

## The effect of putrescine and heat treatment on postharvest quality of pear fruit (*Pyrus communis* cv. Spadona)

Marjan Sadat Hosseini<sup>1</sup>, Mesbah Babalar<sup>2\*</sup> and Mohammad Ali Askari<sup>3</sup>

1, 2, 3, Former M.Sc. Student, Professor and Assistant Professor, University College of Agriculture and Natural Resources, University of Tehran, Karaj, Iran

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### ABSTRACT

In this study, the effect of pre- and post-harvest treatment of putrescine as well as heat treatment were evaluated on quality and storage life of pear fruit "Spadona". The factorial experiment was conducted using a completely randomized design of three replications. During growth season, fruits were sprayed with four levels of putrescine (0, 0.5, 1, 2 mM) at three stages including 30, 60 and 90 days after full-bloom. After harvest, the same fruits were dipped in the putrescine (at the same concentration of pre-harvest treatment), and hot water at 3 levels (40, 50°C and control) for 5 min. After treatment, fruits were stored for 21 weeks at  $0\pm 1^\circ\text{C}$  and 80-85% relative humidity. During the storage period, fruits were carried out every three weeks and some of their qualitative and quantitative traits such as weight loss, firmness, pH, titrable acidity, total soluble solids, flavor index were measured. Result showed that the application of 1 and 2 mM putrescine treatments during pre- and post-harvest, maintained fruit firmness, decreased weight loss from fruit skin, and retarded changes in pH as well as titrable acidity compared to the control. Also, TSS and flavor index were higher at beginning of experiment in the treated fruits while at final stages, TSS was increased compared to the control. Heat treatment at 40 and 50 °C for 5 min increased TSS and fruit flavor index, but did not affect weight loss, fruit firmness, pH and titrable acidity.

**Keywords:** pear (*Pyrus communis*), polyamine, hot water, storage.

## Using vermicompost and fall fertilization for improving quality characteristics of strawberry cv. Camarosa (*Fragaria* × *ananassa* Duch. cv. Camarosa) in soilless culture

Samira Bidaki<sup>1</sup>, Vida Chalavi<sup>2\*</sup> and Hemmatollah Pirdashti<sup>3</sup>

1, 2, Former Graduate Student, Assistant Professors, Sari Agricultural Sciences and Natural Resources University, Sari, Iran, 3, Associate Professor, Sari Agricultural Sciences and Natural Resources University, Genetics and Agriculture Biotechnology Institute of Tabarestan

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### ABSTRACT

The use of vermicompost and fall fertilization in soilless culture on strawberry cv. Camarosa quality characteristics was evaluated in a factorial based on completely randomized design pot experiment with 5 replicates. Experimental treatments were four chemical fertilization timings (no fertilizer, using fertilizer at fall, spring, fall + spring) and three levels of vermicompost (10, 20 and 40% v/v), three levels of cattle manure (10, 20 and 40% v/v) and control medium (50% peat: 50% perlite). The total number of pots in this experiment was 140. The results showed the highest total soluble solids (TDS), 13.35%, and titratable acidity, 8.54%, on growing medium containing 10% cattle manure with spring fertilization. Likewise, the highest fruit firmness (0.43 kg/cm<sup>2</sup>) was observed in growing medium containing 10% cattle manure with fall + spring fertilization. The total antioxidant activity was obtained using the DPPH (2, 2-diphenyl-1-picrylhydrazyl). The total antioxidant capacity was increased in medium containing 10% vermicompost with spring fertilization, 20% cattle manure with fall fertilization and 40% cattle manure without fertilization (95.18, 95.34, and 95.47%), respectively. The highest anthocyanin (18.84 mg/l) was produced in growing medium containing 40% vermicompost with fall fertilization. It can be concluded that an appropriate choice of growing media and fertilization timing can alter different qualities of strawberry fruits according to production goal and type of consumption. The finding of present study showed that the selection of right growing media and fertilization timings could improve strawberry fruit quality.

