Clinical Cancer Investigation Journal-ISSN: 2278-0513

Molecular and biochemical Characterizations of Floral ScentProduction in *Rosa Damascena* Mill and *Crocus sativus*L

Abstract

Since the beginning of history, human life has faced great challenges.Environmental issues and cardiovascular diseases, cancer, can be considered as the most important of these issues. Most types of cancer are caused by oxidant which has destroyed vital molecules. These oxidants can be treated with synthetic antioxidants. Due to the side effects of synthetic antioxidants identification and extraction of antioxidants under the category of secondary plant metabolites can be facilitate the prevention and treatment of various cancers and decrease the side effects of medications.

The aim of this study iis study aims to identify the antioxidant power of Damask Damask rose and Saffron and their effect is on cancer cells. Essential essence extraction using the water distillation method and it was done with the help of the Cloner glass device.

Determine the amount of Phenol, Flavonoids, and Anthocyanin in the extracts, ectively using the colorimetric method of Folin–Ciocalteu reagent, Principles of Colorimetric by Aluminum Chloride reagent, and the differentiated method was done. The antioxidant power of the extracts is determined using the DPPH free radical scavenging test and finally using the MTT method the effect of the extract on the cancer cells of Hela and K562 is tested.

.According to the received data, it can be concluded these two plants, especially Rosa has high antioxidant power and very low costs for cultivation and high efficiency can develop research to produce Anti-cancer herbal medicines with low cost and much less fewer side effects.

Keywords: *Cancer, Rosa, Saffron, Antioxidant, Phenol, Flavonoids*

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Introduction

One of the biggest problems of human society today is the new lifestyle with its relatively bitter consequences, such as the spread of various diseases such as diabetes, cardiovascular disease, Alzheimer's, cancer, and so on. To solve these problems, various instructions have been provided to minimize the painful consequences. Cancer is an essential issue for human health today. According to some sources, the disease is one of the leading causes of death in the world, killing about 8 million people annually. For example, it is estimated that cancer killed at least 550,000 people in the United States in 2010 [2]. Cancer is the second leading cause of death in some countries [3]. It is said that among the types of this disease, lung cancer is the first in the world and gastric cancer is the second in the world, and it seems that the main reason for their occurrence is the use of cigarettes and the wrong way of consuming food, respectively [4].

Ways to fight the consequences of diseases, especially cancer, can be implemented in two ways: prevention and treatment. Due to the many problems of treatment of this disease, which will be mentioned later, the way of prevention will be more reasonable and easier. Prevention can include lifestyle changes and the use of anti-cancer foods. Given that the use of some plants has been common in the distant past and their beneficial effects have been proven in ancient medicine, it seems that more research on those plants for optimal use to prevent and treat a variety of diseases such as cancer can be good for health. May the future of human beings be much more useful and efficient.

Mohammadi flower with the scientific name of Rosa Damascena Mill is one of the most important plant species for flowering plants, subspecies of invertebrates, dicotyledons, Rosidea, Rosales, Rosaceae, and Damask roses with titles such as king and queen of flowers. The essential oil and Damask rose obtained from it are used as an aromatic and fragrant substance in the perfume, cosmetics, and food industries, as well as its therapeutic effects in the pharmaceutical industry. Mohammadi flower has been cultivated in Iran for a long time, but since its extract and Damask rose went to Europe via Damascus, the Europeans called it the Damascus Damask rose, from which the original name is derived. The economic importance of Mohammadi flowers is due to the essential oil in its petals, which makes up only 0.03% of the flowers and is known as liquid gold due to its high value. Approximately one liter of essential oil worth $ 3,000 is produced from every 3 tons of Damask rose. The amount of phenyl ethyl alcohol is one of the main indicators of the valuation of Damask rosehip essential oil in world markets [8]. Iranian Damask rose from Mohammadi flowers is world famous.

Jaimand et al. (2006), in Tehran Forest and Rangeland Research Institute; Two important flavonols called camphorol and quercetin were determined in 15 samples of Mohammadi flower extracts in central Iran. Most and least

The amount of camphor in the samples was 482 ppm and 188 ppm, respectively, and the highest and lowest levels of quercetin were 358 ppm and 172 ppm, respectively [9].

Khademi and Mardani Nejad (2013) conducted a study compare the antioxidant power of five Damask rose families with synthetic antioxidants such as BHT, BHA, and vitamin C. The phenolic content of the extracts was determined with the help of fullene-cocalto reagent and antioxidant power by radical inhibition of DPPH and nitric oxide. The results showed that the phenolic content was directly related to the antioxidant power of the extracts and showed a high number. Therefore, these extracts can replace synthetic antioxidants [10].

