

Effect of insufficient irrigation on plant dry mater and remobilization in three spring safflower genotypes (*Carthamus tinctorius* L.)

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Abstract

In order to investigate the effect of insufficient irrigation on remobilization percent and plant dry mater in three spring safflower (*Cartamus tinctorius* L.) genotypes, a field experiment was conducted at Research Farm, Faculty of Agriculture, the University of Birjand, Iran, during 2008-2009, as a spilt plot arrangement based on randomized complete block design with four replications. Irrigation regimes (full irrigation (whole season irrigation), irrigation until grain filling, irrigation until flowering, and irrigation until heading-bud) and genotypes (Mahali Isfahan (a local variety), Isfahan 28 and IL111) were arranged in main plots and subplots, respectively. Results showed that three safflower genotypes had different responses to different irrigation regimes in terms of total dry matter; leaf, stem and head dry mater in flowering and maturity stages, harvest index and percent of remobilization. With increasing duration of irrigation disruption, plant dry matter in all genotypes reduced, and reduction in these criteria in IL111 was the highest under conditions of irrigation until heading-bud. Furthermore, the share of remobilization to heads was increased by increasing duration of irrigation disruption. Among disruption irrigation levels, the highest and the lowest percentage of remobilization were obtained in irrigation until heading-bud and full irrigation stages, respectively. Moreover, IL111 genotype due to has higher harvest index, early maturity and increased senescence of leaves had the highest percent of remobilization from stem and other leaves. Based on the results, remobilization is an important way to compensate drought stress effects; it can be a proper characteristic of semi-dwarf cultivars in comparison with old cultivars. Grain yield can improve by increasing sink capacity which increase remobilization under terminal drought stress.

Keywords: Flowering, Harvest index, Irrigation, Maturity, Oil seed

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The effect of different crop plant densities on radiation absorption and use efficiency by corn (*Zea mays* L.) and bean (*Phaseolus vulgaris* L.) intercropped canopy

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Abstract

In order to determinate the effects of plant densities in intercropped corn (*Zea mays* L.) and bean (*Phaseolus vulgaris* L.) on radiation absorption and use efficiency, an experiment was conducted at the Agricultural Research Station, Ferdowsi University of Mashhad, Iran during growing season of 2007-2008. This experiment was conducted in low input system. A randomized complete block design with three replications was used. Treatments were included bean intercropping with corn in normal density of bean plus 10%, 20% and 30% excess bean C (B+10%), C (B+20%), C (B+30%), increasing in density bean intercropping with corn in normal density of corn plus 10%, 20% and 30% excess corn B (C+10%), B (C+20%), B (C+30%) and sole crops of corn (C) and bean (B). Results indicated that leaf area index, radiation absorption, total dry matter and radiation use efficiency of corn increased in all intercropped treatments compared to sole cropping, but it reversed for bean. It seems that complementary and facilitative effects of intercropping were more for corn. Range of corn and bean radiation use efficiency was from 1.92 g.MJ⁻¹ (in sole cropping) and 0.72 g.MJ⁻¹ {in (C+30%) (B+30%)} to 2.30 g.MJ⁻¹ {in C (B+30%)} and 1.45 g.MJ⁻¹ (in sole cropping), respectively.

Keywords: Leaf Area Index, Light absorption, Radiation Use Efficiency, Row-intercropping, Total dry matter

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Effect of different methods of soil fertility increasing via application of organic, chemical and biological fertilizers on grain yield and quality of canola (*Brassica napus* L.)

