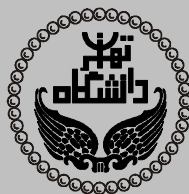


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Effect of biofertilizer, under salinity condition on the yield and oil content of three ecotype of hemp (*Cannabis sativa* L.)

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Abstract

In order to evaluate the yield components and oil content of hemp plant under different biological fertilizer and saline water and soil condition, a field experiment was conducted as a factorial arrangement in a randomized complete block design with three replications in the North East of 'Isfahan' in 2012. The experimental treatments include, three hemp ecotypes of 'Isfahan', 'Shiraz' and 'Mashad' as the first factor and fertilizer treatments of urea, nitroxin, super nitro-plus, bio-sulfur, mycorrhizae (*Glomus mosseae*) and control (without fertilizer) as the second factor, subjected to the saline soil irrigation water. The traits of seed numbers per plant, 1000 seeds weight, grain yield, biological yield, harvest index and percent of seed oil were measured. The results showed the maximum grain yield and harvest index were belong to mycorrhizae treatment and the minimum was belong to control. Besides, mycorrhizae showed maximum biological yield and other treatments had not significantly effect. 1000 seeds weight was not affected significantly under different fertilizer treatments, but the ecotypes of 'Mashhad' and 'Shiraz' showed maximum (13.33 g) and ecotype of 'Isfahan' produced minimum (7.8 g) 1000 seeds grain. Each four fertilizer treatments caused significant promotion of oil content (29.2 percent w/w) compare to control (26.5 percent w/w), but did not observed any significant effect between fertilizer treatments. Ecotype of 'Isfahan' under bio-sulfur and mycorrhizae treatments with average of 800 seeds per plant had maximum and ecotypes of 'Mashhad' and 'Shiraz' had minimum of 76 seeds per plant.

Keywords: bio-fertilizers, grain yield, hemp, oil percentage, salinity stress.



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Comparison of quantitative and qualitative characteristics and storability of onion populations

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Abstract

Quantitative and qualitative characteristics and storability of Behbahan landrace, selected population from Behbahan landrace and 'Primavera' cultivar were compared at Behbahan Agriculture Research Station for two years (2009-2010). Field experiment was performed based on randomized complete block design containing four replications. Seedlings were transplanted in mid-December. A split plot in time experiment based on randomized complete block design containing four replications was used to compare the storability of the studied populations. Populations were considered as main plot in three levels and the date of bulb observations as sub plot in 13 levels. Bulbs were stored in non-control storage. The observations were done for sprouting, rotting, incidence of black mold and weight losses percent at 15 day intervals. The results showed that the differences of total yield (fresh) among populations were not significant, however marketable yield of Behbahan bred onion and 'Primavera' cultivar was significantly higher than Behbahan landrace. The yield of bulb dry weight of Behbahan bred onion was higher than source landrace and 'Primavera' cultivar at five and one percent probability level. Bulb dry matter percent and bulb color uniformity of Behbahan bred onion was higher than source landrace. In the other hand the percent of double bulbs and neck diameter of Behbahan bred onion was lower than source landrace. The difference of storability between Behbahan bred onion and source landrace was not significant, but the storability of 'Primavera' cultivar was significantly lower than other populations.

Keywords: Bulb, genotype, landrace, local, yield.



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Some phytochemical and morphological characteristics of dog rose (*Rosa canina* L.) fruit in North of Iran

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Abstract

Dog rose (*Rosa canina* L.) is an important medicinal plant belongs to *Rosaceae* family. Dog rose fruit is beneficial to the digestive system and it use in food and tea. This study carried out for determination of some phytochemical and morphological characteristics of dog rose fruit in ten regions of north of Iran. Beta-carotene determined by the HPLC method and spectrophotometer used for determination of total soluble carbohydrate and total anthocyanin content. GGE biplot method used for studying effect of different regions on chemical and morphological properties. Results showed significant difference between traits in studied regions. Beta-carotene ranged between 0.05–0.323 (mg/g FW). Total soluble carbohydrate varied from 5.9–23.3 percent. The highest content of total anthocyanin 23.7 and the lowest was 7.71 (mg/L 11 yaniding-3-glucoside). The highest and lowest amount of TSS in regions under study was 15.72 and 34.9 percent, respectively. Chalus region (IR56) had the highest amount of beta-carotene according to the polygon. The highest content of and total anthocyanin obtained from Rudbar region (IR51). Pearson's coefficients showed that fruit weight had significantly correlation with fruit flesh. Fruit length had significantly correlation with fruit width. Also total soluble carbohydrate correlation with total anthocyanin and TSS was significant