Meymandi and Yaghoubi (2014) in Kerman University of Industrial and Advanced Technology; performed a study on the anti-cancer effect of Damask rosehip extract on gastric cancer cells (AGS). Eight different concentrations of extracts were applied to the gastric cancer cell line with 5-fluorouracil. The toxicity of the extracts was evaluated by MTT assay and the effect of the extracts on cell proliferation was assessed by BrdU. The TUNEL method was used to measure apoptotic cell death. The results showed that the extracts reduced the survival of cancer cells. The effect of ethanolic extract was greater. The apoptotic mortality rate of the extracts was 90%. The overall result showed that the aqueous and ethanolic extract of Damask rose reduces survival, proliferation, and death in human gastric cancer cells in various ways. [3]

Wang et al. (1991) showed that pretreatment with crostine 2-6 mg/kg protects rat liver from aflatoxin B1 l toxin and prevents AFB1-DNA adducts by increasing liver GSH, activating GST and glutathione peroxidase. [11].

Abdullaev et al. (1994) investigated the inhibitory effect of saffron crocetin on nucleic acid and intracellular protein synthesis in HeLa cells, lung adenocarcinoma, and altered fetal lung fibroblast cells and found that crocetin has a dose-dependent inhibitory effect on protein synthesis and nucleoside synthesis. [11]

Materials and methods:

Mohammadi flowers were prepared from the narrow flower gardens of Atashgah in the Meymand Fars region (longitude 52.45 east latitude 28.52 north latitude 1545 meters above sea level) 90 km southwest of Shiraz.

Preparation of essential oil:

Mohammadi flower essential oil was extracted using the water distillation method. 400 grams of fresh Damask rose petals were poured into a 5-liter balloon and 10 times its weight (4 liters) of water was added. The balloon was placed in a 5-liter heating mantle and a Glass Clevenger was installed on it. The heating mantle temperature was set to maximum. The essential oil extraction process was performed within 4 hours. During this period, 0.3 ccs of flower essential oil were collected. Due to the low extraction efficiency of Damask rose essential oil, the sample was collected using n-hexane. The sample was placed in a freezer in the chromatographic gas device at minus 18 ° C until analysis.

Preparation of extracts:

Extraction was performed using the soaking method for 72 hours. 123 grams of Damask rose petals and 8 grams of saffron purchased from the market were poured into a suitable Erlenmeyer flask and 20 times the weight of the samples was added to methanol. Both Erlenmeyer was placed on a shaker at 110 rpm for 72 hours. The samples were then filtered separately and concentrated using a rotary apparatus (rotary vacuum distillation) at 38 ° C. After this step, the concentrated extracts were transferred to two Falcon tubes and placed in a vacuum centrifuge at 40 ° C for 3 hours. To completely remove the solvent in the extracts and pulverize the final product, the samples were placed in the freezer for 24 hours. Finally, the obtained extract is completely powdered and free of any solvent. Both extracts were placed in a freezer at 18 ° C for laboratory tests.

Determination of antioxidant power:

DPPH free radical scavenging test was used to determine the antioxidant power. Evaluation of DPPH free radical scavenging was performed using the methods performed in previous studies [182]. Initially, concentrations of 6.25 to 3200 µg / ml were made. Thus, we dissolved 3.2 mg of Damask rose hips and saffron extract separately with 1 cc of methanol. Solving happens fast. This concentration is the same as 3200 micrograms per liter. Then, ten times in a row, dilute this initial solution 1 to 2 to concentrations of 3200, 1600, 800, 400, 200, 100, 50, 25, 12.5 and 6.25 µg / ml. Dissolve one milligram of DPPH in 25 ccs of methanol and prepare a 100 mM solution. The risk of DPPH is very high due to the high oxidant effect of this substance. Therefore, it should be kept in a balloon covered with a layer of aluminum foil and used as soon as possible. In this test, AWARENESS AZARENESS STARFAX-2100 Microplate reader (Elisa reader) was used by Biotek Company of USA.

This device can read light absorption at wavelengths in the range of 590-490. After hitting the wavelength range, the red button of the device will be hit. The samples entered the device on the plate by rail and under maximum UV light, the device began to read the maximum absorption. The device printer simultaneously prints the amount of absorption. To determine the number of absorptions, 96-house plates were used to read the absorptions. For this purpose, 200 µl of 100 mM DPPH solution in methanol was added to 20 µl of different fraction concentrations. After mixing for 30 minutes at room temperature in a dark place and then absorbing the samples at

490 nm were read by an ELISA reader. The rows of houses are 8 rows in 12 columns. The cells of the device in each column were filled from left to right with different concentrations of extracts. The top row contains the cells containing the blank solution, which contains 20 µl of the extract and 200 µl of methanol. The bottom three rows are filled with three replicates of different concentrations of extracts and DPPH. Column 11 cells are empty of the solution, and column 12 contains four replicates of the control sample at 20 µl of methanol and 200 µl of DPPH. The top four rows of the plate were used for Damask rose extract solutions and the bottom four rows were used for saffron extract.

