

Research Paper

**Effect of chitosan nano-emulsion and fennel essential oil on antioxidant activity and biochemical contents of black mulberry (*Morus nigra* L.)****Vahid Parvizi<sup>1</sup>, Habib Shirzad<sup>2\*</sup>, Abolfazl Alirezalu<sup>3</sup> and Shirin Rahmanzade Ishkeh<sup>4</sup>**

(Received: Dec. 15, 2019 - Accepted: Mar. 3, 2020)

**Abstract**

The use of edible coatings in increasing storage life and maintaining the quality of horticultural products is considered as a new idea in modern agriculture. Black currant fruits were treated with fennel essential oil at 0, 250, 500 and 750  $\mu\text{L/L}$ , and then treated with nano emulsion of chitosan at 0, 2500 and 5000  $\text{mg/L}$ , and stored at  $4\pm 1^\circ\text{C}$  with 85-95% R.H. The anthocyanin concentration, antioxidant activity, phenylalanine ammonia-lyase (PAL) enzyme activity, pH, total soluble solids and titratable acidity were evaluated on the third, sixth and ninth days of storage. The highest anthocyanin content was recorded in fruit treated with 500  $\mu\text{L/L}$  essential oil and 5000  $\text{mg/L}$  chitosan nano emulsion on day 3th. The highest PAL enzyme activity was seen in fruit treated with the combination of 750  $\mu\text{L/L}$  of fennel essential oil and 5000  $\text{mg/L}$  of chitosan nano emulsion on the 9th day. In addition, the greatest effect on antioxidant activity was seen on day 9th of storage in combination treatment of 750  $\mu\text{L/L}$  essential oil and 5000  $\text{mg/L}$  of chitosan nano emulsion, and it can be said that all treatments were effective in increasing antioxidant activity of the fruit. In general, the results of this research indicate the effectiveness of the studied treatments in significantly increasing the storage life and maintaining the quality parameters of black mulberry fruit during storage.

**Keywords:** Anthocyanin, Antioxidant, PAL enzyme, Phenolic compound

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Research Paper

**Effect of calcium chloride and nano packaging on quality parameters and biochemical compounds of ‘Shishe-Kab’ pomegranates during cold storage****Mehdi Khayyat<sup>1\*</sup>, Sosan Chamani Asghari<sup>2</sup> and Farid Moradinezhad<sup>3</sup>**

(Received: Sep. 5, 2019 - Accepted: Feb. 7, 2020)

**Abstract**

Pomegranate (*Punica granatum* L.) is one of the most important native sub-tropical fruits in Iran. Because high economic importance of the pomegranates, it is very important to maintain the fruit quality after harvest. In this research, the effects of post-harvest treatment with calcium chloride and nano packaging on physicochemical properties of pomegranate fruit including aril and seed weight, peel color, pH, total soluble solids, vitamin C, antioxidant activity, anthocyanin and total phenolics content of ‘Shishe kab’ pomegranate were studied in a factorial completely randomized design with four replications. The first factor was immersion in calcium chloride at different concentrations (0, 0.5, 1 and 2%) and the second factor was a Dekco nano-based polyethylene packaging with non-packaging as control. After two months of storage at  $5 \pm 1^\circ\text{C}$ , the results showed a reduction in aril weight in control, but it was not decreased in  $\text{CaCl}_2$  treated fruit. Moreover,  $\text{CaCl}_2$  decreased the pH, and enhanced the peel color indices and antioxidant activity of the fruit. The highest antioxidant activity and color index was observed in fruit treated with 2% and 0.5 %  $\text{CaCl}_2$ , respectively. The highest amounts of vitamin C content (8700 mg/ 100gr fresh weight) and anthocyanins (377 mg/L) were observed in fruit treated with 2 and 0.5%  $\text{CaCl}_2$ , respectively. The interaction effects of calcium chloride and nano packaging on the amount of total soluble solids was significant and the highest total soluble solids content was recorded in control fruit (17.40 brix).

