



Effect of seed deterioration on the growth response of wheat under waterlogging stress

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Abstract

Background and objectives: Seed deterioration and waterlogging stress are factors that lead to lower growth. Lower vegetative growth can cause lower emergence rate and percent and lead to lower plant density under unsuitable condition and decrease seed yield. On the other hand, seed deterioration may affect plant growth which can be used to quantify growth analysis.

Materials and methods: In order to investigate the mechanisms that lead to the reduction of growth and interaction of these two factors, a factorial experiment was conducted in a randomized complete block design (3 treatments seed quality for 0, 72 and 144 hours of accelerated aging and four treatments involves waterlogging (0, 5, 10 and 15 days of flooding)) in four replications. In this research wheat seeds (Daria) were aged by accelerated aging in the laboratory for producing different seed quality treatments.

Results: The results of laboratory studies showed that seed deterioration reduced germination and seedling growth. In the greenhouse, the plants during the tiller stage of control treatment (TS) (before waterlogging stress) and heading stage of control treatment (HS) (after waterlogging stress) were harvested. By increasing accelerated aging, number of plants decreased in TS stage. In HS stage plant and tiller number affected by aged seed, with increasing seed deterioration plant number reduced but tiller number increased. At TS stage ground cover was not

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completed and leaf area and dry weight is depend on plant density and they reduced with seed deterioration. Waterlogging stress reduced leaf area per pot. At TS stage with increasing seed deterioration relative growth rate (RGR) increased significantly. One of the reasons for higher RGR of plant from aged seeds is lower plant density and plants tend to compensate lower canopy closure. After waterlogging stress RGR, Net absorption rate, relative leaf area and relative leaf weight significantly affected by seed deterioration but waterlogging stress and interaction effect of seed deterioration and waterlogging effects were not significant.

Conclusion: Seed deterioration treatments, Waterlogging stress and their interaction were effective on the growth response mentioned in wheat

Keywords: Growth and analysis of growth factors, Seed deterioration, Waterlogging stress, Wheat



The effects of winter cover crops and the removal methods on leaf qualitative characteristics and income of greenhouse type Tobacco (K326)

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Abstract

Background and objective: In order to investigate the impacts of winter cover crops and their removal methods on qualitative yield and income of greenhouse tobacco type (K326), an experiment was conducted as a split plot based on randomized complete block design with four replications in Tobacco Research Center of Tirtash in 2012-2013. The main factor was cover crop (including wheat, WM; Berseem clover, BC; hairy vetch, HV; and bitter vetch, CP) and sub-plots included removal treatments (Paraquat+mulch, PM; Glyphosate+Mulch, GM; Moving+Mulch, MM) and control (without cover crop control and mulch management).

Materials and methods: In December 2011, the cover crops were sown with 50, 50, 25 and 200 Kg ha⁻¹ seed rate for bitter vetch, hairy vetch, Berseem clover and wheat, respectively. On April 24, 2011 cover crops removed by with herbicide and stem cutting and they remained on the land surface as mulch. On late February 2012, tobacco was sown in seedbed and on May 8, 2012, the seedlings with 15-20 cm height were transplanted into the field. Forty days after transplanting, the first leaves harvesting was conducted and their sugar, nicotine, phosphor, nitrogen, potassium, chlorine contents and leaf yield were measured.

Results: Cover crops and mulch management had no significant effect on the nicotine and total leaf nitrogen content. Interacted effect of both factors was significant on the sugar content, as the maximum (15.95%) and minimum (11.27%)

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levels were related to WM-MM and HV-PM, respectively. The interaction effect of mulch management and cover crop on potassium content was significant. The maximum and minimum potassium levels were related to WM (2.53%) and HV (2.15%), respectively. Cover crop effect on phosphorus content was significant and the highest content related to BC (1.29%) and the lowest (0.8%) related to WM. Combined treatment of mulch management \times cover crop had significant effect on the tobacco fee.

Conclusion: Overall results revealed that cover crops along with mulch management could be considered as an appropriate alternative to improve qualitative characteristics of tobacco along with increasing the fee and farmer's income. Also could be a proper alternative for chemical inputs to move toward sustainable agriculture goals.

