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Gorgan University of Agricultural Sciences and Natural Resources

Investigated of soybean leaves antioxidant activity, chlorophyll fluorescence, chlorophyll (a, b) and carotenoids content influenced by the flooding and different levels of nutrition

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Abstract

Background and objectives: Flooding conditions refer to the condition in which part of the plant stem below the water. Flooding causes stomata closure and reduction in oxygen concentration in the plant root. It is involved in the formation of reactive oxygen species. Active oxygen species cause oxidative stress. Oxidative stress causes severe membrane damage, lipid peroxidation and antioxidant activity reduction. This causes electrolyte leakage and finally cell death. On the other hand chlorophyll a and b content, especially chlorophyll b reduced at the plant. The sum of these factors reduced the performance of the plant during the flood period. Proper nutrition can reduce the devastating effects of flash flooding on plant, this study was conducted to investigate the effect of different dietary regimes flooding and antioxidant characteristics, Chlorophyll fluorescence, chlorophyll content (a,b), leaves carotenoids and seed yield of soybean (*Glycine max* (L.) Merr) DPX cv.

Materials and methods: The experiment was conducted in factorial arrangement with completely randomized design with three replications in the Gorgan University of Agricultural Sciences and Natural resource in 2012. Treatments include nitrogen treatments at three levels of (1. Do not inoculate plus nitrogen, 2. Inoculated with bacteria (*Bradyrhizobium japonicum*) 3. Non-inoculated without fertilizer), severely flooded in four levels (0, 5, 10 and 15 days) and the flooding stress was applied during reproductive stage (R2), respectively. Plant traits such as the antioxidant activity (catalase, peroxidase enzyme, ascorbate peroxidase and ascorbic acid), chlorophyll (a, b) content, leaves carotenoids, chlorophyll fluorescence and grain yield in soybean was measured.
Results: Based on the results of this experiment the maximum activity of the ascorbate peroxidase enzyme was observed at the non-inoculated and nitrogen

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application treatment without flooding condition. Peroxidase and catalase enzyme activity at all levels of nutrition treatment increased up to 5 days flooding, but in 10 and 15 days flooding the activity of these two enzymes declined. The amount of ascorbic acid production (from 0 to 15 days) in all three levels of nitrogen supply was increased. The chlorophyll fluorescence, chlorophyll content (a, b) and carotenoids showed a decreasing trend under the flooding stress. Chlorophyll b reduction was much more than chlorophyll a by increasing the flooding duration, then chlorophyll b to a ratio reduced, drastically. The results of this experiment showed that the highest and the lowest yield was observed at non-inoculated with nitrogen treatment without flooding (32.30 g plant^{-1}), and at non-inoculated treatment without fertilizer with 15 days flooding (2.10 g plant^{-1}), respectively.

Conclusion: The results of this experiment indicated that there is a strong relationship between the amount of available nitrogen and the function of the stress tolerance mechanisms (the production of antioxidant enzymes, pigments, auxiliaries, etc.) during flooding in soybean; in this case, higher available nitrogen for the plant increase flooding tolerance and reduce crop yield damage.

Keywords: Antioxidants, Chlorophyll fluorescence, Flooding, Inoculated with bacteria, Soybean

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Effect of row spacing and herbicide application on the growth indices, yield and yield components of rice in direct seeding

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Abstract

Background and objectives: Change in the method of crop establishment from traditional manual transplanting of seedlings to direct-seeding has occurred in many Asian countries in the last two decades in response to rising production costs. A change in the rice establishment methods as well as water management practices, tillage and weed control strategies in direct seeded-rice can leads to change in the composition and diversity of the flora of weeds. Also, higher number of weed species in direct-seeding of rice can reduce the effectiveness of strategies to manage weeds. Therefore, this work was conducted with the objective of evaluating the performance of some post-emergence herbicides and different row spacing for weed control in direct-seeded rice.

Materials and methods: Experiment was conducted in a factorial arrangement using a randomized complete block design with three replications during 2011-2012 growing season. Factors consisted of three levels crop spacing between the rows (15, 25, and 35 cm) and seven weed control methods including application of six herbicide treatments (pendimethalin, bentazon, propanil + cinosulfuron, oxadiargyl, clodinafop propargyl + "bromoxynil + MCPA" + bentazon and sethoxydim + "bromoxynil + MCPA" + bentazon) and weed-free treatment. The plots were divided into two sections, treatments were applied in a section and the other part of each plot was considered as the control of treated section.