**Keywords:** Anthocyanin, Antioxidant, Nano-based packaging, Post-Harvest,  $\text{CaCl}_2$ 

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Research Paper

**Evaluation of split root system followed by semi-hydroponic conditions and fungi in peach trees to improve water uptake efficiency in low yield lands****Masoud Nazeri<sup>1\*</sup>, Seyyed Jalal Tabatabaei<sup>2</sup> and Yavar Sharafi<sup>3</sup>**

(Received: Dec. 27, 2019 - Accepted: Mar. 1, 2020)

**Abstract**

The most important factor limiting the production of horticultural crops, especially in countries like Iran, is water deficiency. Application of appropriate methods to increase water efficiency in fruit trees is the most important factor for optimal fruit production. This study was conducted as a factorial randomized complete block design with three replications on 'Redtop' peach trees grafted on GF677. Treatments included placing the bag near to the tree to direct the root to the bag and creating semi-hydroponic conditions that were performed at three levels without bag, one bag, and two bags. Also, to estimate the effects of the split root system in increasing water efficiency, different levels of irrigation were performed at three levels of 50, 75 and 100% of field capacity. Effective fungi inoculation at three levels including no fungus, *Mycorrhiza glumus* and *Trichoderma harizanium* were applied to evaluate the efficiency of water. Physiological and qualitative properties of saplings were evaluated 24 months after planting. The results showed that leaf growth parameters were significantly increased by bag insertion, fungal inoculation and irrigation. One bag placement, 75% irrigation capacity and inoculation of *Trichoderma* increased leaf fresh and dry weights by 62 and 52%, respectively. Fruit diameter and length were increased by 6 and 8%, respectively, in placement of two bags. Bagging was increased sugar content and titrable acidity compared to the control. *Mycorrhiza* fungi enhanced titratable acidity, and *Trichoderma* enhanced fruit firmness up to 9 and 32%, respectively.

**Keywords:** Mycorrhiza, Pumice, Trichoderma, Water efficiency

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Research Paper

## Comparison of nutrient status in different olive varieties with nutrition indicators

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(Received: Jan. 11, 2020 - Accepted: Jun. 1, 2019)

### Abstract

Olive is an important fruit in Iran, but nutritional disorders result in decreased yield. In this study, the nutrient status leaf samples four different olive varieties in Lowshan area of Guilan using DOP, DRIS and CND indexes was investigated. The contents of nitrogen (N), phosphorus (P), potassium (K), manganese (Mn), copper (Cu), zinc (Zn), boron (B) and iron (Fe) in leaf samples were determined. Generally by comparing the mean with deviation from optimum percentage (DOP), most olive cultivars showed a deficiency in terms of N and P macronutrients and B and Cu micronutrients. However, the results showed the excess levels of P and Mn. Except for Fe and Zn, nutrient concentrations showed significant differences in different cultivars. Also, comparison of cultivars for nutrient uptake showed that 'Manzanilla' had significant difference with other cultivars and had the highest nutrient uptake. Comparison of DOP, DRIS and CND results showed that different approaches exist in each index for indicating the excess or deficit status of nutrients.

**Keywords:** Leaf analysis, Manzanilla, Roghani, Shengeh, Zard, CND, DOP, DRIS

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Research Paper

**Effect of putrescine and deficit fertigation on yield and some quality parameters of strawberry fruits (*Fragaria × ananassa* cv. Sabrina) under hydroponic conditions****Feridoun Ahmadi<sup>1</sup>, Mohammad Reza Asghari<sup>2</sup> and Ramin Hajitaghilou<sup>3</sup>**

(Received: Dec. 16, 2019 - Accepted: Feb. 10, 2020)

**Abstract**

Nowadays, for environmental concerns and to ensure the health and safety of the consumers, it is necessary to use safe compounds in food production systems. However, for water shortage and arid environmental conditions it is necessary to decrease water use. In this study, the effect of foliar application of putrescine at 0 and 2 mM and nutrient solutions of 140, 180 and 220 ml /day on 'Sabrina' strawberry fruit quality and yield under hydroponic conditions was investigated. The highest total soluble solids, total phenolics and total antioxidant activity was recorded at 2 mM putrescine with 140 ml nutrient solution per day and the highest values for fruit overall quality yield were recorded in plants treated with 2 mM putrescine under 180 ml nutrient solution per day. However, the highest titratable acidity was obtained in the control fruit (220 ml/day). The results of this study indicate that putrescine application is effective in enhancing strawberry fruit quality and yield parameters under deficit fertigation conditions.

