



Effect of Shoot Girdling, Fruit Thinning and Foliar Application of Urea, Zinc Sulfate and Sucrose on Yield, Leaf Chlorophyll Content, Photosynthesis Rate and Nut Quantitative Characteristics of Pistachio cv. 'Ohadi'

M. Esmailizadeh^{1*} - A.R. Talaie² - H. Lesani³ - A. Javanshah⁴ - H. Hokmabadi⁵

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Abstract

In order to prevent of inflorescence bud abscission and reduce of alternate bearing in pistachio cv. 'Ohadi' an experiment with 12 treatments including of girdling, fruit thinning, application of urea (0.5%), sucrose (3 and 5%) and their combination with urea, zinc sulfate (0.05 and 0.1% of pure zinc) and also their combination with urea in 3 replication and during 2 stages, was conducted in 2007 and 2008. The treatments were applied in two different stages of fruit growth and development including: 1- Initiation of rapid growth of nut endosperm and 2- Endosperm completion and initiation of rapid nut embryo growth. The results showed that girdling reduced inflorescence bud abscission, leaf chlorophyll content and photosynthesis rate significantly, but it didn't have any effect on qualitative and quantitative nut characteristics. The other treatments increased kernel weight and nut dehiscent and reduced ounce (No. of nuts per ounce), blankness, nut deformity and inflorescence bud abscission, but they didn't have any effect on early splitting. With the exception of zinc sulfate treatments, the others increased leaf chlorophyll content, meanwhile sucrose or combination of sucrose with urea reduced photosynthesis rate, but the other treatments increased it.

Keyword: Blankness, Dehiscence, Alternate bearing, Photosynthesis, Chlorophyll

1- Assistant Professor, Department of Horticulture, Faculty of Agriculture, Vali-E-Asr University, Rafsanjan, Iran
(*- Corresponding Author Email: esmaeilizadeh@vru.ac.ir)

2, 3- Professors, Department of Horticulture, Faculty of Agriculture, Tehran University, Tehran, Iran

4, 5- Assistants Professors, Pistachio Research Institute, Rafsanjan, Iran



The Investigation of Factors Influencing on Postharvest Longevity of Tuberose Cut Flower cv. Pearl on (*Polianthes tuberosa* cv. Pearl)

S. Jozghsemi¹- S. N. Mortazavi^{2*}- M. Khodadadi³

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Abstract

The Tuberose cut flower is much less longevity in postharvest. The less vase life due to stress of deficit carbohydrate and quick respiration on inflorescence. In this study, effectiveness factors, sucrose, CaCl₂, Al₂SO₄ and re-cut the stems. In current research two separate experiments were arranged as a factorial based on completely randomized design. The first experiment were added to all experimental units have 100 ppm Al₂SO₄ and investigation the effect of sucrose and CaCl₂ factors. In the other experiment was added in all treatments of suitable solution that obtain from first experiment (3.5 percent Sucrose and 200 ppm CaCl₂) and investigation the effect of Al₂SO₄ and re-cut stems factors. The vase life of cut flower, relative water content(RWC), a, b and total chlorophyll content were evaluated. The results of first experiment indicated the effect of reciprocal treatment with sucrose (3.5 %) and CaCl₂ (200 ppm) increased significantly on the protection of a, b and total chlorophyll content and RWC, and increased the longevity at the time 16 days about 88 percent. The result of secondary experiment showed that the third important cause of reduced longevity of tuberose cut flower high susceptibility to blockage xylem, and treatment with protection solution containing 3.5 % sucrose and 200 ppm Al₂SO₄ and spray 200 ppm CaCl₂ and Re-cut every 48 hours were recommended for using to dissolve problems of post harvest the Tuberose cut flower.