Keywords: anthocyanin, beta-carotene, carbohydrate, dog rose fruit, morphology.



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Azolla an environmental problem or an appropriate growth medium of ornamental plants?

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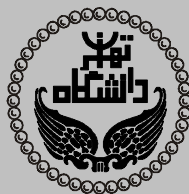
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Abstract

Climatic conditions of Guilan have been helped to expanding Azolla growth in wetland and ponds of this province. Regarding environmental problems of Azolla accumulation, a study was conducted to investigate impact of composted Azolla with nutrient solution on the growth of *Dracaena marginata* in replacement of peat at Ornamental Plants and Flowers Research Station, Lahijan, Iran. The control treatment was a 2:1 ratio of peat: perlite (v/v) and peat was replaced by composted Azolla at zero, 25, 50, 75 and 100 percent v/v. The research was conducted as a factorial experiment based on a completely randomized design in three replicates with 90 plants. Substrate properties including bulk density, porosity, electrical conductivity, pH, C/N ratio and phosphorus, potassium, iron, zinc and manganese concentrations were measured. Plant growth indexes including leaf and stem dry weight, leaf and stem fresh weight, plant height, stem diameter and number of leaves were measured. The results showed that the highest growth was observed at 75 and 100 percent Azolla compost with nutrient solution and the lowest growth obtained at control and 25 percent compost of Azolla. Azolla compost without nutrient solution had a greater effect on plant growth as compared with control even with the consumption of nutrient solution.

Keywords: Azolla compost, *Dracaena*, growth medium, Ornamental plant, peat.



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Investigation of preharvest application of salicylic acid and methyl jasmonate on quantitative and qualitative characteristics of cut rose flower

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Abstract

In this research the effect of preharvest application of salicylic acid and methyl jasmonate on vase life and some qualitative and quantitative characteristics of cut rose flowers cvs. 'Sweet Water' and 'Dolsevita' was investigated. Salicylic acid at 0.01, 0.05 and 0.1 mM and methyl jasmonate at 0.1 and 0.2 mM foliar sprayed and distilled water used as control. This experiment was carried out using CRD with four replications. Harvested flowers kept at $3\pm 1^{\circ}\text{C}$ and 70-80 percent RH. Results showed that methyl jasmonate at 0.2 and salicylic acid at 0.1 mM on 'Sweet Water' and methyl jasmonate at 0.1 mM on 'Dolsevita' increased vase life with delay in senescence related processes through increase in solution uptake, increase in relative fresh weight, maintenance of plant membrane stability and stem total carbohydrate. Also, 'Sweet Water' with average of 40.56 days compared with 'Dolsevita' with average of 27.74 days increased the vase life. Overall, preharvest spray of roses with methyl jasmonate and salicylic acid as a method to increase postharvest quality and maintenance of cut roses is recommendable.

Keywords: maintenance, quality, senescence, spray, vase life.



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The effect of supplementary irrigation and methods of nitrogen application on grain yield and its components in chickpea (*Cicer arietinum* L.)

