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Parameterization and evaluation of SSM-soybean model for Prediction of growth and yield of soybean in Gorgan

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Abstract

Background and objectives: Crop simulation models are mathematical representations of plant growth processes as influenced by interactions among genotype, environment and crop management. Using crop simulation models can be an efficient complement to experimental research. Models are being used to understand the response of crops to possible changes in crop, cultural management and environmental variables. The objectives of this study were to describe a soybean model (SSM-iLegume), determine the genetic coefficients of soybean cultivar in Gorgan and finally report results of the model evaluation.

Materials and Methods: SSM-iLegume model predicts phenological stages as a function of temperature, day length. Calculation of phenological development in the model is based on the biological day concept. A biological day is a day with optimal temperature, photoperiod and moisture conditions for plant development.

Leaf area development and senescence is a function of temperature, provide nitrogen for leaf growth, plant density and nitrogen remobilization. To simulate leaf area expansion, the first step is to determine on each day the increase in leaf number on the main stem using the phyllochron (temperature unit between emergences of successive leaves) concept.

In this model biomass is estimated as a function of the received radiation and temperature. Daily increase of crop mass is estimated as the product of incident

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photosynthetic active radiation (PAR, MJ m⁻² d⁻¹), the fraction of that radiation intercepted by the crop (FINT) and efficiency with which the intercepted PAR is used to produce crop dry mass, i.e., radiation use efficiency (RUE, g MJ⁻¹). Yield formation in the model is simply simulated as total dry matter production during seed filling period plus a fraction of crop dry mass at BSG (as mobilized dry matter). Modeling seed growth rate and yield formation in the current model is based on a modified linear increase in harvest index concept as described by Soltani and Sinclair (2011).

The model needs daily weather data, i.e. maximum and minimum temperatures, rainfall and solar radiation. The model can be run for multiple scenarios/treatments over many years.

Results: Field data were used for coefficient estimation and model evaluation. After estimation of genetic parameters, the model was tested using independent data and indicated an acceptable performance and predictions for important crop variables as compared to observed data including days to flowering (RMSE=5.8, CV=11%) and maturity (RMSE=8.7, CV=6%), main stem node number (RMSE=1.7, CV=13%) and grain yield (RMSE=48, CV=15%).

Conclusion: The results indicate that an acceptable estimate for different variables was obtained. So, the model can be used in simulation studies of soybean yield and its limitations in response to environmental conditions, management inputs and genetic factors.

Keywords: Crop simulation models, Soybean, SSM model, Simulation



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Study on the effect of mycorrhizal inoculation and seed priming on root and shoot characteristics of lentil

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Abstract

Background and purpose: According to FAO's report, lentil yield in Iran is much lower than average yield in the world. This is due to low seedling quality, low germination and emergence capacity, biotic and abiotic stresses and poor seedling establishment which were forced to looking for a way to enhance these components. Seed priming is one of the strategy for increasing the rate and percentage of the germination, increasing in quality of the productivity seedling and plant suitable establishment. So this method can cause the fast growth of plants, the increase of rate and percentage of germination, the quality and quantity of yield and the absorption of nutrients as well as early flowering and plant resistance to drought through roots under variable environmental conditions. Therefore, in order to study the effects of mycorrhizal inoculation and seed priming with application of the some plant growth regulators on the roots and the features of aerial parts of lentil, the present experiment was conducted.

Material and methods: In order to study response of lentil to seed priming (non-primed seeds, hydro-priming, 100 ppm GA3, 100 ppm salicylic acid and 100 ppm GA3 + 100 ppm salicylic acid) and soil mycorrhizal inoculation (non-inoculation as control, *Glomus mosseae* and *G. intraradices*), a factorial experiment based on a randomized complete block design was conducted in the farm research and green house of Gonbad Kavous University in four replications during 2013-2014.

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Measured traits included rate and percentage of emergence, seed vigor, root length, root area, root volume, the number of secondary roots, the number of nitrogen-fixing nodules, the percentage of active nodes, fresh and dry weight of nitrogen fixation nodules, shoot length, the number of primary branches, leaf area, shoot dry weight and leaf dry weight which were measured.

Results: The results showed that different treatments of mycorrhizal inoculation, priming and their interaction had a significant effect on some of the studied traits. Various priming treatments along with mycorrhizal fungi had more increase and significant effect on the most measured traits in comparison with without application of studied fungi. Mycorrhizal inoculation using *G. mosseae* fungal + 100 ppm of salicylic acid significantly increased root volume, fresh and dry weight of nitrogen fixation nodules, while traits of leaf area, leaf dry weight and root length significantly was increased by the mixed treatments of *G. intradices* and salicylic acid. In this study, the highest nitrogen fixing nodules, shoot length, seed vigor and the number of secondary roots were obtained using a mixed treatment of *G. intraradices* + 100 ppm gibberellic acid which had a significant difference with other treatments and control. The treatment of hydro priming + *G. mosseae* increased root volume and seed yield over control and individual treatments when were applied.

Conclusions: The present findings showed that combined effects of priming treatments + mycorrhizal inoculation treatments had more positive effects on the measured traits over control and other treatments.