Keywords: Tuberose, Chlorophyll, Sucrose, Al₂SO₄, CaCl₂

1- PhD Student Horticultural Science, Azad University of Tehran, Iran

2- Assistant Professor of Horticultural Department, Agricultural College, Zanjan University

(*- Corresponding Author Email: Mortazavi46@gmail.com)

3- Assistant Professor, Agricultural Research Center of Karaj



Effect of carbon dioxide injection to root zone on the growth and nitrate accumulation in two cultivars of lettuce (*Lactuca sativa* L. cv. Capitata and Sativa)

M. Rahmnpourazar^{1*} - S.J. Tabatabaei² - S.A. Bolandnazar³

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Abstract

Nitrate is an essential component for plants and vegetables are of the most important source of nitrate for human being. It is estimated that vegetables provide 92 % of nitrate for human nutrition. The positive and negative effects of elevated root zone CO₂ on growth and yield of some plants have been reported. This study has been conducted in order to examine the effect of root zone CO₂ on growth and nitrate accumulation in lettuce. The experiment was conducted as a completely randomized design with four levels of CO₂ (0, 200, 400 and 600 ml per minute) and with five replication on two cultivars of lettuce (Sativa and Capitata). The study performed in floating system and aeration was supplied by air pump. The results showed that injection of CO₂ had significant effect on the fresh and dry weight of leaves, stems and roots of plants. By increasing the concentration of CO₂ fresh and dry weight of leaves, stems and roots increased in both cultivars. Photosynthesis efficiency increased in both cultivars in the treatment of 400 ml/min root zone CO₂. The influence root zone CO₂ significantly decreased nitrate content in leaves of lettuce. Nitrate concentration in the leaves of lettuce was decreased by injection of root zone CO₂ in *L.sativa*. var. Capitata in the treatment of 400 ml/min and in *L.sativa*. var Sativa in the treatment 600 ml/min. respectively by 27% and 47.6%. With increasing input root zone CO₂ increased activity of nitrate reductase enzyme in both cultivars that showed highest content in treatment 400 ml/min.

Keywords: CO₂, Nitrate, Nitrate Reductase, Photosynthetic Efficiency, Lettuce

1 - MSc Graduated of Horticulture Department, University of Tabriz
(* - Corresponding Author Email: m.rahmnpour@gmail.com)

2, 3- Professor and Assistant Professor Horticultural Sciences Department, University of Tabriz



Effect of Putrescine on Postharvest Quality, and Phenolic Compounds and Antioxidant Capacity of Broccoli (*Brassica oleracea* L. cv. Italica) Florets

F. Jafarpour¹- D. Bakhshi^{2*} - M. Ghasemnezhad³- R. Hassan Sajedi⁴

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Abstract

In this study, effect of exogenous putrescine on maintaining postharvest quality and antioxidant compounds of two broccoli cultivars, 'General' and 'Liberty' during cool storage were investigated. Broccoli branchlets were treated with 0.5, 1 and 1.5 mM Putrescine. Distilled water was used as control. Treated florets were put into polyethylene bag and transferred to storage with 0°C and 90% RH. Weight loss, total chlorophyll, total phenols and catechin and chlorogenic acid were determined after 40 days of cool storage and kept 2 additional days in room temperature. Results showed that 1.5 mM putrescine treatment prevented weight loss, delayed chlorophyll degradation and senescence and improved florets quality in General and Liberty cultivars. Total phenols and flavonoids content declined at the end of storage and also two additional days in room temperature, but putrescine treatments prevented its significant decreasing. Catechin and chlorogenic acid content decreased in untreated florets was decreased when transferred to room temperature after long-term storage in low temperature; but 1.5 mM putrescine increased them in both studied cultivars. Overall, application of 1.5 mM putrescine with preventing chlorophyll degradation and maintaining antioxidant compounds, delayed broccoli florets senescence.

Keywords: Putrescine, Floret Senescence, Flavonoid, Catechin, Chlorogenic acid

1, 2, 3- MSc Graduated and Associate Professors, Faculty of Agricultural Science, University of Guilan
(*-Corresponding Author Email: bakhshi-d@guilan.ac.ir)

4- Assistant Professor, Faculty of Science, University of Guilan



Study of Physical Properties, Phenolics Compounds and Antioxidant Activity of Thirty Different Iranian Cultivars of Pomegranates Peels