Results: The loss of maximum leaf area index, total dry matter and maximum growth rate of rice caused by the use of bentazon (an average of 68%) and oxadiargyl (an average of 84%) herbicides were significantly greater than the application of pendimethalin (an average of 47%) and herbicides mixtures (an

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average of 41%). Also, the lowest reduction of rice growth indices in competition with the weeds was observed in 15 cm row spacing (an average of 44%). Row spacing significantly influenced the yield and yield components of rice. As, the lowest rice yield reduction was recorded in 15 cm row spacing (83%). Effects of none of the herbicide treatments on rice yield were similar to the weed-free treatment. However, the rice yield losses with herbicides mixtures of sethoxydim+ "bromoxynil + MCPA" + bentazon (56%), propanil+cinosulfuron (59%) and clodinafop propargyl+ "bromoxynil+ MCPA" + bentazon (59%) were significantly lower than obtained yield reduction with the application of other herbicides (an average of 86%).

Conclusion: Application of herbicides mixtures evaluated in this study caused lowest differences between growth indices and yield of rice in comparison to weed-free control treatment. In this study, the rice yield loss in weed-infected plots was about 98%. Considering the yield loss in the absence of weed control, it is appears that to be satisfactory yield loss obtained by only once application of herbicides mixtures during the growing season.

Keywords: Total dry matter; leaf area index; competition; beta model

Comparison of geostatistical and remote sensing data-based methods in wheat yield predication in some of growing stages (A case study: Nemooneh field, Golestan province)

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Abstract

Background and objectives: Food security has been the most important concern of the mankind on the earth. On the other hand, agricultural productions have always been face by risk probability in the case of weather and changes in international markets; however, this risk probability never undeleted completely, but could be minimized that by pre-harvesting yield estimation. In this study, different methods of vegetation maps provision were involved to provide a suitable pre-harvesting map for wheat yield.

Materials and methods: For comparison of remote sensing and geostatistics-based methods capabilities for wheat yield predication, a survey was conducted in 2011-12 growing season. 101 plant samples were taken from 2500 hectare wheat fields in tillering, booting, seed filling and maturity stages (three times during leaf area index and dry weight and one sampling for yield) and related measurements were done. Ordinary, Universal and Disjunctive Kriging methods were applied and semivariograms were provided, then proper models were fitted. Different statistical indices were used to test the accuracy. Also, three +ETM images acquired by Landsat satellite were used which were matched by sampling dates. Four images for previous years also were used as needed. Eight plant indices were provided from aforementioned images and were compared with plant variables which were recorded or measured simultaneously, then related relations were determined and maps were provided. By fitting the logistic model between yield and plant variables, yield prediction maps were evaluated by remote sensing and, the obtained maps were compared using different statistical indices.

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Results: Evaluation results of interpolation methods revealed that spherical, exponential, Gaussian and circular models were superior models in this study. Also, results on the survey indices derived from satellite images showed a significant relationship between the variables and indices derived from satellite images in the end of tillering stage. Assessment of generated yield maps, demonstrated pronounced superiority of remote sensing techniques compared with geostatistical-based analysis methods. The results demonstrated the capability of satellite images in regional scale to predict wheat yield (with 715 Kg ha^{-1} bias in tillering stage).

Conclusion: According to the acceptable accuracy of the remote sensing compared with the Geostatistics-based method along with easiness and low cost of this method. Application of remote sensing and vegetation indices which are derived from satellite images could be a new evolution in regional yield estimation. Since satellite images provide an actual representation from the crop status, could involve to the growth modeling significantly.

Keywords: wheat, remote sensing, geostatistics, vegetation index, yield predication

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Evaluation of salinity stress effect on some photosynthetic characteristics of five Kochia (*Kochia scoparia* (L.) Schrad.) ecotypes

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Abstract

Background and objectives: Function of the photosynthetic apparatus of halophytes plays an important role in their salinity tolerance. Kochia (*Kochia scoparia*) as a halophyte, has high ability to produce under saline conditions. Photosynthesis and its related factors under salinity stress can provide appropriate physiological view for better understanding of the plant mechanisms under stress conditions. So a field experiment at salinity stress in the real condition was done for evaluation of photosynthesis and related factors.