**Keyword:** Antioxidant activity, Fruit quality, Nutrient solution, Plant growth regulators, Soilless culture

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Research Paper

**Effect of effective microorganisms on physiological and biochemical responses of UCB1 pistachio under salinity stress****Abdollah Fazeli Salmani<sup>1</sup>, Gholam Hossein Davarynejad<sup>2\*</sup> and Bahram Abedi<sup>3</sup>**

(Received: Dec. 30, 2019 - Accepted: Mar. 1, 2020)

**Abstract**

A factorial completely randomized design with two factors including effective microorganisms (EM) at 0, 1% and salinity (at 0.7, 5, 10 and 13.6 dS/m) was conducted in three replication on one year old seedling of pistachio to study the effect of EM on the physiological and biochemical characteristics and nutrient uptake in UCB1 pistachio under salinity stress. Pistachio seedlings have been studied three months after salinity application. The results showed that increasing salinity decreased leaf relative water content, chlorophyll a and b and nitrogen, phosphorus, potassium and calcium content of leaf; it but increased proline, soluble sugars and sodium and chlorine content compared to the control treatment. Results of EM application showed that 1% concentration of this fertilizer increased resistance of UCB1 to salinity stress. Also, the interaction effects of salinity and EM on the relative content of leaf water, proline, chlorophyll b, soluble sugar and nitrogen, phosphorus, potassium, sodium and leaf chlorine were significant. The maximum relative content of water in leaf (87.13%), chlorophyll a (5.83mg/g FW), chlorophyll b (2.93mg/g FW), nitrogen (3.21%), phosphorus (0.25%), potassium (2.69%) and minimum content of sodium (7.90%) and chlorine (12.73%) was observed in treatment with 1% EM and salinity 0.7 dS/m. Based on the results of this study, application effective microorganism can reduce the damages of salinity stress.

**Keywords:** Chlorophyll, EM, Nutrients, Proline, Salinity

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Research Paper

**Design and manufacturing a date palm harvesting machine and comparing it with traditional method of date harvesting****Danial Mahmoodabadi<sup>1</sup> and Mohammad Ali Rostami<sup>2\*</sup>**

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**Abstract**

To evaluate the traditional harvesting and machine harvesting from the ground method without a need for climbing the tree, a machine was manufactured and evaluated. The maps were plotted using Rhinoceros 3D software and the device was made based on these maps. The main parts of the machine included a telescopic handle, a cluster lever, a date transfer shot, a ring and a telescopic handle. To evaluate the performance of this machine, tests were performed in a date palm orchard with three replications. Experimental treatments consisted of, date palm harvesting using the machine made in this study and traditional (manual) harvesting methods. The studied parameters were: time needed for harvesting date palm, amount of date palms felled on the ground, amount of date palm lost, total date harvested, and amount of date packed in three folds (three stages of date harvest). Result of t-student test showed that date harvesting method had a significant effect on the time taken for harvest, the amount of date spilled on the soil and wasted dates ( $p \leq 0.01$ ). Harvesting the dates with the machine made in this study resulted in a 43% reduction in harvest time. The amount of wasted dates in machine and manual methods were 0.7 and 2.68%, respectively, indicating a 57% reduction in the dates spilled on the ground and a 75% decrease in the wasted dates. Harvesting capacity by workers was 274.7 kg or 45.3 cluster in one hour and 474.9 kg or 80.2 cluster in hour by machine.

