



## Study of chloroplast diversity in some apple genotypes from north-west of Iran in comparison of some Alborz genotypes, commercial cultivars and rootstocks

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### Abstract

**Background and Objectives:** Apple is one of the most important fruit products in temperate regions. The cultivation of this product has been done during a very long time in Iran and even according to some resources; Iran has been called as one of the hometowns of this plant. The most basic step in breeding programs for fruit trees is collecting and evaluating internal and external germplasm resources. Nowadays considering the importance of healthy eating and sustainable production of apple with higher quality, modifying apple trees, is essentially based on “resistance genes”. Given that most apple varieties are being propagated asexually, low genetic diversity is expected. But among genotypes that are the result of the upgrade, expected diversity increases because these genotypes are mostly seed progenies. In this study we have tried to evaluate the genetic diversity of organelles of some local genotypes of apple cultivated on the main cultivation areas in north-west of Iran and Central Alborz and compare them with two commercial cultivars (Red Delicious and Fuji) and also M4 and M9.

**Materials and Methods:** For this investigation, young, fully developed leaves were sampled, their DNA genomes were extracted. In order to evaluate organelles diversity, 30 apples, four pairs of specific primers for the chloroplast genome (K<sub>1</sub>K<sub>2</sub>, CS, HK and TF) and two restriction enzymes (EcoRI and MseI) in Cleaved Amplified Polymorphic Sequences (CAPS) method were used. NTSYS and POPGENE were used for data analysis.

**Results:** Among these four markers, three markers have the ability to amplify appropriately, in which 4.13% of apple chloroplast genomes were amplified. By haplotype examination of samples, a total of eight haplotypes were identified which among them, H4 was the largest group with 26.66 percent of the total samples. All this groupings have been created due to the occurrence of mutations and/or deletions. Mean of genetic variation within (H<sub>S</sub>), Total (H<sub>T</sub>) and degree of genetic differentiations (G<sub>ST</sub>) were 0.4451, 0.467 and 0.0481, respectively.

**Conclusion:** The results showed that there is no systematic genetic structure between samples of studied regions. These results also confirmed the possibility of applying Cleaved Amplified Polymorphic Sequences (CAPS) method to identify genotypes and varieties of apples. Using these markers, genetic diversity in organelle DNA was observed amongst apple genotypes, however, this variation was not able to separate the genotypes in different regions. It seems perhaps by increasing the number of primers and restriction enzymes, this distinction can be achieved. The results of this study showed that native apple genotypes in Iran, possess high genetic diversity due to sexual reproduction in the past.

**Keywords:** Cleaved Amplified Polymorphic Sequences (CAPS), General primer chloroplasts, Haplotype, *Malus*, Restriction enzymes

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## Improvement of the rooting capacity in cutting of box tree, an endangered ornamental shrub

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### Abstract

**Background and Objectives:** Box tree (*Buxus sempervirens* L. or *Buxus hyrcana* Pojark.) from Buxaceae, is an ornamental shrub that has application in various industries. This shrub is using extensively for landscape design and gardens. Growth and development of box tree is very slow, and under danger of extinction due to the invasion of some pathogens. Root induction in cuttings causes the faster propagation of the plant. Thus, the aim of this research was to improve the rooting condition of hard-rooting scions of box tree and achievement of the best concentration of hormones treatments of IBA and NAA among 0, 500, 1000, 2000 and 3000 mg L<sup>-1</sup>.

**Materials and Methods:** In order to investigate the effect of different concentrations of IBA and NAA, an experiment was carried out as factorial based on a randomized complete blocks design in four replications. Treatments were 0 (as control), 500, 1000, 2000 and 3000 mg L<sup>-1</sup> of both treatments of IBA and NAA, singular and in combination. In autumn, the 15-20 cm of shoot tips of the 2-years-old mother plants were dissected and used as hardwood cutting. Lower end of the shoot tip cuttings was kept in different concentrations of IBA and NAA and then was planted in cultivation bed. In this research, rooting percentage, root number, root length, plant height, leaf surface, leaf number, the longest root number and root fresh and dry weights were calculated. Cultivation bed of cuttings was perlite. The end of cuttings was put in 400 mg L<sup>-1</sup> silver Nano-particle solutions for 10 sec. to prevent of probably infection.