**Keywords:** strawberry, vermicompost, fertilization timings, manure, soilless culture.

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\* Corresponding Author E-mail: v.chalavi@sanru.ac.ir

Tel: +98 9111562699

## **An investigation of type and state of culture medium and date of ovule and embryo separation on embryo rescue success in grapevine cv. flame seedless**

**Ali Ebadi<sup>1\*</sup>, Mostafa Aalifar<sup>2</sup>, Mohammad Reza Fattahi Moghaddam<sup>3</sup>,  
and Asghar Estaji<sup>4</sup>**

1, 2, 3, 4, Professor, Former M. Sc. Student, Associate Professor and Former M. Sc. Student ,  
University College of Agriculture and Natural Resources, University of Tehran, Karaj, Iran

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### **ABSTRACT**

Flame Seedless is one of the most important and commercial table grape cultivar that is used for breeding program due to its specific characteristics of fruit high production. In order to breed new seedless grape cultivars and with considering importance of selecting seedless varieties as a female parent to increase the production rate of seedless offspring in a breeding cycle, embryo rescue technique was used. In this study, effect of ER and NN media with solid and double-phase states and three ovule culture time (35, 45 and 55 days after pollination) as well as different date for separation of embryos out of ovule (8 and 10 week after ovule culture) were studied on embryo development stages (globular, heart, torpedo and polyembryos), embryo germination and plant production in grapevine cv. Flame Seedless. Results showed that separation of ovules from berry in 55 days after pollination and their culture in NN medium with double-phase state as well as embryo dissecting at 10 weeks after ovule culture had positive and significant effect on measured traits.

**Keywords:** double-phase medium, stenospermic and ovule culture.

## Effect of thiosulfate, salicylic acid, humic acid and nano silver on physico-chemical characteristics of cut narcissus flower

Esmail Chamani<sup>1\*</sup> and Zahra Sadat Nabavi Mohajer<sup>2</sup>

1, 2, Associate Professor and Former M.Sc. Student, College of Agriculture, University of Mohaghegh Ardebili, Ardebil, Iran

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### ABSTRACT

In order to study the effects of Silver Thiosulfate (0.02, 0.05, 0.1 and 0.2 mM), Humic Acid (100, 500 and 1000 mg l<sup>-1</sup>), Nano Silver (5, 10, 25 mg l<sup>-1</sup>), Salicylic Acid (1, 2 and 4 mM) and Sucrose (1%, 2.5% and 5%) on the vase life and some qualitative characteristics of cut *Narcissus var Duch Master* flowers, two experiments were conducted in postharvest laboratory of Mohaghegh Ardebili University. This experiment carried out based on completely randomized design used 5 replications. The results of experiments revealed that different treatments significantly ( $P < 0.05$ ) affected all measured traits. Mean comparison showed that STS at rates of 0.1 and 0.2 was the best treatment at all measured traits compared to control. The results of second experiment revealed that, the highest and lowest flower vase life were related to STS and control, respectively. Sucrose at all concentrations also enhanced flower vase life and the highest effect was related to 2.5% sucrose. Nano silver positively increased flower vase life compared to control with best effects at 1 to 10 mg/l. STS tends to maintain relative fresh weight compared to control and other treatments at all concentrations. In final day, mean comparison showed that plants treated by STS at rates of 0.25 and 0.75 mM and nano silver at rate of 5 mg/l and 2.5% sucrose had the higher solution uptake. Results showed that ethylene significantly decreased flower vase life. The results also revealed that *Narcissus* is sensitive to ethylene.

**Keywords:** narcissus *Duch master*, vase life, fresh weight, salicylic acid, humic acid, silver thiosulfate and sucrose.