Keywords: Berseem clover, Hairy vetch and Bitter vetch, Mulch management, Wheat



Study of rice lines tolerant to heat stress of IRRI By using multivariate statistical methods

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Abstract

Background and objectives: Evaluation of the grain yield and yield components and also morphological traits can help to identify strategies for selection of resistant cultivars and increased crop yield production under heat stress condition. To this end, in experiment to evaluate of grain yield and yield components on 42 rice lines tolerant to heat stress from International Rice Research Institute (IRRI).

Materials and methods: An experiment was conducted based on randomized complete block design (RCBD) with three replications plus Hoveizeh cultivar as control during 2013-2014 in Agricultural Research and Natural Resources Center of Khuzestan province, Iran. The evaluated eight characters were: degree of maturity, growth period, number of tillers per square meter, number of grains per panicle, number of hollow grains per panicle, 1000 grain weight, fertility percentage and grain yield measured on the basis of the standard system of International Rice Research Institute. As the degree of maturity of the product of two traits of fertility percentage and 1000 grain weight were measured in each trial.

Results: Research simple of traits variance analysis showed there were significant differences in effect of cultivar for all traits except number of tiller per square meter that this result showed that diversity of the lines and cultivar for using in the study. Number of tillers per square meter and number of grains per panicle in front of grain yield imported in regression equation that these traits of positive and significant correlation with grain yield. Path analysis showed that the number of grains per panicle with correlation coefficient of 0.337 had the higher direct effect than number of tillers per square meter with correlation coefficient of 0.186 on

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grain yield. Principal component analysis of the first two components explained 74% of the total diversity. In this analysis desirable characters such as fertility percentage, grain yield and degree of maturity in the first component have positive coefficient traits which increase first component, and also 1000 grain weight with negative factor coefficient in second component, so first component increased and second component decreased. Cluster analysis, case of study cultivar and lines resolved in three groups. In the first cluster, lines such as: 1, 34, 54, 35, 39, 21, 33, 40, 25, 28, 9, 10, 15, 29, 32, 31, 30, 36 and 44 as well as in the second cluster, lines such as: 3, 24, 4, 19, 5, 7, 6, 55, 14, 23, 16, 17, 18 and 20 and in the third cluster, lines such as: 8, 50, 52, 43, 41, 45, 11, 13, 12 and 26 were included. In the first cluster desirable lines were 40, 35, 34 and 25 and in second cluster undesirable lines were 11, 12, 13, 26, 41 and 45.

Conclusion: Significant differences in effect of cultivar for all traits except number of tiller per square meter that this result showed that diversity of the lines and cultivar for using in the study. According to graph of biplot the first cluster was as best cluster and third cluster was as worse. Discriminant function showed truth grouping at 95%.

Keywords: Cluster analysis, Discriminant function, Path analysis, Principal components analysis, Rice



The feasibility of Potassium excess using in absorbable Potassium determine in some dryland rain-fed wheat in Golestan province

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Abstract

Background and objectives: Plant appropriate nutrition is one of the most important factors in improving the quality and quantity of product. Providing adequate and balanced of plant nutrients is essential for achieving maximum potential production. Potassium is one of the essential elements to plant's growth. Therefore, knowledge of soil potassium status is so important in order to optimum usage of potassium fertilizers. There are several methods to measure soil K⁺. Ammonium acetate method to extracting the plant usable potassium is not efficient in all kinds of soils and high cost of sodium tetra-phenyl boron is also the negative point of this method for extracting numerous soil samples. Considering this matter that Extraction method with ammonium acetate in Loess soils with high specific surface area in Golestan Province is less accurate compared to the method of sodium tetra-phenyl boron extraction; and on the other hand sodium tetra-phenyl boron extractio is time-consuming and costly; We have to select a different method to estimate K which is more accurate and time and costs are lower. The aim of current study was to determine the feasibility of a low-cost index as potassium excess in determination of soil available potassium in some rain-fed wheat in Golestan province with limited usability of ammonium acetate. Forecasting wheat yield with using artificial neural network in a farm limited unit in order to achieve the final goal of application potassium excess for estimating fertilizer requirements.

Materials and Methods: This study was done in a piece of land (922 m²) in Gorgan University of Agricultural Sciences and Natural Resources Farm one. Plots were divided into 40 plots and wheat (var., line17) seeds were planted. During one stage (before planting) soil samples were collected from each 40 plots and

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transferred to the laboratory for further analyzes. At harvesting time, plants were harvested each plot separately. Potassium was measured by three methods of ammonium acetate, sodium overload and sodium tetra-phenyl boron. Artificial neural network model was used to estimate the predicated yield. In this model output yield and potassium intake was measured by three mentioned methods.