Keywords: Gibberellic acid, Percentage of active nodes, Root volume, Salicylic acid



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Effect of flood duration and nitrogen-fed type on quantitative and qualitative traits of soybean

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Abstract

Background and objectives: Environmental stress has always been one of the most important factors reducing crop yield and production then confronting or reducing effects of stress is a useful strategy to increase the yield qualitative and quantitative. Flooding conditions is occurred when the part of the stem submerged in water. Flooding stress is limiting growth and yield of crops especially under humid regions and causes changes in yield components, pod capacity, biological yield and seed yield in oil plants. Since soybean is one of the country's main oil plants, then; identifying the factors which causes flooding stress and soybean yield reduction, is necessary.

Materials and methods: The pot experiment with factorial arrangement in a completely randomized block design with three replications was conducted. Treatments include dietary treatments at three levels of nitrogen (1. Non- inoculate plus nitrogen, 2. Inoculated with bacteria (*Bradyrhizobium japonicum*) 3. Non-inoculated without fertilizer), flood duration in four levels (0, 5, 10 and 15 days) and the flooding stress during reproductive stage (R2), respectively. In this experiment, yield, yield components, oil content and seed protein were measured.

Results: Results showed that seed yield and oil content in all nutrient levels, during flooding were decline, but the protein was increased. There was a significant difference ($\alpha=0.05$) among nutrient levels for yield, oil content and seed protein. The highest seed yield (3.32 gram per plant) and seed oil content (26.3 percent)

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were in the treatment of non-inoculated with bacteria and fertilizer in the absence of flooding. The lowest seed yield (1.2 g per plant) and seed oil content (11 percent) in the treatment of non-inoculated with bacteria and no fertilizer were achieved in 15 days of flooding. Highest protein content (37.39 percent) was treated with fertilizer and without inoculation with bacteria at 15 days of flooding and the lowest (93.16 percent) was observed in the treatment of non-inoculated and fertilizer and flooding.

Conclusion: The results showed that by reducing the amount of available nitrogen for plants and increasing flooding duration, seed yield and oil content reduced and seed protein content increased with increasing the stress time. The results also showed that the application of urea fertilizer, significantly increase seed yield in compared to soybean plants which are inoculated just by bacteria.

Keywords: Inoculated with bacteria, Seed oil, Seed protein, Seed yield, Urea fertilizer



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Study of seed quality variation of sugar beet monogerm hybrids during fruit development and maturation

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Abstract

Background and objectives: The most important determining factor in sugar beet root yield is seed quality. Seeds with lower germination percentage will have slow and non-uniform germination; then, plants will have slower initial growth. According to various studies harvest time is an important factor influencing the quality of sugar beet seed. Early harvest of sugar beet seed germination and seed vigor is low and late harvest led to an increase seed loss. However, in the specified number of days after the first flowering, germination percentage in various cultivars may be significantly different. Like other crops, harvest time is essential for achieving high quality seeds of sugar beet. Therefore, this study was conducted to evaluate seed quality variation during development and ripening in cytoplasmic male sterile (CMS) lines of sugar beet and determine a stage of development which has maximum seed quality.

Materials and methods: This study was conducted in Ardabil Agricultural Research Station (Alarough) based on a completely randomized block design in 2012. The experimental treatments were five promising diploid cytoplasmic male sterile (CMS) lines (7112×SB36, SB37×28874, 7112×436, 419×SB36 and 261×231) of sugar beet. Each plot consists of eight lines with 6 meter length and 60 cm width. Two side rows are male and six middle lines are male sterile lines. To evaluate changes in the quality of sugar beet seed, five plants in each plot were selected and after 50% flowering, sampling was done in 5-7 days interval. After harvesting fresh and dry weight of fruits were determined and germination test, accelerated aging and electrical conductivity were measured.

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Results: Results indicated that there were significant differences among different female parent in respect to maximum seed dry weight. Degree days (GDD) requirement to attain the maximum seed weight after 50% flowering was 507.5, 563.3, 459.3, 499.7 and 492.7 for 7112×SB36, SB37×28874, 7112×436, 419×SB36 and 261× 231 lines, respectively. At the corresponding dates, the seed moisture content was 52.3, 40.8, 52.6, 44.4 and 42.5%, respectively. The maximum seed quality (maximum germination) for SB37×28874 and 261×231 occurred before, but for 7112×SB36, 7112×436 and 419×SB36 after the physiological maturity.

Conclusion: To achieve high quality seeds in sugar beet, harvesting must be done at 480-580 degree-days after 50% flowering. At this time, the moisture content of fruits was in the range of 40-52% and the fruits were dark brown-colored.

Keywords: Physiological maturity, Qualitative maturity, Seed production, Sugar beet



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The response of purslane (*Portulaca oleracea*) production and quality to different organic and chemical fertilizers

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Abstract

Background and objectives: Although chemical fertilizers in short-term can increase vegetables yield, but must be applied each planting season, this trend increases the concentration of nitrate in the vegetables shoots, nitrogen leaching and contamination of water resources, loss of beneficial insects and microorganisms and soil fertility will decline, and over time reduce the yield and quality of vegetables. So, the aim of this experiment was to prevent the adverse effects of chemical fertilizers and improve the quality of the vegetables.

Martial and methods: The experiment was conducted at the research farm of Agriculture Faculty, Shahrekord University in randomized complete block design in 2014. Different fertilizer treatments consisted of F₀: control (no fertilizer and manure), F₁: nitrogen based broiler litter (BL), F₂: phosphorus based broiler litter, F₃: nitrogen based cattle manure (CM), F₄: phosphorus based cattle manure + urea fertilizer, F₅: chemical fertilizer equivalent F₁, F₆: chemical fertilizer equivalent F₂, F₇: chemical fertilizer equivalent F₃ and F₈: chemical fertilizer equivalent T₄.