## Genetic study of Persian shallot (*Allium hirtifolium* Boiss.) using morphological and molecular markers

Rahele Ebrahimi<sup>1</sup>, Mohammad Reza Hassandokht<sup>2\*</sup>, Zabih-o-lah Zamani<sup>3</sup>,  
Abd-olkarim Kashi<sup>4</sup> and Izabel Roldan-Ruiz<sup>5</sup>

1, 2, 3, 4, Former Postgraduate Student, Associate Professor, Professors, University College of Agriculture and Natural Resources, University of Tehran, 5, Institute for Agricultural and Fishers Research (ILVO), Plant Sciences Unit, Caritasstraat 21, 9890 Melle, Belgium  
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### ABSTRACT

In this research work, genetic diversity of 21 wild Persian shallot (*Allium hirtifolium* Boiss.) accessions from south, southwest, west and center of Iran was evaluated using morphological traits as well as AFLP markers. Results showed that Khansar accession had the highest leaf width (5.42 cm), mean leaf number per plant (5.41), bulb diameter (10.84 cm), bulb height (4.95 cm) and mean bulb weight (122.5 g) which was the suitable accession for domestication and culturing. Based on cluster analysis, studied accessions were divided into three groups according to their morphological characters which mostly had coincidence with geographical distribution. Molecular survey by AFLP markers was done using four primer combinations of *EcoRI* and *MseI* with three selective nucleotides. In molecular analysis 376 bands were obtained in which 204 bands were polymorphic (53.28%). Based on dendrogram from molecular data, Persian shallot accessions at 70 % similarity was divided into five groups which mostly showed coincidence with geographical distribution. Also Kazerun accession from warmer southern region of Iran had obvious genetical differences with accessions from colder northern regions. Results showed that AFLP technique is a suitable tool for evaluation of genetic diversity for Persian shallot accessions.

**Keywords:** AFLP, genetic diversity, landrace, cluster analysis, domestication.

## Effects of concentration and spraying time of phenyl-phethalamate acid (Auxin Synergist) on yield of tomato, cucumber, eggplant and cabbage under field conditions

Roghayeh Javanpour<sup>1\*</sup>, Seyed-Zia Nosrati<sup>2</sup> and Meysam Nejadsahebi<sup>3</sup>

1, 2, 3, Members of the scientific board of the Iranian Academic Center for Education, Culture and Research (ACECR), University of Tehran, Karaj, Iran

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### ABSTRACT

To determine effects of phenyl-phethalamate acid on yield and yield components of tomato, cucumber, eggplant and cabbage, this experiment was investigated in a randomized complete block design with three replications in the spring and summer of 2010. Treatments included the time and number of foliar spraying with phenyl-phethalamate acid (1000 ppm). Control plants were not sprayed. The first step of foliar spraying was the start of flowering. Next sprays were repeated three times and 4 times for cucumber 15 days intervals. According to results, foliar spraying at flowering time had the highest effects on fruit numbers (73 fruits), yield per plant (5 kg) and yield per area (10 kg/m<sup>2</sup>) in tomato. In cucumber, the highest fruit numbers (41 fruits) and yield per plant (6.4 kg/m<sup>2</sup>) was observed in flowering stage. The highest fruit number (6.7 fruits), mean fruit weight (447.3 g fruit<sup>-1</sup>) and yield per plants (3 kg/plant) was observed in eggplant with application of phenyl-phethalamate before flowering as well as 2 weeks later. In cabbage, foliar spraying at transplanting time, 2 and 4 weeks later, produced the largest heads (2.4 kg head<sup>-1</sup>) and the highest plant total weight (3.68 kg F.W.).

**Keywords:** flowering, fruit-bearing vegetables, growth regulator.

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\* Corresponding Author E-mail: javanpoor@ut.ac.ir

Tel: +98 9123623224

## Effect of a biotic elicitor and nano elicitor on some alkaloids production in *Papaver somniferum* L.

Mahdiyeh Khodayari<sup>1</sup>, Mansoor Omidi<sup>2\*</sup>, Ali Akbar Shahnejat Bushehri<sup>3</sup>,  
Darab Yazdani<sup>4</sup>, Mohammad Reza Naghavi<sup>5</sup> and Zohreh Kadkhoda<sup>6</sup>

1, 2, 3, 5, Former Graduate Student, Professor, Associate Professor and Professor, University  
College of Agriculture and Natural Resources, University of Tehran, Karaj, Iran

4, 6, Assistant Professor and Expert, Department of Pharmacognosy and Pharmaceutics,  
Medicinal Plants Research Center, Institute of Medicinal Plants, ACECR, Karaj, Iran

