The effect of salicylic acid foliar spraying on qualitative characters of strawberry fruit (*Fragaria x ananassa* cv. Camarosa)

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ABSTRACT

In order to evaluate the effect of foliar application of salicylic acid on the qualitative characters of strawberry fruit, a factorial experiment (treatment+ the time of harvesting) based on completely randomized design with 3 replications was conducted in a greenhouse and the laboratories of Department of Horticultural Science of University college of Agriculture and Natural Resources, university of Tehran, located in Karaj, during 2010-2011. The experimental plantlets were planted in 30×30 pots and filled with coco peat and perlite in the rate of 1:1 and Salicylic acid at 4 levels (0, 1, 2 and 4 mM) was sprayed on strawberry leaves every month regularly. After ripening, fruits were divided into 4 groups. The first group was transferred to the laboratory with one week away after treatment and ripening, the second group was transferred to the laboratory with two week away after treatment and ripening and so the third and fourth groups, were being taken to the laboratory after three and four week away of receiving treatment, respectively. The strawberry plants were evaluated on qualitative factors such as: fruit weight, fruit humidity percentage, Total Soluble Contents (TSS), Titratable Acidity (TA), pH, vitamin C and fruit antioxidant capacity. The results revealed that by delaying the fruit harvesting time, fruit weight, fruit humidity percentage, TA, vitamin C and fruit antioxidant capacity significantly decreased and TSS increased. Comparing the applied salicylic acid concentrations, the 2 mM, resulted the best effect on fruit weight, fruit humidity percentage, TSS, TA and fruit antioxidant capacity. The 4 mM of salicylic acid, produced the fruits with high vitamin c amount. All of the evaluated factors were unsuitable in control plants. The 2 mM of salicylic had the best effect on most factors and is suggested as the best concentration for strawberry production.

Keywords: antioxidant capacity, quality factors, salicylic acid, strawberry.

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Effect of summer pruning and spray with calcium on mineral composition and fruit quality of kiwifruit cv. Hayward

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ABSTRACT

Summer pruning and calcium spray could improve kiwifruits quality. In this study, effect of summer pruning in two times, 2 and 15 days after petal fall alone or in combination with %1 calcium chloride spray on fruit quality and mineral elements contents of ‘Hayward’ kiwifruit was investigated. Calcium sprayed four times 90 days after petal fall with 15 days intervals. The results showed that summer pruning, especially 2 days after petal fall significantly increased fruit diameter, fruit weight and total soluble solid (TSS). Control vine (without summer pruning and calcium spray) had the lowest dry matter and vitamin C content. Fruit calcium and magnesium concentration and also nutrient elements ratios were significantly affected by summer pruning and calcium spray. In contrast, nitrogen, phosphorus and potassium content were not affected by them. The highest calcium and the lowest magnesium content were found in the vines that pruned 2 day after petal fall alone or in combination with calcium spray. The highest nutrient elements ratios, K/Ca, Mg/Ca, N/Ca was found in control vine (without pruning and calcium spray). Overall, summer pruning and calcium spray could improve fruits quality by increasing fruit calcium content and decreasing some nutrient elements ratio to calcium.

Keywords: calcium chloride, correlation, dry matter, nutrient elements, pruning.

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Somatic embryogenesis and plant regeneration in grapevine (Vitis vinifera L.) cvs Yaghouti, Bidane Sefid, Shahroodi and Flame Seedless using ovary explant

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ABSTRACT

To produce embryonic callus in four grapevine cultivars i.e. Yaghouti, Bidane Sefid, Shahroodi and Flame Seedless, ovary explants were collected at flower developmental stages III and V and cultured in MS medium supplemented with various concentrations of 2,4-D and BAP. For differentiation of somatic embryos, MS medium was supplemented with various concentrations of IAA and BAP. Results showed that collecting ovaries explants at stage V produced the highest percentage of somatic embryos in all studied cultivars. For embryogenic callus production, MS medium supplemented with 4.5µm 2,4-D and 1.1µm BAP was best treatment. However, for embryo differentiation, MS medium supplemented with 2mg/l IAA and 1mg/l BAP was better than the other treatments. The highest percentage of callus which produced somatic embryos obtained in ‘Yaghouti’ and ‘Bidaneh Sefid’ at second sampling time (V), whereas the lowest percentage of callus producing somatic embryos was achieved in ‘Shahroodi’ and ‘Flame Seedless’ at first sampling time (III). For germination and production of plantlets, embryos at the torpedo stage, were transferred to MS medium contained 1mg/l BAP. In this medium most of the embryos were germinated.