Results: The results indicated that nitrate amount of BL and CM treatments was significantly lower than the chemical fertilizer treatments. In the first harvest, the maximum nitrate amount achieved in F₇ treatment (mean 98.77 mg kg⁻¹), but in the second harvest, the greatest nitrate amount obtained in F₅ and F₇ treatments (mean 117.37 and 115.47 mg kg⁻¹), respectively. In the first harvest, F₁ and F₂ treatments had the highest apparent quality, however; in the second harvest apparent quality of F₂ and F₅ were significantly greater than the other treatments. In the first harvest, the moisture content of F₂ and F₅ treatments did not have significant difference

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with F₃, F₄ and F₈ treatments, for the second harvest moisture content of F₃ treatment hadn't significant difference with chemical treatment of F₆ and organic manure treatments. The correlation between nitrate and vegetable apparent quality was significantly positive ($P < 0.05$, $r = 0.38^*$). However there was significant negative correlation between nitrate and moisture content ($P < 0.01$, $r = -0.53^{**}$). In the first harvest, soluble sugar content of F₅ and F₇ treatments was significantly lower than the control. In the first and second harvest, the greatest fresh weight of aboveground (mean 3124 and 5528 g m⁻², respectively) was produced in F₂ treatment.

Conclusion: In general, it can be concluded that the supply of fertilizer in the form of organic (broiler litter and cattle manure) cause to increase the quality and health of the purslane crop.

Keywords: Health, Nitrate, Soluble sugar, Broiler litter



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Evaluation of protein and total phenolics variation in susceptible and resistant varieties of tobacco leaves infected by PVY

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Abstract

Background and objectives: The cultivated tobacco (*Nicotiana tabacum*) is a tropical and annual plant, consisting of a number of species or hybrids belonging to the *Solanaceae* family. Bio-chemical reaction to viral infection is different for various plants. One of the most important defensive mechanisms of the host plant against pathogen agents, is biochemical defense and their related complex reactions. Potato virus Y (PVY) from the Potyviridae family has a worldwide distribution and is one of the common viruses in tobacco fields. Different tobacco varieties show various reactions against these virus strains. This research was carry out in order to evaluation of protein and total phenolics variation in susceptible and resistant varieties of tobacco leaves infected by PVY.

Materials and methods: In this study, total protein, total phenol changes and enzymatic activity of peroxidase and polyphenoloxidase of leaves from two tobacco cultivars, called VAM (resistant) and K326 (susceptible) infected by PVY^O were investigated at 1, 2, 3, 4, and 5 days after mechanical inoculation. The experiment was conducted in a factorial pattern on the basis of completely randomized design with four replications in the greenhouse condition. To confirm the presence of virus, the optical absorption (OD) in the samples were tested by DAS-ELISA using a PVY polyclonal antibody.

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Results: Results showed that the total protein of VAM cultivars was more than inoculated K326 cultivars and the control samples. During the days after inoculation except the third day, their difference was not significant. The highest total protein was observed in the first and fifth days after inoculation and in the inoculated VAM cultivars and the lowest total protein was recorded in the second and fourth days after inoculation and in the K326 cultivars. The highest total phenol was observed in fifth days after inoculation which was significantly different compared to other intervals ($P \leq 0.01$). Amount of total phenol in the inoculated cultivars was higher than control samples and showed a significant different ($P \leq 0.01$).

Conclusion: Peroxidase activity in the inoculated cultivars was higher than control one and it was significantly higher in the K326 than VAM cultivars. Peroxidase and polyphenol oxidase activity of tobacco leaves in VAM cultivar during the days after inoculation was significantly ($P \leq 0.01$) lower than K326 cultivar. The difference in enzymatic activity could be related to the type of cultivar, inoculation treatment and time after inoculation. The OD of K326 was higher than its value in VAM cultivar. Also, correlation between these parameters was very low. There was a positive correlation ($R^2=0.546$) between the enzymatic activity of peroxidase and polyphenol oxidase.

Keywords: *Potato virus Y*, DAS-ELISA, total protein, total phenol, peroxidase and polyphenol oxidase



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Assessing spring and autumn cropping of sugar beet yield in Mashhad and Neyshabor, by a simulation model

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Abstract

Background and objectives: Sugar beet is the major crop in Khorasan-e-Razavi province which is mainly grown in Mashhad and Neyshabor. Because of the high water requirement of sugar beet and water scarcity in Mashhad and Neyshabor, there is a necessity for overcome this challenges. Autumn sowing is one of the solutions to this problem. Accordingly, this research was performed to compare the yield of storage organ in spring and autumn-sown sugar beet and determine the most appropriate sowing date of autumn cropping sugar beet in two locations of Mashhad and Neyshabor in Khorasan-e-Razavi province.