**Results:** The results of analysis of variance showed that the reciprocal effect of different concentrations of plant growth regulators (IBA and NAA) was significant on all traits at 5% and 1% of probability levels, except for plant height. Results showed that the highest rooting percentage (100%) and maximum root number (8.70/plantlet) were observed in cuttings treated with 1000 mg L<sup>-1</sup> NAA along with 1000 mg L<sup>-1</sup> IBA. Also, the highest root length (5.66 cm/plantlet) was recorded in cuttings treated with 2000 mg L<sup>-1</sup> NAA plus 1000 mg L<sup>-1</sup> IBA. Treatment of 1000 mg L<sup>-1</sup> NAA along with 1000 mg L<sup>-1</sup> IBA induced the more extension of leaf surface than the other treatments. The largest number of leaf (33.37 per plant) was calculated in cuttings treated with 3000 mg L<sup>-1</sup> NAA along with 500 mg L<sup>-1</sup> IBA. Cuttings treated with different concentrations of IBA and NAA had different fresh weight and dry weight.

**Conclusion:** *B. hyrcana* may be successfully propagated by stem cuttings. Plant growth regulators especially auxins have effective role on increasing the rooting of hard-rooting cuttings in trees and shrubs. Two hormones of IBA and NAA can be effective on improvement of rooting of *B. hyrcana* stem cuttings. A concentration of 1000 mg L<sup>-1</sup> NAA along with 1000 mg L<sup>-1</sup> IBA induced the better rooting than other hormonal treatments.

**Keywords:** Auxin, Box tree, Cytokinin, Ornamental plants, Plant propagation

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## The competition effects of fenugreek and black cumin on yield and yield components under drought stress

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### Abstract

**Background and Objectives:** Drought stress is one of the most important factors limiting crop production in arid and semi-arid area. Most of the agricultural land of Iran was located in arid and semi-arid area and severe water deficit threaten the agriculture of these areas. Accordingly, any strategy to reduce the effects of drought on crop yields is necessary. In agroecosystems, interspecific plant competition for water commonly is less than the intraspecific competition, because various species have different structure, root system and peak water requirements. So, the competition effects of fenugreek (*Trigonella foenum graecum*) and black cumin (*Nigella sativa* L.) on yield and yield components were investigated with the aim of reducing damage of drought stress.

**Materials and Methods:** In this experiment, five planting patterns including sole fenugreek, sole black cumin and intercrop ratios (2:1, 1:1, 1:2 of fenugreek and black cumin) under W<sub>1</sub>: normal conditions (maintenance of soil water between 70-100% field capacity), W<sub>2</sub>: moderate drought stress (irrigation based on 75% W<sub>1</sub>) and W<sub>3</sub>: severe drought stress (irrigation based on 50% W<sub>1</sub>) were evaluated. Consumed water volume for each plot was regulated by the counter for irrigation time determination. In fenugreek, traits such as plant height, number of branches per plant, number of pods per plant, number of seeds per pod, 1000 seed weight and grain yield were measured. For black cumin, the plant height, number of branches per plant, number of capsules per plant, number of seeds per capsule, 1000 seed weight and seed yield were measured.

**Results:** In moderate drought stress, the highest seed yield was observed in fenugreek: black cumin (2:1) and (1:2) on average with 1,320 and 1,222 kg ha<sup>-1</sup>, respectively. But, in severe drought stress, the greatest seed yield (on an average of 842) was achieved in fenugreek: black cumin (1:2) and the lowest (on an average of 548) was observed in fenugreek sole cropping as well. The highest land equivalent ratio (LER) was belonged to fenugreek: black cumin (2:1) at normal conditions with average of 1.25. In moderate drought, the LER of intercropping treatments was more than one for all patterns. In severe drought stress, fenugreek: black cumin (2:1) and (1:1) had a high LER with average of 1.5 and 1.24, respectively.

