



Crops Improvement

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The effect of drought stress and foliar application with salicylic acid on qualitative and quantitative yield of Black cumin under Kerman climatic conditions

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Abstract

In order to study the effects of drought stress and foliar application with salicylic acid on yield and its components and percentage of essential oil of *Nigella sativa* L., a field experiment was conducted as split plot based on randomized complete block design with three replications at research farm of Shahid Bahonar University of Kerman during growing season of 2013- 2014. The main factor was drought including three levels: no tension (90 percent field capacity), moderate tension (70 percent field capacity) and severe tension (50 percent field capacity). The other factor included four concentrations of salicylic acid: zero (foliar application with distilled water), 5, 10 and 15 Micro molar salicylic acid for foliar application. The results showed that there were significant differences between traits including: the number of grains per plant, 1000 seeds weight, harvest index, essential oil and grain yield with applying drought and salicylic acid. The foliar application with salicylic acid (10 Mm) increased the grain yield by 79.05 percent. The interaction of salicylic acid and drought stress on the number of grains in folicules, the percentage of essential oil and biological yield was significant. The interaction of third level of salicylic acid and moderate drought stress increased essential oil by 150 percent. Therefore, to obtain the maximum biological yield, the number of grains in folicules and essential oil percentage on drought condition, we can apply the third level of SA (S3 = 10 Mm) and moderate irrigation in black cumin that is economic in arid places.

Keywords: essential oil percentage, foliar application, medical plant, regulator of growth, water shortage.



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The effect of application of vermicompost on micronutrient concentrations in soil and lettuce plant

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Abstract

In order to study the effect of vermicompost individually and combined with chemical fertilizer on soil micronutrient content and micronutrient concentration of lettuce (*Lactuca sativa* L.), a three-year experiment was conducted with randomized complete block design in two factors and three replications at the experimental farm of Sari Agricultural Sciences and Natural Resources University in 2008. The main plot included six fertilizer treatments consisting of T₁ (control), T₂ (chemical fertilizers), T₃ (20 ton.ha⁻¹ of vermicompost enriched with 50 percent chemical fertilizer), T₄ (20 ton.ha⁻¹ of vermicompost individually), T₅ (40 ton.ha⁻¹ of vermicompost enriched with 50 percent chemical fertilizer) and T₆ (40 ton.ha⁻¹ of vermicompost) individually. One – year (2006), two - year (2006-7) and three - year (2006-8) applications of that fertilizer were considered as sub plots. The results showed that different treatments had significant effects on the available content of Fe and Zn of soil, root and shoots and also on Cu and Mn concentration of the lettuce roots. The result also showed that the concentration of the elements in soil and lettuce was significantly affected by one-year, two- year and three- year applications of these fertilizers. Interaction of the two factors had significant effect on the available Fe and Zn content of soil and Zn concentration of root and shoot. Totally, from 40 ton.ha⁻¹ vermicompost enriched with 50 percent chemical fertilizers, the highest available micronutrient content was obtained in the soil and the highest micronutrient concentration was obtained in root and shoot of lettuce.

Keywords: copper, iron, manganese, organic fertilizers, zinc.



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The effects of some phosphorus solubilizing bacteria strains on yield and agronomic traits in local bean (*Phaseolus vulgaris* L.) of Guilan under different phosphate fertilizer rates

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Abstract

To evaluate the effects of some phosphorus solubilizing bacteria strains on yield and agronomic traits in local bean (*Phaseolus vulgaris* L.) of Guilan, different phosphate fertilizer rates were tested during 2014 growing season. This research was carried out in experimental field of Agricultural and Natural Resource Research Center of Guilan province as split plot arrangement based on randomized complete block design with three replicates. The rates of phosphate fertilizer including zero, 40 and 80 kg P/ha (P_2O_5), and three strains of phosphorus solubilizing bacteria (*Pseudomonas putida*) including 113, 168 and 173 and non inoculation as check were randomized in main plots and sub plots, respectively. The results showed that the interaction effects between phosphate fertilizer and phosphorus solubilizing bacteria was significant for 100 seed weight and seed protein content of bean. Application of 80 kg P/ha showed the lowest pod number per plant (9.8), seed number per pod (3.53), biological yield (3317 kg/ha), seed yield (1136 kg/ha) per unit area. Also, the greatest seed number per pod (4.12), harvest index (44 percent) and seed yield (1858 kg/ha) were obtained as affected by phosphorus solubilizing bacteria strain 168. The results showed that the strain 168 had the higher efficiency for seed yield enhancement in comparison with other strains of phosphorus solubilizing bacteria. Based on the results of this research, at low levels of soils available phosphorus, the strains of phosphorus solubilizing bacteria can be recommended to enhance seed yield in local bean under Guilan and similar climatic and edaphic conditions.

