

Assessment of nitrogen flow and use efficiency in the course of production to utilization for wheat (*Triticum aestivum* L.) and maize (*Zea mays* L.) in Iran

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Abstract

Increasing resource use efficiency is one of the important ways to enhance agricultural productions and reduce environmental hazards. For this purpose, improvement of N use efficiency is an effective approach. Nitrogen losses not only occur in field but also in the processing course. The objective of this study was to calculate nitrogen losses and efficiency during production to consumption for wheat (*Triticum aestivum* L.) and maize (*Zea mays* L.). Information on the amount of applied nitrogen, cultivation area, yield, returned residues, share and distribution of food production was collected through communication for filling questioner and literature review. Results showed that total nitrogen harvested and N efficiency by wheat and maize were 387, 81.7 Kt and 25%, 60%, respectively. The highest losses of nitrogen was observed in field for wheat but this losses for maize was lower than wheat due to higher efficiency in nitrogen absorption. N harvested rate showed different efficiency that was associated to entering which way for plant or animal production. Nitrogen use efficiency in food production cycle for wheat and maize were 14.2% and 7.6%, respectively. Higher efficiency of N was observed in plant food production path compared with animal food. Nitrogen use efficiency in plant food production system was about 13 times higher than animal production system. It seems for decreasing N losses in food production systems, the nitrogen efficiency in the field and processing courses should be increased.

Keywords: Animal food, N losses, N use efficiency, Plant food

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Evaluation of foliar Fe, Zn and B micronutrients application on quantitative and qualitative traits of safflower (*Carthamus tinctorius* L.)

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Abstract

In order to evaluate the effects of foliar micronutrients on quantitative and qualitative yield of safflower (*Carthamus tinctorius* L.), a field experiment was carried out at Research Farm of Agricultural Faculty, Zabol University during growing season of 2005-2006. The experiment performed based on RCBD with 3 replications and 7 treatments including: Fe, Zn, B, pair combination of them and control. Foliar application of Fe (as FeSO₄) in 0.004, Zn (as ZnSO₄) in 0.003 and B (as H₃BO₃) in 0.002 was used two times, before flowering and after pollination. The results showed significant differences in plant height, seed yield and biological, thousand seed weight, harvest index and percentages of protein and oil due to application of foliar micronutrients, but number of seeds per capitulum was not affected by foliar. The maximum seed yield, plant height and thousand seed weight were relevant to Fe treatment and the maximum number of fertile capitulum per plant, protein percentage were relevant to Zn treatments and the maximum oil percentage was relevant to Zn-Fe pair combination at foliar micronutrient application. In general, application of micronutrients had positive effects on quantitative and qualitative traits of safflower.

Keywords: Fertile capitulum, Number seed per plant, Oil percentage, Plant height, Seed yield

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Effect of nitrogen phosphorous and potassium fertilizer levels on yield, photosynthetic rate photosynthetic pigments, chlorophyll content, and nitrogen concentration of plant components of *Allium altissimum* Regel.

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Abstract

Persian shallot (*Allium altissimum* Regel.) is one of the perennial medicinal and industrial plant which is naturally growing in high elevated lands. In order to evaluate the effects of different nutrient elements such as nitrogen, phosphorus and potassium on photosynthetic rate and pigment content of Persian shallot; an experiment was conducted as factorial based on completely randomized design with three replications in Agricultural Research Green house, Collage of Agriculture, Ferdowsi University of Mashhad during year of 2010. The factors included nitrogen application (as urea) with four levels (control, 70, 140, and 210 kg.ha⁻¹), phosphorus (as super phosphate) with three levels (control, 50 and 100 kg.ha⁻¹) and potassium (as potassium sulphate) with three levels (control, 25 and 50 kg.ha⁻¹). Results indicated that a significant increase in wet and dry matter of bulb yield and chlorophyll content with increasing nitrogen. Nitrogen, phosphorous and interaction of nitrogen and phosphorus caused an increase in photosynthesis rate of Persian shallot. However, potassium did not have any significant effect on studied characteristics that might be because of enough potassium content in the soil. Results of soil analysis and straw stem and leaves after harvesting showed no significant differences in nitrogen concentrations of samples in different levels of fertilizers. With increasing nitrogen application, the content of bulb nitrogen significantly increased. Therefore, the highest concentration of nitrogen in bulbs with 2.3% was observed in the highest nitrogen application level treatments.

Keywords: Chlorophyll content, Leaf area, Persian shallot, Photosynthetic

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Evaluation of allelopathic effects of eucalyptus (*Eucalyptus globules* Labill.) on germination, morphological and biochemical criteria of barley (*Hordeum vulgare* L.) and flixweed (*Descurainia Sophia* L.)