As mentioned, all the tests for each plant were repeated three times according to the number of rows of plate houses in the Elisa (microplate) reader, and finally, the percentage of free radical scavenging was calculated from the following formula, and by drawing a graph using Excel software, IC50 (Concentrations at which 50% of the free DPPH free radicals in the medium are removed by extracts) were practically determined.

High tests for quercetin were also performed to demonstrate the health of the DPPH solution and to compare the antioxidant potency of the extracts with that of a standard antioxidant. The standard quercetin solution was considered as a flavonoid with a standard antioxidant index (approximately similar to vitamin E) as a control.

$$\text{Relation Inhibition percentage} = 100 - \left(\frac{Abs\ test - Abs\ blank}{Abs\ control}\right) * 100 \quad (1)$$

Abs blank, Abs test, and Abs control are blank absorption, sample absorption, and control absorption, respectively. After calculating the inhibition percentage, using Excel software, the concentration diagram was drawn in terms of clearance percentage for each sample and the IC50 value was calculated in terms of µg / ml. Then, the average of the three replications was calculated, the deviation from the standard criterion was calculated and the final data were reported as the average deviation from the standard criterion.

- MTT method:

The cell line used in this study includes myelogenous leukemia k562 and Hela cancer cells prepared from the Pasteur Institute of Tehran. Cells were cultured in a 1640 rpm medium containing 10% fetal bovine serum (Gibco), 100 units of penicillin per milliliter, and 100 micrograms of streptomycin per milliliter. The cells were stored at 37 ° C with 5% carbon dioxide CO2 and 95% humidity. The viability of the culture medium cells was calculated using Trypan blue, and when the number exceeded 95, the cells were collected for testing.

MTT colorimetric test was used to determine the effects of extracts on cell proliferation. Cells cultured with 10,000 wells per 100 µl in 96-well plates were treated in three rows with 10 µl of different concentrations of extracts (200,100,50,25,10,1 µg / ml /) g / ml) and Incubated at 37 ° C and 5% carbon dioxide, negative and positive control cells were treated with the same DMSO concentration for each well and then treated with 50 µg / ml Cisplatin.

After incubation, 10 µl of MTT solution was added to each well for three hours at 37 ° C. The culture medium was removed and the cells were dissolved in 150 µl of DMSO for 15-20 minutes. The amount of light absorption of each well (containing different concentrations of extracts) at 570 nm was read by an ELISA reader (BioTek, Winooski, VT). The percentage of cell growth inhibition was measured as follows:

$$\text{Relation Percentage of cell growth inhibition} = 100 - \left(\frac{Abs\ test}{Abs\ Negetive}\right) * 100 \quad (2)$$

Using GraphPad.Prism software version 8.4.2.679, the inhibitory concentration of IC50 fractions was obtained.

Statistical analysis method:

Statistical analysis was performed by version 23 of SPSS and Exel 2016 software and version 8.4.2.679 of GraphPad.Prism.

Place and time of study:

The places used for the research include the industrial distillation workshop in Meymand Fars, Meymand Medicinal Plants Research Center affiliated with Shiraz University of Medical Sciences, and Shiraz Medical School. This work started in November 2019 and ended in April 2020.

DPPH results:

Antioxidant results of Damask rose using DPPH free radical scavenging method:

The results of light absorption of control, blank and three replicates of different concentrations of Damask rose extract in Elisa reader are shown in the following tables. Also, after including the numbers in this table in the formula for calculating the percentage of radical purification of DPPH, three purification diagrams of three repetitions of different concentrations of Damask rose extract and their average diagram have been recorded(figure-1)

$$\text{Inhibition percentage} = 100 - \left(\frac{Abs\ test - Abs\ blank}{Abs\ control}\right) * 100 \quad (3)$$

figure 2 shows DPPH inhibition percentage of the average of three replications of Damask rose and quercetin extracts.