**Conclusion:** In general, it could be concluded that although the highest seed yield was achieved in normal irrigation, however in mild and severe drought stress, seed yields of fenugreek: black cumin (1:2 and 2:1) were significantly more than sole cropping. Therefore, could be applied for these medicinal plant production in areas with water scarcity and prevent the agricultural unsustainability via intercropping strategy.

**Keywords:** Land equivalent ratio, Planting pattern, Seed yield, Sole crop

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## Effect of inoculation times and acetosyringone concentrations on gene transfer efficiency of $\beta$ -glucuronidase (GUS) mediated by *Agrobacterium* in gerbera (*Gerbera jamesonii* cv. Royal Soft Pink)

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### Abstract

**Background and Objectives:** *Gerbera* is one of the most popular ornamental plants in the world and ranked forth, in the flower industry among the 10 top cut flowers. Nowadays, there is an important for development of generally applicable gene transfer methods for gerbera which will allow rapid introduction of new traits into elite genotypes without changing the existing good properties. This research was done in order to investigation of effect of inoculation times and acetosyringone concentrations on gene transfer efficiency of  $\beta$ -glucuronidase (GUS) mediated by *Agrobacterium* in gerbera (*Gerbera jamesonii* cv. Royal Soft Pink).

**Materials and Methods:** This study was conducted in three separate experiments; First experiment was conducted to evaluate the effect of hygromycin at various concentrations (5, 10, 15, 20, 25 and 30 mg L<sup>-1</sup>) to determine it's the lethal dose in untransformed plantlets of *Gerbera jamesonii* cv. 'Royal Soft Pink'. Then, in second experiment investigated the effect of 10, 15, 20, 25 and 30 mg L<sup>-1</sup> hygromycin on shoot regeneration in leafy petiole explants. Finally, in third experiment evaluated the effect of inoculation times (10 and 20 min) and acetosyringone concentrations (50 and 100  $\mu$ mol) on GUS gene transfer efficiency mediated by *Agrobacterium* and by co-cultivation method of leafy petiole explants. After 2-3 days of co-cultivation of leafy petiole explants with *Agrobacterium*, were transferred to direct shoot regeneration medium. Then putative transgenic shoots derived from petioles and the multiplication were done. Finally, transformed plants were confirmed by GUS histochemical assay and PCR analysis.

**Results:** The results showed that the 10 mg L<sup>-1</sup> concentration of hygromycin is suitable for selection of transgenic shoots and it should be used after initial regeneration. The highest (38%) of putative transgenic shoots regeneration was obtained from treatment of 10 min inoculation with *Agrobacterium* and using 100  $\mu$ mol acetosyringone. Also, the lowest (25.25%) of putative transgenic shoots regeneration was showed from treatments of 20 min inoculation and using 50  $\mu$ mol acetosyringone. The results of histochemical assay and PCR analysis in transgenic plants showed that the highest independent line number (27 shoots) and gene transfer efficiency (11%) per 100 explants were obtained from treatments of 10 min inoculation and using 100  $\mu$ mol acetosyringone.

**Conclusion:** Factors such as inoculation time and acetosyringone concentration had prominent impact on the efficiency and success of transformation. Acetosyringone, is considered to be the phenolic inducer of *vir* genes activation and T-DNA transfer in *Agrobacterium* and enhances the transgenic efficiency. Therefore, the best treatment to produce transgenic plant in *Gerbera jamesonii* cv. 'Royal Soft Pink' with transfer of GUS gene is the inoculation of leafy petiole explants for 10 min and using of acetosyringone with 100  $\mu$ mol concentration.