Keywords: bacteria strains, bean, phosphorus availability, pseudomonas, yield.



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The effect of solitary and combined application of organic and biological manure and chemical fertilizer on some of the qualitative and quantitative properties of sugar beet

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Abstract

In order to study the effect of solitary and combined application of two types of green manure, cow manure, Barvar-2 phosphate fertilizer and conventional chemical fertilizer on some of the qualitative and quantitative properties of sugar beet, an experiment was conducted at the research farm of Shahrekord University in 2013. The experimental design was randomized in a complete block design with three replications and 12 treatments including: 1- control, 2-*Pisum* + Triple Super Phosphate (TSPH), 3-*Lathyrus* + TSPH, 4-Barvar-2 phosphate + Urea, 5-Cow manure (Cm) + TSPH, 6-Conventional manure, 7-*Pisum* + Barvar-2 phosphate, 8-*Lathyrus* + Barvar- phosphate 2, 9-*Pisum* + Cm + TSPH, 10-*Lathyrus* + Cm + TSPH, 11-*Pisum* + Cm + Barvar-2 phosphate and 12-*Lathyrus* + Cm + Barvar-2 phosphate. The results showed that fertilizer treatments had a significant effect on root yield, sugar yield, white sugar yield and harmful nitrogen whereas combined treatments of 8, 10, 11 and 2 had the highest means for root yield, sugar yield and white sugar yield. Application of green manure, farm yard manure and their combinations along with Barvar phosphate biological fertilizer increased root yield of sugar beet between 10-18 and 32-68 percent compared with conventional chemical fertilizer and control, respectively. The lowest amount of harmful nitrogen was related to the treatments of 10 and 11. From the viewpoint of the other studied traits, combined treatments of organic and bio-fertilizers were quite acceptable.

Keywords: Barvar-2 phosphate, chemical fertilizer, cow manure, green manure, sugar beet.



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The effect of biological fertilizers on quantitative and qualitative yield of ajowan (*Carum copticum* L.) at different irrigation levels

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Abstract

In order to investigate the effects of different irrigation levels and biological fertilizers on quantitative and qualitative yield of ajowan (*Carum copticum* L.), a field experiment was conducted at a farm located in West Azerbaijan province- city Nagadeh, Iran during growing season of 2012-2013. The experiment was arranged as split plot based on Randomized Complete Block Design in three replications. The main plots were allocated to irrigation levels (Irrigation after 50 mm (control), 100 mm (moderate water stresses) and 150 mm (severe water stresses) evaporation from class A pan) and sub-plots were allotted to biological fertilizers (Mycorrhiza, the combination of *Azotobacter* and Barvar Phosphate-2, Mycorrhiza + *Azotobacter* + Barvar Phosphate-2 and control). The results showed that by increasing irrigation times from 50 to 150 mm evaporation, plant height, number of umbel per plant, 1000 seed weight, biological yield, seed yield and concentration and content of essential oil in ajowan significantly decreased. Among the biological fertilizers, combined usage of biofertilizers (Mycorrhiza + *Azotobacter* + Barvar Phosphate-2) showed greater increment in studied traits than individual consumption. In each irrigation levels (Irrigation after 50, 100 and 150 mm evaporation), the highest seed yield (783 kg/ha) was obtained from combined usage of biofertilizers and the lowest seed yield (400 kg/ha) belonged to control treatment, respectively.

Keywords: *Azotobacter*, essential oil, Mycorrhiza, *Pseudomonas*, seed yield.