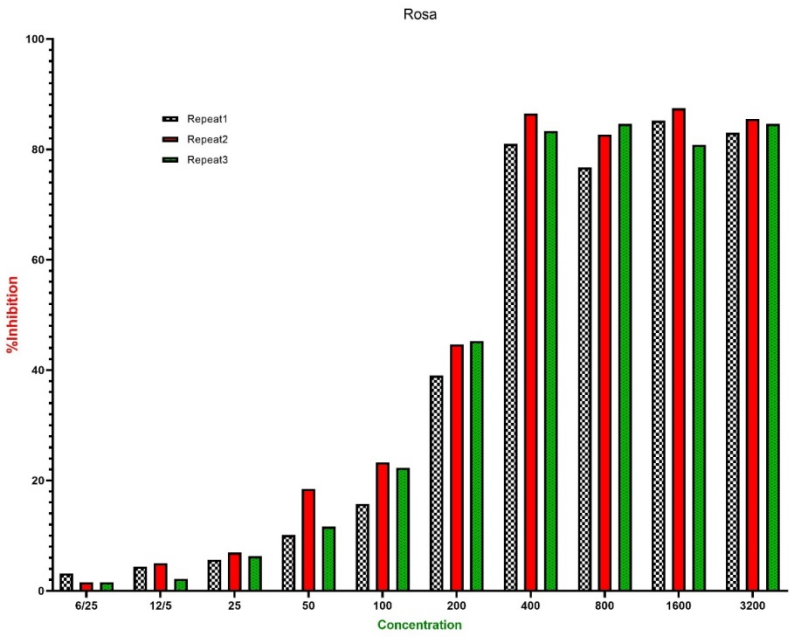

Figure 1: DPPH inhibition percentage of Damask rose extract

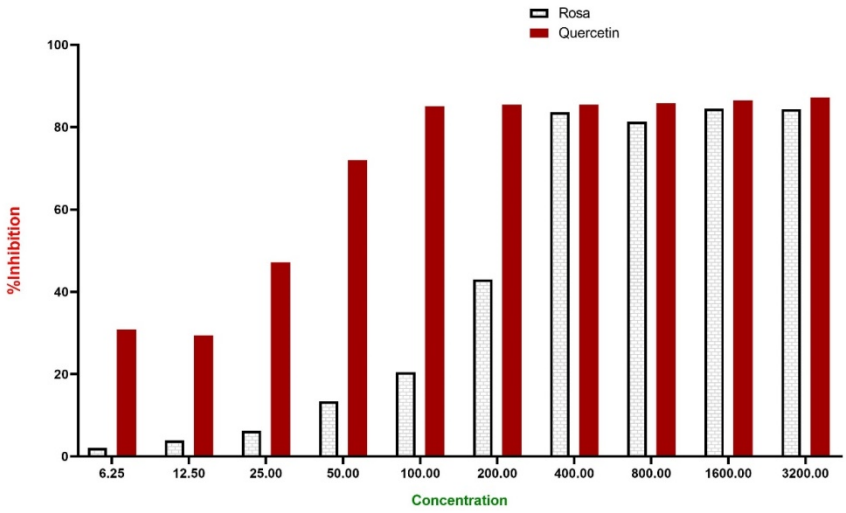

Figure 2: DPPH inhibition percentage of the average of three replications of Damask rose and quercetin extracts

- MTT results:

The results of different effects of methanolic extract of Damask rose extract on Hela and leukemia K562 cancer cells after 48 hours in a cell culture medium show that the highest cytotoxic effect of the extract at a concentration of 200 µg / ml on K562 cells was 42.7%. Its diagram is as follows (figure3)

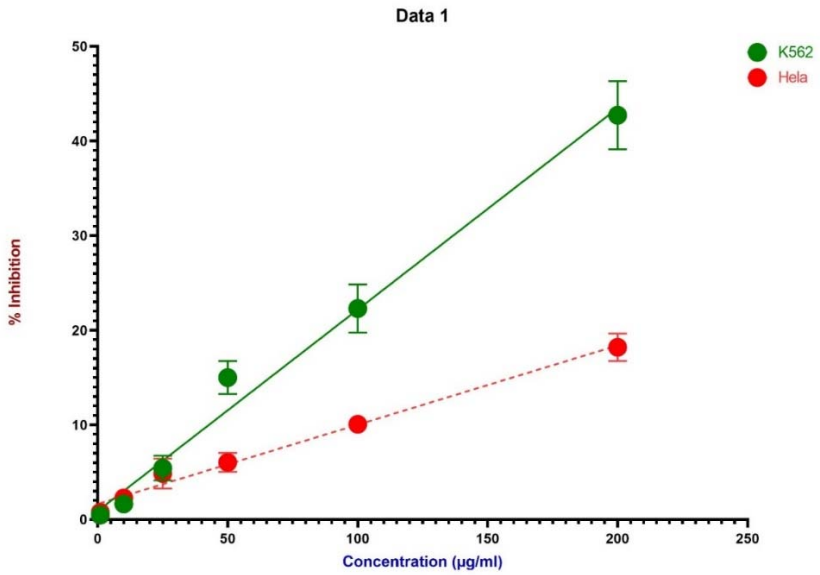

Figure 3: Relationship between concentrations of methanolic extract of Damask rose on Hela and k562 cancer cells

-Statistical analysis:

Regarding the standard diagram of Gallic acid and quercetin, to investigate the relationship between absorption and concentration variables, the data are first checked for normality by the Kolmogorov-Smirnov test in SPSS software.