Materials and methods: So an experiment was conducted as split-plot based on Complete Randomized Block Design with three replications to evaluate some photosynthetic characteristics of halophyte plant, in different salinity levels at the Salinity Research Station of Ferdowsi University of Mashhad, Iran in 2009. Salinity as the main plot had two levels (5.2 and 16.5 dSm^{-1}) and five kochia ecotypes including Urmia, Isfahan, Borujerd, Birjand and Sabzevar were as sub-plots.

Results: Results indicated that increased salinity level had significant effect on stomatal conductance, transpiration and photosynthetic activity. With increasing levels of salinity from 5.2 to 16.5 dSm^{-1}, stomatal conductance, transpiration rate and photosynthesis activity increased 29%, 0.41 mM.m^{-2} and 22.5%, respectively. In the other hand increased salinity level had no significant effect on chlorophyll a, chlorophyll b, carotenoids content, spad, under stomatal CO_2 content (Ci), quantum yield of photosystem II, biomass, water use efficiency and potassium and sodium concentration in leaf and stem. There were significant effect observed between

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ecotypes in water use efficiency and potassium and sodium concentration in leaf and stem. Isfahan and Sabzevar had the highest and the lowest WUE, respectively. Urmia and Borujerd with 52.7% difference had highest and lowest stem sodium and with 75% difference had highest and lowest leaf sodium content. Interaction between salinity levels and ecotypes showed there is a significant effect only in stomatal conductance and water use efficiency. Stomatal conductance increasing in all ecotypes, except Sabzevar ecotype, this increase was 64.9, 39.0, 38.8 and 13.0% in Birjand, Borujerd and Urmia, ecotypes, respectively. Water use efficiency increased by increasing salinity in Urmia and Boroujerd ecotypes and in other ecotypes, this trend was decreasing and Isfahan ecotype had highest decline rate. Significant correlation observed between chlorophyll a with chlorophyll b, carotenoids and total pigments in 5.2 dSm^{-1}. Among the photosynthetic pigments, chlorophyll a to b ratio, showed a positive significant correlation with biomass.

Conclusion: Generally, the variation of photosynthetic characteristics responses to salinity stress in Kochia ecotypes was high which increases the possibility of using these characteristics in breeding programs.

Keywords: Evapotranspiration, Quantum yield, Chlorophyll, Stomatal conductance

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The effect of irrigation with urban wastewater and applied fertilizer type on quantitative and qualitative traits of sugar beet

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Abstract

Background and objectives: Sugar beet is an industrial plant and the second sugar crop after sugar cane. Irrigation plays an important role in increasing yield and quality of sugar beet. The use of wastewater in agriculture is one of the strategies for efficient use and reuse of water. Wastes produced in the edible mushroom production industry, which includes bed mushroom cultivation has the features and potential as an organic modifier for use in the field of agriculture. However, due to the presence of Chaharmahal sugar factory and cultivation sugar beet plant in Shahrekord and with respect to the problem of water scarcity in the country and the region and increasing the production of organic Wastes, the purpose of this study was to evaluate the effect of irrigation with urban wastewater and type of fertilizer on the quantitative and qualitative traits of sugar beet.

Materials and methods: In order to evaluate the effect of irrigation with urban wastewater and type of fertilizer on quantitative and qualitative traits of sugar beet, a field experiment arranged as split plot in randomized complete block design with three replications at Research Station of Shahrekord University in 2013. The main factor including irrigation with urban wastewater at 2-4 leaf stage, 8-12 leaf stage and irrigation with tap water (control) and four types of fertilizer include sheep manure, spent mushroom compost, chemical fertilizer and no fertilizer (control) in sub-plot. In current study the space between planting rows was 50 cm and space between plants on rows was 20 cm. Traits of potassium and sodium content on root, α- amino-N, alcalite, sugar content, root yield and sugar yield of sugar beet were evaluated. The data were analyzed by using SAS. Least Significant Difference test was used to compare the means at 1% of significant.

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Results: The results showed that irrigation with urban wastewater at 8-12 leaf stage of sugar beet, significantly increased root potassium, α- amino-N, root yield and sugar yield of sugar beet compare to plot irrigated with tap water. Irrigated plot with urban wastewater had not significantly effect on the root sugar content. Besides, the maximum alcalite were belonging to irrigation with tap water. Among all fertilizer treatments, the maximum root potassium, α- amino-N, root yield and sugar yield were belong to application of sheep manure and also, the highest sugar content was belong to the treatment of spent mushroom compost. Spent mushroom compost compare to sheep manure leads to significantly decrease of α- amino-N in root sugar beet.