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Abstract

Different resource of fertilizers had an effect on grain yield, oil and grain quality. Information regarding the effect of simultaneous application of organic, chemical and biological fertilizers on canola (*Brassica napus* L.) traits is not available. In order to study the effect of different systems of soil fertility on grain yield and quality of canola (Talayah cultivar), an experiment was conducted at experimental farm of Agricultural Research Center of Sanandaj, Iran, during two growing seasons of 2007-2008 and 2008-2009. The experimental units were arranged as split plots based on randomized complete blocks design with three replications. Main plots consisted of five methods for obtaining the basal fertilizers requirement including (N₁): farm yard manure; (N₂): compost; (N₃): chemical fertilizers; (N₄): farm yard manure + compost and (N₅): farm yard manure + compost + chemical fertilizers; and control (N₆). Sub plots consisted four levels of biofertilizers were (B₁): *Bacillus lentus* and *Pseudomonas putida*; (B₂): *Trichoderma harzianum*; (B₃): *Bacillus lentus* and *Pseudomonas putida* and *Trichoderma harzianum*; and (B₄): control, (without biofertilizers). Results showed that basal fertilizers and biofertilizers have a significant effect on grain yield. The highest grain yield was obtained from N₅ treatment in which organic and chemical fertilizers were applied simultaneously. Basal fertilizers, biofertilizers have a significant effect on leaf chlorophyll. The highest nitrogen content (42.85 mg.g⁻¹) and least amount of (N/S) were obtained from N₅ treatment. The highest oil percent was obtained from N₁ and N₂ treatments and highest oil yield was obtained from N₅ treatment. Finally, application of organic manure and biofertilizers with chemical fertilizer led to an increase in yield and quality of canola grain.

Keywords: Biofertilizer, Compost, Farmyard manure, Oil

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Yield, yield components and nitrogen use efficiency of wheat (*Triticum aestivum* L.) in mushroom compost, biological fertilizer and urea application

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Abstract

More nitrogen use efficiency in crops is important for maintaining and developing sustainable agriculture. In order to study the effect of different levels of mushroom compost and different resource of nitrogen on yield, yield attributes and nitrogen use efficiency of wheat (*Triticum aestivum* L.), an experiment was conducted at Faculty of Agriculture, Ferdowsi University of Mashhad, Iran, during 2009-2010. A completely randomized block design with three replications and 18 treatments was used. The experimental treatments were all combination of different levels of mushroom compost (0, 10, 20, 40, 80 and 160 t.ha⁻¹) and three different resources of nitrogen [control (no fertilizer), urea fertilizer (150 kg.ha⁻¹) and nitroxin biofertilizer (including *Azotobacter* sp. and *Azospirillum* sp.)]. Results indicated that dry matter, plant height, number of grains per plant, grain weight per plant and 1000 grain weight were increased significantly with gradually increasing levels of mushroom compost, while harvest index and nitrogen use efficiency were decreased with increasing mushroom compost levels. Grain weight and number of grains per plant and 1000 grains weight were increased 4.70, 2.98 and 1.56 times compared with control (without any fertilizer or any additives), respectively. In addition, results showed that urea fertilizer and nitroxin biofertilizer had significant effects on mentioned traits. However, results of present study suggest that nitroxin might not be suitable and successful biofertilizer to wheat production, if there is organic matter deficiency in the soil.

Keywords: Harvest index, Nitroxin biofertilizer, Organic fertilizer, Urea fertilizer

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Effects of *Azospirillum lipoferum* on seedling characteristics derived from sunflower (*Helianthus annus* L.) seed water deficit conditions

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Abstract

Seedling characteristics of different sunflower (*Helianthus annus* L.) cultivars under drought stress and inoculation with the *Azospirillum lipoferum* in a split-factorial layout based on randomized complete block design with three replications were evaluated. Treatments included dehydration stress (seed produced on maternal plants which irrigated after 60 (desirable irrigation), 120 (medium stress), 180 mm (severe stress) evaporation from evaporation pan class A), different sunflower cultivars (Lakomka, Master, Favorite, Soor and Armavirosky) and inoculation with bacteria (*Azospirillum lipoferum* and control). Bacteria allocated in the main plots and seeds which derived from dehydration stress conditions and different cultivars were allocated in sub plots as a factorial layout. Results showed that the time of seedling emergence, seedling vigor index, leaf petiole, stem and seedling dry weight were increased 14, 44, 30, 31, 22 and 27 percent by inoculating with bacteria, respectively. The percent of Seedling emergence of seeds derived from medium stress 48 percent was more than optimal irrigation conditions. Final appearance, speed of emergence, emergence index, dry weight and stamina seedling resulting from severe stress conditions were decreased compared with optimal irrigation. Seedling emergence of seeds derived from medium stress which inoculated with bacteria increased by 9 percent. Emergence speed index, appearance, stamina and seedling dry weights of seeds which inoculated with bacteria increased at medium and sever water stress. With consideration of the effect of dehydration stress on germination and seedling emergence, seed inoculation with bacteria improved seedling emergence and seedling vigor of seeds derived from dehydration stress conditions.