Materials and methods: The SUCROS crop simulation model was employed to simulate growth and development of spring and autumn-sown sugar beet in two locations (Mashhad and Neyshabor) in Khorasan-e-Razavi province under potential conditions. The model was evaluated using two independent experiments. The first experiment was based on a randomized complete block design with four replications. The experimental factors included three cultivars (Fiama, Magnolia and Nagano) and four levels of nitrogen application (0, 80, 160, 250 kg N ha⁻¹). In the second experiment, four levels of irrigation regimes along with four levels of nitrogen application (control, 90, 180 and 170 kg N ha⁻¹) were investigated. The evaluated model was used to perform simulation experiments. The simulation experiments consisted of a factorial combination of six sowing dates including two spring dates (March 6 and May 6) and four autumn dates (October 2, October 17, November 1 and November 16) in two locations of Mashhad and Neyshabor.

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Results: The results showed that maximum fresh and dry yield of storage organ were observed on October 2 (104191 and 26047.6 kg ha⁻¹, respectively). The results of group comparisons of fresh and dry yield also indicated the superiority of autumn sowing dates compared with spring sowing dates. In additions, the autumn sowing dates had better performance than spring sowing dates in terms of maximum leaf area index and gross assimilation rate at both locations. Water use efficiency was also higher in autumn sowing compared to the spring sowing. Water use efficiency in spring and autumn cropping was 2.57 and 1.67 kg dry weight of storage organ per m³, respectively.

Conclusion: Overall, autumn sowing of sugar beet in Mashhad and Neyshabor has high benefits. Autumn cropping in comparison to spring cropping had higher rainfalls, water use efficiency and lower evapotranspiration. Because of the high water requirement of sugar beet during spring and summer, autumn cropping and using precipitations result in more production in the region. The optimum sowing dates among four autumn sowing dates were October 2 and 17 at both locations.

Keywords: Assimilation, Modelling, Water use efficiency



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Mapping of summer weeds distribution and flora in citrus orchards of Bandar-e-Gaz township by Geographic Information System (GIS)

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Abstract

Background and Objectives: Weeds distribution, their development power, less management, non-identify of weed, non suitable application of control methods, and unaware of farmers from new results in weed management strategy are the important factors in reduction of agricultural production. Weed distribution mapping can be used in correct application of different control operations and reduced herbicide use and increased its efficiency. Also, it can be useful for evaluation of management strategy in past and design of management strategy for weed control in future. The objective of this research was weed distribution mapping and flora of summer weeds in citrus orchards of Bandar-e-Gaz township by Geographic Information System (GIS).

Materials and methods: In order to identify flora and distribution mapping of weeds in *Citrus* orchards of Bandar-e-Gaz township, 101 orchards were selected during 2014, and the summer weed species were sampled and detected using a W method. With using specific formula of density, frequency, uniformity, abundance of each weed species was calculated. Also, geographic coordinates of orchards (latitude, altitude and elevation) were determined by using GPS. These data were used for producing weed maps using ArcGIS 10 software.

Results: The results showed that there are 28 summer weed species in *Citrus* orchards of Bandar-e-Gaz township and these belong to 14 families. 25 percent of

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these species belong to Asteraceae and other belongs to 12 families, respectively. In general, 68 and 32 percent of species were annual and perennial weeds, respectively. Also, 71 percent of weeds belong to dicotyledonous and 29 percent to monocotyledonous. The important species of *Poaceae* family were included *Setaria glauca*, *Echinochloa crus-galli*, and *Setaria verticillata*; also, the important species of *Asteraceae* family were *Eclipta* sp., *Artemisia annua*, and *Conyza bonariensis*. Based on dominance index, the most important weeds in citrus orchards of Bandar-e-Gaz were included: *Cynodon-dactylon* (42.2%), *Amaranthus* spp., (36%), *Cyperus-rotundus* (32.6%) and *Portulaca-oleracea* (32.5%).

Conclusion: The weed distribution maps showed that *Amaranthus retroflexus*, *Cynodon dactylon*, *Cyperus rotundus*, *Portulaca oleracea*, and *Solanum nigrum* were presented in the most orchards. Also, in the some of studied citrus orchards, high diversity and dominance were observed that due to similar management practices of farmers in the studied area.

Keywords: Dominance index, Frequency, Uniformity, Distribution maps, Geographical information system



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Effect of different levels of nitrogen, bio-fertilizers and Nano-nitrogen on some qualitative and quantitative traits of soybean in Darab region (Fars)

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Abstract

Background and objectives: Soybean is one of the plants that need large amounts of nitrogen for grain yield production. nowadays bio-fertilizers are considered as a best replacement for chemical nitrogen to increase soil fertility and sustained agricultural production. Meanwhile, application of soybean symbiotic bacteria and nitroxin, which contain the most effective nitrogen-fixing bacteria of the genus *Azotobacter* and *Azospirillum*, and nano fertilizers containing nitrogen, have been considered. This study aimed to investigate the effect of different levels of nitrogen, bio-fertilizers and nano-nitrogen on some quantitative and qualitative characteristics of soybean cultivar Williams.

Materials and methods: Experiment was conducted as split plot in a randomized complete block design with three replications and 12 treatments in the Fars Research Center of Agriculture and Natural Resources (Darab) in the summer of 2013. The main factor consisted of mineral nitrogen (0, 75 and 150 kg ha⁻¹) as urea and sub plot consisted of nitrogen sources (*Rhizobium Japonicum*, Nano nitrogen, nitroxin and control). In this study, yield, yield components and seed oil and protein content were measured.