As can be seen, the p-value is acceptable at the 0.05 level and the data are normal.

Due to the normality of the data, Pearson correlation was used to confirm or reject the linear relationship. The correlation between these two variables was 1,000, and the p-value in this test was 0.000 at the level of 0.05. There is a linear relationship between absorption and concentration variables. Since this correlation coefficient is positive, the amount of adsorption increases with increasing concentration.

For statistical analysis of the Mohammadi flower DPPH test, two hypotheses are proposed:

1) It is assumed that there is a significant relationship between the mean percentage of DPPH radical clearance and extract concentration.

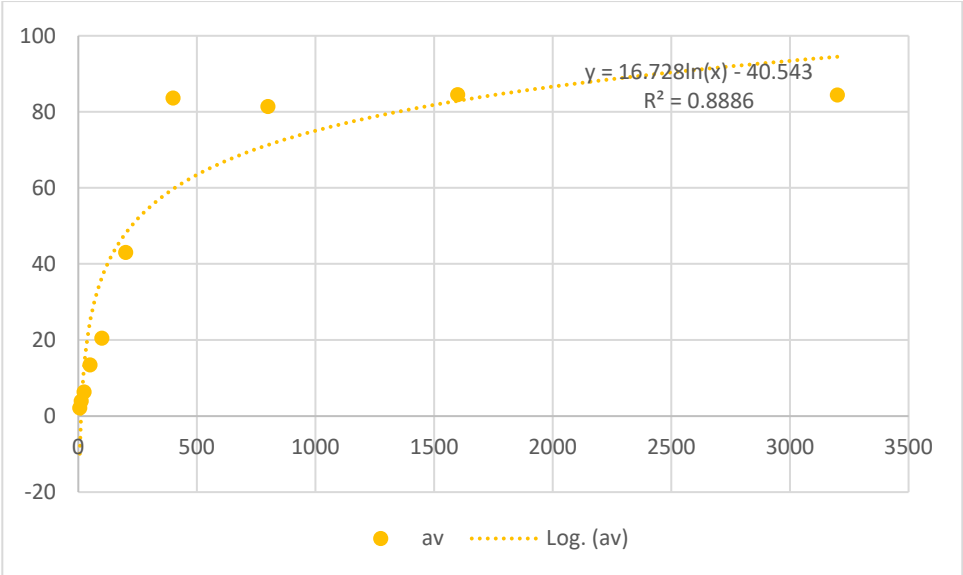

Figure 4: Logarithmic curve fitting of Damask rose concentrations Average and DPPH inhibition percentage

Logarithmic curve fitting of Damask rose concentrations Average and DPPH inhibition percentage shows in figure 4

Based on data there is a logarithmic relationship between the average percentage of DPPH radical scavenging and the extract concentration. Therefore, we use nonlinear models.

Table 1 - coefficients of constant value and extract concentration

Predictive variables	B	SE	Beta	T	P
Constant	-40.543	11.117	-	-3.627	0.007
Extract Concentration	16.728	20.094	0.943	7.988	0.000
Attention	R^2_{adj}= 0.875 R^2= 0.889 R= 0.943				

In table 1, the value of R2adj = 0.875, which indicates that the extract concentration variable of 87.5% of the total variance justifies the average percentage of radical purification of DPPH. Therefore, there is a logarithmic relationship between the research variables. Logarithmic relationship between Damask rose extract concentration and DPPH scavenging percentage shows in figure 5. Due to the significant level of coefficients of constant value and extract concentration, the assumption that these coefficients are zero is rejected. We accept that the extract concentration variable is in the model.