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Some changes in cellular adaptation of forage sorghum genotypes during stress

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Abstract

This study was carried out to evaluate the changes in some important cell parameters under water limitation in sorghum genotypes. A factorial experiment was conducted based on completely randomized design in greenhouse, in University of Mohaghegh Ardabili in 2014. Treatments included water stress at levels of 85, 65, 45 and 25 percent field capacity and three genotypes of forage sorghum (KFS2, KFS6 and KFS17). The results showed that water stress reduced the osmotic potential, relative water content, cell membrane stability redecase by one percent, also the amount of potassium, calcium, phosphorus, while increased sodium content and finally decreased biomass. Interaction between stress and genotype was significant only on proline, soluble sugars, cell membrane stability, relative water content and biomass. KFS2 genotype had the highest amounts of proline, soluble sugars and nutrients, as well as the highest osmotic potential, relative water content, cell membrane stability and biomass in most severe stress levels (25 percent of field capacity). Proline and calcium amount had the highest contribution in prediction of osmotic potential and membrane stability. These factors also play an important role in biomass production. In general, we can say the genotypes use different mechanisms to deal with stress, however, the genotypes which use faster and less expensive methods have greater tolerance to stress and will produce a higher yield.

Keywords: biomass, nutrients, osmotic potential, proline, water stress.



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The effect of 24-epibrassinolide on increasing tolerance of eggplant (*Solanum melongena* L.) seedling to cold stress

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Abstract

To study the effects of 24-epibrassinolide on improving germination parameters and seedling growth of typical American eggplant under chilling stress, an experiment with four concentrations of 24-epibrassinolide (0, 0.5, 1 and 2 μM) in completely randomized design in factorial form with three replicates was performed in plant physiology lab of Arak University in 1391. Eggplant seeds were soaked in different concentrations of 24-epibrassinolide for 48 h and then were moved to plate. Three plates each containing 20 seeds were considered as replications for each treatment. After planting the seeds, plates were divided into two groups. One group was transferred to an incubator with 16/8 -hour light/dark photoperiod ($25 \pm 1^\circ\text{C}$ temperatures) and the other group was exposed to 4°C temperature for 4 days then transferred to the incubator. The results showed that 24-epibrassinolide had a great effect on the germination parameters, length of root and shoot, fresh and dry weights of root and shoot in both control and stress conditions. The increase of lipid peroxidation and membrane penetration observed in chilling stress, indicated a significant decrease in treatment with 24-epibrassinolide. 1 μM concentration was the most effective concentration compared to others. In plants under chilling stress and 1 μM of 24-epibrassinolide, lipid peroxidation and membrane penetration decreased by 28.30 and 37.89 percent, respectively.

Keywords: brassinosteroids, cell membrane leakage, cold stress, germination parameters, lipid peroxidation.



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Comparison of the important quality characteristics of red flesh apples and some Golab cultivars

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Abstract

This study was conducted to evaluate the quality of the red flesh apples and Golab cultivars. Two Iranian red flesh apples from Shahroud and four Golab cultivars as well as 'Gala' as control from Damavand were selected in Summer 2012. Fruit physical characteristics including length, diameter, fresh weight and dry weight, firmness, color and their parameters were evaluated for each cultivar. The measured chemical properties consisted of total soluble solids (TSS), titrable acidity (TA), TSS: TA, total phenol content (TPC) and 50 percent inhibitory activity of DPPH radical. The results showed that 'Bekran' and 'Bastam' red flesh genotypes had the highest dry weights (15.44 and 15.07 g, respectively). The highest and lowest firmness were in 'Bekran' red flesh and 'Golab-e Kermanshah' (5.65 and 2.82 N/mm²), respectively. The highest TPC was determined in two red flesh apples 'Bekran' and 'Bastam' (4481.01 and 4011.73 mg GAE/100 g FW), respectively. The lowest TPC was detected in 'Atlasi' (2596.05 mg GAE/100 g FW). The highest IC₅₀ was observed in 'Bekran', 'Golab-e Kermanshah' and 'Gala'. Despite the fact that Iran is a major producer of apple in the world, it does not take advantage of export. Growing cultivars with improved physicochemical properties can help our country to boost its apple export status.

Keywords: DPPH scavenging, *Malus*, physiochemical characteristics, red flesh apple, total phenol content.



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The effects of water deficit and Salicylic acid on essential oil and antioxidant enzymes of fennel (*Foeniculum vulgare* Mill.)