Results: According to the results, the correlation between yield and the three extractor ammonium acetate, sodium tetra-phenyl boron and potassium excess, are 0.62, 0.78 and 0.77 respectively. Accordingly, the extraction method with an overload of potassium, has higher correlation with grain yield, than ammonium acetate extraction method, and has close results with extractor sodium tetra-phenyl boron.

Conclusions: The studied soil extraction method with an overload of potassium compared to the current method (in the region) by ammonium acetate extraction has greater accuracy and efficiency. As a result of using less fertilizer and potassium excess not only increase the yield per unit area, but also will reduces environmental pollution due to excessive use of chemical fertilizers.

Keywords: Artificial neural networks, Ammonium acetate, Dryland wheat, Golestan, Overload potassium



Response of growth criteria, yield and physiologic efficiency and nitrogen appear recovery of flint corn to Simultaneous cropping of legumes and different levels of urea

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Abstract

Background and objectives: Sustainable agriculture is combination of knowledge that can be long-term management of biological, environmental and economic which have suitable added value. One of the ways to move towards sustainable agriculture is mixcropping of different species of plants in agriculture (1). In many parts of the world mixcropping as part of the management of agricultural ecosystems accepted and has certain advantages in terms of the degree of variability in time and space (4). Intercropping can be effective as an important factor in sustainable agriculture and according to the different needs of the species in the mix, so the output will be less competition. Research has shown that the superiority of mixed agriculture due to more complete use of growing resources (37). The aim of this study, was to investigate of growth criteria, yield and physiologic efficiency and nitrogen appear recovery of flint corn to simultaneous cropping of legumes and different levels of urea levels.

Materials and methods: This study was carried out at field of agricultural research center of Markazi province during growing season of 2012-2013. A factorial arrangement based on randomized complete block design with three replications was used. Nitrogen manure levels [N_0 = without urea (Control), N_1 = 75 kg ha⁻¹ of urea, N_2 = 150 kg ha⁻¹ of urea, N_3 = 225 kg ha⁻¹ of urea) and Simultaneous cropping treatment, (S_1 = Cultivation of corn, S_2 = Cultivation of corn + chickpea, S_3 = Cultivation of corn + cowpea, S_4 = Cultivation of corn + mung bean) were assigned in plots. Each sub plot consisted of 4 rows, 6 m long with 60 cm between rows space and 20 cm between plants on the rows and S.C 704 hybrid was used. In this study characteristics such as: height of ear, nitrogen physiological efficiency of

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corn, dry weight of cob and husk, number of branches per legumes, number of grain per legumes, harvest index of corn, forage weight of corn + legumes, nitrogen appear recovery of corn and grain yield were assessed.

Results: Results indicated that the effect of different levels of urea was significant on the characteristics such as: height of ear, nitrogen physiological efficiency of corn, dry weight of cob and husk, number of branches per legumes, number of grain per legumes, harvest index of corn, forage weight of corn + legumes, nitrogen appear recovery of corn and grain yield. The maximum and minimum nitrogen physiological efficiencies (22.75 and 4.38 %) were obtained in 225 kg ha⁻¹ urea + corn and 75 kg ha⁻¹ urea + corn treatments, respectively. The maximum and minimum grain yield (8.1 and 4.5 ton ha⁻¹) were obtained with the (225 kg ha⁻¹ urea + corn) and (without urea + Cultivation of corn + mung bean) treatments, too.

Conclusion: Therefore, the application of integrated plant nutrition can increase nutrient use efficiency and producing products with greater quality and quantity. Also, by reducing the use of chemical fertilizers and leaching by reducing the amount of the tremendous waste, reduce environmental pollution of surface water and groundwater. As a result, production stability and sustainability of agriculture and natural ecosystems will be very important.

Keywords: Corn, Forage yield, Harvest index, Mixed cropping, Mung bean



Delay cropping effect on yield, yield component, grain oil content of two canola (*Brassica napus*) cultivars

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Abstract

Background and objectives: In recent decades, canola is one of the most important oil crops. One of the factors affecting canola yield is sowing date. In Golestan provinces sowing date is delayed because of the unsuitable weather condition during canola sowing such as lack of rainfall and unsuitable condition for soil preparation. Then evaluation of delay cropping effect on yield and yield components and selecting best genotypes and row spacing is essential.

