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Genetic diversity of some melon and cantaloupe genotypes infected with *Fusarium* wilt via antioxidant enzymes activity

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ABSTRACT

Fusarium wilt disease is one of the major plant diseases that affect melon production. In this study a total of 23 landraces and breeding lines of melon were collected from different regions of Iran planted in a randomized complete block design with three replications and were studied to find new sources of resistant ones in the tray contained clay, pith mass and perlite in greenhouse. The root of seedlings after reaching at one to two true leaf stages were placed in a high inoculum concentrations of 1×10^6 spores per ml of *Fusarium oxysporum* f. sp. *melon* for 3-4 min and then, roots were wounded. Root samples from infected plants of all sensitive, semi-resistant and resistant genotypes were taken to examine biochemical changes for 8 days after 2 days of transplanting in 5 times and were kept in -80°C . The root of control plants dipped in tap water. The activity of peroxidase (POX, EC 1.11.1.7), polyphenol oxidase (PPO, EC 1.14.18.1), Catalase (CAT, EC 1.11.1.6), Superoxide dismutase (SOD, EC 1.15.1.1) and Phenolic compounds (PCs) were measured. Area under disease progress curve and disease severity were studied to identify relationship between disease resistance and enzymatic composition. The results of analysis of variance showed that infection of melon seedling with *F. oxysporum* race 1.2 led to many biochemical changes. The level of antioxidant defensive enzyme and PCs content increased in response to infection by the *Fom* 1.2. The activity of POX, PPO, SOD, PCs and CAT in different genotypes approached to highest level at 4 days after inoculation. In clustering of cultivars via Ward method, 32 landraces clustered into three groups. Principal component analysis diminished all of variables to two components with 96% cumulative variances. Isabelle and Shadegani 2 landraces had the maximum genetic distance together. The Isabelle and Shadegani 2 were identified as the most resistance and the most susceptible genotypes, respectively. The Isabelle, Zard Eyvanakey, Charentais Fom1, Japalizi and Maghasi placed in the same group. Therefore, by crossing between these land races, the basic population could be obtained to study the gene action and to identify the effective gene(s) regarding tolerance to *Fusarium* wilt.

Keywords: biochemical changes, cluster analysis, Fom 1.2, genetic diversity, principal component analysis.

Investigation of changes in antioxidant enzyme and total phenol level in some pear cultivars inoculated with fire blight disease

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ABSTRACT

Fire blight, caused by the bacterium *Erwinia amylovora*, is one of the most destructive diseases of plants in the Rosaceae subfamily *pomoideae*. The objective of this study was to determine the level of resistance of 30 pear cultivars and describe the biochemical changes induced in some resistant and susceptible cultivars. The level of resistance was determined by the length of the fire blight lesion as a percentage of overall shoot length. Finally, 'Dargazi' and 'Harrow Sweet' as very resistance cultivars, 'Bartlett' as susceptible cultivar and 'Mohamad Ali' as a very susceptible cultivar were selected for biochemical evaluation. Some antioxidant enzymes such as ascorbate peroxidase (APX), catalase (CAT), guaiacol peroxidase (POX) and total phenol content were measured at 0 (before inoculation) 3, 6 and 12 days after inoculation by *Erwinia*, in order to find out their resistance mechanisms when get attacked by the pathogen. Catalase and ascorbate peroxidase activity showed a significant increase in the leaves of very resistance cultivars compared with susceptible cultivars during *Erwinia* infection with the highest activity in 6th day after treatment. Guaiacol peroxidase activity was increased in very resistance cultivars survey until 3rd day after inoculation, but decreased even more than that in susceptible cultivars, in 6th day. Pathogen attack caused an increase in total phenol content in all infected cultivars, but significant difference was observed among cultivars.

Keywords: antioxidant enzymes, fire blight, pear, resistant cultivars, total phenol.

Effect of pressure infiltration of putrescine on postharvest quality of two table grape cultivars (*Vitis vinifera* L.)