A. Tehranifar^{1*} - M. Zarei² - B. Esfandiyari³ - Z. Nemati⁴

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Abstract

Pomegranate (*punica granatum* L.) is an important Iranian-native fruit, whose many varieties are cultivated. Fruits are widely consumed fresh and in processed forms as juice, jams and etc. Pomegranate peel, as a by-product of the commercial juice industry, is a rich source of bioactive compounds. This research has been done to evaluate and compare physical characteristics, total phenolics, total tannins and antioxidant activity of thirty different cultivars of pomegranates peels in a Completely Randomized Design with 4 replications. This study showed that there were significant differences among the cultivars in all measured factors. The fruit weight, peel percentage and peel thickness were within the range of 196.89-135.87 g, 59.82-63.61% and 3.13-5.25 mm, respectively. The results also showed that the values of total phenolics ranged from 320.35 mg g⁻¹ dry matter to 328.52 mg g⁻¹ dry matter. The total tannins content was observed in pomegranate cultivars between 189.35 mg g⁻¹ dry matter and 197.35 mg g⁻¹ dry matter. The antioxidant activity of pomegranate peel, as determined by the DPPH assays, was between 69.60 and 93.60%. In addition, the antioxidant activity was positively correlated with the total phenolics ($r = 0.923$) and total tannins ($r = 0.816$). These results demonstrated that the cultivar is the main parameter which determined the physical properties, phenolics compounds and antioxidant activity in the peel of pomegranate. The large amount of phenolics compounds in pomegranate peels provided a good potential as a supplement rich in natural antioxidants.

Keywords: Pomegranate, Phenolic, Tannin, Antioxidant Activity

1- Professor, Department of Horticultural Science, Faculty of Agriculture, Ferdowsi University of Mashhad
(*- Corresponding author Email: Tehranifar@um.ac.ir)

2, 3, 4- Ph.D. Students, Department of Horticultural Science, Faculty of Agriculture, Ferdowsi University of Mashhad



Optimizing of *in vitro* Zygotic Embryo Culture of *Salvia leriifolia* Benth.

M. Modarres^{1*}- M. Lahooti²- A. Gangali³- J. Asili⁴

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Abstract

Salvia leriifolia (Lamiaceae) is endemic of Khorasan and Semnan province and an endangered plant. Poor seed germination of this plant has a serious problem with the high production. The first step to improve this precious plant is to produce sterile plantlets in order to prepare explants of appropriate vigor. In this study, *in vitro* culture of *Salvia leriifolia* zygotic embryo was performed through a factorial experiment in the form of completely random design including culture medium, BAP and NAA. The results showed that, MS and 1/2MS media appeared to be more efficient than B5 medium and significant differences were observed. Efficient concentrations of BAP and NAA were 1mgL^{-1} and had a significant effect in growth and development of embryos. The seedlings were obtained 10 days after planting. Based on these results, the best choice for quick access to strong seedlings, seedling growth and development of embryos is MS and 1/2MS media supplemented with 1mgL^{-1} BAP and NAA.

Keywords: Optimizing, Embryo culture, *Salvia leriifolia*

1- Assistant Professor, Shahid Hasheminejad Campus -Farhangian University of Mashhad

(*- Corresponding Author Email: m_modarres70@yahoo.com)

2, 3- Professor and Associate Professor, Department of Biology, Faculty of Science, Ferdowsi University of Mashhad

4- Associate Professor, Department of Pharmacognosy, Faculty of Pharmacy, Mashhad University of Medical Sciences



Improvement of white button mushroom yield by AFLP marker-assisted single spore selection method

M. Alipoor¹- M. Farsi^{2*} - A. Mirshamsi Kakhki³

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Abstract

The white button mushroom, *Agaricus bisporus*, is a commercially important cultivated filamentous fungus. Strain stability is of great importance to both spawn producers and mushroom growers. Mushroom strains are usually propagated via vegetative method on nutritionally rich substrates. Abnormal growth and poor yield are the consequences of this replication method. The reason for this phenomenon is still unknown. The use of molecular markers is one way of assessing and understanding the genetic changes. In this study, for the first time we reported the application of amplified fragment length polymorphism (AFLP) marker to assess genetic variation in single spore progeny and to assist selection of superior cultivars based upon the use of monosporous cultures of *A. bisporus* commercial strain, Holland737. We isolated 30 single spores that differed in growth rate, productivity and AFLP inheritance pattern. Nine *EcoRI* / *TaqI* primer combinations identified a total of 353 AFLP bands from 19 single-spore isolates, of which 53 were polymorphic. Results showed that the single spore selection is an effective method for strain improvement in *A. bisporus*, so that two isolates averagely performed 47% increased yield over the maternal strain and AFLP showed enough sensitivity to detect polymorphisms among single spore isolates.