Conclusion: The results showed that although urban wastewater containing adequate amounts of nutrients, but in order to achieve maximum root yield, the use of organic and chemical fertilizers more efficiently. Also based on mentioned qualitative parameters, suggests that the supply of nutrients can not be effective role in improving the qualitative traits of sugar beet.

Keywords: α- amino-N, Spent mushroom compost, Sugar beet, Sugar content, Urban wastewater.

Wheat leaf rolling under water stress condition and its effect on yield and yield components

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Abstract

Background and aims: Leaf rolling particularly in cereal crops had been considered as a water stress tolerance mechanism. Leaf rolling reduces the level of intercepted light on leaves, reduces the temperature and as result reduces transpiration rate without reducing leaf area and leaf photosynthetic capacity. In this research leaf rolling, response of leaves and its relation with leaf anatomical characteristics and also its effect on the yield and yield components of some wheat cultivars under water stress condition were investigated. If there is sufficient genetic variation among cultivars in terms of leaf rolling and its possible role in reducing transpiration, breeding wheat for water stress tolerance will be possible.

Materials and methods: In order to investigate the effects of water stress on leaf rolling and its relation with anatomical characteristics and yield components of wheat, an experiment was conducted in the field of Kerman university. Five wheat cultivars (Sholeh, Omid, Azar2, Azadi and Shahpasand) and two levels of irrigation as normal and water stress were applied in a split plot experiment based on randomized complete block design with three replications. At heading stage leaf rolling rate was measured on selected leaves and then samples were taken to determine specific leaf area, leaf thickness and number of bulliform cells on the epidermis. Anatomical parameters were measured using image analysis technique by Scion-Image analysis software. Data were subjected to analysis of variance and mean values were compared using LSD procedure.

Results: Results showed that under water stress condition the area and number of bulliiform cells, leaf thickness, specific leaf area, grain yield, number of spikes per unit area, number of grain per spike, and 1000 grain weight were decreased while leaf rolling level increased. Significant negative correlations coefficient were found

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between leaf rolling level in one hand and grain yield and number of spikes per unit area on the other hand. The highest value of leaf rolling was observed in cultivar Shahpasand; while, it showed higher number of grains per spike and grain yield compare to the other cultivars. Mean while in the Azar 2 cultivar despite high degrees of leaf rolling due to lower effects of water stress on specific leaf area and number of grains per spike and number of spikes per unit area, grain yield was the highest compare to the other cultivars.

Conclusions: water stress caused leaf rolling and affected some anatomical characteristics in wheat plant leaves. Considering the negative correlation coefficient between grain yield and leaf rolling, which can be explained in some cultivars while cannot be explained in the others. It seems to be necessary to use isogenic lines in order to have a better understanding of the effects of anatomical changes and leaf rolling on wheat yield under water stress condition. Using such plant characteristics in the process of selection and analysis of their effects can improve the efficiency of selecting more stress tolerant cultivars.

*Keywords***:** Number of cells baliform, Grain yield, Leaf thickness, Leaf rolling, specific leaf area.

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A simple model for simulation of growth, development and yield of faba bean in Golestan province

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Abstract

Background and objectives: Faba bean (*Vicia faba* L.) is one of the most important grain legumes in world. Due to the increasing world population and reduced access to other sources of protein, the demand is increasing for this plant. Model is a tool that helps us to interpret and understand the world that we are living. Scientists and engineers use a variety of models as tools for understanding the phenomena under study. Mathematical model is an equation or set of equations that describe the behavior of the system quantitatively. Accurate prediction of the phenology of crop is an essential characteristic for simulation models. Production and distribution of dry matter in crop simulation models greatly regulate by the timing of developmental stages. To predict growth and yield, study sub-models of phenology, dry matter production and partitioning, leaf area and soil water balance is necessary. The objective of this study was to develop a faba bean growth and yield simulation model for the use in analyzing the effects of climate, soil, crop management and cultivar characteristic on soybean yield under Gorgan conditions.

Materials and methods: In the present study, for predicting yield of faba bean under Gorgan conditions, parameters of sub-models were estimated using data of planting dates in Gorgan and data of other researchers in different regions of world. Daily variations of phenology, dry matter, leaf area and soil water balance were estimated using model and then final yield was predicted at the end of the growth season. A soil water balance sub-model was included to simulated soil water dynamics and severity of water stress. Moreover, yield simulated based on obtained parameters and observed yield were evaluated together.