**Keywords:** Gerbera, GUS gene, Histochemical assay, PCR, Shoot direct regeneration

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## Study of genetic analysis and relationships between yield and its components in Iranian coriander genotypes

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### Abstract

**Background and Objectives:** Coriander is mainly cultivated and widely distributed for the seeds. Therefore, development cultivar with high seed yield is important in coriander. On other hands, seed yield is a complex quantitative trait, considerably affected by environment and usually has a low heritability. Therefore, study on relationships between yield and its components will improve the efficiency of a breeding program with appropriate selection criteria. The objectives of this research were relationship between seed yield and related traits, path analysis and heritability estimates to identify effective traits for improve coriander genotypes.

**Materials and Methods:** Plant materials including 36 genotypes of diallel crosses progenies of six coriander landrace and their F<sub>1</sub> and F<sub>2</sub> generations were evaluated in randomized complete blocks design with three replications. The phenological, morphological characteristics and yield and its components including days to flowering, days to end of flowering, days to ripening, leaf number, branch number per plant, umbel number per plant, fertile umbel number per plant, seed number per plant, thousand seed weight, seed weight per plant and chlorophyll content were measured. Diallel analysis (Griffing method), correlation analysis, stepwise regression analysis and sequential path analysis was performed on the data.

**Results:** Results of genetic analysis of variance showed significant general and specific combining abilities for the all measured traits that reveals the importance of both additive and non additive gene effect in controlling these traits. Also, results showed that the highest coefficient correlation was obtained between fertile umbel number per plant ( $r=0.67^{**}$ ) and thousand seed weight ( $r=0.66^{**}$ ) with seed yield. Sequential stepwise multiple regression analysis was performed to organize the predictor variables into first and second order paths based on their respective contributions to the total variation of yield and minimum collinearity. Based on the variance inflation factor and magnitude of direct effects, fertile umbel number per plant ( $r=0.45^{**}$ ), days to flowering ( $r=-0.46^{**}$ ), thousand seed weight ( $r=0.31^{**}$ ) and seed number per plant ( $r=0.30^{**}$ ) were considered as first order variables and accounted for 86 percent of total variation of yield. The *t*-test showed that all direct effects of traits on seed weight were significant. Number of fertile umbels had the largest direct effect ( $0.45^{**}$ ) on seed weight and also number of fertile umbels had the largest indirect effect ( $0.40^{**}$ ) through thousand seed weight on seed weight.

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**Conclusion:** The results indicated that three traits including fertile umbel number per plant, thousand seed weight and seed number per plant considering the positive correlation and direct effect with seed yield and having additive genetic control and high narrow-sense heritability, can be used as a suitable criterion in selecting for increased seed yield in breeding programs of coriander in different generations of coriander under field conditions. Also, considering the negative correlation and direct effect of day to flowering with seed yield and having additive genetic control and high narrow-sense heritability, early maturity can be considered as an independent selection index for breeding of different varieties of coriander.

**Keywords:** Coriander, Correlation, Sequential path analysis, Stepwise regression



## Rooting of honeysuckle (*Lonicera japonica* L.) under treatment of natural and chemical compounds

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### Abstract

**Background and Objectives:** Honeysuckle (*Lonicera japonica* L.) is a valuable plant from climbing groups with many usages in green space. Thus, its production in short time with better commercial quality is very important. One of the important proceedings in propagation process of plants is improving the speed of rooting and shortening this growth stage. This is happening mostly with the use of various chemical compounds and methods. Today, use of natural materials as an alternative for chemical compounds is concerned in improving rooting of cuttings in ornamental plants that in some cases have observed better and effective influence of this compounds compared with chemicals. Current research was conducted for study of the effect of some natural compounds (organics) in compare with the usual and chemical rooting hormone (IBA) on rooting of Honeysuckle. Also, effect of human hormonal pills on rooting of this plant were studied.