Keywords: Yield improvement, Genetic variety, white button mushroom, Single spore selection, AFLP, *Agaricus bisporus*

1, 2, 3- MSc Graduated, Professor and Assistant Professor, Department of Biotechnology and Plant Breeding, Faculty of Agriculture Ferdowsi University of Mashhad, Mashhad, Respectively
(*- Corresponding Author Email: mohfarsi@yahoo.com)



Effect of Drought Stress and Organic Fertilizer on Activity of Some Antioxidant Enzymes, Photosynthetic Pigments, Proline and Yield of Borage (*Borago officinalis*)

R. Gholinejad¹ - A. Sirousmehr^{2*} - B. Fakheri³

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Abstract

In order to study the effects of drought stress and organic fertilizers (compost and vermicompost) on some physiological and biochemical characteristics of borage, an experiment with complete randomized block design in split plot arrangement with three replications was conducted in Zabol University, Zabol, Iran. The treatments included 3 levels of stress as a witness or 100% of field capacity, 80% field capacity (mild stress) and 60% field capacity (tension) as the main factor and use organic fertilizers, including control (nofertilizer), consuming 40 tons of compost per ha, and consumes 4 ton of vermicompost per ha, were considered as minor. Results showed that chlorophyll index (SPAD) decreased with increasing severity of dehydration and the amount of chlorophyll fluorescence were added. The highest chlorophyll a (11.383 mg/g) in conditions stress and application of compost obtained and it was reduced with increasing stress intensity level and the lowest (5.763mg/g) in severe stress and lack of fertilizer application, respectively. The same trend was observed for total chlorophyll content. Most of the enzymes catalase, ascorbate peroxidase and polyphenol oxidase in conditions of severe stress and lack of application and at least 100% of field capacity and compost application, respectively. Proline at 60% field capacity and no application of any fertilizer (20.213 mmol/g wet weight) was a significant difference with other compounds treatments. Drought stress affected the dry weight of the borage plant and cut it and dry yield (6.134826 kg/per ha) in the water level control was not a significant difference with mild stress (80% field capacity). Overall production in drought conditions and the amount of enzyme scavengers, hydrogen peroxide and free radicals increases, then, in order to have acceptable performance of dry borage, crop irrigation to 80% capacity seems appropriate.

Keywords: Antioxidant enzymes, Chlorophyll, Compost, Drought stress, Vermicompost

1 - Former MSc Student of Horticulture, Department of Agronomy, Zabol University

2- Assistant Professor, Department of Agronomy, Zabol University

(*- Corresponding Author Email: asirousmehr@uoz.ac.ir)

3 - Associate Professor of Biotechnology and Plant Breeding Department, Agriculture Faculty, University of Zabol



The Effect of Distant Irrigation on Ionic Changes, Relative Water Content, Prolin Level, and some General Characteristics of Petunia

M. Zadeh Bagheri^{1*}- F. Al-Boali²- H. Sadeghi³ – Sh. Javanmardi⁴

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Abstract

In this complete random block study we aimed to assess the morphologic reactions of Petunia under water deficiency. We used four irrigation treatments (irrigation amount of 25%, 50%, 75%, and 100% of the field's irrigation capacity). The study consisted of 8 repetitions during 6 months in the greenhouse. Data were analyzed using SPSS software, version 12.0 and the mean data were compared with each other using the least standard deviation (LSD) at a 5% level. The results showed that the root's length, weight, and dry weight, the wet to dry weight ration of the branch, number of branches, number of flowers, relative water content of the leaf, and chlorophyll content reduced. However, the flower period, prolin content, and the potassium and sodium percentage increased. The Petunia can sustain low irrigation and can be used as a resistant plant to poor water conditions in green spaces.