Keywords: grapevine, ovary explant, regeneration, somatic embryogenesis.

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Effect of bagging on fruit quality and reducing of sunburn in pomegranate cv. Rabab Neiriz

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ABSTRACT

Experiments were conducted to test the effects of two different paper bags, white single- and green double-layers, on fruit quality and sunburn of pomegranate (Punica granatum cv. Rabab Neiriz). Young fruits, at 35 days after full bloom, were covered by bags. The results showed that white single layer bag increased size and weight of fruits and aril weight in comparison to those of control. In contrary, green bag reduced size and weight of fruits. Green bag reduced peel water content; however, there were no significant differences in aril water content. Green bag delayed fruit ripening. Results indicated that bagging significantly reduced total phenolics and anthocyanin content. Antioxidant activity increased in white bags covered fruits, and reduced in those of green bag covered ones. Bagging treatments decreased sunburn intensity and sunburn areas. White bag was the most effective treatment for increasing quality and reducing sunburn in pomegranate fruit cv, Rabab Neiriz. Therefore, the use of white bags, due to the enhancing of quality and decreasing of sunburn, can be useful for pomegranate cv. 'Rabab Neiriz'. This could then serve as a useful tool for pomegranate growers to use white single layer bags to increase fruit quality and control sunburn.

Keywords: bagging, physical and chemical properties, pomegranate, sunburn.
The effect of mycorrhizal symbiosis on the water uptake efficiency and some growth traits of Osteospermum
(Osteospermum hybrida ‘Passion Mix’)

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ABSTRACT

In order to study the effect of different arbuscular mycorrhiza fungi on growth performance
and water absorption efficiency of osteospermum, a factorial experiment based on a randomized
complete block design with six replications was conducted in greenhouse conditions. A total of
22 different species of mycorrhizal fungi in symbiosis with the plant was studied in this
experiment. The results showed that mycorrhiza fungus Glomus mossea CA and Glomus mossea
st6 had a significant effect on growth indices of osteospermum compared to the others.
Inoculation of osteospermum plants with the fungus Glomus mossea CA improved the water use
efficiency better than other species of mycorrhizal fungi. Despite the low rates of colonization in
inoculated plants with fungus Glomus sp St2 and its insignificant impact on the characteristics of
this plant, high water absorption efficiency was observed. Fungus Glomus mossea St2 and
Glomus sp St2 had no significant symbiotic relationship with this plant and the effect of the other
mycorrhizal species was moderate. Furthermore, plants inoculated with the fungus Glomus
mossea st6 had significantly higher root length, root fresh weight and root surface compared to
the plants inoculated with other strains. Thus, it was shown that different species of arbuscular
mycorrhiza fungi depending on the used species, could lead to improve some growth traits in this
plant. It was also proved that osteospermum might have different reactions in response to
different isolates of arbuscular mycorrhiza fungi.

Keywords: colonization, fungi isolate, ornamental plant, phosphorus, root inoculation.
Using vermicompost in casing soil for button mushroom 
(*Agaricus bisporus*) cultivation

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ABSTRACT

Casing soil is one of the most important indicators of button mushroom production, which has a direct impact on the size and performance. Due to the easy availability of resources for the production of vermicompost, this mix can be used as an alternative of peat for button mushroom production. This study was conducted with nine treatments and three replications in a completely randomized design at the Faculty of Agriculture, University of Guilan in 2013. Different treatments were prepared before and after leaching vermicompost (worm waste) in combination with peat in ratio of (0:100), (25:75), (50:50), (75:25) and (100:0). The results showed that the treatments of washed vermicompost alone or in combination with peat, were suitable for production of casing soil. Although different treatment didn’t show any significant differences on yield, but leached vermicompost led to increasing number of mushroom and reduction of two days from casing to harvest, but decreased dry matter content of mushroom.

Keywords: alternative peat, mushroom casing, peat moss, yield.

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Effect of different ratio of vermicompost in growth media on seedling development of gooseberry (*Physalis peruviana* L.)