Results: Results showed that interaction of nitrogen and nitrogen source was significant for seed yield, harvest index, the first pod distance from the soil and seed protein content. Maximum seed yield (2018 kg ha⁻¹) was seen in 75 kg ha⁻¹ nitrogen with *Rhizobium* application and minimum seed yield was seen in 0 kg ha⁻¹ nitrogen. In general, with increasing nitrogen application, 1000 seed weight

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increased. So that the maximum 1000 seed weight (110.98 g) was seen at 150 kg ha⁻¹ nitrogen. Maximum biological yield (4508.4 kg ha⁻¹) related to the use of *Rhizobium*. The highest harvest index (44.24%) obtained from 75 kg ha⁻¹ nitrogen with *Rhizobium*. The most distance of the first pods from the soil surface (9.56 cm) was found from 150 kg ha⁻¹ nitrogen with *rhizobium*. Maximum of the seed protein belonged to the combination treatment of 150kg ha⁻¹ nitrogen and *Rhizobium* inoculation. The highest (22.99 %) and the lowest (20.32 %) percentage of seed oil was found in without fertilizer and 150 kg ha⁻¹ nitrogen, respectively. The highest oil yield was seen in *Rhizobium* (386.31 kg ha⁻¹) treatment.

Conclusion: Generally, for soybean (cv. Williams) production in the Darab region, 75 kg nitrogen consumption with application of *Rhizobium* is suggested, wich compared to the consumption of 150 kg ha⁻¹ nitrogen (commonly used in the region), will reduced consumption of chemical nitrogen fertilizer by 50 percent.

Keywords: Inoculation, Oil, Soybean, Nano, Nitroxin



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Characterizing the competitive traits of watergrass (*Echinochloa oryzoides*) as a new-introduced, and barnyardgrass (*Echinochloa crus-galli*) as a common weed species in rice

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Abstract

Background and objectives: early watergrass (*Echinochloa oryzoides*) is considered as a new-introduced species and then as a potential invader. Investigation of competitive traits of this species, in comparison with barnyardgrass (*E. crus-galli*), one of the most important weeds in rice fields of Guilan province, would be useful to determine its spreading possibility as an aggressive weed. Therefore, competitive traits of two weed species in rice were studied in this research.

Materials and methods: This field experiment was conducted at Rice Research Institute of Iran, Rasht as a factorial based on randomized complete block design with three replications. Treatments were weed species ((barnyardgrass and watergrass) and plant proportions of weed: rice 0:4, 1:3, 2:2, 3:1, and 4:0 in each hill. By substituting rice and weed seedlings in each hill, different densities were created. To study the growth and development of rice and weed, 5 stages of destructive sampling were taken every 14 days in addition to the last sampling was done at harvest (90 days after transplanting).

Results: About 8 weeks after transplanting, the highest height was related to watergrass, however at the harvest, barnyardgrass height increased. Lower leaf area index of watergrass comparing with barnyardgrass at about 10 weeks after

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transplanting indicated less leaf area duration for this species. At the harvest time, around 13 weeks after transplanting, higher leaf but lower total dry weight was recorded for watergrass than barnyardgrass. In general, new-introduced as compared to common weed species had lower final height, leaf duration, and total biomass, but earlier tillering stage, leaf development, and booting. Rising in the ratio of each species at the planting proportion caused major variables except for plant height, to increase; whereas tiller number, leaf area, and leaf and total dry weight increased as seedling number increased. In all plant proportions weed had higher leaf area index, and leaf and total dry weight than rice.

Conclusion: More early growth rates and shorter life cycle were observed for new-introduces than common weed species. Final height, tiller number, leaf area index, leaf maximum dry weight, and total biomass exhibited higher competitiveness for weed than rice. Weeds were superior to rice in all plant proportions except for 1:3 (weed:crop) which were similar in final tiller number; where presence of only one weedy plant in each hill, resulted in equal or mostly higher production compare with three rice plant. These results indicated that new-introduced as well as common weed species possess the high competitive ability against rice.

Keywords: Competitive ability, Plant proportion, Weed invasion



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Investigation of the possibility of increasing efficiency of Pinoxaden and Clodinafop by different application methods of these herbicides on *Avena ludoviciana* and *phalaris minor*

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Abstract

Background and objectives: Nowadays herbicide reduction and different approaches leading to this goal like split application have been brought to attention. At split application, recommended or reduced doses divided in such a way which half of dose applied at one growth stage and the other half will use at next growth stage and finally all used doses are equal to recommended or any other reduced doses. In this approach in comparing with the simple application weed control duration will extend. Although using reduced doses of herbicides to control weeds require long lasting information on seed bank of weeds so the crop yield loss by increased weed society will not occur. The goal of this experiment was to evaluate the possibility of reducing Pinoxaden and Clodinafop by different application and study the time interval application on herbicides efficiency at split application treatments on *A. ludoviciana* and *P. minor* as important weeds of wheat fields.

Materials and methods: Greenhouse experiments were carried out to investigate the efficiency of single and split application of Pinoxaden to control *Phalaris minor* and Clodinafop to control *Avena ludoviciana*. The influence of time applications interval and the ratio of the two applications doses were studied. These herbicides were used as simple and split application. Simple application treatments were applied at four stages G1 (2 leaf stage) G2 (3 days after first stage), G3 (7 days after first stage) and G4 (14 days after first stage) of *A. ludoviciana* and *P.*

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minor. At split application treatment 50 or 25% herbicide doses were used at G1 stage and the rest of them (50 or 25%) applied at G2, G3 and G4 stages. Statistical analysis was done with ED50.