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Abstract

To investigate SA effects on physiological and biochemical characteristics of fennel (*Foeniculum vulgare* Mill) under water deficit, a split plot experiment based on latin square design with three replications was carried out at research farm of Shahid Bahonar University of Kerman in 2012. Three levels of water deficit (50, 75 and 100 percent of field capacity) and 3 concentrations of SA (0, 0.5 and 1mM) were considered as main and sub plots, respectively. Foliar application of SA was performed at 3 to 4 leaves growth stages and before application of Irrigation. The obtained results showed that water deficit reduced grain yield, essential oil content and percentage while the amount of superoxide dismutase and guaiacol peroxidase increased significantly compared to control. Increasing the concentration of salicylic acid led to a significant increase in grain yield, essential oil content, essential oil yield, superoxide dismutase and guaiacol peroxidase compared to control. Interaction of water deficit and SA on grain yield, essential oil yield and antioxidant enzymes were significant. Increasing the antioxidant enzymes leads to a reduction in oxidative damage and implies SA roles in tolerance of fennel under water deficit.

Keywords: biochemical traits, essential oil yield, guaiacol peroxidase, physiological traits, superoxide dismutase.



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The effects of different irrigation levels on some quality and quantity traits of grass pea (*Lathyrus sativus* L.)

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Abstract

To evaluate the effect of irrigation regime on quantitative and qualitative yield of grass pea, a field study was conducted at the research farm of Vali-e-Asr University of Rafsanjan in 2013. The experiment was arranged in a randomized complete block design with four replications and four irrigation intervals. Irrigation was done after 40 (control), 60, 80 and 100 mm evaporation from pan class A, from seedling establishment till physiological maturity. The results showed that irrigation level did not significantly change percentage of qualitative traits including Neutral Detergent Fiber (NDF), Acid Detergent Fiber (ADF), Acid Detergent Lignin (ADL), starch and crude protein as well as 1000- seed weight. However, the above mentioned qualitative traits content as well as seed number per plant, seed and biological yield were significantly affected by irrigation interval. Based on mean comparison results, only 100 mm evaporation treatment significantly reduced qualitative traits content and there were no significant differences between 40 and 80 mm evaporation. Also, seed yield, seed number per plant and shoot biomass were shown to be highest in 40 mm (165.5 g/m², 36.17 per plant and 2.4 g/plant, respectively) and lowest in 100 mm irrigation treatment (63.1 g/m², 24.5 per plant and 1.07 g/plant, respectively). Based on the results, it seems that grass pea qualitative forage yield is relatively tolerant to water deficit till 80 mm evaporation.

Keywords: drought, grass pea, protein, starch, yield.



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Evaluation of forage quantity and quality in intercropping maize with pinto bean and naked pumpkin

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Abstract

To compare the quantity and quality of forage production in intercropping systems with maize, pinto bean and pumpkin, an experiment based on randomized complete block design with three replications was conducted at faculty of agricultural science, University of Guilan, during 2012 growing season. The treatments consisted of maize, pinto bean and naked pumpkin sole cropping, maize – pinto bean and maize – pumpkin double cropping and maize-pinto bean-pumpkin triple cropping . The results showed that the highest forage dry weight was produced in triple cropping and the lowest in pinto bean sole cropping. The highest and lowest crude protein productions were observed in triple cropping and maize sole cropping systems, respectively. The highest acid detergent fiber (ADF) and neutral detergent fiber (NDF) were observed in maize sole cropping, versus, both were reduced in triple cropping system due to intercropping with pinto bean and pumpkin. The ADF and NDF of maize in triple cropping systems reductions were more than sole cropping systems; therefore, the total digestible nutrients and consumable dry matter were increased. This research showed that the quantity and quality of total forage production of triple cropping systems of maize, pinto bean and pumpkin were significantly superior to the other cropping systems.

Keywords: acid detergent fiber, crude protein, land equivalent ratio, total digestible nutrients, triple intercropping system.