So the final model is as follows:

Relation $Y = -40.543 + 16.728 (\ln X_1)$ (4)

If we replace the dependent and independent variables in the above model with research variables, we will have:

Average percentage of DPPH radical scavenging= -40.543 + 16.728 (Extract concentration) ln

Diagram of the final model:

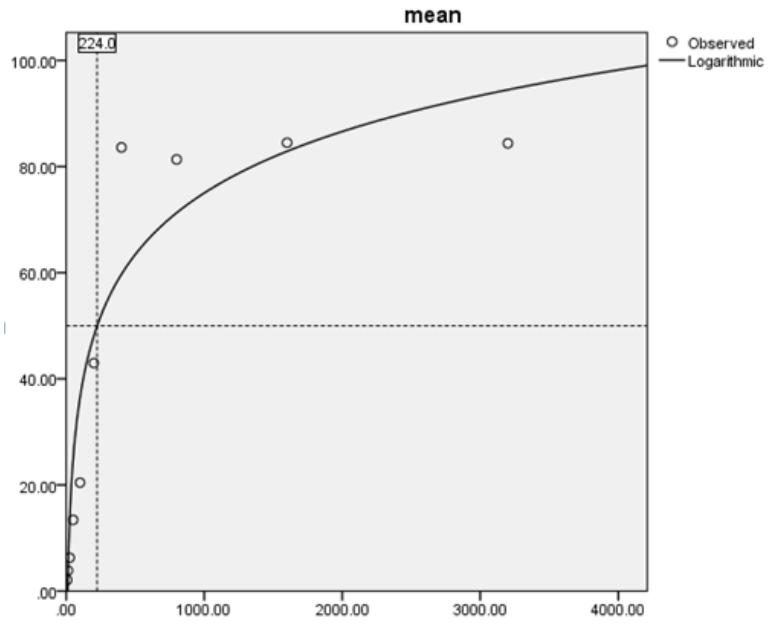

Figure 5- Logarithmic relationship between Damask rose extract concentration and DPPH scavenging percentage

2) It is assumed that there is a difference between the mean percentage of DPPH radical scavenging in repetitions 1, 2, and 3.

ANOVA analysis was used to test the above hypothesis.

In the ANOVA test, the source of variance is divided into two groups: intergroup and intragroup. The ANOVA test examines whether the dispersion is due to intergroup and to what extent within groups. Here, the researcher's intergroup variance is due to the variance of the mean DPPH clearance percentages in repetitions 1, 2, and 3.

To use the ANOVA test, it is necessary to assume that the data is normal. Through the Kolmogorov-Smirnov test, this hypothesis is checked whether the data is normal or not.

As can be seen, the p-value is acceptable at the 0.05 level and the assumption that the data is normal is accepted at all levels of the experiment.

Percentage of DPPH scavenging in the three groups Shows in table 2.

Table 2 - Percentage of DPPH scavenging in the three groups

	Sum of squares	df	Mean square	F	p-value
Between groups	72.326	2	36.163	0.026	0.974
Within groups	37552.414	27	1390.830		
Total	37624.740	29			

According to the output of table 2, the p-value = 0.974, and the hypothesis H0 is accepted. In other words, there is no significant difference between the Average Percentage of DPPH scavenging in the three groups.

-Discussion and Conclusion:

In the results of the gas chromatography test of Damask rose essential oil, long-chain alkanes such as Nonadecane, Heneicosane, 9-Nonadecene and Tricosane constitute the highest percentage of essential oils. As mentioned, the percentage of Mohammadi flower essential oil compositions of previous research with the report of this work has differences that may be affected by plant species, plant environment, climatic conditions at the time of plant extraction, type of plant change, essential oil extraction method, the temperature used To prepare essential oils and ....

The results, which were performed to compare the composition of essential oils in different genotypes of Mohammadi flowers in the Kashan region, showed that of the 39 compounds identified in the pink genotype, Citronellol (34.7%) and nonadankan (5.5%), respectively. 14%), and Henicosan (10.3%) were the major compounds, while in the white genotype 21 compounds were identified and Citronellol (53.61%), Nonadcan (17.57%), and Geraniol (12.59%) were the major compounds. They were compounds and were the most important in the golden genotype of 29 identified compounds: Henicosan (32%), Nonadkan (30%), and 9-Nonadkan (10.5%). Nonadekan was highly present in three genotypes, which is in complete agreement with the observations of this study (31.52%) [8].

Also, in the study of Kamkar Jaimand and Mohammad Baqer Rezaei, which was performed to evaluate the flavonoid composition of Mohammadi flower species, Henicosan was reported in the essential oil of Mohammadi flower in Kashan, 11.5% to 16.5%, with a report rate (21.03%). It is consistent in this research [12, 13]. The amount of this compound has been recorded at 25.5% and 21% in Ghamsar Mohammadi flower's essential oil in China with 16.95% and 10% in Bulgaria [14,15].

In the study by Rao et al. In 2000 to study three genotypes of Indian Damask rose, were alpha-pinene (1.7%), terpinene-4-L (1.3%), and linalool (7.6%) were introduced as the main compounds. [16].