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ABSTRACT

This experiment was designed to study the effect of putrescine on quality of table grapes during storage. Table grapes cvs, Rishbaba and Olhoghi were dipped in putrescine solutions (0, 1 and 2mM) by the method of pressure-infiltration. The results indicated that after 55 day of storage putrescine 1 mM in Rishbaba and at 2mM in Olhoghi cultivars were the most effective treatments in maintaining the firmness with means of 0.28 and 0.56 kgf, respectively. On the other hand, these treatments showed the lowest weight loss compared to control at the end of experiment period. In respect to the microbial activity, putrescine at 2mM decreased the infection about 3.59 CFU g⁻¹ compared to control. Untreated fruits showed the reduction in total phenolic compounds, antioxidant activity, titratable acidity, color indices, but increment in weight loss, pH, total soluble solids and ripening index. All these changes delayed significantly by putrescine treatments.

Keywords: firmness, grape (*Vitis vinifera* L.), microbial activity, putrescine (polyamine).

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Evaluation of genetic relationships between almond (*Prunus dulcis* L.) cultivars and genotypes using SSR markers

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ABSTRACT

Using microsatellite molecular markers is important particularly due to their high accuracy in studying the genome of the fruit trees. In this study, genetic diversity and relations of 68 almond cultivars and genotypes using microsatellite marker (SSR) were studied. Genomic DNA extracted from young leaf tissues and PCR reactions were performed using 22 selected primers (among 100 primers) of microsatellites. In total 167 polymorphic alleles, between 4 to 11 alleles with an average of 7.60 alleles were obtained for each location. Pchgms 6 and UDP97401 loci had better performance and more advantages than other used loci regarding more number of alleles, high effective allele, resolution power, the amount of polymorphism information, expected heterozygosity and high "Shannon" information index. Based on the similarity matrix, maximum similarity (0.74) was observed between '5-17' and '1-21' genotypes and the lowest similarity (0.14) was observed between '2-7' and 'Mashhad-3' genotypes. Cluster analysis based on Dice's similarity coefficients and UPGMA method were divided cultivars and genotypes into 8 groups at 0.44 similarity distance. According to the results of cluster analysis, cultivars and genotypes were well separated that were in accordance with their geographical origin and some morphological characteristics.

Keywords: almond, genetic diversity, similarity matrix, simple sequence repeat.

Determination of self- compatibility levels, physiological disorders, pomology of apples and introduction of 'IRI6' as promising self- compatible cultivar

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ABSTRACT

The level of self-compatibility of the 48 pre-selected apple cultivars, using their own pollen, the genetic capacity of flowering, flower-fruit conversion ratio, multiple fruit fall and bearing preservation during 4 successive biological growth stages were examined through two main treatments of self and cross pollination, in Horticulture Research Station of Kamalshahr in Karaj (Iran). The fruit samples were analyzed via 43 pomological traits and physiological disorders. Six to 10 branches carrying flower buds were labeled within the canopy of the existing, 3 to 6, trees. The labeled branches were isolated by bags, and 5 other open pollinated branches were marked as control for each cultivar or genotype. All branches were submitted to a precise recording of flower buds, young fruits, June drop and mature fruit numbers in 4 different biological stages including 1. bud swelling phase, before balloon stage, 2. two weeks after bloom end, 3. June drop and 4. maturity time. The results showed that there were significant differences between all genotypes and cultivars in the number of produced flowers, flower-fruit conversion ratio, fruit fall and fruit set percent during growth stages and particularly for the self-compatibility level among and within the cultivars. Inbreeding pressure caused appearance of physiological disorders at different levels (based on cultivar), changing the expression of fruit weight, fruit length, fruit diameter, seed number, seed abnormality and other traits. The mean comparisons made by Duncan test confirmed that the promising genotype IRI6, with 6.49% of efficiency in fruit retaining capacity, surpassing the open pollinated treatment as control with 4% of fruit set at the end of the 4th stage of fruit growth or at harvest time, confirming itself as a completely self-fertile apple genotype. Among the pre-selected self-compatible cultivars, except the 12 off cultivars, all other cultivars demonstrated different and considerable levels of self-compatibility. Complete pomology test of 30 traits was worked out on 10 fruit samples taken from each self and cross treatment belonging to each cultivar and genotype, based on national guideline for the conduct of tests for apple (UPOV), and ulterior biochemical characteristics.

Keywords: fruit set, hetero carpel, hetero seed, inbreeding pressure, phenological stages.