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Abstract

In order to examine the allelochemic effects of seed and leaf aqueous extracts of eucalyptus (*Eucalyptus globules* Labill.) on germination, growth, morphological and biochemical criteria of barley (*Hordeum vulgare* L.) and flixweed (*Descurainia Sophia* L.), a series of experiments with five levels of seed and leaf aqueous extract of eucalyptus, including concentrations of 30, 50, 70, 90 and 100 percents by weight–volume, separately for seed and leaf with control treatment (distilled water) in a completely random design with three replications were conducted. All experiments conducted in laboratory of Biology, Faculty of Sciences, Ferdowsi University of Mashhad during 2010. The results showed that the seeds and leaves aqueous extracts of eucalyptus at all concentrations had inhibitory effects on final germination percentage and germination rate of both species. The inhibitory effects enhanced as the extract concentration increased. The shoot and root lengths and fresh and dry weights were greatly reduced in flixweed than in barley. Similarly, chlorophyll a and b and total chlorophyll contents were decreased in leaf of barley and flixweed. In both species, accumulation of proline and soluble sugars amounts increased, it seems that this is an adjustment mechanism for ameliorate of stress tolerance. The results of this study also showed that the seeds aqueous extract of eucalyptus was more effective in morphological and biochemical characteristics of two species than to leaves; it was also observed that allelopathic impacts of eucalyptus seeds was more for dicotyledon species (flixweed) than to monocot (barley). Finally, it seems that the allelopathic chemicals of seeds and leaves aqueous extracts of eucalyptus may have the potential as biological herbicide or new formulation of herbicide.

Keywords: Aqueous extract, Chlorophyll content, Growth, Weed

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Effect of vermicompost on photosynthesis and transpiration rate and water use efficiency of bean (*Phaseolus vulgaris* L.) under salinity stress

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Abstract

Vermicompost can play an effective role in plant growth and development and also in reducing harmful effects of various environmental stresses on plants. This study was carried out with aim of the investigation on the interaction effects between vermicompost and salinity on photosynthesis, transpiration rate and water use efficiency of bean (*Phaseolus vulgaris* L. cv. Light Red Kidney) cultivar, at seedling and flowering growth stages. Five different volumetric ratios of vermicompost and sand, including: 0:100, 10:90, 25:75, 50:50 and 75:25 and four levels of salinity (20, 40, 60 and 80 mmol.l⁻¹ NaCl), along with control were conducted based on randomized complete block design with three replications, at the Research Greenhouse, Faculty of Agriculture, Ferdowsi University of Mashhad, during year of 2010. Bean seeds were cultured in plastic pots and the photosynthesis and transpiration rate, water use efficiency (WUE) and intracellular CO₂ concentration were measured. Hoagland's nutrient solution was used during the growth period of plant in order to supply nutrient requirements. Results showed that salinity decreased and vermicompost increased photosynthesis rate of plant. In the flowering stage, vermicompost in all ratios, significantly increased water use efficiency in different levels of salinity compared to the control plants. In the seedling stage, 10 and 25% of vermicompost and in the flowering stage almost all of the ratios ameliorated the negative effects of salinity on plant photosynthetic rate. Vermicompost probably can play an effective role in reducing harmful effects of various environmental stresses such as salinity on plants due to the porous structure, high water storage capacity, having hormone-like substances and plant growth regulators, and also high levels of macro and micro nutrients. In this experiment, vermicompost improved the photosynthetic rate in plants exposed to salinity.

Keywords: Environmental stresses, Organic fertilizer, Photosynthetic system, Water holding capacity

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Effects of drought stress and fertilizer sources on yield and yield components of safflower (*Carthamus tinctorius* L.)

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Abstract

In order to study the effect of different drought stresses and fertilizer sources on yield and yield components of safflower (*Carthamus tinctorius* L.), a field experiment was conducted as split plot based on randomized complete block design with three replications at the Agricultural Research Station, college of Agriculture, Urmia University, Iran during growing season of 2009-2010. Treatments consisted of well-irrigation (I₁), irrigation only at vegetative growth stage (I₂), and irrigation only at reproductive growth stage (I₃) as main plots and fertilizer sources including control (C), Urea (U), Humix as organic fertilizer (O), biofertilizers of Nitroxin (N), Biosoulphoure (B), integrated fertilizer treatments (Urea + Humix + Nitroxin) (T₁), and (Urea + Humix + Biosoulphoure) (T₂) as sub plots. The results indicated that the head number per plant, 1000-seed weight and oil content were significantly influenced by "Water deficit stress × fertilization" interaction. The most number of head per plant (18.3) obtained in I₁T₂ and the least (10.4) observed in I₂U treatment. The highest (44.7 g) and lowest (32.05 g) 1000-seed-weight was obtained in I₃T₂ and I₁O treatments, respectively. I₁B and I₃C treatments had the maximum and minimum oil contents, respectively. The greatest amount of biological yield (8819.6 kg.ha⁻¹) obtained from I₁, while the lowest was observed in I₂ treatments. Seed weight per head and seed yield were the highest and lowest in I₁ and I₂ irrigation treatments, respectively. Plants treated with T₂ and control fertilization treatments had the highest (2830 kg.ha⁻¹) and the lowest (1845.4 kg.ha⁻¹) seed yield, respectively. Generally, water deficit stress in reproductive growth stage caused the greatest reduction in most of the traits associated with yield and yield components of safflower. Among the fertilizer sources, integrated fertilizer treatments (Urea + Humix + Biosoulphoure) had the most effect on safflower.