Material and methods: In order to evaluate the delay cropping on yield and yield component of two canola cultivars and selecting the best genotype and row spacing, an experiment was conducted at three years (2007, 2008 and 2009) in Gorgan Research Station. This experiment was arranged in split-factorial based on randomized complete block design with four sowing dates (28 Oct., 12 and 28 Nov. and 12 Dec.) as main plot and row spacing (12 and 24 cm) and cultivar (RGS and Hayola 401) as subplot in three replications. Growth stage, number of siliques per plant, number of seed per silique, seed yield and grain oil content (%) was recorded.

Results: Results showed that delay cropping had different effect in three years and delay planting had higher risk during dry years. Average seed yield of three years at different sowing date showed that Hayola produced higher yield (3287 Kg ha⁻¹). Seed yield of Hayola and RGS reduced 379 and 410 Kg ha⁻¹ per ten days delay in sowing date. Relationship between mean air temperature during flowering and maturity showed that the effect of increasing temperature on seed number (351 Kg ha⁻¹ loss) was more than seed weight (100 Kg ha⁻¹ loss). Ten days in planting date increased oil percent (1%).

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Conclusion: In general, in normal years seed yield reduced 27 Kg ha⁻¹ per one day delay in sowing. In delay planting Hayola cultivar is recommended and increasing row spacing did not have significant effect.

Keywords: Delay sowing, Production risk, Oil crop



Crop Rotation Effects on the Critical Period of Weed Control in Canola

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Abstract

Background and objectives. The fundamental role of integrated weed management (IWM) is to provide a source of scientifically based knowledge from which growers can make informed weed-management decisions, for this reason IWM approaches can help to decline cost and improve weed control. Critical period of weed control (CPWC) is defined as the best time for weeding. If CPWC is recognized we can accurately use herbicides and prevent environmental pollutions. Beginning and duration of CPWC depend on some agents such as crop and weed traits, environment and agronomical factors. With respect to inexistence data about the effect crop rotation on the CPWC this study was done.

Materials and methods: In order to determine effect two different crop rotations (wheat-canola and soybean-canola) on the critical period of weed control in rape seed, two experimental designs were performed for the first and second rotation in 2011 and 2012, respectively. These studies did in the suburban of Galugah region in randomize completely block format with three replications. Factors which measured were some soil physico-chemical characteristics (bulk density, nitrogen, phosphorous and organic carbon), yield and yield components and also number and weight of weed species. Treatments included periods of weed management on the canola growth stages (five weeding and competition levels up emergence, two leaf stage, four leaf stage, eight leaf stage, flowering stage plus two control treatments). For estimating critical period of weed control we used Gompertz (for computing weed-free duration) and Logistic (for measuring weedy duration) equations.

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Results: Findings showed canarygrass dominated in both rotations. Species diversity in soybean-canola rotation by using Shannon index ($H= 0.69$) was higher than wheat-canola ($H= 0.45$). Canola yield was 4060 and 2280 kg ha⁻¹ in the wheat-canola and soybean-canola rotations, respectively. Further yield in the first rotation can be related to positive role of organic matter which was more in the soil and its influence on the most important yield component that was number pod in each plant. The CPWC for wheat- canola rotation was between 161 and 354 days after planting (DAP) (emergence to six-leaf stage) and between 65 to 920 DAP (planting up maturity stage), using 5 percent acceptable yield reduction. Hood canary grass (*Phalaris paradoxa*), Carrot bur parsley (*Caucalis platycarpos*), Milk thistle (*Silybum marianum*) and Wild mustard (*Sinapis arvensis*) were dominant in wheat-canola rotation but Littleseed canarygrass (*Phalaris minor*) and Yellow sweet clover (*Melilotus officinalis*) were the dominant weed in wheat-soybean rotation.

Conclusion: CPWC in soybean-canola rotation relative to wheat-canola rotation began sooner and its duration also was longer.

Keywords: Culture succession, Integrated management, Weed control



Evaluation of yield and morphological characteristics of sweet corn (*Zea mays* var. *saccharata*) by different irrigation levels and cultivation techniques

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Abstract

Background and objectives: In Iran, reducing of water resources and increasing of water losses in the various methods of the surface irrigation, has increased attention to pressurized irrigation method, especially drip irrigation. Application of the plastic mulch method is used in cultivation of early sweet corn. Application of this technique due to providing temperature in both plant growth and early maturity results the on-time delivery of product to the target market. Additionally, to reducing of water consumption, using germinated seedlings in the greenhouse and transplants it under plastic on the farm, cause early maturity.