Improving water/fertilizer use efficiency of hydroponically cultured greenhouse tomato by partial root zone drying, deficit irrigation and hydrogel amendment

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ABSTRACT

Soilless culture of greenhouse vegetables has been a fast developing section in Iran during recent years. Most growers fertigate plants without enough knowledge about plant water requirements. Since some soilless substrates have low water retention capacity, wasting a great amount of nutrient solution can be occurred due to poor management. In this research work, effects of hydro gel amendment and partial root zone drying were studied on hydroponically cultured greenhouse tomato and water/ fertilizer use efficiency. Results showed that plants treated by partial root zone drying had lower yield than those irrigated normally, but their water/fertilizer use efficiency was improved. According to the results, PRD showed better results than deficit irrigation treatment probably due to better absorption of water and fertilizer from substrate. Incorporating hydro gel into media could improve coarse perlite physical properties and increased its water holding capacity. This can be resulted in more availability of water and fertilizer to plant root and increment of yield and water/fertilizer use efficiency. Hydro gel showed better results on water/fertilizer use efficiency values under deficit irrigation compared to normal irrigation conditions.

Keywords: super absorbent, tomato, water holding capacity, yield.

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Physiological effects of some essential oils in comparison with 8-hydroxyquinoline in cut lisianthus flowers (*Eustoma grandiflorum* L.)

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ABSTRACT

In order to study the physiological effects of some of the essential oils in comparison with 8-hydroxyquinoline in cut Lisianthus flowers (*Eustoma grandiflorum* L.), an experimental was conducted in a completely randomized design with three replications. Treatments included 8-Hydroxyquinoline, essential oil of Australian Cheesewood (*Pittosporum undulatum*) and Rosmary oil (*Rosmarinus officinalis*) at the two concentrations 200 and 300 mg/l and Zataria oil (*Zataria multiflora*) at two levels of 50 and 100 mg/l. All this treatments was used in combination with sucrose 3% and three treatments of distilled water, ethanol at 500 ppm and 3% sucrose as control treatments. The results showed that treating with 8-Hydroxyquinoline at a concentration of 300 mg/l had maximum vase life (18.4 days) compared to the control (distilled water 10.3, ethanol 10.8 and sucrose 3% 12.1) treatments. Among essential oils, Australian Cheesewood at a concentration of 300 mg/l, Rosmary oil at a concentration of 200 mg/l and Zataria oil at a concentration of 100 mg/l had vase life of 15.8, 15.6 and 15.5, days, respectively which was Significantly higher than control. The Rosmary oil at a concentration of 200 mg/l had the maximum effects on total chlorophyll. 8-Hydroxyquinoline and then, essential oil of Australian Cheesewood at a concentration of 300 mg/l had the maximum effects on anthocyanin, protein, malondialdehyde and enzyme levels. According to the results, using essential oils instead of chemical compounds can be an effective way to improve vase life of cut lisianthus flowers.

Keywords: chlorophyll, enzyme, lisianthus, protein.

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Effect of K and N concentrations in nutrient solution on growth and quality of tomato transplants

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ABSTRACT

The aim of this study was to evaluate the effect of different potassium (K) and nitrogen (N) concentrations in nutrient solution and their interaction on growth and quality of tomato transplants. A full factorial experimental design was carried out with three potassium concentrations (1.5, 3 and 6 meqL⁻¹) and three nitrogen concentrations (1.5, 3 and 6 meqL⁻¹) for 27 days after seed germination. Fresh and dry weight of stem, root and leaf, stem diameter, and leaf area were measured at the beginning and at the end of treating period. Biomass partitioning and growth characteristics were calculated. Increasing of K concentration was accompanied with increased stem diameter and dry weight, while nitrogen increment led to increase of stem diameter and fresh weight. Both N and K increased fresh and dry weight and area of leaves. While K increment expanded specific leaf area (SLA), N didn't have any effect on SLA. Root mass fraction (RMF) and root: shoot ratio (RSR) decreased by increasing K and N concentrations. K didn't affect leaf mass fraction (LMF), but nitrogen significantly increased LMF. While maximum stem mass fraction (SMF) was achieved in 6:1.5 (K:N) ratio, 1.5:6 ratio led to minimum SMF. Increasing of K concentration in nutrient solution significantly increased relative growth rate (RGR) and leaf area ratio (LAR), while didn't affect net assimilation rate (NAR). Nitrogen also enhanced plant RGR, but its effects on NAR and LAR wasn't significant. Interaction effect of potassium and nitrogen on biomass allocation and growth characteristics wasn't significant. It can be concluded that higher K:N ratios could improve transplant quality.