Keywords: Petunia, Prolin, Dry tension, Relative water content

1- Assistant Professor, Department of Horticultural Science, Shiraz Branch, Islamic Azad University of Shiraz
(*-Corresponding Author Email: zadehbagheri@iaushiraz.ac.ir)

2,3- Former MSc Student and Assistant Professor, Faculty of Agriculture, Islamic Azad University, Jahrom Branch

5- Department of Horticultural Science, Shiraz Branch, Islamic Azad University



Effect of Pre Harvest Application of Salicylic Acid on Post Harvest Characteristics of Pomegranate Fruit and Storage in Cold Store

H. Rastegari^{1*}- A. Tehranifar²- S. H. Nemati³- M. R. Vazifehshenas⁴

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Abstract

To investigate the effect of different concentrations (0, 0.01% and 0.02%) of salicylic acid (SA) on some quantitative and qualitative characteristics of pomegranate fruit cultivar 'Malase Yazdi' at ripening, 2 and 4 month of storage at 5°C, a factorial experiment based on randomized complete block with three replications was conducted. Quantitative characteristics including percentage of fruit weight loss, percentage of healthy arils, aril paleness percentage, and fruit quality characteristics including percentage of skin browning and white segments separating the arils (membrane), electrolyte leakage (EL), juice pH, titrable acidity, total soluble solids, antioxidant activity, juice ascorbic acid content and fruit taste index were measured. The results showed that with time until two month of storage, the weight loss of fruit had happened, but then the rate of weight loss reduced. With SA application percentage of healthy arils and aril paleness increased. The lowest and highest percentage of membrane browning was related to concentration of 0.01% of SA after two month of storage (14.8%) and control fruits after four months of storage (96.6%), respectively. SA in 0.02% concentration reduced EL at harvest but with time the EL increased so that SA could not prevent EL increases after 4 month of storage. Also fruit taste index reduced with increasing in SA concentration. Over time and during storage titrable acidity, total soluble solids, juice PH and browning percentage increased significantly while ascorbic acid decreased.

Keywords: Pomegranate, Postharvest, Electrolyte leakage, Browning, Weight loss

1, 2, 3- Former MSc Student, Professor and Assistant Professor, Department of Horticultural Science, Faculty of Agriculture Ferdowsi University of Mashhad, Respectively

(*-Corresponding Author Email: hrastegari@ymail.com)

4- Instructor, Agricultural Research Center of Yazd, Yazd, Iran



Study on Freezing Tolerance of Calendula (*Calendula officinalis* L.) in Vegetative and Reproductive Stages

A. Nezami^{1*} - M. Javad Mousavi² - S. Nezami³ - E. Izadi Darbandi⁴ - M. Yousef Sani⁵ - F. Keykha Akhar⁶

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Abstract

Calendula (*Calendula officinalis*) is relatively cold tolerant plant, but in some years plant seriously injured due to harsh winter. In order to evaluate freezing tolerance of calendula an experiment was carried out at college of Agriculture, Ferdowsi University of Mashhad in a factorial-completely randomized design with three replications and plants of two sowing dates (summer and autumn) were exposed to 12 temperatures (0, -2, -4, -6, -8, -10, -12, -14, -16, -18, -20 and -22°C). Seeds of calendula plants were sown in summer (summer plant) and autumn (autumn plant) in the bed and in six to eight-leaf stages were transplanted to the pots. After the cold acclimation in natural condition, freezing stress was applied with using a thermogradient freezer. To employ stability of cytoplasmic membrane, percentage of electrolyte leakage (EL%) was measured after freezing. Also survival percentage (Su%) and regrowth of calendula plants determined after three weeks recovery. Leaves EL% in autumn plants was significantly more than summer plants and autumn plants have higher Su%, but plant height, number of lateral branches, numbers of reproductive traits, total dry matter, vegetative and reproductive dry matter in summer plants were more than autumn plants. However, there were no difference between calendula plants for LT_{50el} in both autumn and summer plants, but there was significant difference between them for LT_{50su} and total dry matter, and LT_{50su} and reduced dry matter temperature 50 (RDMT₅₀) for summer plants were -18.6 °C and -11.3 °C and for autumn plants were -19.4 °C and -13.7 °C, respectively.

Keywords: Dry matter, Electrolyte leakage, Lateral stem, Plant height, Survival percentage

1, 4, 5- Professor, Assistant Professor and Former MSc Student, Department of Agronomy and Plant Breeding, Faculty of Agricultural, Ferdowsi University of Mashhad, Respectively.