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Impact of methyl jasmonate on vegetative parameters and fruit yield of melon cv. 'Semsuri'

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Abstract

To investigate the effects of methyl jasmonate growth regulators on growth characteristics, fruit number and fruit yield of 'Semsuri' melon, an experiment was conducted at the field of Shahid Bahonar University in summer 2012. Melon (cv. 'Semsuri') is widely cultivated in Iran and therefore it is necessary to increase the fruit yield and quality of this cultivar. Some growth regulators including Methyl Jasmonate (MJ) may improve growth and development of plants when applied at appropriate low concentrations. Thus, a complete random block experiment at the research field of Shahid Bahonar University was conducted to study the impact of 0, 2.5 and 5 μ M of MJ applied as seed soaking, foliar spray at 6-7 leaf stages, after fruit set and in combination with treatments on growth and fruit yield of 'Semsuri' melon. To promote growth and fruit yield, two-time application of MJ is required. MJ reduced leaf ion leakage and increased chlorophyll index, relative water content, flesh thickness, plant fresh weight and fruit yield. Moreover, MJ significantly reduced fruit set that reduces fruit hand thinning. The most effective level of MJ was 5 μ M applied at 3 stages. Compared with control, 5 μ M MJ reduced leaf ion leakage (42 percent), and increased chlorophyll index (45 percent), relative water content (32 percent), flesh thickness (33 percent), plant fresh weight (38 percent), root fresh weight (40 percent) and fruit yield (24 percent with two melons per plant and 19 percent with three fruits per plant).

Keywords: growth parameters, Jasmonate, melon, spray, yield.



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The effect of chemical and natural treatments on vase life of *Anturium andranum* cv. 'Climax'

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Abstract

This experiment was conducted in National Institute of Ornamental Plants for extending vase life of *Anturium andranum* cv. Climax cut flowers. The experiment was done based on Completely Randomized Design (CRD) with three replications and three cut flowers per replicate. Treatments included Volk oil emulsion wax coating (10, 20 and 30 percent), Thyme oil (100, 150 and 250 ppm), Salicylic acid (200, 400 and 600 ppm) and *Aloe vera* gel as wax coating (2.5, 5 and 7.5 percent). Sucrose (5 percent) was added to all of the treatments. After treatments some quantitative and qualitative traits were measured. Results showed that vase life of cut flowers increased significantly in volk oil wax coating by 10 percent (27.33 days) compared to control (17.88 days), the lowest vase life was found using Thyme oil treatment. The flowers which were treated with 2.5 percent of *Aloe vera* gel had the highest solution uptake compared to control. Treatment with thyme oil of 150 ppm caused the highest ion leakage (69.5 percent) compared to the others. The lowest ion leakage (10.71 percent) was obtained in *Aloe vera* gel treatment of 7.5 percent.

Keywords: *Aloe vera*, ion leakage, Salicylic acid, Thyme essence, Volk oil.



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Improving quantitative and qualitative characteristics of sweet pepper using GA₃ and CaCl₂ treatments in Ilam region condition

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Abstract

In order to study the effects of GA₃ and CaCl₂ treatments to solve the problems of sweet pepper culture in Ilam region (including small size fruits with sunscald and blossom end rot disorders), this study was carried out in Ilam University in 2012. For that purpose, GA₃ (50 mg/l) and CaCl₂ (0.5%) treatments were sprayed for two (fruit set and 15 days thereafter) and three (fruit set, 10 and 20 days thereafter) times on the 'California Wonder' pepper, and fruit characteristics were investigated after ripening. The results showed that, in most of the studied traits, there were no significant differences between two- and three-time spraying. However, GA₃ in comparison to control, significantly increased yield, fruit number, marketability, fruit diameter, fruit weight, flesh firmness, fruit dry matter, ascorbic acid content, antioxidant capacity, chlorophyll content, plant height, internodes length, leaf area and lateral branch number and decreased sunscald and blossom end rot rates. CaCl₂ treatment as compared to control increased fruit dry matter, flesh firmness, fruit thickness, chlorophyll b and total chlorophyll content, and reduced sunscald and blossom end rot. However, CaCl₂ treatment had no significant effects on vegetative properties, including stem height, shoot diameter, internodes length, leaf area, lateral branch number, as well as fruit size and yield. According to these results, application of both GA₃ and CaCl₂ treatments can be effective in improving the qualitative and quantitative properties of sweet pepper.

Keywords: blossom end rot, firmness, sunscald, vegetative growth, yield.