Keywords: Growth stimulus, Seedling dry weight, Seedling emergence, Seedling healthy

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An evaluation of the impact of the endophyte fungus *Piriformospora indica* on some traits of barley (*Hordeum vulgare* L.) in drought stress

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Abstract

Microbial endophytes, which make one of the most important classes of soil microorganisms, induce genetic, physiological and ecological alterations in their host plant and thus increase its yield and enable its cultivation in saline or dry soils or in climates facing biotic and abiotic stresses. The endophyte fungus *Piriformospora indica* exhibits a high effect in plant growth and increased resistance against environmental tensions like drought and salinity, as well as against phytopathogens. This work was intended to study the potential of *P. indica* in enhancing growth and elevating drought resistance in barley (*Hordeum vulgare* L.) during 2010. A greenhouse trial of completely randomized design with two fungal treatments (inoculated vs. non-inoculated) and three drought levels (F.C., 50% F.C. and 25% F.C.) with four repeats was conducted in greenhouse of Agricultural Biotechnology Research Institute (Isfahan). The results indicate that the fungus *P. indica* has accompanied biomass increments of both shoot and root parts in the inoculated plant compared to the control, as in inoculated plant, total shoot dry weight and root dry weight were increased by 39 and 46 percent, respectively. Also, in stress conditions RWC in inoculated plant was greater. In addition to the growth increasing activity, the effective role of the fungus in enhancing barley growth and yield under drought conditions (especially at the 25% F.C. level) is evident. According to the results, and to the fact that the fungus can be cultured on artificial (host-plant-free) growth medium, this fungus can be contemplated as making a growth stimulating agent and in producing biological fertilizer for use in crops; and it might take a significant role toward a sustainable agriculture. The application of this fungus can also be beneficial in increasing growth and production of crops such as barley and wheat under the dry conditions widely encountered in Iran.

Keywords: Environmental stress, Inoculation, Mycorrhizal fungi, Sustainable agriculture

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Evaluating effect of biofertilizer on nodulation and soybean (*Glycine max L*) plants growth characteristics under water deficit stress of seed

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Abstract

In order to evaluate the effects of biofertilizer on soybean (*Glycine max L.*) seed vigor that produced under water deficit condition and related traits, an experiment was conducted in a factorial layout based of complete randomized block design with four replications at the research greenhouse of Aboureyhan campus- Tehran University, Iran. Experimental treatments were include biofertilizer (seed inoculation with *Bradyrhizobium japonicum*, co-inoculation with *Bradyrhizobium japonicum* and *Pseudomonas fluorescens*, co-inoculation with *Bradyrhizobium japonicum* and *Glomus mosseae*), Cultivar (Zalta Zalha and Clark×Hobbit line) and water deficit stress [irrigation plants after 50 (normal irrigation), 100 (medium stress), 150 (sever stress) mm evaporation from pan class A, in parents field]. Results showed that the water deficit stress had negative effects on seed quality and seedling emergence percentage, mean daily seedling emergence, root, leaf and shoot dry weight, number of nodule were decreased. ZaltaZalha cultivar had higher shoot dry weight and number of leaf compared with other cultivars. Applications of biofertilizer was effective on stem diameter, root, leaf and shoot dry weight, number of leaf and nodule and those attributes increased by co-inoculation of *Bradyrhizobium japonicum* and *Glomus mosseae*. Also, use of biofertilizer in stress levels was effective on stem dry weight. Stem dry weight was increased by Co-inoculation of cultivar seeds with *Bradyrhizobium japonicum* and *Glomus mosseae*.