Materials and methods: In order to evaluation of yield and some morphological characteristics of sweet corn by different irrigation levels and cultivation techniques, an experiment was carried out as split plot in randomize complete blocks design with three replication in Faculty of Agriculture, Research Field Station of Yasouj University in 2015. The main factor consisted of three levels of irrigation (100 (I₁), 75 (I₂) and 50 percentage of water requirement (I₃)) and the sub-factors were cultivation techniques of sweet corn in six levels (seed cultivation of sweet corn under plastic mulch on April 4 (CT₁), seedling cultivation under plastic mulch on April 4 (CT₂), seed cultivation to conventional method of sweet corn on May 5 (CT₃), seed cultivation of sweet corn under plastic mulch on May 5 (CT₄), seedling cultivation of sweet corn under plastic mulch on May 5 (CT₅) and seedling cultivation to conventional method of sweet corn on May 5 (CT₆)).

Results: The result indicated that interaction effect of irrigation and cultivation techniques were significant on ear yield, the canned yield, water use efficiency

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based on fresh grain, forage yield and biological yield. The maximum ear yield was obtained in I₂CT₁, I₁CT₁, I₂CT₂ and I₁CT₂ treatment equal to 1442, 1441, 1369 and 1351 g m⁻², respectively. The minimum ear yield was obtained in I₃CT₃ treatment equal to 706 g m⁻². The maximum canned yield was obtained in I₁CT₁, I₂CT₁, I₁CT₂ and I₂CT₂ treatment equal to 558.7, 551.1, 536.2 and 527.4 g m⁻², respectively. Transplanting accelerated plant growth and development. The maximum water use efficiency based on fresh grain was obtained in I₂CT₂, I₂CT₁, I₃CT₂ and I₃CT₁ treatment equal to 2.21, 2.18, 2.16 and 2.14 Kg m⁻³, respectively. With increasing of water consumption economic efficiency of water consumption decreased. Then drip irrigation along with supplying 75 percentage water requirement with achieve acceptable performance with maximum water use efficiency. The maximum forage yield and biological yield were in I₁CT₁ treatment equal to 2008 and 3399 g m⁻² and the minimum forage yield and biological yield were in I₃CT₆ treatment equal to 1237 and 1947 g m⁻², respectively. The effect of irrigation was significant on ear length and the effect of cultivation techniques was significant on plant height. The maximum ear length 100 percentage water requirement in treatment were equal to 20.3 cm and the minimum in 50 percentage water requirement treatment equal to 17.6 cm. the maximum plant height was obtained in seed cultivation under plastic mulch on April 4.

Conclusion: If there are water restrictions, application of 75 percentage of water requirement of sweet corn with plastic mulch is suitable for maximum yield production.

Keywords: Drip Tape Irrigation, Evapotranspiration, Grain Yield, Water Use Efficiency



Evaluation of drought under increasing of temperature due to climate change in the rainfed wheat-growing areas of Fars province using Aridity Index

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Abstract

Background and objectives: Making a reliable prediction of drought index status for the future is one of the major elements in a successful water resources management particularly under climate change processes, including increase in atmospheric carbon dioxide concentration, temperature and fluctuations in rainfall. The present study aims at assessing drought trend under changing climate conditions in some locations of Fars province.

Materials and methods: This study was conducted in six locations of Fars province (Shiraz, Lar, Abadeh, Darab, Eghlid, Fasa). In the current study, two general circulation models (IPCM4 and HadCM3) under three emission scenarios (A1B, B1 and A2) were applied during three time periods of 2011-2030, 2046-2065 and 2080-2099. LARS-WG program was employed to assess rainfall, maximum and minimum temperatures during the mentioned periods and in different emission scenarios. AI (Aridity Index) was used to study drought pattern during wheat growth stage in study locations.