Results: The study revealed that both single and split applications efficacy decreased as application timing was delayed but this reduction was more highlighted at single spray. 75:25 ratio approximately had more efficiency for controlling of *A. ludoviciana* and *P. minor* in comparison to 50:50 ratio. Although split application had appropriate control of *P. minor* but its difference with single application of Clodinafop was not significant.

Conclusion: In general, it could be concluded that single application treatments, had enough control at early stages of weed but as these weeds were more grown, the efficiency of single application reduced and the efficiency of split application treatments depending on the type of weed species could be successful (*A. ludoviciana*) or had no significant differences with the single application treatment (*P. minor*).

Keywords: Dose response, Herbicide reduction, Split application, Single application



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I investigation on positional relation of soil potassium distribution with growth attributes and yield of rainfed wheat

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Abstract

Background and objectives: According to importance of wheat production in country, high area under cultivation, amount of consuming of this crop, fertilization costs, and destructive effects of residues of fertilizers in contaminating the environment; identifying and studding on wheat needs to fertilizer requirement in different stages of growth is necessary and recommended. Apply suitable amount of fertilizer according to GPS (i.e. global positioning system) points and following the precision farming methods will cause to increasing of yield, decreasing of fertilizers utilization and environmental pollution due to excessive use of fertilizers. As a results of last researches on different soils, plants have shown different sensitivity to potassium deficiency. Therefore with detailed knowledge and point to point of field conditions will be investigated and take steps to improve the uniformity of the field.

Materials and Methods: In order to performance of research, the land area of 922 square meters, located on the farm 1 of Gorgan University of Agricultural Sciences and Natural Resources was considered. The area study was divided into 40 plots and dry-land wheat (line 17) was sown. In two stages, before planting and before heading, soil samples were taken from each plot and were used to analyze the data.

Results: Result showed that different parts of the farm had different requirements and needs to apply different fertilizer levels in each part of the farm. The results indicated that the minimum and maximum amount of yield were 2999 and 4585 kilogram per hectares, respectively. Furthermore, measured potassium content in

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this stage had the highest correlation with the samples before planting. The minimum and maximum of potassium content were 180.25 and 483.93 milligram per kilogram. Based on the results, there is a good correlation between the yield and the amount of soil potassium concentrations which obtained from the measurement. This relation in time before the planting was positive than the time before heading.

Conclusions: According to these results in the studied area, in wheat management practices, precision farming techniques were recommended to achieve sustainable production. These results can be more appropriate for estimation of fertilizer requirements.

Keywords: GPS, Precision Agriculture, Potassium, Wheat



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Effect of dust on chlorophyll fluorescence parameters and photosynthetic characters of sugarcane in Ahvaz

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Abstract

Background and Objectives: Sugarcane (*Saccharum officinarum* L.) is from poaceae tribe and perennial native plant of Asia continent warm areas. Ratio Fv/Fm estimates the maximum quantum yield of photosystem II. Under conditions of stress Fv/Fm decreased, this decreasing is due to low activity of reaction of photosynthesis centers and reducing of proteins that are responsible for water electron transport to chlorophyll a. Dust closed the pore openings and increased leaf temperature, lack of heat exchange, lack of transpiration and loss of the entry of CO₂ to leaves, on the other hand dust accumulation on plant also creates a shadow on plant and decreases leaf photosynthesis. Since the maximum area under cultivation of sugarcane is in the region, studying the effects of dust on this growing phenomenon in the region seems to be necessary.

Materials and methods: This study aimed to examine the effects of dust, in a controlled environment greenhouse Development Research Institute of sugarcane in the 2013-2014. In this experiment, dust courses and various concentrations of artificially applied. The experimental design was a randomized complete block design with 4 replications and 4 treatments. Treatments were: control (without dust), once a month, twice week, weekly dust apply. To isolate and correct actions dust on each treatment, the stool is made of metal with a half-inch galvanized pipe to a height of 2 meters, 3 meters in length and a width of one meter, was applied. The stool was covered by a thin translucent plastic all interior and on both sides of it. The planting of cuttings CP69-1062 was used. Values of Fv/Fm (maximum quantum yield), NPQ (non photochemical quenching), qP (photochemical quenching), Φ_{PSII} (efficiency of Photosystem two), SPAD number, photosynthesis

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rate, transpiration, leaf temperature, under stomatal CO₂ concentration, electrolyte leakage, ascorbate levels, PAR and sugar content were measured.

Results: The results showed that the dust decreases the values of Fv/Fm, qP, Φ_{PSII} , photosynthesis rate, transpiration flux, under stomatal CO₂ concentration, PAR and sugar content but increases the amount of NPQ, SPAD number and leaf temperature. A significant positive correlation between stomatal conductivity with photosynthesis, transpiration and CO₂ under stomata were observed that showed restrictions on the entry of gases into the cell. Sugar production showed a significant decline. qP had highly correlated with Fv/Fm, and qP reducing, cause to reduce Fv/Fm.