2, 3- Lecture and Former MSc Student, Department of Horticulture Sciences, Faculty of Agricultural, Ferdowsi University of Mashhad.

(*-Corresponding Author Email: nezami@um.ac.ir)

6- PhD Student of Biotechnology, Faculty of Agricultural, Ferdowsi University of Mashhad



Effect of Foliar Spray of Mono and Di-potassium Phosphate on Some Quantitative and Qualitative Characteristic of Pomegranate Fruit (*Punica granatum* L. cv. Malas e Saveh)

S. Davarpanah^{1*} - M. A. Askari² - M. Babalar³ - M. S. Hosseini⁴ - M. Amani Beni⁵

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Abstract

The current study was conducted in order to evaluate the effect of Mono and Di-potassium phosphate combination (MDKP) on some quantitative and qualitative characteristics of Iranian pomegranate (CV. Malas-e-Saveh) in Pomegranate Research Center of Saveh city, in 2012. To adjust the pH of the solution, the Mono Potassium Phosphate and Di-Potassium Phosphate combined with each other in the ratio of 1:3, and their combined effects (Mono and Di-potassium phosphate) were studied. This experiment was carried out based on randomized complete block design (RCBD) with four concentrations of MDKP (0, 0.05, 0.1 and 0.2%) at two stages (Full bloom stage and one month after full bloom) and three replications per treatment. The results showed that foliar spray at concentrations of 0.1% and 0.2% resulted in significant increase in yield per tree, fruit number, Titrable Acidity (TA) compared to control treatment, so that 0.1% spraying caused 12/16% increase in yield per tree and 9/17% enhancement in fruit number in comparison to control treatment. Furthermore, foliar spray brought about significant enhancement in aril juice and color intensity of extract in which the highest amount of aril juice and color intensity of extract was obtained in 0.2 % and 0.1 % treatments, respectively. Foliar spray at 0.2 % concentration resulted in the reduction of Total Soluble Solids/Titrable Acidity ratio by 10% compared to control treatment. In conclusion, the results of this study show that MDKP spray at 0.1 % concentration was more effective than other concentrations.

Keywords: Foliar Spray, Mono and Di-Potassium Phosphate, pomegranate and Yield

1, 2, 3, 4- MSc Graduated, Assistant Professor, Professor and MSc Student of Tehran University, college of agriculture and natural resources, Department of Horticultural Sciences and Landscape, respectively

(* - Corresponding Author Email: s_davarpanah@ut.ac.ir)

5- MSc Graduated of Horticultural Department, Agricultural Faculty, Guilan University, Rasht, Iran



Effect of Salicylic Acid and Salt Stress on Seed Germination and Functional Antioxidant in Broccoli Sprout

A. Esfandiari¹- M. Babalar^{2*} - J. Hashemi³- Y. Mostofi⁴

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Abstract

Sulforaphane is a strong anticarsenogen compound which is produced in broccoli. It seems salt stress improves sulforaphane production via systemic acquired resistance. To obtain suitable salt concentration and for having more content of sulforaphane with controlling germination percentage, NaCl in 5 levels 0, 50, 100, 150, 200 mM (0, 4.53, 9.125, 13.68, 18.25 dS/m) and salicylic acid in 3 levels (0,100, 200 μ M) were examined. A logistic regression model was used to assess the effects of treatments on the maximum cumulative germination percentages, rate of increase, and germination lag times. Sulphoraphan and vitamin C were determined by HPLC method. Combination between salicylic acid and chloride sodium improved sulforaphane concentration. The 100 μ M salicylic acid with 100 mM chloride sodium was the best treatment as the highest concentration of sulforaphane and vitamin C with perfect growth factors achieved in the treatment.