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### ABSTRACT

To develop an optimal bioprocess for benzophenanthridin alkaloids production, various metabolite engineering are studied to increase yields, in which one of them is elicitation. Elicitors are biotic or abiotic molecules that have effectively stimulated the production of plant secondary metabolites in cell and organ cultures. Since this plant serves as the only commercial source of morphine and sanguinarine production and chemical synthesis of those alkaloids are not economically feasible, therefor, in this study, after selection of the best media and explant, the effects of two elicitors, nano TiO<sub>2</sub> and yeast extract, were studied at different time points (24 and 48h) following treatments on sanguinarine and thebaine production in meristem and root suspension cell cultures. This research was conducted using a randomized complete design with factorial arrangement and three replications. It was observed that these elicitors had the positive effect on accumulation of sanguinarine and thebaine. Elicitation with yeast extract at 48h intervals enhanced the accumulation of sanguinarine (2.2 times) and thebaine (3.4 times) compared to the control. Treatment of nano TiO<sub>2</sub> in 24h increased both alkaloids (2.1times) which decreased over the time. This study showed the higher excitability of meristemic cells compared to the root suspension cell culture. Therefore, due to the more provoking and increasing effects on sanguinarine and thebaine content throughout the study, these elicitors and in particular nano one are proved to be promising and suitable candidate for elicitation in both meristem and root cell suspension cultures.

**Keywords:** thebaine, sanguinarine, nano tio<sub>2</sub>, yeast extract.

## Effect of arbuscular mycorrhizal fungi and *Pseudomonas fluorescence* on vegetative growth of pistachio seedlings (*Pistacia vera* cv. Qazvini) under four different irrigation regimes

Afsaneh Shool<sup>1\*</sup>, Mohammad Hossein Shamshiri<sup>2</sup>, Abdolreza Akhgar<sup>3</sup>  
and Majid Esmailizadeh<sup>4</sup>

1, 2, 3, 4, Former M. Sc. Student, Assistant Professors, College of Agriculture, University of  
Vali-e-Asr Rafsanjan, Rafsanjan, Iran

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### ABSTRACT

In order to investigate the symbiotic effect of arbuscular mycorrhizae (*Glomus mosseae*) and a bacteria (*Pseudomonas fluorescence*) on vegetative growth of pistachio seedlings (*Pistacia vera* cv. Qazvini) under drought stress, a greenhouse experiment was conducted using four drought stress levels (100% FC as control, 75, 50 and 25% FC) and four levels of biofertilizers (non mycorrhizal and non bacterial plants as control, mycorrhizal treatment, bacterial treatment and a mixed treatment of both). In the experiment, application of bacteria in different drought stress levels could not affect root colonization with mycorrhizae whereas increase in root colonization percentage was observed along with increase in drought intensity. The highest values of leaf area and number, stem height and dry weight of leaf and stem were obtained with 50% FC in comparison with control. Root length was increased with increase in drought stress levels. Dry weight of stem, root length and leaf area were more in mycorrhizal and mixed treatments in comparison with control. The least values of leaf area and number, stem diameter, root length and stem dry weight were observed in bacterial treatment in comparison with control. Root volume and dry weight were maximum in bacterial treatment with a significant difference with control. Totally, it can be concluded that the mixed treatment had the most effect on vegetative growth of pistachio seedling under different drought stress levels and from drought point of view, 50% FC was the best treatment which improved the most vegetative growth parameters.

**Keywords:** arbuscular mycorrhiza, drought stress, *Pseudomonas fluorescence*, Qazvini pistachio.

## **Analysis of lignin in seeds and peroxidase and laccase enzymes activity in the arils of some soft- and hard-seed pomegranate genotypes at different fruit developmental stages**

**Abdolkarim Zarei<sup>1</sup>, Zabihollah Zamani<sup>2\*</sup>, Reza Fatahi<sup>3</sup>, Seyed Alireza Salami<sup>4</sup>  
and Amir Mousavi<sup>5</sup>**

1, 2, 3, 4, Former Post Graduate student, Professor, Associate Professor and Assistant Professor,  
University College of Agriculture, University of Tehran, Karaj, Iran

