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Yield and quality of potato seed and edible tubers in response to different phosphorus levels and nitrogen application times

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ABSTRACT

To investigate the appropriate distribution of nitrogen fertilizer application and optimum amount of phosphorus fertilizer to achieve high quality and quantitative yield in edible and seed potato (*Solanum tuberosum* L.) tubers, this experiment was conducted in Research Farm of the College of Agriculture and Natural Resources, University of Tehran in 2012. The experiment was performed a strip split blocks based on randomized complete block design (RCBD) with three replications. The effects of two factor of phosphorus fertilizer diammonium phosphate (DAP) at four rates of 0 (control), 175, 350 and 525 kg.ha⁻¹) and supplemental nitrogen (N) fertilization (Urea) was studied on three application times includes: N1 (15% planting time, nonuse in tuberization stage and 85% at three times of tubers bulking stage), N2 (35% planting time, nonuse in tuberization stage and 65% at once in tubers bulking stage) and N3 (35% planting time, 30% in tuberization stage and 35% in tubers bulking stage) on potato plant. Results showed that third method of supplemental nitrogen fertilization reduced effectively the rate of nitrate percentage in tubers. Tuber yield significantly increased in this treatment. Although, the different levels of phosphorus fertilization had no effect on tubers yield, but rising of phosphorus fertilization up to the third level (350 kg DAP.ha⁻¹) caused to enhance the number of tubers and excess application of this rate reduced the number of tubers significantly. Moreover fourth level of P fertilizer (525 kg DAP.ha⁻¹) significantly increased specific gravity of tubers, compared to the other levels. Therefore results indicated that addition of phosphorus fertilizer effectively stimulated tuberization of potato plants.

Keywords: nitrate percentage, phosphorus, tuberization, tubers bulking, tuber yield.

Assessment of genetic diversity in different genotypes of *Brassica spp.* using NBS-LRR markers

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ABSTRACT

Breeding for resistance is one of the main approaches to control diseases. In this approach, there is a necessary for existence a sufficient genetic variability of resistance genes. Accordingly, assessing the genetic variability in the available germplasm is needed to manage genetic resources. Molecular markers are effective tools to investigate genetic diversity for resistance to pathogens. NBS-LRR (Nucleotide-Binding Site- Leucine Rich Repeat) marker can be used to study genetic variability. Those markers specifically targets chromosome regions containing R-genes and R-gene analogues. In this study eight primer combinations of NBS markers were used to assess the genetic diversity among 46 accessions of *Brassica spp.* As result, NBS markers amplified 790 DNA bands that more than 89% bands were polymorphism. Average PIC (Polymorphism Information Content) and average MI (Marker Index) were 0.29 and 26.36 respectively. Cluster analysis based on Simple Match Coefficient and UPGMA algorithm showed that there is wide variation in the evaluated samples. The average of similarity based on NBS markers was 0.66. These high levels of diversity of these amplified NBS markers indicate a high potential of these markers for discrimination the Brassica genotypes.

Keywords: *Brassica spp.*, genetic diversity, NBS Profiling.

Investigation of genetic diversity in chickpea (*Cicer arietinum* L.) lines using ISSR markers

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ABSTRACT

In this research, ISSR technique was applied to assess genetic diversity among 56 chickpea lines. Out of 34 primers, nine primers produced appropriate banding patterns and produced 35 polymorphic bands in chickpea lines. Mean percentage of polymorphism of the primers was 66.01 with range of 25 to 100 percent. Mean of Nei's genetic diversity and Shannon information index over all primers were 0.325 and 0.492, respectively. Based on Jaccard's similarity coefficient, lines of FLIP01-40C and FLIP02-84 had the lowest similarity (0.166) and lines of FLIP03-6C and FLIP03-8C had the highest similarity coefficient. Cluster analysis using UPGMA method and Jaccard's similarity matrix was done. The dendrogram was cut at 0.51 scaled intervals and categorized the lines in six distinct groups. Distinct grouping and large genetic distances among the chickpea lines stated a good molecular variation. Showing the lines by a triplot based on the three first coordinates from PCoA, verified the clustering and efficiently separated them.