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**ABSTRACT**

Gooseberry (*Physalis peruviana* L.) belongs to Solanaceae, is a tropical plant and native to South–America with high nutritional value. As its cultivation is by seedling, this study was performed to investigate the effect of different ratio of vermicompost (0, 10, 20, 30, 40 & 50%) in two types of substrate (coco peat and coco peat-perlite (50:50 V:V)) on growth characteristics of gooseberry seedling in research greenhouse of University College of Agriculture and Natural Resources, University of Tehran, in 2013. A factorial experiment based on completely randomized design with four replications was carried out. Criteria such as root length, shoot height, crown and plant diameter, leaf number and area, fresh and dry weight of aerial part and root, ratio of fresh and dry weight of shoot to root and chlorophyll index were evaluated. Results showed that treatments significantly affected most measured criteria in which root length in coco peat-perlite and Chlorophyll index in coco peat media were increased. Application of 10% vermicompost resulted in higher root length, leaf number, crown and plant diameter. However, 30% vermicompost caused the highest plant height. Interaction effect of treatments pronounced better for leaf area, root fresh and dry weight, shoot fresh and dry weight in media with coco peat-perlite and 20% vermicompost while no application of vermicompost in coco peat-perlite media caused the highest ratio of fresh and dry weight of shoot to root.

**Keywords:** coco peat, compost, gooseberry (*Physalis peruviana* L.), growth indices, perlite.

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Effect of explant type and different hormonal combinations on direct regeneration of lemon balm (*Melissa officinalis* L.)

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**ABSTRACT**

Lemon balm (*Melissa officinalis* L.) is an herbaceous perennial plant of the Lamiaceae family that has a wide edible and medicinal uses. In this research the potential of five different explants (nodal segments, shoot tip, cotyledon, hypocotyl and leaf segments) on MS medium supplemented with different concentrations of 6-Benzylaminopurine (BAP) (2.2, 4.4 and 8.8 µm) alone or in combination with 1µm Indoleacetic acid (IAA) for direct regeneration of Lemon balm was investigated. The experiment was conducted using a factorial based on completely randomized design with three replications. The maximum mean number of shoots (23.59 and 16.90 shoots in shoot tip and nodal segment explants, respectively) was observed on the MS medium supplemented with 8.8 µm BAP. The highest regeneration rate (99%) in shoot tip and nodal segment explants was achieved on the MS medium supplemented with 8.8 and 2.2 µm BAP, respectively. No shoot regeneration occurred in other explants. The rooting of regenerated shoots was assessed on MS, ¹/₂ MS and MS medium supplemented with 1, 2.5, 4.92 and 9.84µm Indole butyric acid (IBA). The highest mean number of roots (9.06 roots per explants) was observed on the MS medium supplemented with 4.92 µm IBA.

**Keywords:** BAP, direct regeneration, Lemon balm (*Melissa officinalis* L.), MS medium, nodal segment.

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Evaluation of chloroplast DNA diversity and phylogenetic relationship among 28 Iranian Artemisia species

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ABSTRACT

Thirty-four species of genus Artemisia have been reported in Iran. From distribution, density and coverage point of view, it is one of the most important genera of plants in Iran. Since no general comprehensive system for the classification and phylogeny of this genus has been achieved yet, in this research we tried evaluation of chloroplast diversity and phylogenetic relationships of Artemisia species and comparison with other species in the world. Also, we tried to identify evolutionary path, genetic similarity for some species of Iran, to maintain these genetically valuable treasures. In this research, polymorphisms were studied in non-coding regions of chloroplast DNA of 28 Iranian Artemisia species. At first, 13 public primers of chloroplast DNA were evaluated for proliferation, and according to the degree of proliferation, six primer pairs (PB, BD, 1c2, CS, trnL–F and B2B3) were selected for the final study. PCR products were digested by three restriction enzymes of MseI, EcoRI and TaqI. From 14 combinations of used primer- enzymes, 10 combinations showed polymorphism status. Data showed a completely different banding pattern in A. Armeniaca, A. incana, A. austriaca, A. melanolepis, A. oloveriana A. turanic and A. turnifortiana than other species. Formation of specific individual haploid groups individually showed that this group of Artemisia species had greater divergence in chloroplast genomes than other species. We constructed a molecular phylogeny for 28 species of Artemisia using the trnL–F region analyzed with parsimony. Our results showed a topology similar to other recent studies and suggested that A. turanica and A. spicigera are only distantly related to other Artemisia species. Phylogenetic analysis showed that the trnL–F region does not have sufficient variations to identify the 28 Artemisia species. It also revealed that there is a need to search new genome regions to establish a natural classification based on modern molecular techniques.