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Abstract

To study the responses of grain yield of chickpea to drought stress and application methods of nitrogen fertilizer, an experiment was carried out as split-plot at College of Agriculture and Natural Resources, Razi University, Kermanshah, Iran, during 2009-10 and 2010-11. The supplementary irrigation at three levels (1. without irrigation, 2. one irrigation at flowering and 3. two irrigations at flowering and podding stages) as main-plot and the combination of different amounts and application methods of nitrogen fertilizer were as sub-plots. The results showed that grain yield increased significantly due to increasing the number of grains per plant and 100-grain weight in response to supplementary irrigation treatments. There was no significant difference in grain yield between one and two supplementary irrigation treatments with 1646 and 1728 kg/ha, respectively. Methods of nitrogen application had significant effects on grain yield and some yield components, but had not effect on 100-grain weight. Foliar spraying accompanied by soil application of N increased significantly grain yield. Finally, to get high grain yield in chickpea we recommend supplementary irrigation at flowering stage and also usage of both nitrogen application methods (soil application + foliar spraying).

Keywords: chickpea, drought, fertilizer, nitrogen, soil application, spraying.



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The effect of drought preconditioning on increasing drought stress tolerance in two turfgrass species, creeping bentgrass (*Agrostis stolonifera* cv. Palustris) and tall fescue (*Festuca arundinacea* cv. Greystone)

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Abstract

Drought preconditioning (DP) is a method of irrigation with low frequency and longer duration to extend the root system and suppress drought damage in plants. In the present study, the effect of DP for 30 days on increasing tolerance to drought stress in two turfgrass species, creeping bentgrass (*Agrostis stolonifera* cv. Palustris) and tall fescue (*Festuca arundinacea* cv. Greystone) was investigated. DP and control plants were irrigated for 50 days with different levels of soil suction (20-23, 40-43, 50-53 and 70-73 centibar), and finally plants were watered up to field capacity level for 15 days, to recover from stress. Results showed that DP significantly lead to reduction in shoot length and increase in root length in both turfgrass species. DP plants showed less shoot dry and fresh weight and also less electrolyte leakage (EL) at each levels of stress, in compare with the control. Furthermore, DP plants showed greater reduction in EL after recovery. DP treatment also reduced leaf RWC at the end of 50 days of stress and after recovery in tall fescue, but in creeping bentgrass retained it at the control level. Overall, it appears that DP treatment can increase tolerance to drought stress in two species with increasing root length, reducing shoot length and EL and preserving leaf RWC.

Keywords: conditioning, electrolyte leakage, recovery, water shortage, water stress.



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Seasonal changes in essential oil content, yield and composition of spearmint (*Mentha spicata* L.) cultivated in Shoshtar

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Abstract

Spearmint (*Mentha spicata* L.) is one of the most important mint family plants that have numerous applications in food, cosmetical and pharmaceutical industries due to its valuable medicinal properties. In this research, the change in plant fresh and leaf dry weights, essential oil content, yield and composition were studied during year as randomized complete block design with 12 treatments and three replications. Result showed that harvest time had a significant effect on plant fresh and leaf dry weights, essential oil content and yield. The highest plant fresh weight (1868.7 gr/m²) and leaf dry weight (253.3 gr/m²) were recorded in July and June, respectively. Plants also showed highest amount of essential oil content (3.82 percent) and yield (8.5 gr/m²) in July. The main essential oil components were carvone, limonene, careen, α -pinene, myrcene, β -borbonene, cisdihydrocarvone, dihydrocarveol, dihydrocarvyl acetate, pulgone and trans caryophyllene. The highest (67.9 percent) and lowest (22.4 percent) amounts of carvone were observed in July and January, respectively. The highest (21.1 percent) and lowest (4 percent) amounts of limonene were observed in August and December, respectively. The maximum amount of caren (5.8 percent) was obtained in January. Cis dihydrocarvone, dihydrocarveol and dihydrocarvyl acetate increased during winter. In total, spearmint can be harvested from May to October but best harvesting time is July.

Keywords: carvone, dry weight, essential oil, fresh weight, harvest time, limonene, spearmint.