Keywords: chickpea, cluster analysis, genetic diversity and ISSR markers.

Effect of crop protection and herbicides management on weed species distribution in wheat fields

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ABSTRACT

In order to investigate the effects of crop rotation and applying of herbicides on weed distribution in irrigated wheat fields of Kermanshah province, this study was performed during 2011-2012. Multivariate analysis (RDA) revealed the significant relationship between composition and species frequency and exerted management techniques. The first and second features of RDA indicated 57%, 74.9% and 58.3% distribution variance under the effect of crop rotation, grass herbicides and rotation, and broadleaf herbicides and rotation respectively. The highest effect was for the continuously wheat cultivation which had a positive correlation with the frequency of the weeds including *Lolium rigidum*, *Hordeum spontaneum*, *Avena ludoviciana*, *Lithospermum arvense* and *Phalaris brachystachys*. Application of the herbicide clodinafop propargyl and rotation between wheat-barley and wheat-sugar beet had a low correlation with grass weeds. The weeds including *Sinapis arvensis*, *Carthamus oxycantha*, *Vicia assyriaca* and *Galium tricurnutum* in the rotation wheat-barley were not controlled by applying 2,4-D, tribenuron methyl and Sulfosulfuron and had a high density.

Keywords: density, distribution, redundancy analysis (RDA), weed flora.

Evaluation of phenology relationship with yield potential and drought stress tolerance in some of wheat (*Triticum aestivum* L.) genotypes and varieties in Iran

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ABSTRACT

Proportionality of wheat cultivars growth patterns to the area's agro climatic condition will improve crop production. The objective of this study was identifying the phenology of a wide range of wheat varieties in Iran, as well as evaluating the relationship between phenology and drought stress tolerance under late season drought stress. In this experiment, 36 wheat genotypes were studied under irrigated and drought stress conditions, at farm of the Agricultural College of Tehran University during 2010-11 cropping season. Experimental design was simple lattice with three replications. Phenology, grain yield, grain number per spike and 1000 kernel weight were recorded for all cultivars. The results showed that most of the varieties which had short vegetative duration subsequently had greater ability to tolerate late season drought stress. Also, under drought stress condition, wheat varieties with short grain filling period had the highest 1000 kernel weight, such as Simineh, Chenab, Stork, Moghan 3, Cross falat hamoon and DN-11.

Keywords: drought stress, Grain filling duration, Phenology, Flowering, Wheat.

Evaluation of genetic diversity of lentil germplasm using morphological traits in Bardsir.

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ABSTRACT

In order to study of genetic diversity in 35 lentil genotypes in some morphophenological traits, yield and yield components, and determine the relationships between different traits by multivariate statistical methods, an experiment was conducted as augmented design in 4 blocks in 2012. The results of descriptive statistics showed that many of traits had considerable variability. The results of the simple calculated correlation coefficients showed that harvest index had the greatest effect on seed yield. Stepwise regression analysis showed that traits such as, harvest index, biologic yield and leaf and stem dry weight justifies the most variation of yield. Results of path analysis showed that the highest direct positive effect on yield was related to harvest index. Factors analysis with varimax rotation extracted 6 factors which it described almost 85.9 percent of total variation in the data. Cluster analysis by average linkage method established all genotypes in 3 different groups. The highest diversity was observed between cluster 2 and 3.

Keywords: factor analysis, cluster analysis, genetic diversity, lentil.