Keywords: *Glomus mosseae*, Seedling emergence percentage, Seed quality

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Biodiversity of carabidae beetles (Coleoptera: Carabidae) in agroecosystems of Azadshahr region, Golestan province, Northern Iran

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Abstract

Ground beetles (Family Carabidae) with more than 40,000 described species worldwide are one of the most important generalist predators in agroecosystems. Because of their habit of feeding on agricultural pests and weed seeds, in this study we tried to assess their biodiversity in agroecosystems of Azadshahr region, eastern Golestan province. Samples were collected for some main crops, using pitfall traps during 2009 and 2010 and two indices, including Simpson's reciprocal index and Shannon-Weaver index were used to measure diversity and structure of the community. Results showed that there were a high species richness of ground beetles in this region and 24, 22, 18, 18 and 12 species were identified in rape seed, wheat, tomato, broad bean and soybean fields, respectively. Dominant species in these crops were *Harpalus distinguendus* Duftchmid, *Agonum dorsale* (Pontoppidan), *Poecilus cupreus* (L.), *Agonum dorsale* (Pontoppidan), and *Harpalus rufipes* (De Geer), respectively. The values of Shannon and Simpson indices in these ecosystems were 2.16, 2.57, 1.81, 2.22 and 2.00, and 4.93, 10.09, 4.21, 6.16 and 6.12, respectively. The highest (7.1 ± 0.85) and the lowest (0.45 ± 0.12) numbers of beetles were captured in margins of rape seed and soybean fields, respectively.

Keywords: Community, Conservation, Ground beetles, Shannon-Weaver, Species richness

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Effects of elevated carbon dioxide concentrations on some morphological and physiological characteristics of sesame (*Sesamum indicum* L.) and amaranthus (*Amaranthus retroflexus* L.)

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Abstract

Carbon dioxide is the most important resource for crop growth. In order to investigate the effect of elevated CO₂ concentration on morphological and physiological characteristics of sesame (*Sesamum indicum* L.) and amaranthus (*Amaranthus retroflexus* L.) an experiment was conducted in greenhouse conditions. The experiment was factorial based on randomized complete block design with six treatments and three replications. Different CO₂ concentrations (including 360, 520 and 750 ppm) on monoculture and mixture of two species were investigated. The results indicated that plant height, node number, internode and stem dry weight had significant differences in the CO₂ concentrations. Elevated CO₂ concentration caused increasing plant height, node number, internode and stem dry weight in sesame and monoculture was better than mixtures, but in the amaranthus, elevated CO₂ concentration resulted in decreasing plant height, node number, and internode and stem dry weight. Number and length of branches and their dry weight had significant difference in CO₂ concentrations. So, effect of elevated CO₂ concentration was positive for sesame and negative for amaranthus. In amaranthus, monoculture was more successful than mixture. In the sesame, yield was included number and weight capsule and in the amaranthus was included total seed weight, that both had significant affected. Elevated CO₂ concentration had positive effect on yield of sesame and negative effect on yield of amaranthus. In the sesame, monoculture was more successful. The effect of elevated CO₂ concentration was significant on transpiration and photosynthesis rates. In the sesame, elevated CO₂ concentration increased transpiration and photosynthesis rates and decreased them in the amaranthus. In the sesame, shoot total length and root dry weight was significantly different in CO₂ concentrations and increased by elevated CO₂ concentration, but in the amaranthus, decreased by elevated CO₂ concentration. In the both species, monoculture was more successful. R/S ratio had significant difference in CO₂ concentration. In the sesame, elevated CO₂ concentration decreased, but in the amaranthus increased. However, results showed that elevated CO₂ concentration in the sesame as a C₃ and thermophilic plant, resulted in successful growth and production. In the amaranthus, there was not effect by elevated CO₂ concentration, but high temperature due to elevated CO₂ concentration caused short growth season and decreased production.

Keywords: Crop, Inter-species competition, Intra-species competition, Weed

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Effects of freezing stress on electrolyte leakage of Persian shallot (*Allium altissimum* Regel.) under controlled condition