According to the mentioned reports, Citronellol Monoterpene is one of the most important Monoterpene compounds of Damask rose essential oil, which is also due to the presence of the same composition [12, 13 , 16].

The levels of Citronellol and Geraniol are reported to be relatively low due to several factors. The reason for the decrease in the amount of Geraniol and beta-Citronellol in the results of the device may be due to the use of high temperatures during the extraction of essential oils, which destroys the structure of valuable molecules of essential oils and the formation of long-chain alkanes. In traditional methods, after the essential oil is taken, the container containing the oil and essential oil is placed in front of the sunlight to form two phases, i.e. the oil and the essential oil are separated from each other. If this is wrong and the light causes a large number of useful molecules to come out. Although the amount of geranium and Citronellol in this sample is low, this does not reduce the economic value of this essential oil. Natural Damask rose essential oil has a high economic value, but the higher the amount of geranium and Citronellol, the more valuable it will be. It seems that distillation devices with proper pressure and temperature and time adjustment can produce good quality essential oils with higher levels of geranium and Citronellol [17].

In a comprehensive and satisfactory study on the comparison of quantity and quality of distillation methods for the preparation of Damask rose essential oil, a more appropriate and newer method for the preparation of essential oil of this plant can be proposed to replace traditional methods of essential oil extraction [18]. By using modern methods of extracting essential oils, we can prevent the damage of useful molecules of geranium and Citronellol and increase the quality and economic value of Iranian Mohammadi flower essential oil in world markets.

The amount of anthocyanin in Damask rose and saffron was 548 and 712 mg of cyanidine-3-glycoside per 100 g of dry plant extract, respectively.

In the research of Ghodsieh Bagherzadeh and Maryam Montazeri on the subject of identifying the amount of saffron anthocyanin with ultrasound, this number has been obtained as 11.52. Also, the amount of phenol and flavonoids in saffron was calculated to be 8.05 and 4.73, respectively [19], while in the research of Katayoun Mahdavi-Khazaei et al., The amount

of saffron anthocyanin was 1712.19 mg / l of the extract [20]. Also in the research of VASIL SHIKOV et al. In 2008, the amount of anthocyanin in Mohammadi flowers was 39.8 ± 1 g / l of plant extract [21].

In a 2011 study by Helle Margrete Meltz et al. On the subject of dietary flavonoids, can the progression of coronary heart disease? The most important characteristic of flavonoids is their ability to prevent cardiovascular disease [22]. In the results of this study, the saffron plant has more flavonoid content and less phenolic content than Mohammadi flowers. Due to the high phenolic content of saffron, more investment and research on this plant can pave the way for the production of low-risk herbal medicines for the treatment of cardiovascular diseases.

The amount of total flavonoids in saffron extract (342.66 mg quercetin/g extract) is much higher than in Mohammadi flower extract (84.18 mg quercetin / g extract), but the total phenol content of saffron extract (84.28 mg gallic acid / g extract) It is much less than Damask rose extract (259.76 mg gallic acid per gram of extract). Also, the antioxidant power of saffron (with IC50 = 303.229) is relatively less than Mohammadi flower (with IC50 = 224.07).

In this research, the antioxidant activity of some dark Damask rose plants for replacement with synthetic antioxidants, the antioxidant power of Damask rose extract was calculated to be 233.24 ± 3.39 [174] which is consistent with the number 234.86 ± 13 Also, the phenolic content of the extract of this plant is 233.56 ± 7.25 in Khademi's research is relatively consistent with the phenolic content of Damask rose extract in this study and minor differences may be due to experimental error or climatic or physiological differences of the studied plants.

In the research of Nilgun Gokturk Baydar and Hasan Baydar on the phenolic content and antioxidant power of Damask rose extract, the phenolic and flavonoid content of this plant was 233.56 ± 7.25 and 50.04 ± 2.35mg gallic acid per gram of extract, respectively.[23] The numbers are close to 259.76 ± 0.43 and 84.18 ± 2.49, and these differences may be due to different plant species and environmental conditions.

In the study of G. kanzkan et al. In Turkey on determining the antioxidant and antibacterial power of Damask rose extract, the total phenol content of the extracts was 276.02 ± 2.93mg gallic acid per gram of the extract, which is close to the results of this study [24].

In this study, it was found that Damask rosehip extract has a higher phenolic content and higher antioxidant power than saffron. In a 2011 study by Mazandarani et al. On the relationship between antioxidant power and phenolic and flavonoid content, a positive relationship between antioxidant power and phenolic content of plants was confirmed [25], which is consistent with the results of this study.