Keywords: Artemisia L., chloroplast diversity, parsimony analysis, phylogenetic relationships, trnL–F region.
Collection and evaluation of genetic diversity of Iranian coriander landraces using morphological characteristics and antioxidant properties

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ABSTRACT

In this study, 21 coriander populations, Collected from different regions of Iran were evaluated using augmented design at Shahid Chamran University of Ahvaz. Some of morphological characteristics (time of emergence, plant height, fresh and dry weight, seed weight) and antioxidant (carotenoids, vitamin C, catalase and peroxidase) of these populations were evaluated. The analysis of variance showed that there are significant differences among genotypes in fresh and dry weight as well as Seed weight. The principal component analysis declared three components which accounted 74.31% of total variation. Based on cluster analyses UPGMA method, populations were separated into four clusters. The first cluster included populations of Bushehr (1), and Khuzestan (2) with shortest mean of emergence, highest mean of leaves fresh and dry weight, stems, plant and seed weight, maximum vitamin C and peroxidase activity in comparison with other groups. They were the most compatible in the Ahwaz conditions. This good genetic diversity among native coriander populations could be used as a valuable genetic resource for breeding in next works.

Keywords: catalase, morphological characteristics, peroxidase cluster analysis, vitamin C.

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Effect of drought pre-conditioning on antioxidant enzymes activity and reducing drought stress damage in two turfgrass species, creeping bentgrass and tall fescue

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ABSTRACT
Drought preconditioning, which is irrigation with low frequency and longer duration, could be used for extending root system and suppressing drought damage in plants. In the present study, the effect of drought preconditioning for 30 days was investigated on increasing tolerance to drought stress in two turfgrass species, creeping bentgrass (Agrostis stolonifera cv. Palustris) and tall fescue (Festuca arundinacea cv. Greystone). Drought preconditioning and control plants were irrigated for 50 days with different levels of soil suction (20-23, 40-43, 50-53 and 70-73 centibar). Finally, in order to recovery plants were watered up to field capacity point for 15 days. The results showed that drought preconditioning increased root to shoot length ratio in both grass species. Preconditioning in both species also showed higher leaf peroxidase, superoxide dismutase, ascorbat peroxidase and catalase activity than control plants at the end of 50 days of drought stress treatments. At recovery stage, activity of antioxidant enzymes was higher only in preconditioned creeping bentgrass compared to control plants. Overall, drought preconditioning could increase drought stress tolerance in both turfgrass species by increasing root to shoot ratio and improving enzymatic antioxidant systems.

Keywords: drought tolerance, hardening, recovery, root to shoot ratio, water stress.

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Effects of ‘Effective Microorganisms’ on morpho-physiological traits in commercial cultivar of pomegranate (*Punica granatum* L. cv. shishe-kap) under salinity

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**ABSTRACT**

Effective microorganisms (EM) is a commercial biofertilizer mainly consists of photosynthetic and lactic acid bacteria, yeast and actinomycetes. In order to evaluate the influence of EM (0 and 1%) and salt stress (0 mM, 50 mM, 100 mM and 150 mM) on the morphophysiological characteristics of pomegranate cv. shishe-kap, a factorial experiment was conducted based on the completely randomized design at the greenhouse of Ferdowsi University of Mashhad. NaCl (10 part) and CaCl2 (1 part) were utilized to exert the salinity stress. Studied parameters included the main stem height, shoot fresh weight, root length, root dry weight, root volume, leaf relative water content, electrolyte leakage, chlorophyll index, potassium and sodium contents. The results showed that all the measured morphophysiological parameters except the electrolyte leakage were significantly higher in EM treatment in comparison to no EM treatment in saline conditions. In addition, under the extreme salinity stress (150 mM), application of 1% EM decreased the sodium content up to 12.5% and increased the potassium content to 11.5%. According to the obtained results from the above parameters, it seems that EM can reduce the harmful effects of salinity.

