QTL mapping of genes affecting salt tolerance in rice (Oryza sativa L.) using microsatellite markers

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ABSTRACT

Rice is moderately sensitive to salinity. Salinity affects virtually all aspects of rice growth in varying degree at all stages from germination through maturity. Tolerance to salinity is genetically and physiologically complicated and inherited quantitatively. Application of molecular-marker aided selection technique for improvement of salinity tolerance would accelerate breeding progress by increasing selection efficiency. In order to map the Quantitative Trait Loci (QTLs) for salinity tolerance in rice and determine the contribution of each QTL in phenotypic variation, 63 advanced backcross lines (BC 2F5) derived from a cross between IR64 as recurrent parent and Tarom Molaii as donor parent, were used. The phenotypic traits under study included: Sodium(Na) and Potassium(K) concentration in root and shoot, dry and wet weight of root and shoot, Na+:K+ ratio in root and shoot. Polymorphism between the two parents was assessed using 235 SSR markers with uniform coverage on all 12 linkage groups, through which 114 markers showed polymorphism and assigned for genotyping. The map length was 1692.6 cM with an average interval size of 16.3 cM. Transgressive segregation was observed for all traits. We found QTLs with additive effects for K+ in shoot, dry weight of root and shoot, Na+:K+ ratio in root and shoot. At least one QTL was mapped for Na+:K+ ratio in root, on all chromosomes except chromosome 9. All detected QTLs had significant threshold (LOD>4) and also approved by both IM and CIM methods.

Key words: Rice (Oryza sativa L.), Salinity tolerance, Microsatellite, QTL, Na:K ratio, Transgressive segregation.

Study of plant density and irrigation intervals on forage yield and some physiological traits in forage sorghum

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ABSTRACT

Forage yield and some physiological traits of a forage sorghum cultivar (Speed feed) was studied in three irrigation intervals 4, 7 and 10 days in the Azad university of Iranshahr in 2003 cropping season. The experimental design was split plot based on randomized complete blocks with three replications. Irrigation intervals were studied in main plots and plant density of 8, 12 and 15cm were assigned to sub-plots. Planting was carried out in May 5, 2003. Different physiological traits associated to forage yield and its components were measured during growing season. Analysis of variance and mean comparison were performed using the principles of split plot design and DMRT, respectively. The best irrigation intervals and plant density determined. In this expriment the best irrigation interval, were 4 and 7 days and the best plant density was 12cm. Results indicated that fresh forages are in the same group as irrigation interval, of 4 and 7 days, and the best plant density was 12cm. However, after drying the dry forage at first irrigation level and the second plant density level (37130 kg/ha) was the highest.

Key words: Forage sorghum, Irrigation intervals, Planting density, Fresh forage, Dry Forage.

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Effect of row spacing and plant density on grain yield and yield components in maize (cv. SC 704) in Miyaneh

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ABSTRACT

To study the effect of row spacing (45, 60 and 75cm) and plant density (50, 60 and 80 thousand/ha) on grain yield and yield components in maize cv. Sc 704 a field experiment was conducted in Miyaneh in 200 cropping season. This experiment was arranged as factorial-using randomized complete block design with 4 replications. In this experiment, developmental and growth stages, morphological characteristics and ear, and dry weight of different parts of plant, grain yield and yield components and harvest index were measured and evaluated. The results showed that with increasing row spacing, plant dry weight at anthesis stage, thousand kernel weight, grain yield, harvest index and kernel number per ear were significant increased. It was also found that with increasing the plant density, some traits such as leaf dry weight between anthesis and physiological maturity stages, plant dry weight at anthesis and physiological maturity stage, and tassel dry weight at anthesis and physiological maturity stage, and grain yield were significantly increased, however leaf dry weight in transitional stage, stem diameter in physiological maturity stage, grain number per row and plant dry weight in transitional stage significantly decreased with increasing plant density. Interaction effect of row spacing and plant density on stem diameter anthesis stage, and grain yield was significant.

Key words: Row spacing, Plant density, Grain yield, yield components, Anthesis, Physiological maturity.

Development of PCR based molecular marker for candidate Fusarium head blight Resistance gene (PDR5) in wheat

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ABSTRACT

The PDR5 (pleiotropic drug resistance 5) gene, encoding ABC transporter protein, detoxifies cells using ATP hydrolysis. To develop PCR based marker for Fusarium head blight resistance candidate gene (PDR5) in wheat, similar sequences of PDR5 were aligned with DNASTAR software. Primers were designed based on conserved and non conserved sequences. Molecular analysis using moderately resistant (Frontana) and susceptible (Falat) parental lines showed a specific PDR5 allele in Frontana. Amplified allele was isolated, cloned and sequenced. The sequencing was verified on data Bank. Single marker analysis based on phenotyping and genotyping data of F3 generation developed from a cross between Frontana and Falat indicated the specific PDR5 allele had negative effect on FHB infection in wheat.

