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THE IMPACT OF MOISTURE STRESS ON GRAIN YIELD AND YIELD COMPONENTS OF BREAD WHEAT LINES

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Introduction

Drought stress is one of the most important abiotic factors that limiting crop yield around the world. As climate change leads to increasingly hotter and drier summers, the importance of drought constraints on yield and yield components has increased in Asia and Iran. Bread wheat (*Triticum aestivum* L.) is one of the most important crops in the center and the west of Iran, where high temperatures and water stress often reduce plant growth and crop yield. (Rashid et al, 2003). Some morphological traits such as root length, tillering, spike number per m^2, grain number per spike, number of fertile tillers per plant, 1000-grain weight, peduncle length, spike weight, stem weight, awn length, and grain weight per spike affect wheat tolerance to the moisture shortage in the soil (Plaut et al., 2004). Stepwise multiple linear regressions proved to be more efficient than the full model regression to determine the predictive equation for yield (Kian Ersi et al, 2013). The purposes of this research were to study: (i) detection the with lines desirable morpho-physiological traits, (ii) determine the genetic diversity of the mentioned traits for selection, and (iii) detection of the best important effective traits on economic yield under terminal moisture stress condition.

Materials And Methods

Seeds of 20 winter wheat lines (*Triticum aestivun* L.), including, 18 promising lines and 2 control lines were prepared from the Natural Resources and Agriculture Research Center of Isfahan, Iran. The land for the tests was prepared by deep plowing, two disks and furrowing. Then, nitrogen, phosphor and potassium fertilizers were added according to results of the soil nutrient test. This experiment was conducted in 2011-2012 in a research field, located in the station of Kabotarabad (Isfahan, Iran). Seeds were sown in plots of 5.5 m×1.2 m with six rows in each plot. The distance between rows was 20 cm and seed density was established at 400 seeds per square meter. The experiment was arranged as a randomized complete block design with three replications under terminal moisture stress conditions. Moisture stress condition was applied by cutting after initiation of wheat heading. Measurements for the following traits were taken during the growth season; days to 50 percent physiological maturity, flag leaf width and total leaf area and, according to 10 randomly selected plants, the other traits of plant height, peduncle length, spike length, awn length, stem weight, tiller number per m2, number of spikelets per spike, 1000-kernel weight, peduncle weight, grain number per spike, and rate of spike weight to stem weight ratio were calculated after harvesting. In addition, biological and economic yield were measured for each plants of each plot and data were transformed and represented in units per hectare. After testing "the normality residual exam", data were analyzed using SAS (version 6.12) and Minitab software. Analysis of results was made by stepwise regression to detect the most effective agro-morphological traits on economic yield.

Results and Discussion

The results of ANOVA showed significant difference for all tested lines ($p<0.01$) for the traits of 50 percent physiological maturity, number of tillers per m^2, 1000-kernel weight, plant height, peduncle length, spike length, awn length, spikelet number per spike, peduncle weight, stem weight, number of grains per spike, flag leaf width, total leaf area per square meter, harvest index and economic yield. These results indicated high diversity under conditions of terminal moisture stress among lines for the above-mentioned traits, particularly for economic yield. Thus demonstrating that breeders can use this information on diversity among wheat lines in response to drought stress in improvement programs.

Stepwise regression analyses were done to detect the most effective traits on economic yield. Stepwise regression helps to estimate the functional relationship between variables or the relationship between independent and dependent variables. Traits of days to 50 percent physiological maturity, plant height, total leaf area, harvest index and biological yield were entered in the regression model and they explained a total of 86.31% of grain yield variation.

Keywords: Wheat lines, moisture stress, Regression Analysis

References

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