The impact of barley root structure and physiological traits on drought response

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ABSTRACT

Drought is the most important factor limiting crop yield world wide. Osmotic adjustment (OA) and strong and deep root system result in increased cereal drought tolerance through increasing water uptake and water use efficiency. The impact of root structure and physiological traits on drought stress response was studied in three barley cultivars including Yousof (drought tolerant), Morocco (susceptible), and Fajr30 (semi-tolerant) and an Iranian accession of wild species, *Hordeum spontaneum* (tolerant). Seeds were planted in PVC pipes 100 cm depth and 10 cm diameter. Two moisture regimes applied including a normal irrigation at field capacity (control), and drought stress at 20% available water. Root characteristics and physiological traits were measured at flowering stage. Drought stress reduced stomatal conductivity, RWC, Leaf water potential, osmotic potential, OA and increased leaf temperature. Minimum decline in Leaf water potential, osmotic potential and RWC was observed in tolerant varieties (Yousof and *H. spontaneum*). The tolerant and susceptible varieties showed the highest and the lowest OA. Drought stress led to reduced root dry weight and volume in all varieties, susceptible variety showing the highest decline. Root depth increased under stress in all tolerant and semi-tolerant cultivars, while decreased in the susceptible one. The results showed that tolerant varieties are varieties which could uptake more water by increasing root depth leading to higher OA and higher RWC. Higher RWC results in more transpiration and lower leaf temperature under stress condition.

Keywords: drought stress, osmotic adjustment, relative water content, root depth, root volume.

Identification of canola cultivars with drought tolerance indices

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ABSTRACT

Water deficit is a major problem for the successful production of agricultural products in Iran. This research was conducted to evaluate drought tolerance indices and identifying drought tolerant cultivars of canola. Twenty eight canola cultivars were sassed implementing complete block designs experiments in normal and drought stress conditions at Isfahan University of Technology Research Farm during 2008-2009. Fisher and Maurer Stress Sensitivity Index (SSI), Tolerance Index (TOL), Rosielle and Hamblin Mean Productivity (MP), Geometric Mean Productivity (GMP) and Fernandez Stress Tolerance Index (STI) were used to compare reactions of genotypes in two moisture conditions. Based on correlation of tolerance indices with the grain yield the results showed that STI, GMP, and MP are the most appropriate in selection for drought tolerance. Mean comparison of tolerance and sensitivity indices for canola cultivars showed that based on STI index 'NK fair' cultivar was the most tolerance and 'RPC 2023' was the most sensitive cultivar to drought stress. According to 3-D plot of Y_p , Y_s and STI cultivars Nk fair and Oase were identified as high yield under non-stress condition and had relatively good yield under stress condition. These cultivars can be introduced to region with deficit irrigation.

Keywords: biplot, canola, drought stress, yield.

Analysis of correlation coefficients between grain yield and yield components in cowpea genotypes under normal and drought conditions stress

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ABSTRACT

In order to deliberate correlation coefficient between grain yield and yield components among 31 cowpea genotypes under normal irrigation (non-stress) and drought stress (water with holding after flowering stage until maturity) an experiment was performed in a randomized complete block design (RCBD) with three replications at research field of University of Tehran located at Karaj during 2011-2012 growing season. The traits measured comprised of plant height, branches number per plant, pods number per plant, seeds per pod, biological yield, grain yield per plant and 100 seed-weights. Results showed that under both irrigation regimes, biological yield and pods number per plant were highly correlated with grain yield. Stepwise regression analysis revealed that biological yield and pods number per plant had the highest effect on grain yield of cowpea genotypes under both irrigation conditions. Path analysis showed that the highest direct positive effect of biological yield and pods number per plant on grain yield under both conditions. Therefore, in breeding programs, to boosting grain yield in cowpea genotypes, it is better that the selection to be based on the biological yield and number of pod per plant traits.

Keywords: coefficient correlation, cowpea genotypes, drought stress, path analysis.

Seed yield stability in winter rapeseed (*Brassica napus*) genotypes using Eberhart and Russell's method

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ABSTRACT

In order to study the seed yield stability of oilseed rape lines, a series of experiments were carried out at Karaj, Kermanshah, Tabriz, Hamedan and Arak agricultural experiment stations using 10 lines, two control varieties of winter rapeseed and 3 promising lines (a total of 15 genotypes) in randomized complete block designs with three replications for two cropping seasons (2009-11). Analysis of variance showed that there was significant differences among genotypes in different environments in terms of yield. Combined ANOVA revealed significant interaction of genotype×year×location. The Lines L183, HW101, SW101, Karaj1, Karaj2 and SW103 with seed yields 4.647, 4.595, 4.556, 4.443, 4.441 and 4.306 (t/ha) respectively, were better than overall mean and had lower ranks and rank variance than others. Eberhart and Russell stability analysis method showed significant differences between genotypes for grain yield. Environmental variance (linear) was significant and showed a linear relationship between the genotypes in each environment with the environmental index. Genotypes L183, SW101, SW103, HW101, Karaj1 and Karaj2 with highest yield, coefficient of regression equal to unity and non-significant deviation from regression line were the most stable genotypes. Therefore, these genotypes can be used in further studies and eventually for cultivation in cold and mild cold regions.