**Keywords:** Date harvesting, Machine, Palm, Waste

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Research Paper

**Effect of plant spacing and primocane number on photosynthesis and yield indices of Thornless blackberry (*Rubus fruticosus* agg.)****Mehdi Hadadinejad<sup>1\*</sup>, Alireza Effati<sup>2</sup> and Kamran Ghasemi<sup>1</sup>**

(Received: Nov. 26, 2019 - Accepted: Jun. 1, 2020)

**Abstract**

Optimal management of environmental factors, especially sunlight, in the trellis type cultivation of raspberry is one of the ways to increase the yield and quality of the crop. In order to investigate the effect of planting distance and number of vegetative branches on photosynthetic parameters and yield of Thornless blackberry, a factorial randomized complete block experiment with 4 replications was conducted in the four-year-old commercial garden of blackberry, located in Sari. Treatments were row spacing at two levels of 1.5 and 2.5 meters and the number of vegetative branches per plant at two levels of 4 and 6 branches. The results of mean comparison showed that the highest area of five leaves (140.6 cm) was belonging to the planting distance of 2.5 m and four branches. The highest production of branches and plants was observed in planting distance of 2.5 m (1.74 and 8.65 kg), respectively. Fruits harvested from plants with planting distance of 1.5 m had the highest amount of total anthocyanin, antioxidant activity, fruit size and the highest rate of photosynthesis (with an average of 5.58  $\mu\text{mol}/\text{m}^2\cdot\text{s}$ ). Also, the lowest leaf temperature (32.5 °C) was recorded in this treatment. According to the results of his study, by reducing the distance between the raspberry plants, reducing the leaf temperature leads to an increase in photosynthesis rate and potential yield per branch. Conversely, at greater planting intervals, an increase in the number of branches is necessary to compensate the density and thus increase the total yield per hectare.

**Keywords:** Anthocyanin, Density, Floricane, Fruit size, Leaf area

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Research Paper

## Investigation of pomological and morphological diversity of apple in Sistan region

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and Mehdi Aran<sup>5</sup>

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### Abstract

This research was conducted to determine the characteristics and germplasm grouping of different genotypes of apples grown in Sistan and Baluchestan province. 25 apple genotypes were collected from four regions of Hamoon, Bonjar, Imamieh and Zahedan and morphological and pomological traits were evaluated. Means comparison of data showed that there was a genetic diversity between the genotypes in terms of quantitative traits, especially the annual shoot diameter, leaf blade length, width of the eye socket and pedicel cavity, pedicel thickness and length, and fruit length and width. The means for these traits were higher in Zahedan genotype than that of Zabol genotypes. In terms of pomological traits, the genotypes had a considerable diversity. Correlation analysis between traits showed a positive and significant correlation between pedicel thickness with pedicel length (0.65), fruit width (0.76), fruit weight (0.48) and also between annual shoots diameter (0.61) with the width of the eye socket (0.83), depth of eye basin (0.84) and fruit length (0.72).

**Keywords:** Correlation of traits, Fruit, Genetic diversity, Germplasm, Morphological traits

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Research Paper

**Effects of radiation reflectants on the oil content and fatty acids profile of ‘Mary’ olive cultivar****Javad Mahzoon<sup>1</sup>, Yavar Sharafi<sup>3\*</sup> and Seyyed Jalal Tabatabaei<sup>2</sup>**

(Received: Dec. 25, 2019 - Accepted: Apr. 29, 2020)

**Abstract**

Due to the lower water requirement than other fruit trees, olive (*Olea Europea L.*) is one of the most important horticultural crops grown in most parts of Iran especially in arid and semi-arid subtropical regions. Because of the arid and semi-arid climatic conditions of Iran, it is important to use methods to reduce the water consumption of fruit trees. The purpose of this study was to investigate the effect of some radiation reflectants and shading net on the oil properties and fatty acid composition of ‘Mari’ olive cultivar. The experiment was conducted in a completely randomized design with eight treatments including talc, zinc oxide, silica, kaolin, TSZ (talc, silica and zinc oxide), TSZK (talc, silica, zinc oxide and kaolin), shading net and control in three replications. The results showed that spraying with radiation reflectants reduced the amount of palmitic acid (C18: 0), linoleic acid (C18: 2), linolenic acid (C18: 3), and total saturated fatty acids (SFA). Whereas the amount of oleic acid (C18: 1), unsaturated fatty acids (UFA) also, increased total monounsaturated fatty acids (MUFA) and oleic acid to linoleic acid ratio. In general, the anti-transparent increased the oil content by reducing fruit temperature, improving the fatty acid composition of the oil and by enhancing the monounsaturated fatty acids, especially oleic acid. Due to the positive effect of reflectants on fruit quality and oil content, by reducing leaf and fruit temperature, foliar application of these compounds can be recommended in olive growing systems in hot and dry areas.