Conclusion: The result of dust stress and reducing of QA capacity, electron transfer into photosystem I reduced and causes a loss of light energy absorbed in the form of chlorophyll fluorescence excitation. In fact, during the excitation of chlorophyll, NPQ prevailed qP, and therefore, the quantum yield of photosynthesis reduced and the temperature of leaf increased because of stomatal closure and reduction stomatal conductivity and losses of energy in the form of light and heat grew. Sugar decreases because many enzymes involved in the sugars revival of the Calvin cycle are activated only with appropriate light intensity. Since the Fv/Fm component showed the highest correlation with most of the measured characters, so it can be used as a criteria along to the qP and NPQ for sugarcane studies under dust stress.

Keywords: Fv/Fm, NPQ, qP



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Effects of soil suction and water salinity on yield and yield components of cotton

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Abstract

Background and objectives: In arid and semi-arid regions, salinity is a serious and chronic problem for agriculture. Due to the improved methods of irrigation and mechanization this methods to increase water use efficiency and enhance the uniformity of water distribution in the field, is very important. Main area of farming cotton in Iran is about 150000 ha, which in Kerman province mostly is in Orzoueyeh region by the area of 2500 ha and capability of 2.5 ton ha⁻¹. Therefore, due to a shortage of good quality water resources in the province, the aim of this study was to evaluate the combined effect of irrigation and salinity on the yield of cotton.

Materials and methods: In order to investigate the effect of salinity on yield and yield components of cotton under soil suction, a field experiment was carried out during 2011 and 2012 growing seasons at an experimental farm in Orzoueyeh territory of Kerman province. The treatments were laid out in randomized complete block design with three replications. The treatments were comprised of four soils potential including 45, 55, 65 and 75 Kpa tension in main plot and sub plot consisted of three salinity of irrigation water including 1.5, 4.5 and 7.5 dS m⁻¹.

Results: The results showed that in comparison to 45 and 55 Kpa tension, parsimony of water usage equal 1150 m³ ha⁻¹ achieved. Moreover yield, plant height, number of bolls per plant and bolls weight decreased 7.3, 11.4, 7.7 and 11.4 percent, respectively but water use efficiency increased 4.8 percent. Also, in comparison to 1.5 and 4.5 dS m⁻¹ salinity of irrigation water, yield, water use efficiency, bolls weight, number of bolls per plant and height of plants increased 8.6, 4.2, 8.4 and 4.1 percent, respectively. But from statistically point view all mentioned traits in both treatment of study placed in one statistic group.

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Conclusion: According to the results, it can be said that in arid and semi-arid areas of the country, increase irrigation efficiency in furrow irrigation systems can play a role in saving water and energy costs. Also, due to the increased salinity of water resources, applying the 55 Kpa potential point in using salinity water with 4.5 dS m^{-1} can have efficient role in increase yield, water use efficiency and cultivated area of cotton.

Keywords: Furrow Irrigation, Salinity Stress, Soil Suction, Water Use Efficiency



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Evaluation of different management methods for dodder control (*Cuscuta monogyna*) on common privet (*Ligustrum vulgare*)

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Abstract

Background and objectives: Common privet (*Ligustrum vulgare*) is one of the most important plants in landscapes of Iran. This plant is adaptable to unfavorable environmental conditions, so that is cultivated widespread in urban landscape. Invasion of dodder to common privet caused problems for landscape management in Mashhad city in recently. Dodder is an obligate parasite of many plant families and because of the wide geographical distribution, wide range of hosts and inefficient management methods has become one of the most damaging species of parasite. Because this parasite is very adept and successful from biological and ecological perspectives, a single control strategy is unlikely to provide sufficient economic control. Then integrated management was considered. Therefore, various methods of weed management including mechanical, chemical and biological control of dodder on common privet were evaluated during two years in Mashhad landscape.

Materials and methods: Experiments were conducted in Mashhad landscape in 2010 and 2011. Two sites almost uniformly infested with dodder were selected for implementation of examination during two years. In the first year, experiment was performed in a randomized complete block design with four replications. Treatments included chemical [trifluralin (Treflan 41%), chlorthal-dimethyl (Dachtal 75%) and glyphosate (Roundup 41%)] and mechanical control (mowing and flaming). Mowing treatment had two levels of once and twice mowing. Second

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year treatments were carried out in a randomized complete block design with three replications that consisted of two isolates of fungi as biological control agents, Roundup and integration each isolate of fungus with herbicide.

Results: The results of first year indicated that application of herbicides significantly controlled dodder, as dodder growth reduced 84-98% than control plots and Dachtal had the most efficient effect. Dry weight of dodder at twice mowing treatment was 16.8 gm⁻² that declined 71% dodder development on host vs. control. Once mowing simulated new foliar growth of Common privet that created suitable conditions for growth of remaining dodder on host. However, there was no significant difference with control. Flaming application was also affected in reduction of dodder weight, as the dry weight of dodder in flaming plots was one third of control plots. The results of second year showed that application of fungi isolates individually revealed no significant differences compare to control plots. However, dodder growth showed a significant reduction with using fungi in integrated with herbicide, so that integration of *Fusarium* sp. and *Alternaria* sp. with Roundup caused reduction of 83.60 and 81.19% of dodder growth compared to control plants, respectively.

Conclusion: The results of our study suggested that dodder can be controlled with application of integrated management and using non-chemical methods can reduce herbicides use. Treatments of twice mowing, flaming, and integration of Roundup with biological agents were successful in controlling dodder. Using methods that prevent seed production of dodder or reduce seed vigor can reduce weed infestation in subsequent years.