Keywords: cold and mild cold regions, grain yield, rapeseed, stability.

**Evaluation of agronomical traits fennel
(*Foeniculum vulgare* Mill) – fenugreek
(*Trigonella foenum-graecum* L.) in intercropping**

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ABSTRACT

In order to study yield and yield components of fennel (*Foeniculum vulgare* Mill) – fenugreek (*Trigonella foenum-graecum* L.) in different patterns of intercropping and sole cropping, an experiment with use replacement and additive intercropping based on randomized complete block design with three replications was conducted at the Research Station of Faculty of Agriculture, Zanjan University, Iran, during growing season 2012. Treatments included additive intercropping in three levels (%100 fennel+33, 66 and %100 fenugreek), replacement intercropping in six levels (1:1, 1:2, 2:1, 2:2, 1:3, 3:1), Sole fennel and Sole fenugreek. Results showed that most traits significantly ($p \leq 0/05$) were affected by different sowing pattern with the exception 1000-seed weight and harvest index in fennel. Fenugreek and fennel yield increased with higher each of ratio in intercropping. The highest grain yield of Fenugreek was obtained in pure stand of Fenugreek and the lowest it was obtained in the 3:1 replacement series. Also in fennel %100 fennel + %33 fenugreek additive series and 1:3 replacement series have the highest and the lowest seed yield respectively. Land equivalent ratio (LER) was more than 1.00 in all sowing patterns.

Keywords: LER, replacement series, sowing pattern, yield.

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Evaluation of two subspecies of flax (*Linum usitatissimum*) in different geographical regions for genetic diversity of seed yield and its components

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ABSTRACT

In order to investigate genetic diversity of two flax species, 50 genotypes were evaluated. The results showed that there was significant difference between two subspecies and also among different regions in subspecies for some seed yield components and Us subspecies was superior than Md for number of capsules/plant but Md subspecies had more 1000 seed weight. Genetic variation in each region was different depending on the trait. Genetic variation ranged for number of capsules/plant from 13.9 to 81.7, for number of seed/capsules from 5.4 to 9.22 and for 1000 seed weight from 2.5 to 6.4 gram. Seed yield/plant varied from 0.3 to 9.06 gram and seed yield ranged from 188.7 to 1453 kg/ha in Norway 1005 and Lybia 1686 genotypes, respectively, indicating the existence of genetic potential to improve important traits in flax. Cluster analysis classified genotypes into six groups. Genotypes within group one having highest capsule/plant along with genotypes within group two and three had high seed yield/plant. Number of capsules/plant showed highest genetic correlation due to high direct effects along with negative indirect effect through 1000 seed weight on seed yield/plant

Keywords: cluster analysis, genetic correlation, germplasm, path coefficient.

Effects of salicylic acid and gibberellic acid on improvement and prevailing seed deterioration in two sesame (*Sesamum indicum*) cultivars