Keywords: Biofertilizer, Irrigation withhold, Oil content, Organic fertilizer

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Effect of polyethylene and organic mulches in different intervals of irrigation on morphological characteristics and grain yield of sunflower (*Helianthus annus* L.)

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Abstract

In order to investigate the effects of polyethylene and organic mulches in different Irrigation intervals on morphological characteristics and seed grain of sunflower (*Helianthus annus* L.) hybrid Azrgol, an experiment was conducted in split-plot design based on randomized complete blocks with three replications at research farm of college of Aboureihan, University of Tehran during year of 2009. Main factor was three irrigation interval including of 7, 12 and 17 days and sub-factors were treatments without mulch as control and different types of mulch (polyethylene, cow manure including of 8.5 t.ha⁻¹, 17 t.ha⁻¹, 25 t.ha⁻¹, wheat stubble mulch in three levels of 2.5, 5.5 and 7.5 t.ha⁻¹). Plant height, head diameter, seed number in each head, 1000-seed weight, seed yield, oil yield, harvest index were investigated. The results indicated that the effect of irrigation period and the effect of mulches for all measured traits were significant. Highest seed yield with average of 2.965 t.ha⁻¹ was obtained from 7 days irrigation and also polyethylene mulch and stubble mulch level three in different irrigation periods, had the highest yield. The overall results showed that, using mulches by reducing irrigation water use can increases the quality and quantity seed yield. Regarding the results of the study and non-toxic effects of stubble mulches in agriculture, we suggest their usage.

Keywords: Irrigation intervals, Mulch, Water deficit stress, Yield

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Agro-climatic zonation of Khouzestan province based on potential yield of irrigated wheat using WOFOST model

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Abstract

By application of climatic zoning methods, it is possible to study different agricultural aspects and then with harmony this aspects, determined similar states in a zone. Today, simulation models are widely used around the world in agricultural research and education and cropland management. Due to the vast extent of the agricultural activities in Iran, application of such models seems to be quite necessary for optimization objectives. The primary focus of this research was climatic zoning of Khouzestan region based on the results from wheat yield potential by means of WOFOST model. First, model performance and the accuracy of its results were evaluated. The findings showed that WOFOST model can adequately simulate phenological phases and grain and dry matter yields. The calculated Root Mean Square Error (RMSE) values from blooming and physiologic maturity of crop were 1.97 per day and for seed and dry matter performances 810 and 810 kg ha⁻¹, respectively. Also, one-to-one linear regression values for these stages were 0.96, 0.97, 0.93 and 0.91, respectively. The results of simulations indicated that the potentials of crop yield and the actual yield of farmlands are considerably different. Determination of the yield potentials of crop and its restricting factors were considered as the first step toward higher yield of crop. The results emphasized the fact that maximum and minimum yield potentials were found near the cities of Izeh (9247 kg. ha⁻¹) and Shushtar (7538 kg. ha⁻¹). A comparison of potential and actual crop yield trends revealed that the latter has been decreased might be due to the global warming phenomena resulting from green gases release into atmosphere while the increase of the farmer has been related to genetic modification of crop and management strategic. The results also showed that the poor yield of Mahshahr croplands (65.8%) was because of unsuitable soil and high level ground water resources. The lowest performance was found in Dezful cropland (41.6%), which was mainly due to the unfavorable soil, extremely low range temperature variations and solar radiations along with suitable social-economic status of local farmers. The difference of performances at various points within Khouzestan region in terms of climate yield potentials was estimated as 18%. However, results indicated that the yield potentials and actual yields of farmers are substantially different. Still, the interpretations of results hopefully indicate that the potentials for augmentation of actual wheat performance through improvement of farming management practices and soil modification are huge.

Keywords: Agro-climatic zonation, Simulation, Yield gap

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