**Materials and Methods:** This experiment based on completely randomized design with 25 treatments in 6 groups of treatment including Indole butyric acid (IBA), aspirin pill, LD pill, natural honey, grape syrup and Arabic gum in 4 concentrations comparing to control (distilled water) in 5 replications with 5 cuttings in each replication was done in Gorgan agricultural research center and horticultural laboratory during 2015-2016 year. Rooting traits including rooting percent, number of primary and secondary root, length of primary root, fresh and dry weight of root and survival percent of honeysuckle cuttings were measured in this experiment.

**Results:** According to obtained results, natural and chemical treatments had significant effect at 1% Level on rooting traits of honeysuckle. In treatments, the best and highest quantity and quality of roots were observed in 1000 mg/l of indole butyric acid and 60% of natural honey. Separate study of other natural and chemical treatment showed that %20 Arabic gum, %20 grape syrup, 0.5 pill/L aspirin (40 mg/L) and 2 pill/L human LD (0.36 mg/L) showed the best results in compare with other concentrations and control.

**Conclusion:** Due to the desirable effects of natural compounds such as natural honey on rooting of honeysuckle cuttings, by consideration the economic efficiency, health and effective role of these compounds in organic agriculture, the use of this natural compounds was priority and suggested as an alternative to chemical compound like indole butyric acid. Also, best concentration of other treatments are still usable, because of their significant preference in compare with control and their positive role in accelerating rooting of cuttings.

**Keywords:** Honey, Honeysuckle, Indole butyric acid, Rooting

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## Evaluation of morphological, yield and medicinal properties of perilla (*Perilla frutescens*) under soil fertility treatments in Mashhad Ardehal and Sensen regions of Kashan

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### Abstract

**Background and Objectives:** Medicinal plants are one of the main natural resources of Iran from ancient times. Perilla is an annual plant of the mint family Lamiaceae, native to East Asia and widely cultivated in India, China, Japan, Hong Kong, South and North Korea. Since, there was no study not only on adaptability of perilla in Iran climate conditions but also on different fertilizer systems, this experiment was conducted in two experimental sites (Mashhad Ardehal and Sensen of Kashan).

**Materials and Methods:** Experiment was conducted as split plot factorial based on a randomized complete blocks design with three replications at two experimental sites under year 2014. The main factor three chemical fertilizer levels (control, 50, 100, 200 kg/ha) and sub plots were different, of organic fertilizer (control, humic acid and compost application) and inoculation with *Piriformospora indica* (inoculation and without). Plant height, node number per plant, flower number per inflorescence, stem number per plant, leaf area index, plant yield, rosmarinic content and rosmarinic yield per area were studied. Statistical analysis of the data was performed using SAS software (version 9.1). Also, means comparison were compared by LSD test at 5% probability level.

**Results:** Among levels of chemical fertilizers, 50 and 100 kg/ha and between organic fertilizers humic acid were recorded better result but biological fertilizers had no significance effect on studied traits, however, this fertilizer positive effects were obtained along with other fertilizer integrations. The highest plant yield (147.2 g/m<sup>2</sup>) and rosmarinic acid yield per area (3.432 g/m<sup>2</sup>) was achieved in 100 kg/ha at chemical fertilizer with humic acid and biological fertilizer application and the lowest plant yield (89.86 g/m<sup>2</sup>) and rosmarinic acid yield per area (1.253 g/m<sup>2</sup>) was observed in control. The results showed significance different between two experimental locations so that Mashhad Ardehal showed better performance than Sensen in terms of all studied traits.

**Conclusion:** Overall, Mashhad Ardehal due to good soil and climate characteristics was better for planting Perilla as compared to the Sensen region. Also, integrated application of the studied fertilizers showed more positive effect on yield and quality of perilla than individual application of those fertilizers.