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ABSTRACT

Seed deterioration of seed is one of the most important limiting or even hindering factors in germination. The main purpose of this study was to determine the effects of salicylic acid and gibberellic acid hormonal on improvement and prevailing seed deterioration in two sesame cultivars. This study was carried out at the Department of Agronomy and Plant Breeding Seed Laboratories of College of Agriculture, University of Tehran (Karaj) during 2012-2013. The sesame cultivars Darab2 and Darab14 were the ones studied. The experiment was designed as a factorial of completely randomized design with tree replication. First, germination characteristic measured and then seeds were aged through Controlled deterioration test. Treatments including: two sesame cultivars; 2 level deterioration (24 and 48 hr) with controlled; and 6 h ormonal concentration (25, 50, 100ppm gibberellic acid - 25, 50, 100 ppm salicylic acid) with controlled. The characteristics were measured, including: germination percentage (%), germination index (GI), germination speed (GS), vigor1 and vigor2. Hormonal treatments were applied to both pre-treatment and post-treatment in two separate experiments. The results showed that seed deterioration in both level reduced seed trait measured. Darab 14 the more resistant to deterioration than darab 2. But, with primed hormonal concentration in two conditions pre-treatment and post-treatment, investigated characteristics for two cultivars improvement and prevailing deterioration had taken place. In Darab 2, all concentrations of gibberellic acid in 24 h deterioration level in testing hormonal pre-treatments were better. But, in Darab 14, at both levels deterioration, the hormonal post-treatment showed better results. Our results suggested that salicylic acid 50 ppm, was the most effective treatment in this study.

Keywords: deterioration, germination, hormone, priming, sesame.

Interrelationships between Chlorophyll Content and Seed Yield in Bread Wheat under Saline Conditions

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ABSTRACT

The measurement of chlorophyll content of leaf is as an appropriate criterion in breeding programs to increase the rate of leaf photosynthesis. In order to study the relationship between chlorophyll content and seed yield under saline conditions, 41 wheat genotypes were evaluated in two conditions (normal and salinity stress) at the research field of the National Salinity Research Center (NSRC). The salinity of water used in irrigation in saline and non-saline conditions was 10 and 2 dS. m⁻¹ respectively. The results of the analysis of variance indicated significant differences in bread wheat genotypes for chlorophyll content and seed yield in both the non-saline and saline conditions. According to the results of compare of means, genotypes Shahryar, Rushan and Bumi Yazd had the highest seed yield and also had the highest chlorophyll content among the genotypes under saline conditions. Therefore can be concluded that tolerant genotypes and with high yield had the highest chlorophyll content under saline conditions. Also, the results of correlation and factor analysis indicated that there was a positive relationship between chlorophyll content and seed yield in saline conditions. Therefore, selecting genotypes with high chlorophyll content under salt stress can lead to the selection of genotypes with high yield and salt tolerant.

Keywords: bread wheat, chlorophyll content, salinity stress, seed yield.

Investigating the germination response of two *Echinochloa* species to temperature and photoperiod with emphasis on invasiveness

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ABSTRACT

This experiment, conducted to examine the effects of temperature and photoperiod on seed germination of watergrass (*Echinochloa aoryzoides*) as a new-introduced and barnyardgrass (*E. crus-galli*) as a common weed species in rice fields of Guilan province. This study was consisted of two separate experiments. At the first study, germination responses of two species to different temperatures (10, 15, 20, 25, 30, 35, 40 and 45°C) were evaluated and the cardinal temperatures were estimated. For the second study, the photoperiod effects (0.24, 4.20, 8.16, 10.14, 12.12, 14.10, 16.8, 20.4, and 24.0 hours light/dark) under two constant temperatures of 25 and 30°C were intended. The results indicated that, for the both species, the highest final germination, maximum germination rate, and nil germination were observed in 25 to 30, 30 and 40°C, respectively. At low temperatures, greater germination was recorded for barnyardgrass compared to watergrass. The minimum, optimum and maximum germination temperatures were 9.6, 31, and 45.5°C for barnyardgrass, and 10.5, 31.4, and 45.6°C for watergrass, respectively. Despite the occurrence of some germination in complete darkness, increased light exposure promoted the germination. Short photoperiods promoted germination more in barnyardgrass rather than watergrass. Increasing temperature from 25 to 30°C, caused partial reduction in light requirement for germination, especially in barnyardgrass. Overall, it seems that the new-introduced species compared with the common species needs higher temperatures and is more tolerant to different photoperiods for germination. These characteristics can be enumerated as competitive advantages for this species, especially under the early season higher mean temperature scenarios.

Keywords: cardinal temperature, *Echinochloa crus-galli*, *Echinochloa oryzoides*, germination requirement.