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Effect of micronutrient elements on seed yield, qualitative traits and oil in winter rapeseed (*Brassica napus* L.) varieties

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Abstract

To evaluate the seed yield and qualitative traits and oil in some winter rapeseed (*Brassica napus* L.) varieties as affected by micronutrient elements, this experiment was performed during 2011-2012 cropping seasons as split plot arrangement in randomized complete block design with three replications, in Arak, Iran. Micronutrient fertilizers including Zero as check, Fe, Zn, Mn, Fe+Zn, Fe+Mn, Zn+Mn, Fe+Zn+Mn as main plot and rapeseed varieties including 'Zarfam', 'Okapi', 'Modena' and 'Licord' as sub plot, comprised the experimental factors. The results showed that 'Okapi' variety had the highest seed yield as affected by check (4194 kg/ha) and Zn+Mn (4011 kg/ha) treatments, respectively. In this research, 'Licord' variety showed the highest seed content of zinc at check and Fe+Mn treatments. The greatest seed content of copper obtained in 'Modena' variety and Fe+Zn treatment. The greatest seed content of iron was shown in 'Modena' variety, Fe and Fe+Zn treatments. Also, the highest seed content of manganese obtained in 'Modena' variety and Zn+Mn treatment. In general, Zn+Mn treatment increased seed yield and oleic acid in 'Okapi' variety. Hence, these treatments could be recommendable in Arak region and similar agroclimatic conditions.

Keywords: Fatty Acids, Micronutrients, Seed Quality, Rapeseed, Yield.



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Improving tolerance to water deficit using zinc foliar spraying in two common bean cultivars under Ilam climatic conditions

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Abstract

To investigate the impact of foliar zinc application in reducing the negative effects of water stress on bean growth and yield, a field experiment was carried out in the Research Field of Ilam University in 2010. The experiment was arranged in split factorial based on a randomized complete blocks design with three replications. The experimental factors were water stress including water withholding at flowering stage, water withholding at pod formation and control (full irrigation) as main plots, and the factorial of zinc application levels including; zero, 2000 and 4000 ppm and two bean cultivars including 'Akhtar' and 'Dorsa' as sub-plots. Results showed that water stress significantly reduced grain yield and the lowest grain yield obtained from water stress at flowering stage. The highest (3163.6 kg/ha) grain yield achieved by zinc application with 4000 ppm concentration. There was a significant difference between cultivars in different treatments and in overall 'Dorsa' with 3846.4 kg/ha, produced the highest grain yield. According to the results, the most sensitive stage of bean plants to water stress is flowering stage and zinc application with a concentration of at least 4000 ppm can improve plant tolerance to water deficit.

Keywords: grain yield, *Phaseolus vulgaris*, water deficit stress, yield components, Zn.



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Effect of chitosan on *in vitro* proliferation of grape (*Vitis vinifera* L.) 'Bidaneh Ghermez' cultivar

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Abstract

Effect of different concentrations of chitosan (with low molecular weight) on *in vitro* proliferation of grape cultivar, 'Bidaneh Ghermez' was evaluated. 30 days after establishment, elongated shoots were cultured on the half strength Murashige and Skoog medium supplemented with 0.5 mg/l BAP, 0.1 mg/l IBA and different chitosan concentrations (zero, 10, 20, 40 and 80 mg/l). The experiment was based on completely randomized design with five replications. Based on the results, number of shoots, fresh and dry weight of biomasses, leaf surface and chlorophyll index were the highest at 40 mg/l chitosan. The highest shoot length and diameter were observed at 20 and 40 mg/l chitosan. The highest internode length was seen both in the control and 40 mg/l chitosan. In general, 40 mg/l chitosan significantly improved the proliferation. As a result, it can be used as a growth stimulant material to increase *in vitro* proliferation of this grape cultivar.

Keywords: benzylaminipurine, chlorophyll index, indol butyric acid, micropropagation, number of shoots.