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The effect of zeolite application and selenium foliar spraying under different moisture regimes on some physiological traits and grain yield in medicinal pumpkin

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Abstract

In order to evaluate the effect of zeolite application and selenium spraying on some physiological traits and grain yield in medicinal pumpkin (*Cucurbita pepo* L.) under different moisture regimes, a study was conducted in a factorial experiment based on randomized complete block design with three replications during 2010 in Takestan at Gazvin province, Iran. The three levels of irrigation factors including normal irrigation based on 60mm evaporation from class A pan (control), withhold irrigation at the flowering and fruit formation stages, zeolite factors including two levels of non-application and application of 10 tons per hectare and selenium were sprayed at two concentrations in zero and 30 grams per liter per hectare. The results showed that water deficit stress decreased stomatal conductivity, carotenoid content, chlorophyll a, total chlorophyll, grain yield and increased proline concentration and chlorophyll b content. Zeolite application of 10 tons per hectare under water deficit stress conditions had desirable effect on chlorophyll a and chlorophyll b content and grain yield, it also improved such traits as stomatal conductivity and reduced proline concentration. The highest grain yield (1329 kg.ha⁻¹) was obtained with zeolite and selenium application together at normal irrigation conditions. According to the results, it seems that application of zeolite and selenium in areas that are subjected to water deficit stress can be useful in improving plant growth and production.

Keywords: carotenoid, chlorophyll, proline, selenium, water deficit stress.



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The effect of arbuscular mycorrhizal fungi on some vegetative traits and yield of linseed (*Linum ussitatissimum* L.) under water deficit stress conditions

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Abstract

To evaluate the effect of arbuscular mycorrhizal fungi under water deficit stress on linseed, a field experiment was conducted as split-plot in RCBD design with three replications at the research station of faculty of Agriculture at Shahrekord University in 2013. Water deficit stress at four levels of no stress, mild, medium and severe stress as main factor and inoculation with *Glomus intraradices*, *Glomus mosseae* and no inoculation as sub factor was used. The results showed that the effects of mycorrhiza inoculation and water deficit stress treatment were significant on all the measured traits. Interaction between mycorrhiza and water deficit stress was significant for the plant height and shoot dry weight. Based on the results, both species of *Glomus intraradices* and *Glomus mosseae* significantly increased the grain yield whereas the treatment inoculated with *G. intraradices* produced maximum (0.080 kg/m²) and the treatment without inoculation with mycorrhiza produced minimum (0.063 kg/m²) grain yield. Maximum (0.097 kg/m²) and minimum (0.050 kg/m²) grain yield were obtained in the treatment under water deficit stress and no-stress conditions, respectively.

Keywords: aboveground dry weight, grain yield, inoculation, irrigation, stem branch.



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Integrated management (chemical and mechanical) of field bindweed in rotation of fallow-sugarbeet

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Abstract

This study was conducted in the research field of Iranian Research Institute of Plant Protection in Karaj as strip split plots with three replications. The first factor was tillage and no-tillage, and the second factor included herbicide: Glyphosate 6 L/ha, 2,4-D + MCPA 2L/ha, Glyphosate + 2,4-D + MCPA (6 + 2 L/ha), Glyphosate 3 L/ha, 2,4-D + MCPA 1 L/ha, Glyphosate + 2,4-D + MCPA (3 + 1 L/ha), and control without herbicide. The number of field bindweed shoot was determined to be 15, 30 and 45 days after spraying and field bindweed biomass was determined to be 45 days after spraying. In the second year, sugarbeet was planted and the effect of herbicides was determined on sugarbeet yield. The best treatment for field bindweed density decrease was Glyphosate + 2,4-D + MCPA (6 + 2 L/ha). The same treatment and its split dose as suitable treatments caused the highest decrease in field bindweed biomass. There was no significant difference between till and no-till treatments in terms of their effect on field bindweed density and biomass. Under the effect of no-till treatment, field bindweed biomass showed higher decrease and under the effect of no-till treatment, sugarbeet yield showed higher increase. Overall, The best treatment for field bindweed density and biomass was Glyphosate + 2,4-D + MCPA (6 + 2 L/ha), and then its split dose.

Keywords: chemical management, cultivation, herbicide, perennial weed, split dose.