5, National Institute of Genetic Engineering and Biotechnology (NIGEB), Iran

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### **ABSTRACT**

In order to study seed hardening process in pomegranate, some of the relevant biochemical parameters were evaluated in fleshy part of arils or seeds in various soft and hard seeded pomegranate genotypes from the initial fruit set upto ripening stages. Lignin was determined from the seeds and enzyme assays were performed on the flesh of arils. Analysis of variance revealed significant differences among different genotypes and stages. At the first stage that the seeds of all genotypes were soft, the peroxidase activity was relatively high and decreased in the second (start of the seed hardening in hard seed genotypes) and third stages. Thereafter, at the final stages, it increased in the hard seed genotypes (four times of that in soft seed genotypes), whereas remained low in the soft seed ones. Laccase activity during the growing season had a non predictable trend and did not show much differences in the soft and hard seed genotypes, although in most of the genotypes, its activity decreased at the last stage. In the soft seed genotypes, total protein was in the highest value at the early stage, and decreased at the second stage, then in the next stages, after a little increase, reached to a constant amount. In the hard seed genotypes, the total protein decreased until the third stage, afterward increased to the ripening. The protein content of soft and hard seed genotypes in the last stage of sampling reached to the same value. Lignin content of pomegranate seeds increased gradually during different stages, and the soft seed genotypes had less lignin in their seed compared to the hard seed ones. According to the results, considerable differences that were observed in the peroxidase activity at the last sampling stage, and higher activity that observed in peroxidase than laccase (at least 10,000 times), may indicate a main role for this enzyme to make differences in the seed hardness of pomegranate.

**Keywords:** aril, peroxidase, laccase, lignin, biochemical parameters.

## Variation in the Essential oil of *Artemisia annua* L. Apical Shoots at Different Developmental Stages

Reza Bovard<sup>1\*</sup>, Shams Ali Rezazadeh<sup>2</sup>, Mohammad Reza Naghavi<sup>3</sup>, Mansour Omid<sup>4</sup>, Sepide Torabi<sup>5</sup>, Saeed Parvane<sup>6</sup>, Farhad Hariri Akbari<sup>7</sup> and Rahim Taghizad Farid<sup>8</sup>

1, 5, Former M. Sc. Students, Faculty of Agriculture, Islamic Azad University, Research and Science branch, Tehran, Iran, 2, Faculty Members, Department of Pharmacognosy, Institute of Medicinal Plants, Jihad Daneshgahi, Karaj, Iran, 3, 4, Professors, University College of Agriculture and Natural Resources, University of Tehran, Tehran, Iran, 6, Former M. Sc. Student, Faculty of Agriculture, Zabol University, 7, Former M. Sc. Student, Islamic Azad University, Shahre Qods Branch, Iran, 8, Former M. Sc. Student, Faculty of Basic Sciences, Islamic Azad University, Shahre Qods Branch, Iran

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### ABSTRACT

*Artemisia annua* is a medicinal annual herb that widely distributed in Asia, Europ, North America, and also is grown in north reagions of Iran. In this study, variation in the quantity and quality of the essential oil of *A.annua* apical shoots at different developmental stages including vegetative, early flower opening and full flowering stages is reported. The obtained oils by hydrodistilation of dried samples were analyzed by GC and GC/MS. The maximum percentage of oil was in full flowering stage. 29, 28 and 28 compounds were identified in the oils of apical shoots in vegetative, early flower opening and full flowering plants, respectively. The major components of the branches essential oils were similar in all stages which included camphor, beta-selinene, 1,8-cineole,  $\alpha$ -pinene, caryophyllene oxide, borneol, comphene, Artemisia ketone. Results showed that the essential oil of *A.annua* apical shoots were rich in monoterpenes. 64.3%, 63% and 67.6% of the total identified compounds were monoterpens in vegetative, early flower opening and full flowering stages, respectively. Results also indicated a few variation in kind of compounds, while the percentage of compounds were various relatively.

**Keywords:** *Artemisia*, *Artemisia annua*, GC, GC/MS.