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Comparison of some physio-morphological characteristics of eight cut rose (*Rosa hybrida* L.) cultivars

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Abstract

Postharvest characteristics of eight cut rose cultivars ('Valentine', 'King Pride', 'Prima Donna', 'Black Baccara', 'Victory', 'Papagayo', 'Royal Baccara' and 'Yellow Island') were investigated in a growth room with temperature of 20°C, relative humidity of 50 percent and light intensity of 10 $\mu\text{mol}/\text{m}^2\text{s}^1$ in autumn 2008. Among cultivars, significant differences were found for all of the traits evaluated. According to the results, 'King Pride' with 17.7 days and 'Papagayo' with 9.4 days showed the longest and the shortest vase life, respectively. After 'King Pride', 'Royal Baccara', 'Yellow Island' and 'Black Baccara' showed a high longevity. Flower peduncle was the largest in 'Yellow Island' and 'King Pride' and the lowest in 'Papagayo'. Moreover, fresh weight loss was the highest in 'Papagayo' and the lowest in 'King Pride' and 'Yellow Island'. 'King Pride' showed the highest water uptake while 'Papagayo' showed the highest water loss. Both water uptake and water loss were the lowest in 'Victory' but its flower buds didn't open fully. Moreover, 'King Pride' and 'Papagayo' showed the highest and the lowest stomatal density, respectively. Overall, cultivars with larger flowers and peduncle diameter and higher relative fresh weight, water uptake and stomatal density showed higher vase life. 'King Pride', 'Royal Baccara' and 'Yellow Island' were selected as best cultivars based on the vase life and other postharvest characteristics.

Keywords: flower longevity, flower opening rate, relative fresh weight, stomatal density, water loss.



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Effect of on-farm seed priming and application methods of zinc sulfate fertilizer on emergence characteristics, yield and yield components of two corn hybrids in Hamedan

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Abstract

To evaluate the effect of on-farm seed priming and methods of zinc sulfate application on seed emergence properties, yield and yield components of two corn cultivars, an experiment was conducted as factorial in randomized complete block design with three replications during 2012 at research farm of Bu-Ali Sina University, Hamedan. First factor was methods of zinc sulfate application containing four levels of no-application, broadcasting in soil, banding and foliar application. Second factor included on farm primed and no primed seeds and third factor consisted of two corn hybrids (Es-sensor and Biaris). Percentage and rate of emergence of on-farm primed seeds increased about 16 and 12 percent, respectively also emergence uniformity coefficient in primed seed while banding zinc sulfate comparing with no-primed seed and broadcasting zinc sulfate showed 74 percent increase. In 'Biaris' cultivar priming increased significantly the number of kernel per ear. In two cultivars, the highest 100 seeds weight was achieved of primed seed plus banding or foliar zinc sulfate application. In this study, the highest grain yield was obtained of primed 'Biaris' seed cultivar combined with zinc sulfate banding application (1370.42 g/m²) that was about 9.6 percent higher comparing with no-primed and no zinc sulfate treatment.

Keywords: banding, corn, seed, yield, zinc.



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Effect of foliar application of nitrogen and potassium on yield and yield components of hybrid rice (*Oryza sativa* cv. Daylam)

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Abstract

A randomized complete block design with three replications was performed at Rice Research Institute of Iran, Rasht in 2008, to find the effect of supplement foliar application of nitrogen and potassium on 'Daylam' hybrid rice grain yield, its components and grain protein percentage. Foliar application of 20 kg nitrogen (five percent N) and 15 kg potassium (three percent K₂O) in different pre-anthesis stages was considered as treatments. Foliar application of distilled water was considered as control. Results showed that the grain yield and biological yield were increased in treatments which nitrogen and potassium was applied at pre-anthesis stages compared to control treatment. Foliar spraying of nitrogen in maximum tillering stage had the highest effect on number of tiller per plant and grain number per panicle. The highest percentages of fertile tillers were related to foliar application of nitrogen at both maximum tillering and booting stages. Foliar application of nitrogen at maximum tillering and booting stage significantly increased grain protein content by 12.1 percent which was 8.3 percent greater than control treatment. The results also showed that a significant and positive correlation exists between grain yield with biological yield and percentage of panicle fertility. Overall, it was concluded that maximum tillering stage is the best pre-anthesis phenological stage for foliar application of nitrogen and potassium on 'Daylam' cultivar hybrid rice.

Keywords: booting, foliar application, hybrid rice, protein, tillering.