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The effect of foliar application of iron chelate type on morphological traits and essential oil content of holy basil (*Ocimum sanctum*)

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Abstract

To evaluate the effect of foliar application of nano iron chelate and iron chelate fertilizers on morphological traits and essential oil content of holy basil, an experiment was conducted at research farm of Department of Horticultural, Shahid Chamran University of Ahvaz based on randomized complete blocks design with six treatments and three replications. The treatments consisted of control, nano iron chelate (0.5, 1 and 1.5 g/l) and iron chelate (1 and 1.5 g/l) fertilizers. Foliar application of fertilizers was done at six to eight leaves stage and repeated with 15 days interval until the end of the study. Intended traits were measured at full bloom stage. The results showed that the effect of foliar application of iron fertilizers on morphological traits such as plant height, axillaries shoots, leaf number, leaf area, fresh and dry weights of leaf and aerial parts and essential oil content of holy basil was significant. The highest and lowest values of mentioned traits were obtained in plants sprayed with 1 g/l nano iron chelate and control, respectively. Overall, regarding non-significant difference between 1 and 1.5 g/l nano iron chelate and 1.5 g/l iron chelate treatments, for increasing mentioned traits of holy basil, foliar application of nano iron chelate with 1g/l is recommended.

Keywords: chlorophyll, essential oil, holy basil, iron chelate, nano iron chelate.



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Growth and yield response of potato plant to different nitrogen levels

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Abstract

This experiment was conducted in Andimeshk Region (north of Khuzestan) to study the effects of nitrogen levels on plant characters of two potato cultivars (*Solanum tuberosum* L.) in identical conditions of poultry manure, during 2012-2013 crop year, as a factorial randomized complete block design with three replications. The first factor consisted of four nitrogen levels (0, 70, 140 and 210 kg/ha). The second factor included two potato cultivars (cv. 'Arinda' and 'Sante'). The results showed that cv. 'Arinda' was significant in all the tested characters (plant height, stems per plant, tubers per plant, tuber weight per plant, micro tuber numbers, macro tuber numbers and tuber yield) except for medium tuber numbers compared with cv. 'Sante'. The highest tuber yield was observed at cv. 'Arinda' and N₁ fertilizer treatment with mean of 41870.3 kg/ha and lowest tuber yield in cv. 'Sante' and N₀ fertilizer treatment with mean of 20437.6 kg/ha. Therefore, the cv. 'Arinda' under the consolidated conditions with lower consumption of nitrogen fertilizer up to 70 kg/ha has all desirable plant characters for increasing tuber yield, and it is recommended for cultivation in climate conditions of region.

Keywords: cultivar, fertility management, fertilizer compound, quantitative and qualitative characteristics, tuber yield.



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Investigating the relationship between the accumulation of phenolic compounds in Salustiana and Italian orange cultivars with their rootstock fruits

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Abstract

The present study aims to investigate the correlation between biochemical changes of grafted tree fruits and rootstock fruits in Gorgan university of agricultural science and natural resources during time span of 2012-2013. For this purpose, the antioxidant activity and the total content of phenol and flavonoid on four rootstocks such as Yuzu (*Citrus junos*), Shelmahalleh (*Citrus sinensis* var. *shel mahalleh*), Citrumelo (*Citrus paradisi* X *Poncirus trifoliata*), Sour orange (*Citrus aurantium*) and Italian and Salustiana grafted tree were studied in skin and flesh of fruits. This research was done as a factorial experiment based on completely randomized design with three replications. The result showed that the measured parameters were significantly influenced by cultivar, rootstock and tissue. The highest amount of total phenol (21.38 mg/g_{DM}) was recorded in Italian skin on Shelmahalleh rootstock. The most antioxidant activity (85.71 percent) was produced in the skin of Citrumelo rootstock. The maximum content of total flavonoid (0.337 mg/g_{DM}) was observed in the skin of Salustiana on Yuzu rootstock. The investigation indicated that the total phenol accumulation ability of rootstock fruit influences the antioxidant activity of the grafted tree fruits with a positive correlation. Although there were significant differences between antioxidant compounds of grafted tree fruits with fruits of their rootstocks, no relationship existed between them. It seems this was due to a combination of physiological characteristics of each group (grafted or not) of fruits.

Keywords: antioxidant activity, citrus, fruit skin and flesh, total flavonoid, total phenol.

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