Keywords: Hydroxy benzoic acid, Sodium chloride, Germination factors, Sulforaphane, Vitamin C

1, 2, 4- Ph.D Student, Professor , Professor , Department of Horticulture, Faculty of Agriculture, University of Tehran, Karaj, Iran

(*-Corresponding Author Email: mbabalar@ut.ac.ir)

3- Assistant Professor, Agriculture Biotechnology Research Institute of Iran (ABRI)



Effect of *Aloe vera* gel on Polyphenol Oxidase Enzyme Activity, Quality Attributes and Storage Life of Sweet Cherry Fruit (*Prunus avium* cv. Siahe mashhad)

M.R. Asghari¹- H. Khalily^{2*}

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Abstract

Because of the harmful effects of chemicals on human health and environment, the use of these compounds in postharvest technology of horticultural crops is highly restricted. Current study was done to evaluate the effect of *Aloe vera* gel on postharvest quality and storage life of fruit cultivar Siahe-Mashhad. Fruit were treated with *Aloe vera* gel of 25 and 33% for 5 min at 22 °C. Control fruit were treated with distilled water at 22°C. After drying the surface moisture of fruit at ambient temperature. Fruit were divided into different groups of 25 fruit in each group and were transferred to cold storage of 1±0.5°C with 85-95% RH. Fruit quality attributes including marketing, total acidity, total phenolics, pH, weight loss and polyphenoloxidase enzyme activity were evaluated at first day and after 15 and 30 days of cold storage. 33% *Aloe vera* gel effectively preserved marketability, total acidity and total phenolics content and prevented increase in pH, polyphenoloxidase enzyme activity and decrease in fruit weight during 30 days of cold storage. The results showed that *Aloe vera* gel could be used as commercial compound as a good alternative to chemicals in postharvest technology of cherry fruit cultivar Siahe-Mashhad.

Keywords: Sweet cherry, Storage life, Polyphenoloxidase, Total phenolics

1,2-Assistant Professor and MSc Student, Department of Horticulture, Urmia University
(*-Corresponding Author Email: khalilyhojjat@yahoo.com)



The Effects of Drying Methods on drying Time and some Biochemical Characteristics of *Mentha × piperita* L.

F. Roozdar^{1*} - M. Azizi² - A. Ghani³ - Gh. Davarynejad⁴

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Abstract

In this research an experiment based on completely randomized design with three replications and 11 treatments was conducted of *Mentha piperita*. Treatments consisted of dryer drying, artificial shade drying, oven drying (50 and 70 °C), and microwave drying with different powers (100, 180, 300, 450, 600 and 900 w) and fresh sample as control. The end time of each treatment determined on the basis of moisture content equal to 0.10 on the basis of dried weight. After drying the samples, traits such as drying time, essential oil content, color parameters (L*, a*, b*, Hue and Chroma) and some biochemical parameters (total polyphenolic content, total flavonoids, flavone and flavonols, total carbohydrate and antioxidant activity) were studied. The results showed a significant effect of different drying methods on the studied traits. The minimum and maximum drying times (5.03 and 570 minutes) associated with microwave dried (900w) and drying method of dryer, respectively. The maximum essential oil content (2.6%) obtained from dryer dried samples. The highest amount of chroma and b* index related to fresh, artificial shade and dryer dried samples while the minimum content related to microwave dried samples (180 and 900 w). Also, the maximum amount of polyphenol compound obtained in fresh sample and microwave (900 w) and artificial shade dried samples, respectively. While the minimum content obtained to oven dried samples (70 °C). The most antioxidant activity (percentage of radical scavenging activity) obtained to fresh, artificial shade dried and microwave dried (600 and 900 and 450w) samples and the minimum amount were observed on oven dried samples (70 and 50 °C).

Keywords: *Mentha × piperita*; Polyphenol compound; Antioxidant activity

1,2,4- MSc Student and Professors of Horticultural Science, Department of Horticulture, Faculty of Agriculture, Ferdowsi University, Mashhad, Respectively

(* - Corresponding author Email: Mf.roozdar@gmail.com)

3- Assistant Professor, Department of Horticulture, Faculty of Agriculture, Jahrom University



Effect of Irrigation Duration on Some of characteristics Growth Thomson Navel Orange Grafted on Three Citrus Rootstock