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Mechanism of drought stress tolerance of GF677 rootstock (peach and almond hybrid) under *in vitro* conditions

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Abstract

Mechanisms of drought stress tolerance of GF677 rootstock, peach and almond hybrid, (*Prunus persica* × *Prunus amygdalus*) were studied under *in vitro* conditions. Plantlets of GF677 rootstock were subcultured into the Murashige and Skoog (MS) solid proliferation medium containing one mg/l BA (6-Benzyladenine) and 0.1 mg/l NAA (naphthaline acetic acid) in four drought stress levels zero (control), 10, 20 and 30 gr/l polyethylene glycol 6000 (corresponding to osmotic potentials zero, -0.2, -0.4 and -0.6 MPa, respectively). After six weeks results showed that induced drought stress had a significant effect on measured parameters. By increasing drought levels in the culture medium, antioxidant enzymes activity (catalase and peroxidase), total protein content and proline content significantly increased; meanwhile soluble sugars had non-significant increasing in the different levels of drought. According to the results it can be concluded that, the most important mechanisms of drought tolerance of GF677 rootstock under *in vitro* conditions are the use of antioxidant defense system, increasing protein synthesis (enhancing genes expression) and proline accumulation and osmoregulation by soluble sugars had less important.

Keywords: antioxidant enzymes, osmoregulation, proline, soluble sugars, total protein.



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Using thermotherapy for elimination of tristisa virus in ‘Thomson Navel’ orange (*Citrus sinensis* L.)

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Abstract

Tristeza is one of the most important and devastating citrus viral disease in the world. Thermotherapy is one of the tristeza management methods that used in this study. Thus 36 ‘Thomson Navel’ orange were placed in temperature controlled chamber (TCC) to investigate the effect of thermotherapy on elimination of tristeza virus. First, the scions were inoculated by grafting and after six months tested by ELISA. Plants were placed in 35/30°C (day/night) temperature for two weeks (as pre conditioning). Then they were incubated at: 40/30, 42/32, 44/34°C for 11 weeks, two weeks and 10 days, respectively. In the last temperature, 12 plants dried out and in six of the remaining plants, no infected plants were verified. The other 18 plants were alive but infected. Thermotherapy is considered as one of the healthy ways for citrus seedlings depends on plant species. Viruses infecting alone or together with shoot tip grafting (STG) led to the production of healthy seedlings. The results also indicate inefficiency of this method to eliminate viruses and suggest using a combination of thermotherapy and STG

Keywords: ELISA, immuno printing, indicator plant test, sanitation, tristeza.



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Effect of Fe and Zn spraying on some characteristics of mungbean using chemical and organic fertilization

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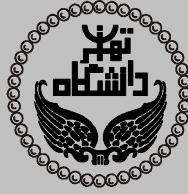
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Abstract

To study effect of Fe and Zn spraying on some characteristics of mungbean, an experiment was designed as factorial based on randomized complete block with three replications in Urmia University in 2012. Treatments were nutrition systems (organic, chemical, integrated and no nutrition) and micronutrients (Fe, Zn, no foliar application and water spraying). The plant height, pod length, number of pod, number of grain in pod, and grain yield were measured in plants treated with organic as well as chemical and integrated fertilization systems. With regards to obtain the maximum biomass (3421.8 kg/ha) and eco-friendly benefits of organic system, it is recommended as suitable fertilization treatment. The highest plant height (37.78 cm) and grain yield (800.8 kg/ha) obtained from Zn spraying, while the highest biological yield (3250.80 kg/ha) from Fe spraying and foliar application of micronutrients were the same, statistically. In conclusion, Zn and Fe spraying cause to increase the yield and yield component of mungbean.

Keywords: micronutrient, mungbean, nutrition systems, yield component, zinc.