Results: Observed yields were between 2500 and 4520 Kg ha^{-1}, with average yield of 3422 Kg ha^{-1}; while, the predicted yields were ranged between 2820 and 3950

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Kg ha^{-1}, with average yield 3478 Kg ha^{-1}. In this study, all points were in the range of 85% from 1:1line. The value of R^2 was 0.67. In addition, values of RMSD and CV were 521 kg/ha and 3.9%, respectively. To evaluate the model and compare it with the reality, some statistics were used. These statistics are based on the difference between simulated and measured amounts and the correlation between them.

Conclusion: Therefore, it was concluded that this model has suitable precision for predicting yield under Gorgan conditions. Obviously, models can be useful when they are applied by physiological and ecological analysis, experiments, and empirical measurements of system.

Keywords: Faba bean, Model, Phenology, Simulation

Evaluation of some morphophenological traits related to yield and early maturity of quinoa cultivars (*Chenopodium quinoa*, Wild.)

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Abstract

Background and objectives: Quinoa (*Chenopodium quinoa* Willd.) is a member of Amaranthaceae family that originated in the Andean region in Bolivia, Chile and Peru five thousands of years and it has a tiny and round seeds. Quinoa in different combinations of diet used as food, as well as how to cook like rice grains and known as the Inca rice in the South American countries. World Food Organization compared quinoa with dry milk because of its high nutritional value. According to quinoa tolerance to drought and salinity, the most important factor that quinoa suitable for cultivation in arid and desert-prone culture is early maturity because at the end of the growing season, drought is a major problem for quinoa culture, early maturity is an important strategy to reduce drought effects.

Materials and methods: In order to identify the variety with higher yield and early maturity, five genotypes of the quinoa include of Ames13737 (QA1), Ames13724 (QA2), PI634919 (QP1), PI51055 (QP2) and PI665272 (QP3) have received from National Salinity Research Center and planted in Agricultural Sciences and Natural Resources of Gorgan university under greenhouse condition in a completely randomized design with five replications. Some different morphophenological traits related to yield (1000- grain weight, plant height, stem height, ear no. per main inflorescence and stem diameter) and early-maturity (germination (days), days to 4-leaf stage, days to inflorescence formation, days to inflorescence colouring, days to pollination, days to milky stage and days to physiological maturity) were evaluated.

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Results: The results of analysis of variance indicated that evaluated genotypes had significant differences for six traits of twelve measured traits. Correlation coefficient analysis indicated that the highest positive significant correlation was observed between the days to flowering and days to panicule colour change. The result of Euclidean distance matrix showed that QA1 with QP1 and QA1, QA2 and QP1 with each other, had the least genetic distance, the highest genetic distance was observed between QA1 and QP3. The results of principal component analysis (PCA) characterized three components that these justified 96.6% of the data variation. The first component justified (Yield) 45.5%, the second component (Germination) 40.4% and the third component (Height) 10.7% of the total diversity of the data.

Conclusion: Based on cluster analysis, thousand grain weight and day to milky stage were identified as the most important factors affecting the choice of quinoa genotypes to improve early-maturity genotypes with greater yield. The results of principal component analysis showed that QA1, QA2 and QP1 selected for seed breeding programs and also QP2 based on its important growth traits, were fitted as a genotype is used in forage breeding programs.

Keywords: Quinoa; Morphophenological traits; Cluster analysis; Principal component analysis

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The investigation of vermicompost organic fertilizer on some of physiological and qualitative traits of different varieties of calendula (*Calendula officinalis* L.) under different levels of drought stress

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Abstract

Background and objectives: Since medicinal plants in natural areas spread within the broad geographic limitations and collection and access to them is not cost-effective and on the other hand, the use of natural habitats will not be enough for the pharmacy industry, therefore, it is necessary to grow these plants in agricultural areas. In this regard, the choice of the landraces and suitable cultivars and nutrition and irrigation management, play an important role in increasing the quantity and quality of medicinal plants and reduce the negative effects of various environmental stresses on plants. The present research aimed to study the effect of drought stress on some physiological and quality traits of calendula varieties under applied and non applied of vermicompost.

