposed plant matter and it causes no damage. Adults cause destructive attack the reproductive parts of the fruit crops and many ornamental bushes as well as rosa damascena. The feeding usually results in the damage of the anthers and stigma which affects fruit setting and consequently reduces the yield. Controls of blossom beetles are difficult, as most insecticides cannot be applied during flowering without affecting honeybees or natural enemies. The mentioned pests are reported mostly in centre, north, northwest, northeast provinces of Iran.

Methods. The traps we tested were consisting of two parts. The upper one was a captured surface made by a plastic plate and shaped it as funnel. The lower part was a 3 litres bottle plus water and detergent whereas serves holding captured beetles. Three different trap colors consist of white, yellow and blue were investigated in a cherry orchard in Bastam, Shahrood region to find the most attractive color traps for the adult beetles (Schmera et al, 2004). We set up 30 traps (3 colours types with10 replication) in early April in 2014, one week before blossoming starts. We also tested a medicinal plant extraction (kod101) as bait that was placed to upper part of traps.

Results. The start of trapping in Bastam was in early April. We found that yellow, white and blue colours traps were no significant differences in capture of *E. hirta* in cheery orchard, but blue colour trap caught the most beetles (totals of mean 510, 485 and 393 beetles for blue, white and yellow traps, respectively). The results also showed that blue trap with medicinal plant extraction (kod101) as bait was significantly attracted beetles.

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The study of essential oils yield variation in *Rosa damascena* Mill. from different regions of Iran

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Introduction. *Rosa damascena* Mill. is one of the valuable species with a long history in Iran and some other countries. It is considered that the damask roses originated geographically and historically from ancient Persia (present–day Iran) and later spread throughout Europe and Northern Africa. In Iran and some of Eastern Europe countries distillate those flowers to extract Rosewater and essential oils to food and cosmetic markets of all over the world.

Method. We collected and investigated all species of Damask Rose that comes from different regions of Iran to Iran Golab Co. to perform Rosewater and isolation first and second essential oils and codify coordinate system to rank and price flowers from grade A to C.

Results and Discussion. The highest amount of oils yields of *R. Damascena* were recorded at Nashalj, Azeran and Alavi regions with 0.064%, 0.052% and 0.042%, respectively.

According to some parameters such as distant, picking up time, transportation and other factors the essential oils of *R. Damascena* will be changed. We solved this problem with codifying coordinate system to rank and price different flowers.

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