Keywords: biomass allocation, K and N interaction, relative growth rate, specific leaf area, stem diameter.

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Effects of different potassium and magnesium ratios on cluster necrosis and fruit quality in grapevine cv. Bidaneh Sefid

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ABSTRACT

Vineyard management, plant nutrition, irrigation, genotype and pests and diseases are effective factors quantity and quality of crops. Among mentioned factors, plant nutrition has more importance and nutrient imbalance in soil can affect crop quantity and quality. Grape cluster necrosis at veraison time is important disorders in vineyard, because of lack of balance between potassium and magnesium in plant leaves. Therefore this research were done in two factor randomized complete block design consist of: A- potassium with three levels 0(K1), 300(K2) and 600(K3) gram per vine from potassium sulfate source), B- magnesium with three levels 0 (Mg1), 100(Mg2) and 200(Mg3) gram per vine from magnesium sulfate source), with three replication (three vine per replicate) in two vineyards of Urmia, Iran. Results showed that highest chlorophyll content was obtained in T3 (K1 Mg3) which was 29.4% more than control. Effect of different ratios of potassium and magnesium on TA, pH and berry diameter was not significant, but control treatment showed longer berries than other treatments. Berries weight was best in T4 (K2 Mg1) with 30.5% increase compared to control. Clusters with highest weight were observed in T8 (K3 Mg2). T9 (K3 Mg3) showed higher TSS than other treatments and in contrast with control had 67.5% increase in TSS. Treatments of T6(K2Mg3), T7(K3Mg1) and T8 had the highest cluster necrosis due to their high potassium/magnesium ratio. Cluster necrosis degree was decreased in second year compared to first year. At different ratios of potassium and magnesium, highest leaf potassium content observed in T9 which were 7% and 10% higher than those in control and T3, respectively. Effect of year on potassium content of leaf was significant and in first year potassium content was 41.9% higher than that of second year. Highest leaf magnesium content was observed in T3 which its potassium to magnesium ratio was low. However, it was not significantly different with control, but there was significant difference among T3, T7 and T8 which had higher potassium to magnesium ratio. In T3 treatment, magnesium content was 21 and 16% higher than that of T8 and T7, respectively. Results showed that with potassium application without magnesium usage, potassium to magnesium ratio was increased because of more absorption of potassium than magnesium, balance between potassium and magnesium level was negatively affected which resulted in reduction of crop quality.

Keywords: cluster necrosis, fruit quality, grape, potassium and magnesium ratio.

Effect of substrates and chilling requirement n quantitative and qualitative attributes of three strawberries cultivars

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ABSTRACT

Soilless culture systems of strawberry production are increasing. Yield and fruit quality are not only affected by growing media but also by chilling and horticultural managements. The aim of this study was to evaluate the effect of different growing media and chilling on vegetative growth, yield and fruit quality of three strawberry cultivars. The experiment was conducted in factorial experiment based on randomized complete blocks design with three replications. Treatments were growing media (Complex lignin, Premix and Coco peat), chilling treatments (without chilling and chilling at 4°C for two weeks) and three strawberry cultivars (Paros, Camarosa and Selva). Results indicated that the yield was higher in Coco peat medium and lowest in Complex lignin. Chilling treatment increased yield but decreased anthocyanin contents and vegetative growth, indices such as biomass, leaf number and crown number. 'Camarosa' showed the highest yield among three cultivars. The highest yield was observed in Coco peat medium. There was no significant taste difference index between 'Camarosa' and 'Selva'. However, it was lower in 'Paros'.

Keywords: anthocyanins, chilling requirement, soilless culture, strawberry.

فهرست

علوم باغبانی ایران

دوره ۴۵، شماره ۲، تابستان ۱۳۹۳

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