Results: Results showed that the impact of climate change on AI was a result of increasing temperature and evapotranspiration (ET) as well as decreasing cumulative rainfall which consequently reduced AI in all locations, scenarios and time periods compared to the baseline (i.e. locations would be drier in the future). There was no difference between climate models, scenarios and time periods in terms of ET. Generally, there will be a substantial increase in ET in Fars province

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in the future as a result of rising temperature which is highly correlated with ET. Results also revealed that the highest variability in AI was observed in Lar under three scenarios. In B1, fluctuation in AI was lowest amongst study locations and ranged from -55 to +55 percent while it was -100 to +150 in the other two scenarios compared to the baseline.

Conclusion: Results of the current study indicated that a reduction in AI in Fars province would be observed under future climate change. There will be a substantial increase in AI in Fars province in the future as a result of rising temperature which is highly correlated with ET. Drought spatial map also portrayed that drought would be intensified as the time period after 2030 and became closer to 2090 in all locations. In two climate models, three time periods and three scenarios, increasing ET and lower rainfall had high correlation (positive and negative, respectively) with max temperature. It is predicted that AI intensify in the future and reduce rainfed wheat production. In this research increasing CO₂ from climate change on stomatal conductance and transpiration was not mentioned. Based on references it could decrease stomatal conductance, transpiration and drought from 15 up to 22%.

Keywords: Aridity index, Climate model, Emission scenarios, General circulation models, LARS-WG



Effect of nitrogen and organic fertilizers on soil properties and essential oil characteristics of Ajowan (*Carumcopicum*)

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Abstract

Background and Objectives: The Ajowan (*Carumcopicum*) is a medicinal plants from Apiaceae family that seeds contains 2-4% of volatile oil. 9-17 of chemical composition of ajowan essential oil have been reported (2), it has antibacterial and antioxidant activity and it could be used to preserve the food materials. The application of chemical fertilizer leads to environmental pollution and ecological disaster (13). The proper approach to solve these problems is the use of sustainable agriculture fundamentals in agro ecosystems, that biological fertilizer such as vermicompost and Alkazotplus and Humic acid could be effective for these issues. In order to mentioned issues, the goal of this research was the examination of the effects of different fertilizer resources on essential oil of Ajowan and soil properties in Ahvaz condition.

Material and Methods: A field experiment was conducted based on randomized complete block design (RCBD) as a factorial arrangement with three replications at the Agricultural Research Station of Shahid Chamran University in 2014-2015. Nitrogen sources at the four levels (control (no nitrogen source), 150 Kg ha⁻¹ urea (U), 75 Kg ha⁻¹ sulfur-coated urea (SCU), half of Sulfur-coated urea (1/2 SCU)+Alkazot Plus biological fertilizer) were first factor, and the second factor were organic fertilizers at 4 levels (control (no organic sources), humic acid, 5 t ha⁻¹ vermicompost, half of vermicompost + humic acid). The measurement traits were essential oil percent and yield, soil organic matter percent, total nitrogen percent and soil phosphorus and potassium. After ripening the plants harvested at May 2015. The seeds were planted with 4 Kg ha⁻¹ seed density, the 30 cm distance

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between rows and 5cm far from distance in rows). The Ajowan seeds collected and its essential oil extracted with Clevenger apparatus and water distillation with water vapour methods.

Results: The results showed that the interaction between different sources of nitrogen and organic fertilizers on Ajowan essential oil percent and yield was significant at 1%. The highest essential oil percent (5.5%) and performance (85.4 kg/ha) were obtained at control (without nitrogen source), vermicompost and urea (U) with vermicompost, respectively. The highest organic matter percentage (1.45%) , soil nitrogen percent (0.06%), the percent of soil potash (226.3 mg/kg) and soil phosphorus (22.38 mg/kg) were obtained at urea (U) with control (without organic fertilizer) treatments, urea (U) with vermicompost, half of urea-coated Sulfur+Alkazot Plus with vermicompost and urea (U) with vermicompost, respectively.

Conclusion: Integrate use of chemical and biological fertilizers, in addition to the positive environmental effects, had positive effects in increasing the characterization essential oil that can be economically effective and also by improving the characteristics of the soil, it could be attain sustainable agriculture (Permaculture).

