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“Development on the margin”

Differential Response of some Bread Wheat (*Triticum aestivum* L.) Genotypes on Yield and Yield Components to Terminal Heat Stress under Sudan Conditions

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Abstract

Due to the high food demand, the expansion of wheat production into the warmer non-traditional areas becomes a necessity in Sudan. Therefore the objective of this study was to assess the genotypic variability and heat tolerance among 15 wheat genotypes under terminal heat stress under Sudan field conditions. Three different sowing dates (S1, S2 and S3) were used to simulate terminal heat stress. A split-plot design with three replications was used to lay out the experiments, for two consecutive winter seasons (2005/06–2006/07), at Shambat (Khartoum, Sudan). Different genetic aspects and heat tolerance parameters were estimated for various measured plant attributes. Results of combined analysis revealed highly significant difference due to sowing dates for most of the investigated traits, with some rare exceptions. There was a significant effect of heat stress on growth and yield of wheat. Heat stress (late sowing=S3) resulted in reduction of many of the studied characters, *e.g.*, dry weight (g), number of spikelets/spike, number of kernels/plant and 100-kernels weight (g), and the maximum reduction (up to 42.3%) was observed in yield kg ha⁻¹ during the first year. Wide genetic variability was determined among genotypes for the estimated heat tolerance parameters. Genotype × environment interaction was significant for most of the measured traits. Grain yield kg ha⁻¹ was positively correlated with some of its components, where it had a positive and significant association with number of kernels per plant, number of spikelets per spike, number of kernels per spike, and 100-kernels weight (g). Significant positive and negative correlations among yield components were observed. It could be concluded that the induced terminal heat stress during both years was severe enough to cause a reduction in yield of the tested genotypes. The observed significant effect of the interaction between sowing dates and years on yield entails the crucial impact of the onset and duration of winter season on wheat productivity under Sudan conditions. The determined differential variability to terminal heat stress exhibited by genotypes and the estimated correlation among different traits could be exploited in breeding programs for improving and development of new wheat cultivars more adapted to wheat high-temperature non-traditional areas of Sudan.

Keywords: Heat stress, Sudan, wheat genotypes