Keywords: Biological control, Flaming, Herbicide, Mowing



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(Short Technical Report)

Reaction to septoria leaf blotch in a number of elite genotypes of bread wheat

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Abstract

Background and objectives: Septoria leaf blotch disease (STB) caused by the fungus *Mycosphaerella graminicola* (Fuckel) J. Schroeter (Anamorph: *Septoria tritici* Roberge), is one of the most destructive foliar diseases of wheat in the world, that its worldwide damage in outburst years is about 30 to 50 percent. The pathogen is a bipolar heterotallic ascomycete that its sexual life cycle is repeating during the cropping season when environmental conditions are favorable for disease development. Due to evolution of resistance to fungicides in fungus strains and harmful effects of fungicides for environment, planting resistant cultivars is the most effective method to manage the disease. However, the disease has been spreading around the world due to use of susceptible, premature and semi-dwarf cultivars that have been cultivated broadly during the last decade, because of high yield and resistance to some diseases such as rusts. Identify to resistance source to pathogens and selection of resistant genotypes is one of the most basic components in breeding programs for disease resistance. The purpose of this study is comparing the resistance of different wheat lines and identification of cultivars with the highest level of resistance to septoria leaf blotch.

Materials and methods: In this study the reaction of 40 lines from north humid climate of wheat genotypes and Tajan cultivar for control was evaluated by artificial inoculation in tillering stage in field during 2013-2014 cropping season. For this purpose, separation and purification of the fungus were carried out and prepared inoculation was used for inoculating. Then artificial inoculation was done

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in cultivated genotypes using infected leaves and spore suspension. Finally, statistical analysis of recorded data and means comparison was performed using SAS software and LSD test. The reaction of wheat genotypes were evaluated by assessing leaf necrosis area and calculate of area under the disease progress curve (AUDPC).

Results: Analysis of variance showed significant differences among genotypes for leaf necrosis area at 1% level. The difference is representative of genetic variants between genotypes in susceptibility and resistance to disease. Mean comparison of leaf necrosis area in genotypes according to LSD test separated the genotypes in different groups. Evaluation of means comparison showed that line 27 (N-91-6) and 10 (N-92-9) were the most susceptible and the most resistant in leaf necrosis area and infection intensity, respectively. The highest AUDPC was calculated for line 27 and the lowest for line 10. The cluster analysis of genotypes according to the average percentage of pycnidia coverage on leaf surface put the genotypes in two groups. Genotypes with sensitive reaction were in the first group, and the second group included genotypes with moderately resistance reaction.

Conclusion: Due to the results of this study, from the used lines, two lines number 10 (N-92-9) and 19 (N-92-18) showed moderately resistance reaction to septoria leaf blotch and other lines placed in susceptible and moderately susceptible groups. Then two lines number 10 and 19 can be used in biotechnology to make resistant cultivars to the septoria leaf blotch disease.

Keywords: Wheat, Septoria leaf blotch, Resistance, Leaf necrosis, *Mycosphaerella graminicola*



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(Short Technical Report)

Effects of deficit irrigation on yield, yield components and water use efficiency of lentil in Khorramabad

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Abstract

Background and objectives: Although more than 90 percent of consumed water was used in agricultural sector, water is the major limiting factor for agricultural development in Iran. Over the past few years increasing agricultural crop water productivity thorough deficit irrigation methods has been studied by agricultural researchers and planners. Although Lorestan province is one of the major producers of lentil, the effects of deficit irrigation on its yield is not studied yet in this province. Therefore this study was carried out in order to study the effect of deficit irrigation on the yield and yield components of lentil (Gachsaran cultivar) in Khorram Abad, Lorestan province.

Materials and methods: A field experiment was conducted as randomized complete block design with four irrigation treatments (100, 75, 50 and 25 percent of actual crop evapotranspiration measured in the micro lysimeter) and four replications in the research farm of Lorestan university. Average of the measured evapotranspiration in the four micro lysimeters located at the research farm was considered as the crop water requirement of 100% treatment (control treatment). The crop water requirement of other treatments was calculated based on corresponding level of irrigation (75, 50 and 25 percent). Volume of irrigation was calculated based on crop water requirement, area of plot and irrigation efficiency (75%). At harvest time 10 plants were taken randomly from the two middle rows of each plot and were used to measure or calculate traits such as plant height, number of main branches, the number of branches per plant, number of pods per plant,

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number of seeds per plant, biological yield, grain yield, water use efficiency (based on grain yield) and crop water productivity (according to the average price of lentils in Lorestan). Finally the statistical analysis included analysis of variance and mean comparison test by Duncan method at five percent level were done using MSTATC software.

Results: Results of this study showed the lowest and the highest grain yield were obtained 1022 and 1381 kg per hectare, respectively at 25% and 75 % irrigation application treatments. Water use efficiency and water productivity in the treatments of 25% and 50% irrigation application was the highest and in the treatment of 100% was the lowest. Results of statistical analysis indicated that amount of irrigation had significant impact (1%) on the characteristics of the number of pods per plant, number of seeds per plant, biological yield, grain yield, water use efficiency and crop water productivity.

Conclusion: Considering the high water use efficiency and water productivity of treatment 50% irrigation application and small differences with 100% irrigation application it can be suggested to apply 50% irrigation requirement of lentil in case of water scarce condition.

Keywords: Deficit irrigation, Yield, Lentil, Irrigation treatment, Water use efficiency