**Keywords:** Compost, Humic acid, Mycorrhiza like, Plant yield, Rosmarinic acid

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## Optimization of tissue culture conditions for micropropagation in semi-dwarf M<sub>7</sub> apple rootstock

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### Abstract

**Background and Objectives:** Plant tissue culture technology, often used for plants large-scale multiplication. This commercial technology is based on micropropagation. Micropropagation is regeneration of organs, plants, tissues, cells and proliferation of true to type selected genotype, using *in vitro* culture technique. The improved plants produced by tissue culture method are stronger than those obtained from seed. Therefore *in vitro* propagation of M<sub>7</sub> apple rootstock, often produces strong plants with accelerated growth. This research was performed with the aim of optimizing the *in vitro* propagation conditions of M<sub>7</sub> rootstock and the survey effect of basal medias, different plant growth regulators on proliferation and rooting.

**Materials and Methods:** Current study was performed with the aim of optimizing the *in vitro* propagation conditions of M<sub>7</sub> apple semi-dwarfing rootstocks in the three separate experiments. In the first experiment, the effect of five types of basal media culture including, MS, 1/5MS, 2MS, WPM and B<sub>5</sub>, on shoot number and shoot length were studied. In the second experiment, the effects of two types of plant growth regulators, BAP and TDZ in various concentrations (0, 2.2, 4.4 and 8.8 μM) on shoot number, shoot length, node number, internode number and internode length were studied. In the third experiment, the effect of two types of basal media (MS and 1/2MS) supplemented with two types of plant growth regulation IBA and NAA in different concentrations (0, 1.5, 3 and 4.5 mg/l) under three and four days darkness on root number and root length was investigated. Hardening of rootstocks in large perlite, small perlite, perlite with peat moss and peat moss separately was surveyed.

**Results:** According to results of first experiment, the highest proliferation (15.66 shoots per explant) was observed in B<sub>5</sub> media. In second experiment, BAP was more effective than TDZ on proliferation rate, number of nodes, internodes and reduce internode length characteristics. The highest proliferation (16.55 shoots per explant) was observed in BAP (2.2 μM). In the third experiment, highest root number (with mean 11.10 root per explant) was observed in 1/2MS media supplemented with 3 mg/l NAA. The results of the effect of growing media on M<sub>7</sub> apple rootstock hardening showed that growing media of peat moss have most favorable results compared to other treatments.

**Conclusion:** B<sub>5</sub> media containing 1 mg/l BAP was detected as favorable and optimum media for the proliferation of M<sub>7</sub> apple. BAP was more effective than TDZ on regeneration traits. Treatment of three days under darkness showed better results than four days. According to the results of the third experiment, the best dark period, culture media type, plant growth regulator type and concentration were obtained, in three days darkness, 1/2MS media, NAA (3 mg/l) respectively.

**Keywords:** Hardening, *In vitro* propagation, Optimization, Rootstock

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## Effect of pre-harvest fruit covering on some physicochemical properties and quality of pomegranate fruit cv. Shishe-kab

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### Abstract

**Background and Objectives:** The pomegranate is native to tropical and subtropical regions. Therefore, the intensity of solar radiation and high temperatures in the warm seasons cause physiological disorders and loss of product quality. Therefore, the purpose of this study was to assess the effect of the covering fruit (bagging) and covering time (early July and early August) with different colors of the textile bag (white and light brown) on the physicochemical properties of Shishe-Kab pomegranate cultivar.

**Materials and Methods:** This experiment was performed in Ferdows county, in a randomized complete block design with four replications and five fruits in each replication. Treatments were included: 1) control (non-bagged fruit), 2) fruit covered with a white bag in July, 3) covered with a light brown bag in July, 4) covered with a white bag in August and 5) covered with a light brown bag in August.