Also, in the study of Faith et al. In 2010 with the subject of studying the relationship between phenolic content and antioxidant power of some dark mint plants, a strong correlation between these two factors has been confirmed [26]. This high power can pave the way for the use of Damask rose to make medicine to treat diseases affected by oxidants such as cancer etc.

In the research of Katayoun Meymandi and Mohammad Mehdi Yaghoubi at the University of Kerman, which aimed to determine the neurological and ethanolic effects of Damask rose on cancer cells, both extracts were not significant ($p < 0.05$). IC50 index for aqueous and ethanolic irritability 3.877 and 2.517 µg / ml, respectively, were specified. Both compounds also reduce the presence of cancer cell proliferation drugs compared to fibroblasts [27]. Examination of the effect of methanolic irritation of Damask rose on Hela and k562 cells shows that this substance is destroyed in k562 cells and is destroyed by cells because it exists due to the antioxidant power of this plant. In this study, it was found that there is a significant and direct relationship between increasing the concentration of the extract and the percentage of inhibition of cancer cell growth so that with increasing the concentration of the extract, the percentage of inhibition of cancer cell growth increases. However, the extract was more effective on K562 cells and killed 50% of cancer cells at a lower concentration.

In a 2011 study by Zamiri et al. On the cytotoxic effect of Damask rose extract on the human cervical cancer cell line, it was found that different concentrations of this plant extract significantly ($p < 0.05$) reduced the survival of cancer cells. IC50 was obtained after 24, 48, and 72 hours at 2135, 1540, and 305 µg / ml, respectively, which confirms the results of this study. In this study, the IC50 value for Damask rose extract in 48 hours was 230, which shows a better result and confirms the hypothesis of the effect of Damask rose extract on cancer cells significantly. However, the difference in IC50 numbers may be due to differences in the structure and biology of cells, which differ in the two types of research [28].

A 2016 study by Qiongli Su et al. On the induction of apoptosis in bladder cancer cells found that quercetin had a significant effect on the induction of apoptosis in these cells. Due to the high amount of quercetin in Damask rose in the results of this study, the extract of this plant can be a good investment option for the treatment of various cancers, especially bladder cancer [29].

-Conclusion:

Mohammadi and saffron plants with high levels of effective biochemical compounds such as phenol and flavonoids and also high antioxidant power can be a suitable background for the production of food and medicine products for prevention and treatment with proper production and productivity and

more efficient and delicate use. All kinds of cancers and economic and industrial prosperity of the country.

- Suggestions:

It is suggested to use new industrial methods to prepare the essential oil of Mohammadi flowers with higher quality and medicinal and economic value, and after each series of perspiration, the essential oils are separated from the Damask rose and these valuable compounds are stored at -18 ° C.

Due to the phenolic content, antioxidant power, suitable climatic conditions, and low costs of growing Mohammadi flowers, these plants can be used more optimally for the advancement and development of the country's pharmaceutical industry. It is also recommended that more research be done on these plants for antioxidant power such as FRAP, ABTS, and NO methods.

Identify the most suitable climate for growing these plants to produce better crops and higher productivity.

More research should be done on these plants from different angles to treat and prevent other diseases such as physiological diseases.

Modification of traditional agricultural methods to industrial and modern for planting and harvesting the products of these plants will create high employment and more exports of food and medicine products.

Ethical Statement

Hereby, I "habibeh Zare" consciously assure that for the manuscript "Molecular and biochemical Characterizations of Floral Scent Production in Rosa Damascena Mill and Crocus sativusL" the following is fulfilled:

1) This material is the authors' own original work, which has not been previously published elsewhere.

2) The paper is not currently being considered for publication elsewhere.

3) The paper reflects the authors' own research and analysis in a truthful and complete manner.

4) The paper properly credits the meaningful contributions of co-authors and co-researchers.

5) The results are appropriately placed in the context of prior and existing research.

6) All sources used are properly disclosed (correct citation). Literally copying of text must be indicated as such by using quotation marks and giving proper reference.

7) All authors have been personally and actively involved in substantial work leading to the paper, and will take public responsibility for its content.

Financial support : no Financial support

Acknowledgement:

We thank Besat Research Institute of Shiraz for its cooperation in measuring antioxidants and Dr. Zahra Amir Ghofran, Head of Immunology Department of Shiraz University of Medical Sciences, for measuring the anti-breast cancer power of the Mohammadi flower in the Immunology Laboratory.

Conflicts of Interest Statement

The authors whose names are listed immediately below certify that they have NO involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-fi nancial interest (such as personal or professional relationships, affi liations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

Habibeh zare

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