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Abstract

In order to evaluate the effect of freezing stress on electrolyte leakage of three Mooseers' (*Allium altissimum* Regel.) ecotypes (Shirvan, Kalat and Tandoureh), a factorial experiment based on completely randomized design with three replications was carried out under the controlled conditions in the Faculty of Agricultural, Ferdowsi University of Mashhad, Iran, during 2009. Plants were grown in natural conditions to acclimate with the growth condition, and then at two growth stages of emergence and seedling were transferred to the thermogradient freezer with the six freezing temperatures (0, -4, -8, -12, -16 and -20 °C). Cell membrane integrity was measured by electrolyte leakage (EL) index and the lethal temperature 50% (LT50_{el}) of samples were determined based on this index. The results showed that electrolyte leakage percentage and LT50_{el} were significantly affected by experimental treatments. As the temperature decreased, EL (%) of leaf, bulb and root of all ecotypes was significantly increased. In the all freezing temperatures, the highest and the lowest electrolyte leakage was observed in the root and leaf in the emergence stage. Shirvan ecotype at two growth stage (emergence and seedling) showed the highest root electrolyte leakage and hence showed the lowest freezing tolerance in comparison with Kalat and Tandoreh ecotypes. The lowest and highest LT50_{el} due to freezing were observed in Kalat, Tandoureh ecotype and Shirvan ecotype, respectively. At seedling stage, Shirvan ecotype's root showed the highest LT50_{el}, which was more sensitive to freezing temperatures in comparison with leaf and bulb. Among all ecotypes, Kalat and Tandoreh ecotypes showed the lowest electrolyte leakage percentage, the lowest LT50_{el} and the most tolerance to the freezing stress.

Keywords: Electrolyte leakage, Growth stage, Lethal temperature (LT50)

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Study of the yield and its components of chamomile (*Matricaria chamomilla* L.) under drought stress and organic and inorganic fertilizers using and their residue

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Abstract

Management of organic and inorganic fertilizer application and residual of them are very important in their effect on environment and plant yield. In order to determine the effect of drought stress and different amendments on flower, essential oil and Chamazulene yield and its components of *Matricaria chamomilla* L., this study was conducted as a split plot design with three replications, at Agricultural Research Station of Zabol University, Iran, during two growing seasons of 2007-2008 and 2008-2009. Treatments included W₁ (non stress), W₂ (75% FC) and W₃ (50% FC) as main plot and three kind of residual's fertilizers: F₁ (non fertilizer), F₂ (chemical fertilizer), F₃ (manure) and F₄ (compost) as sub plot that using in the first year. Results showed that water stress at W₃ treatment reduced dry and fresh flower yield at both years. Low drought stress increased essential oil and Chamazulene yield however high drought stress decreased these variable. Chemical fertilizer caused to make the highest yield and essential oil in the first year, but in the second year, that had no different with control treatment (without fertilizer). The residue of animal manure and compost enhanced flower, oil and Chamazulene yield at the second year. In addition, animal manure and compost under drought stress in first year and under all water conditions in second year reached to the best quantitative and qualitative yield and application of them was recommendable.

Keywords: Animal manure, Compost, Chamazulene, Essential oil

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Evaluation of sustainability in saffron agroecosystems in Birjand and Qaen counties

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Abstract

This research was conducted during 2009 at a regional scale in Birjand and Qaen counties, Southern Khorasan, as an attempt to develop a sustainability index (SI) for quantifying the sustainability of saffron agroecosystem. The information of these agroecosystems, including socio-economic, agronomic and ecological indicators was collected using questionnaires and was subjected to statistical analysis. The average SI in these agroecosystems was 39.46 for whole studied region, and 37.20 and 45.09 for Birjand and Qaen, respectively. These low indices show the undesirable sustainability condition of saffron agroecosystems. In general, only 9.18 percent of all farmers achieved to a SI equal to or more than 50 and the highest score was 55.12. Among all indicators, the lowest obtained values of total for each indicator was belong to the tillage and machinery (28.31%), and water and irrigation (30.01%). The stepwise regression analysis indicated that most important factors determining SI for these agroecosystems were presence of livestock in farms, summer irrigation, availability of agricultural promoter, availability of insurance and loan, once plowing, availability agriculture inputs, the gross income from saffron yield, saffron farm size, other incomes, and water consumption. Resulted coefficient from the stepwise analysis for above factors respectively consist of: 3.42, 2.99, 2.54, 1.36, 1.29, 0.0049, 0.00031, 0.00000042 and -0.0005.

Keywords: Indicator, Sustainable agriculture, Sustainability index

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