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Effect of arbuscular mycorrhizae and on-farm seed priming on emergence characteristics, yield and yield components of maize (*Zea mays*) at different levels of phosphate fertilizer

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Abstract

To investigate the effect of on-farm seed priming and arbuscular mycorrhizal fungi in different amounts of phosphate fertilizer on emergence, yield and yield components of a semi-mid maturity corn hybrid (ES-SENSOR), an experiment was conducted at the research station of Agriculture College, Bu-Ali Sina University in 2012 in a factorial randomized complete block design with three replications, where the first factor was priming in two levels including control (non-primed) and priming with water and second factor was arbuscular mycorrhizal fungi (control and application of mycorrhizae) and the third factor was phosphate fertilizer application in three levels (non-use, 50 and 100 percent of recommended phosphate fertilizer). Results showed that seed priming increased seedling emergence rate by 15 percents. The highest symbiosis percentage was about 65.47 which obtained by application of mycorrhizae and 50 percent of phosphate fertilizer recommendation. Also, seed priming increased the number of grains per ear. 100 seed weight was also increased significantly by priming and inoculation with mycorrhizae at 50 percent phosphate fertilizer recommendation. In this study, seed priming increased grain yield by 22.32 percent. The highest yield rate of 1249.59 g/m² was obtained in 50 percent phosphate application and use of mycorrhizal symbiosis. Therefore by application of mycorrhizal fungi in the direction of sustainable agriculture, phosphate fertilizer can be reduced by up to 50 percent.

Keywords: corn, mycorrhizae, pretreatment, seed, symbiosis.



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Genetic variation for salinity tolerance and its association with biomass production in cultivated chickpea (*Cicer arietinum* L.) genotypes

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Abstract

In this study, salinity tolerance of 51 Kabuli chickpea genotypes was investigated at vegetative growth phase using 4.5 and 6.5 ds/m salt solution (by adding NaCl to 1/2 Hoagland solution) and 1/2 Hoagland solution (EC= 1.7 ds/m) as control treatment. A split plot design was used in this experiment where the main plot was salinity treatments and the sub plot was genotypes. Treatments continued until 40 days and after that, shoot length, leaf area, chlorophyll content and biomass ratio were measured. Genotypes responded differently to saline condition. Based on vegetative biomass production under salt treatments in comparison with control treatment, different salinity tolerance indices calculated. Ranking of genotypes based on these indices indicated that, the genotypes number 5620, 6364, 5941, 5280, 6142, 6356, 5843 and Hashem cultivar were more tolerant to salinity. Under 6.5 ds/m NaCl, genotype 6142 was the most tolerant genotype. Sowing the genotypes at saline soil generally affected by Na⁺ and Cl⁻ with electrical conductivity of 9.8 ds/m at Neishabur (Feiz abad) field caused strong damages on all the genotypes and 60 days after planting none of the genotypes could survive at saline field. High salinity level in the field in comparison with salinity tolerance threshold of the chickpea genotypes might be the reason for this reaction.

Keywords: genetic diversity, Kabuli chickpea, NaCl, salt stress, soil salinity.



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Effects of drought stress and salicylic acid on morphological and physiological traits of (*Foeniculum vulgare* Mill.)

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Abstract

Recently, application of salicylic acid (SA) has been increased to improve plants resistance to stresses such as drought. Hence, to investigate SA effects on morphophysiological characteristics of Fennel (*Foeniculum vulgare* Mill.) under drought stress, 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 drought stress (50, 75 and 100 percent of field capacity) and three concentrations of SA (zero, 0.5 and one mM) were considered as main and sub plots, respectively. Foliar application of SA was performed at three to four leaf growth stage and before application of drought stress. The results showed that drought stress reduced plant height, number and length of internodes on the main stem, grain yield and leaf protein (14.2, 2.4, 31.5, 51 and 23.5 percent, respectively) and increased lipid peroxidation, hydrogen peroxide and phenolic compounds (66.6, 10.5 and 14.1 percent) compared to control. With increasing concentrations of salicylic acid, except for a reduction in lipid peroxidation and hydrogen peroxide (31.8 and 13.7 percent) a significant increase was observed in other traits when compared to control. Interaction of drought stress and SA on internode length on the main stem, lipid peroxidation and protein were significant. It is concluded that salicylic acid whit concentration of one mM has an effective role in alleviating stress injuries induced by drought.

Keywords: drought stress, fennel, morphological and physiological traits, salicylic acid.