

Abstract

The use of insecticides and herbicides containing arsenic, Arsenic enhances the environment. Arsenic contamination in soil has become a severe threat to crop production and food safety. The experiment was conducted using a barley 72 DHL derived of the cross “Steptoe/Morex” population to detect the QTLs associated with Arsenic tolerance, and to determine the portion of each QTL in the phenotypic variation of the related traits. The experiment was conducted at Agricultural Biotechnology Research institute of Zabol University in the hydroponic environment in 2013. The experiments was arranged as to Completely randomized block design, with three replicates and two treatments normal and Arsenic stress. The studied traits morphologic traits and physiologic traits including: Percentage and rate of, Fresh and dry weight of root and shoot and the ratio, root length and shoot and the ratio, Chlorophyll concentration, Proline, The amount of soluble sugars, Relative water content, Membrane stability index and Chlorophyll fluorescence. After measuring traits, statistical analysis achieved for phenotypic surveys such as analysis of variance, correlation between traits, cluster analysis and principal component analysis. Analysis of variance result showed significant difference among the lines in both Arsenic stress and normal conditions for all of the traits. Maximum correlation between Fresh weight shoot of dry weight shoot rate were ($r= 0.94^{**}$). In The PCA (principal components analysis) analysis, the first seven principal components explained 75% of the total variability in normal condition and the first eight principal components explained 70% of the total variability in stress condition. Factor analysis extracted characters taken into consideration and named as optical factor, Water-holding capacity factor and weight factor. Using cluster analysis grouped genotypes normal and salt stress conditions 5 and 6, respectively, were identified. QTL analysis was carried out using genetic linkage map derived from 327 marker of RFLP marker, QTL cartographer software with composite interval mapping method. In total 39 QTL was found for the traits (22 QTL for normal condition and 17 QTL for Arsenic stress condition). Phenotypic variation that were explained by these QTLs, varied from 10.22-43.94. The highest phenotypic variances were related to root length (Qlr3H_{3.n}) in normal condition and lowest phenotypic variances were related to root fresh weight (Qwtr3H_{3.s}) in stress condition. . LOD ranged between 2.56-7.36. The highest and lowest LOD were attained for the QTLs root length and root fresh weight / shoot fresh weight ratio normal condition.

Key words: Hydroponic culture, Barley, Arsenic, Stress, QTL



University of Zabol
Graduate school
Faculty of Agriculture
Department of Plant Breeding and Biotechnology

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**QTL analysis of morphological and physiological
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Supervisor:

Dr. B. Fakhari

Advisor:

L. Mehravaran

By:

F. Mousavi

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