Materials and methods: In order to investigate the effect of vermicompost levels on some of physiological and qualitative traits of different varieties of calendula (*Calendula officinalis* L.) under different drought stress levels, a pot experiment was conducted as split factorial based on a randomized complete block design with four replications in Torbat- Heydariyeh during 2012-2013.Treatments included vermicompost in two levels (0 and 50 valium percentage; the half volume of pot was soil and half volume, vermicompost) and drought stress in three levels (100, 50 and 20 percentage of field capacity) in main plots and seven varieties (low petals and many petals of Tehran and Isfahan as Iranian varieties and Faron, Golden yellow و Dandy as Netherland varieties) in sub plots. For applying water stress, after determining field capacity of soil, water loss per day was provided by weighting method. Measured traits included total dry weight, flower, leaf, stem and root dry weight, essential oil percentage and flower's extract.

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Results: The result indicated that with vermicompost applying, total physiological traits and essential oil percentage of calendula were increased. With increasing in drought stress to 25% of field capacity, stem, root, leaf and flower dry weights decreased 36.5, 43.8, 37.9, 45.2% compared to irrigation in field capacity, respectively. With increasing drought stress to 25% of field capacity, essential oil percentage of calendula was decreased (39.1%). There were some variation among varieties for root to shoot dry weight ratio and harvest index. The highest flower dry weight was obtained in Golden yellow variety that it had not significant difference with many petals of Isfahan and Tehran. The highest essential oil percentage was observed in low petals and many petals of Isfahan, many petals of Tehran and Golden yellow. The interaction effect of vermicompost, drought stress and variety was significant on total dry weight of plant, stem, flower and root to shoot dry weight, statistically. The highest total, leaf, stem, root and flower dry weight were observed in Foren variety under field capacity and fertilizer applying.

Conclusion: Generally, the study results showed that the reaction of varieties to drought stress levels and nutritional condition was different, but optimum nutritional status could improve the growth and yield of calendula varieties and also adjust the effects of drought

Keywords: Essential oil, Dry weight, Harvest index, Root to shoot ratio.

(Short Technical Report)

Study of optimum transplanting date and nitrogen application in double-cropping of rice 'Kuhsaar' cultivar in Mazandaran

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Abstract

Background and objectives: Recently, double-cropping of rice in Mazandaran due to favorable climate condition is highly interested by the rice farmers. So that, after harvesting of main crop of rice, farmers can grow again one crop of rice during summer, especially in the years which climate conditions are suitable for double cropping of rice. Therefore, development of suitable field practice and management to produce optimum level of grain yield of cultivars which released for double cropping rice system is crucial. Hence, this experiment was carried out to develop a suitable field practices, including transplanting date and nitrogen (N) application rate on Kuhsaar cultivar in a double - cropping system of rice in Rice Research Institute, Mazandaran-Amol in 2012.

Materials and methods: With this experiment rice cultivar so called Kuhsaar was used and the effect of two factors studied in this experiment including: 1) transplanting date in three levels (9 August, 19 August and 29 August), and 2) nitrogen fertilizer rates (0, 25 and 50 Kg ha^{-1}) were tested in a factorial experiment arranged in Randomized Complete Blocks Design (RCBD) with three replications.

Results: Results of analysis of collected data in this experiment indicated that the effect of transplanting dates was significantly different for traits such as days to 50% flowering, harvest index, number of filled grain/panicle, and grain yield ($\alpha < 0.05$), and plant height, flag leaf area, un-filled spikelet /panicle ($\alpha < 0.01$). Also, effect of nitrogen rate was significant for effective tillers/plant ($\alpha < 0.01$), and interaction of transplanting date/ nitrogen rate was also significant for two traits including effective tillers/plant and harvest index. Traits mean comparison through least significant differences (LSD) method showed that 1st transplanting date

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(August 9th) performed a higher number of grain/ panicle (74.93), as the main component of grain yield, with a maximum grain yield (4194.7 kg/ha). We found that traits such as panicle/plant and panicle harvest index (PHI) were in maximum level in 1st and 2nd dates (19th and 29th August) of transplanting.

Conclusion: According to the results of testing two factors of interest, including transplanting dates and nitrogen application rates we found that through transplanting of this cultivar earlier on 9th August in summer that climate factors affecting plant growth such as temperature and radiation which are in optimum condition could be suitable field practices in a rice-rice cultivation system, will produce the optimum amount of grain yield.