**Keywords:** chlorophyll index, effective microorganisms, leaf relative water content, stem height.

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Effects of essential oils, silver nanoparticles and some of the chemical compounds on vase life of gladiolus (*Gladiolus grandiflora* L.) cut flowers

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ABSTRACT

The aim of this research was to improve quality and vase life of cut *Gladiolus* flowers. The investigation was done with the effects of different concentrations of essential oil of thymol and zataria oil (50 and 100 mg L⁻¹), silver nanoparticles (3 and 5 mg L⁻¹) and 8-hydroxyquinolin sulfate (300 and 400 mg L⁻¹) with sucrose 3%. In addition, distilled water, ethanol 500mgL⁻¹ and sucrose 3% were used as control treatments. Cut flowers were pulsed for 24 h in different preservative solutions. Different characteristics like: vase life, bacteria count, chlorophyll content, lipid peroxidation, protein content, peroxidase and catalase activity were studied. The results showed that vase life of cut flowers treated with 100 mgL⁻¹ of each zataria and thymol essential oils treatments, increased to 13.6 and 12.8 days, respectively. Also, silver nanoparticles at the concentrations of 3 mg L⁻¹ and 8-hydroxyquinolin sulfate at the concentrations of 300 mg L⁻¹ increased the vase life of cut flowers to 14.8 and 17.4 days, respectively. Treatments of zataria oil and thymol had no significant effect on vase life in concentration of 50 mg L⁻¹. Also, proteins and chlorophyll content were higher in the mentioned treatments than others. Lipid peroxidation, peroxidase and catalase activity and bacteria count were lower in the cut flowers that treated with 100 mg L⁻¹ of essential oil of thymol and zataria oil, 300 and 400 mg L⁻¹ of 8-hydroxyquinolin sulfate, 3 mg L⁻¹ of silver nanoparticles compared to control. Efficacy of essential oils and silver nanoparticles and 8-hydroxyquinolin sulfate treatments accompanied with sucrose increased longevity and quality maintenance of *Gladiolus* cut flowers cv. White.

Keywords: senescence, thymol, zataria oil, 8-hydroxyquinolin sulfate.
Vegetation percentage and urban hard surfaces on microclimate changes and thermal comfort in the hottest period of year in Mashhad

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ABSTRACT

Considering high population and presence of hot and arid climate in most cities in Iran, creating optimum thermal comfort during the hot periods is necessary. An experiment was conducted to examine the effect of percentage coverage of vegetation and hard surfaces on changes of urban temperature and humidity and their effect on thermal comfort of urban dwellers in three urban sites as well as Mashhad weather station was investigated. Climate and recorded data from Mashhad weather station and the three sites, Danesh crossroad, Moghadam-Tabarsi intersection and Mellat Park that were different in terms of percentage coverage of urban vegetation and hard surfaces were compared with each other. Also, Thermal comfort indices were calculated and the ranges of thermal comfort of the city dwellers in hottest period of 2011 were calculated by categorizing age and gender differences of the city dwellers. The results of statistical analysis and RayMan model outputs showed that temperature and relative humidity of Danesh crossroad and Moghadam-Tabarsi intersection in comparison with those of weather station site and in particular Mellat Park were significantly higher and lower, respectively. Assessment of thermal comfort indices of this temporal period showed that as time passes in this period, the potential of the days create little heat stress, strong and very strong heat stresses in urban dwellers, respectively. Mellat Park and weather station site were more appropriate places than Danesh cross road and Moghadam-Tabarsi intersection in terms of creation of thermal comfort for people.

Keywords: green space, heat islands, humidity, temperature, thermal comfort indices.
Introduction of commercial protocol for \textit{in vitro} proliferation of \textit{Brassica oleracea} var. acephala

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ABSTRACT

In recent years, ornamental kale is commonly used in landscapes due to its colorful shoots and resistance to the diverse environmental conditions. Thus, \textit{in vitro} proliferation was studied in series of experiments. Different concentrations of BA (0/10.1, 0.5 and 1 mg/L), 2,4-D (0.1, 0.5 mg/L) and silver nitrate (2, 4 mg/L) were employed for the establishment stage. Treatments of the proliferation stage also included BA (0.1 and 0.5 mg/L) and IBA (0.1 and 0.5 mg/L). Acclimatization of in vitro plantlets was conducted using different concentrations of MS (complete and half strength) and vermicompost extract (direct and diluted). Results revealed that, using of 0.1 mg/L BA with one mg/L 2,4-D was able to provide regeneration in this ornamental plant. Proliferation medium supplemented with 0.5 mg/L BA caused shoot development. Finally, \textit{in vitro} plantlets were successfully adapted by transferring to media containing reduced MS medium without plant growth regulators. In conclusion, by using the relatively low cost, accessible media and the least concentrations of plant growth regulators, successful regeneration of ornamental kale was obtained.

Keywords: \textit{in vitro} regeneration, kale ornamental, plant growth regulators.

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