Keywords: Alkazot Plus, *Carumcopticum*, Essentialoil, Humic acid, Sulfur-coated urea, Vermicompost



Interactive effect of nitrogen and salinity on yield, oil content and nitrogen use efficiency in of canola

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Abstract

Background and objectives: In most saline and non-saline soils, nitrogen is the most restrictive nutrient for plant growth. In saline soils, interactive effects of salinity and soil fertility is very important from optimum production. Nutrient imbalance is one of the problems with saline soils. In these circumstances, the fertilizer application may to increase osmotic effect of salt, the question is whether fertilizer is necessary or not, in saline soils? In order to answer these questions, an experiment with salinity and nitrogen factors were carried out on canola.

Materials and methods: In order to evaluate the interaction of salinity and nitrogen, a factorial experiment in a randomized complete block design with factors of salinity and nitrogen were carried out on canola. Salinity treatments were included a non-saline water (0.3 dS m^{-1}), and natural saline waters with salinity of 3, 6, 9 and 12 dS m^{-1} . Nutrient nitrogen levels were four value: zero (N1), 75 (N2), 150 (N3) and 300 (N4) mg N per kg of soil as the ammonium nitrate. The soil texture used in this research was sandy loam containing low amounts of salinity and nitrogen.

Results: The results showed that with increasing salinity, seed canola yield reduced and increased by adding nitrogen to the soil. In this experiment, nitrogen application even to the amount of 300 mg N Kg, increased percentage of seed oil content. The increase was little in the salinity of less than 12 dS m^{-1} . Generally, with increasing water salinity and nitrogen application, nitrogen agronomy efficiency (NAE) decreased for oil production. NAE threshold for oil production in saline conditions depended on the amount of nitrogen application. NAE threshold

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for oil production in the first level of nitrogen equal to 0.3 dS m⁻¹ and at higher levels of nitrogen increased to 6 dS m⁻¹. By increasing nitrogen levels nitrogen apparent recovery (NAR) decreased sharply.

Conclusion: With increasing salinity, canola yield reduced and increased by adding nitrogen to the soil. In general, by increasing salinity (especially in high salinity), at all levels of nitrogen, nitrogen physiological efficiency (NPE) of canola increased. In the highest salinity value, N application, increased canola seed oil content so significantly. Nitrogen agronomic efficiency threshold for producing of canola oil in saline conditions depended on the amount of nitrogen application. According to the results, it is recommended to act more cautiously using large amounts of nitrogen in salt condition.

Keywords: Apparent nitrogen recovery, Nitrogen agronomic efficiency, Nitrogen physiologic efficiency, Nutrient, Saline water



(Technical Short Report)

Cokriging in predicting wheat yield using principle component analysis

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Abstract

Background and objectives: Increasing demand for food in the world and limiting available resource for production make the necessity of using new tools for prediction of crop production. Knowing factors that limit regional production and promote management methods is essential. The measurement of wheat crop yield in large areas is time consuming and requires high expenses. One way to save time and cost, using geostatistical methods for mapping crop yield. The aim of this research is interpolation of irrigated wheat yield with two methods of ordinary kriging and cokriging in order to use the optimum method.

Materials and methods: In this research principle component analysis were used for identifying variables that have correlation with each other, and Kriging and Cokriging were used to map crop yield prediction. Forty six samples were used for prediction as training, and 21 samples for test. For selection of covariate, principle component analysis was performed. So that predicted yield by square root method in PC2 was selected as covariate in Cokriging.

Results: Predicted irrigated wheat yield is from 3002 to 4593 Kg ha⁻¹ with kriging method and 2112 to 5215 Kg ha⁻¹ with cokriging. For measured yield is 2000 to 5300 Kg ha⁻¹. Based on result of cross validation for predicted dataset, RMSE, MAE and MBE for Cokriging was 496, 417 and -91 Kg ha⁻¹, and for Kriging was 896, 754 and -124 Kg ha⁻¹. These result showed higher accuracy of yield estimation in Cokriging than Kriging and indicated higher accuracy of yield estimation in Cokriging than Kriging.

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Conclusion: Using auxiliary variable for predicting soil and crop yield is significant. In this research observed wheat yield was used as main variable and predicted yield with square root method was as auxiliary variable. For validation of kriging and cokriging methods cross validation was used with criteria of RMSE, MAE and MBE that shows amount of error and accuracy of methods. Lower rate of these criteria shows less error and higher accuracy. With lower values of these criteria in cokriging to kriging, the prepared map with cokriging showed higher accuracy. In this research showed that interpolation method with auxiliary variable such as cokriging is better than normal interpolation method like ordinary kriging.

Keywords: Geostatistic, Land characteristic, Wheat