**Keywords:** Fatty acids profile, Oil content, Olive, Radiation reflectants

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Research Paper

## Estimating the breeding value of some pomological traits in grape cultivars of West Azarbaijan

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### Abstract

In a breeding program, it is important to know gene action, because knowledge in this field helps the researchers in their crossing programs and effective selection. In this study, breeding values of 14 traits (TSS, pH, TA, berry weight, flesh weight, single seed weight, seed number, juice content, pollen germination, cluster length, cluster width, cluster weight, fruit set in open and under controlled pollination) in 45 grape cultivars from West Azerbaijan were predicted using the best linear unbiased prediction (BLUP) procedure. Considering the sum of ranks of the breeding values of all the studied traits, Agh Shani, Qara Shani, Lal Qermez, Angotka, Qzl Ouzum, Taifi, Tabarze Qermez and Sahebi Qermez cultivars had the highest rank. Among the studied seedless cultivars, Rejin in terms of single seed weight and Keshmeshi Sefid in terms of seed number had the highest breeding values. Among the seeded cultivars, Shirazi in terms of single seed weight and Chava-Ga in terms of seed number had the highest breeding values. Taifi, Sahebi Qermez, Sarghola, Chava Ga, Gazandaii and Qzl Ouzum cultivars with high and positive breeding values for berry weight, flesh weight and juice content can be used as a good parent for breeding of these traits in crossing programs because they can better transfer their characteristics to their offspring. At-Ouzum, Rishbaba Qermez, Shahroudi, Sahebi Qermez, Tabarze Qermez, Dastarchin, Lal Qermez, Alhaghi, Agh Shani and Angotka cultivars had positive and high breeding values for cluster length, cluster width and cluster weight traits, so they can be introduced as suitable parents for breeding of these traits in breeding programs.

**Keywords:** Additive effects of gene, Grape, Heritability, Mixed linear model, Molecular markers, Quantitative genetic

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Research Paper

**Evaluation of phenotypic diversity of nut and kernel characteristics in some almond cultivars and promising genotypes****Seyed Asghar Mousavi<sup>1\*</sup>, Mahmood Ghasemnezhad<sup>2</sup>, Maryam Tatari<sup>3</sup>  
and Safoura Eskandari<sup>4</sup>**

(Received: May. 15, 2019 - Accepted: Aug. 18, 2019)

**Abstract**

To evaluate the morphological diversity of some almond cultivars and genotypes, an experiment was carried out on 35 Iranian and foreign almond genotypes. Thirty-eight quantitative and qualitative characteristics of nuts and kernels of almond trees were evaluated. Analysis of variance and means comparisons showed that all of the characteristics in examined cultivars were significant, showing high variability in these cultivars and their characteristics. Results of simple correlation analysis indicated the existence of significant, positive and negative correlations among some important traits. Cluster analysis showed that, in Euclidean distance of 15, all cultivars and genotypes divided in to 2 main branches. With decrease in Euclidean distance from 25 to 5, the cultivars and genotypes were divided to 8 main sub clusters. Cluster analysis showed that nut length, kernel length, kernel weight, nut weight, shell thickness and hardness, dispermous kernel percentage, patterns of outer shell and suture opening of shell were the main characteristics that separated the genotypes. According to results, 'Shahrood 13', 'Shahrood 21', 'Shahrood 6', 'Sefied', 'Premorski', 'Yalda', 'Shahrood 10', 'Shahrood 12', 'Mamaei', 'Shahrood 7', cultivars, and also 'AIM2', 'AIM1', 'GM1', 'AHN2', 'AHN1', and 'AHYU' genotypes were better than other cultivars and genotypes.

**Keywords:** Almond, Morphological traits, Correlation, Cluster analysis, Factor analysis

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