Key word: Wheat, Fusarium Head Blight, PCR, PDR5 gene, Phenotyping, Genotyping.
Genetic diversity and geographical distribution in Iranian lentil accessions

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ABSTRACT

Lentil Collection of National Plant Gene bank of Iran was investigated for trend and pattern of genetic diversity in relationship with geographical distribution in the country in 2000. A total of 990 accessions were evaluated in Karaj at Seed and Plant Improvement Institute Field station. Fifteen morphological and phenological characteristic were evaluated according to the IPGRI descriptors during 200 × growing seasons. Statistical parameters such as mean, mode and variance and Shannon-Weaver Index were calculated for diversity within accessions. Data were analyzed for correlation, factor and cluster analysis studies. The highest value for Shannon-Weaver Index was determined in plant height, 100 seed weight and date of maturity, however, lowest value was determined for pod pigmentation, flower color and tendril length. The observed diversity in this study was about 58% of potential diversity. Accessions from different provinces were significantly different for most of the traits. According to their origin, accessions were grouped in four clusters. The first cluster mostly contained accessions of cold provinces, whereas, accessions of warm provinces grouped in the second cluster. The lentils of Khorasan province clustered in a separate group. Distribution of accessions based on tow first factors in Factor analysis confirmed the results of cluster analysis.

Key word: Lentil, Gentic diversity, Accession, Geographical distribution.

Interaction effect of plant spacing and nitrogen on growth and yield of rice (Oryza sativa L.) under different Barnyardgrass (Echinochloa crus-galli) densities*

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ABSTRACT

In order to evaluate the interaction effects of plant spacing and nitrogen on growth and grain yield of rice, an experiment was conducted in Kushkak agricultural research center in 1998 cropping season. The experimental design was split-split plot in which nitrogen was assigned to main plots, plant spacing to sub-plots and weed density to sub-sub plots. With increase in rice plant spacing from 20×20 to 25×25 cm, rice grain yield increased. Among yield components, the number of panicle per plant (11.7 vs 13.7) and number of grain per plant (782.2 vs 1202.7) significantly increased. The increase in Barnyardgrass weed density significantly reduced rice grain yield (from 4328 to 2587 kg ha⁻¹). Rice grain yield increased by increasing nitrogen rate (from 2818 to 3802 kg ha⁻¹) but there was no significant difference between 80 and 120 kg/ha⁻¹. Nitrogen fertilizer efficiency decreased when the rate of nitrogen increased. Harvest index reduced by increasing the rate of nitrogen, but this reduction was not significant.

Key words: Rice plant spacing, Nitrogen, Barnyardgrass weed, Grain yield.

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Genetic study of wheat (*Triticum aestivum* L.) root characteristics under drought stress condition

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**ABSTRACT**

General and specific combining ability and gene action for some traits as root dry weight and root: shoot ratio under drought stress condition in bread wheat genotypes were studied, using eight parents (six lines and two cultivars) in a diallel crossing design in 2002. The 28 F1 hybrids and the eight parental genotypes were sown in a randomized complete block design with four replications in a research greenhouse. Results of the analysis of variance showed that differences between genotypes were significant for root dry matter and root: shoot dry matter in both normal and drought stress conditions. It was also observed that the majority of the genetic variance for root dry matter was due to additive gene action. Under normal conditions, the parents 7007-2 and Shahpasand had the highest general combining ability (GCA) for root dry matter trait and considered to be the best general combiner for root to shoot dry matter ratio under in both conditions. Results also indicates that, the over-dominant gene actions under stress condition were the most contributors to the inheritance of both traits. The lines 5593/2 and 524-4 had the maximum dominant genes and the minimum recessive genes, for both traits under drought stress respectively.

**Key words:** Wheat root, Combining, gene effect, Tolerance, Drought stress.

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**scientific short article**

The effect of row and planting spacing on yield in the white bean cv. Danshkadeh

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**ABSTRACT**

In order to study the effects of row and plant spacing on the grain yield of white bean, cv. Danshkadeh, a field experiment was carried-out in Khomein field Research station in 2002 cropping season. Four levels of row spacing, 30, 40, 50 and 60 cm and three levels of plant spacing on row, 5, 10 and 15 cm were studied in split plot arrangement using randomized complete block design with four replications. Four levels of row spacing were assigned to main plots and three levels of plant spacing to sub plots. The results showed that increasing row spacing and plant spacing, i.e. decreasing plant density, the grain yield significantly decreased. The highest grain yield (2605 kg/ha) was obtained from the combination of 30 X 5 cm, row and plant spacing, respectively.

**Key words:** Row space, Plant spacing, white bean, grain yield.

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