M. Ghasem Nejad¹- A. Momenpour^{2*}-A.R. Abdolahpour³-A.R. Sheiykh Eshkevari⁴

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Abstract

In this research, the effect of irrigation duration on growth characteristics of Thomson navel orange grafted on three rootstocks was evaluated in Complete Randomized Block Design in Iran Citrus Research Institute. Factors included rootstock in three levels (Poncirus (*Poncitus trifoliata*), citrange (*Citrus sinensis* × *Poncitus trifoliata*) and sour orange (*Citrus aurantium*)) duration of irrigation in four levels (2, 4, 6 and 8 once days) and time in six levels (T1, T2, T3, T4, T5 and T6). In the during irrigation, vegetative traits such as scion height, leaf number, diameter of rootstock and scion, leaf water content and chlorophyll value were measured. Also, at the end of the experimental period, amount of nitrogen, phosphorus and potassium in soils mixtures were determined. The results showed that time of sampling, type of rootstock and duration of irrigation can affect on growth characteristics of studied rootstock and scion. Height of scion, leaf number, diameter of rootstock and scion were increased so that the increase for all traits to time T3 was significant, but from time T3 to T6 was not. The difference among different rootstocks in the absorption of nutritional elements in short time (two days) was more. Poncirus rootstock in uptake of nutritional elements in drought stress was more efficient than other rootstocks and with increase in intervals of irrigation, amount of nitrogen, phosphorus and potassium in soil mixture of Poncirus rootstock, was less. Overall, studied rootstocks in this research which are common citrus rootstocks in north of Iran, in drought stress conditions, did not show superiority over others in growth characteristics.

Keywords: Scion height, Thomson navel orange, Rootstock, Drought stress, Citrus

1, 2- Associate Professor and PhD Student, Department of Horticulture, Faculty of Agriculture, University of Guilan, Respectively

(*- Corresponding Author Email: alimomenpour2005@gmail.com)

3- MSc Graduated, Department of Soil Science, Faculty of Agriculture, University of Guilan

4- Researcher, Citrus Research Institute, Ramsar



Effects of Nutrient Management on Flowe Yield and Corm Characteristics of Saffron (*Crocus sativus* L.)

P. Rezvani Moghaddam^{1*} - A.A. Mohammad Abadi² - H. R. Falahi³ - M. Aghhavani shajari⁴

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Abstract

In order to understand the effects of different organic and chemical fertilizer on stigma yield, corm characteristics and leaf dry matter yield (as a forage) of saffron (*Crocus sativus* L.), an experiment was conducted in the Research Station of Faculty of Agriculture, Ferdowsi University of Mashhad, Iran, in 2005-2009; as a Randomized Complete Block Design with 12 treatments and three replications. Experimental treatments included of: different levels of chemical fertilizers (250 kg Triple Superphosphate + 50 kg Urea/ha; 250 kg Triple Superphosphate + 100 kg Urea/ha; 250 kg Triple Superphosphate + 300 kg Urea/ha), cow manure (20, 40 and 60 t/ha), sheep manure (20, 30 and 40 t/ha) and hen manure (5, 10 and 15 t/ha). Results showed that the highest fresh flower (315 kg/ha) and dry stigma yield (3.8 kg/ha) were obtained from chemical fertilizer (300-250 kg/ha Urea- Triple Superphosphate) and the highest dry forage yield (3410 kg/ha) and the highest mother and replacement corm per clump were obtained in sheep manure (40 t/ha). However, the highest corm weight per clump (119 g), average corm diameter (1.6 cm) and average number of bud per corm (6.5) were observed in 300 kg/ha Urea, the maximum average weight of corm (2.4 g) and total number of bud per clump (410) were obtained in 100 kg/ha Urea and 30 t/ha sheep manure, respectively. Most of growth indices and yield of saffron were improved by increasing in levels of sheep manure and chemical fertilizer but most of that characteristics had a decreasing trend by increasing in levels of cow and hen manure. Generally, the highest amounts of most studied indices were obtained in chemical fertilizer and sheep manure and the lowest amounts of those studied indices were observed in hen manure.

Keywords: Saffron, Corm, Flower yield, Organic fertilizer, Chemical fertilizer

1, 2, 4- Professor, Lecture and PhD Student of Agroecology, Department of Agronomy and Plant Breeding Faculty of Agriculture, Ferdowsi University of Mashhad, Respectively

(*- Corresponding Author Email: rezvani@um.ac.ir)

3- Assistant Professor, Department of Agronomy, College of Agriculture, Birjand University