**Results:** The results showed that coverage decreased the cracking percentage of fruit so that the highest cracking percentage (56.2%) was observed in non-covered fruits (control) and the lowest (7.03%) in fruits covered with a light brown bag in August. The percentage of aril browning in covered fruits compared to the control showed a significant difference which the highest aril browning (20.13%) gained in covered fruits with a white bag in August and the lowest (1.66%) gained in non-covered fruits. The highest skin lightness was observed in fruits covered by the light brown bag in August and the lowest in fruits covered with the white bag in July. Covering fruit had no significant effects on fruit juice weight, volume and density, fresh weight and thickness of the skin, compared to the control. However, covering time had a significant effect on the juice weight and volume so that the maximum weight and volume of juice was observed in July. Covering fruit reduced juice anthocyanins. Non-covered fruits (control) had the highest amount of anthocyanin and fruits covered with the light brown bag in August had the lowest amount of anthocyanin. Coverage fruit had a significant effect on antioxidant activity reduction of juice. Also, results showed that the highest antioxidant activity was obtained in non-covered fruits and the lowest activity was recorded in fruits covered with a light brown bag in August.

**Conclusion:** Good quality of the product by reducing cracked fruits increase the price of the product and also its marketability. In addition, cracked fruits are unsuitable for the market and storage. Therefore, covering fruit can reduce this disorder to some extent. However, in this study, anthocyanin and antioxidant values which are the most common indicators of nutritional and medicinal of pomegranate fruit reduced by high temperatures and low radiation. Nevertheless, with the proper selection of cover type, color and the covering time and removing time of the bag before harvest, not only a good appearance and quality, but also desirable nutritional and medicinal aspects can be achieved.

**Keywords:** Anthocyanin, Antioxidant activity, Aril browning, Cracking

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## Study of the effect hormone of gibberellic acid and corm weight on vegetative and yield traits of saffron (*Crocus sativus* L.)

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### Abstract

**Background and Objectives:** *Crocus sativus* L. is one of the most important medicinal plants and expensive spice in the world. The export of saffron has made plans for increasing the quantity and quality to compete in the global market is inevitable and will require extensive research anywhere. Therefore, the present study is to investigate the synergistic effects of gibberellic acid and corm weights on vegetative traits and yield of saffron.

**Materials and Methods:** In order to investigate the effect of gibberellic acid and mother corm weights on flower yield and growth characteristics of saffron, a factorial experiment was conducted in a randomized complete blocks design with two levels of gibberellic acid (0 and 20 ppm) and 3 levels of mother corm weights (including groups weighing 0.1-4, 4.1-8 and 8.1-12 gr) in 3 replications at the research farm of Birjand University in 2016.

**Results:** The results showed that mother corm weight was effective on all flowering traits, so that the highest number of flowers, average fresh weight of flowers, average fresh weight cream and average fresh and dry weight of stigma (0.381 g per plant, 37.72% in square meter, 0115 g/plant, 0.025 and 0.0046 g/plant) from the treatment of corm weigh 8.1-12 g and the least of them from corm weighing 0.1-4 grams were observed. Also, the increase in corm weight increased the leaf traits (leaf length, fresh and dry weight of leaves, chlorophyll a, b and total leaf), so that the highest and lowest of these traits were treated with weight 8.1-12 g/g and 0.1-4 g. According to the results of this experiment, it was found that gibberellic acid also had significant effect on most vegetative traits of leaves. For example that the maximum leaf length (32.02 cm), leaf number (6.28), average fresh weight Leaf (0.388 g/plant), chlorophyll a (0.203 mg/mg/ fresh weight) were obtained from gibberellic acid treatment. But, gibberellic acid only significantly affected the flowering traits, which reduced the number of flowers. The results of the interaction of treatments showed that the highest amount of chlorophyll b was obtained in corm weigh 8.1-12 g and consumption of gibberellic acid treatment. Also, the highest mean length of the stigma was obtained from seedlings of weigh 4.1-8 g and no use of gibberellic acid was obtained.

**Conclusion:** According to the results of this study, coarse mother corm weights (8.1-12 g) had positive effects on growth characteristics and yield of saffron, while the use of gibberellic acid only improved the vegetative traits of saffron and influenced the flowering traits of saffron did not have.

**Keywords:** Leaf dry weight, Number of flowers, Total chlorophyll

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