



Tropentag, September 17-19, 2013, Stuttgart-Hohenheim  
“Agricultural development within the rural-urban continuum”

## Combining Ability Analysis for Stem Characters and Yield Components in Wheat (*Triticum aestivum* L.) under Drought and Heat Stresses

AHMED SALLAM, N. EL-SAYED, M. HASHAD, M. OMARA

*University of Assiut, Fac. of Agriculture, Dept. of Genetics, Egypt*

### Abstract

The frequency, duration, and severity of heat and drought stresses singly or in combination could be significantly increased due to the effect of climate change. Under these stresses, the stored carbohydrates in stems play an important role in grain filling in wheat after anthesis. The objective of this study is to determine the gene effects and combining ability of stem traits and yield components in some wheat cultivars. A diallel analysis of wheat (*Triticum aestivum* L.) parents ( $n = 7$ ) and their  $F_1$  ( $n = 21$ ) was conducted for stem traits: stem diameter (SD), stem weight (SW), stem density (SDN) and yield components: 1000 kernel weight (1000-KW) and grain yield per spike (GYPS) under favourable (F), drought (D), combined drought and heat stress (D+H) conditions. The reduction due to D+H was higher in GYPS (36.27%) than 1000-KW (17.36%). Moreover, GYPS showed higher reduction due to drought (19.23%) than heat stress (17.03%). The reduction in 1000-KW due to drought (8.73%) and heat stress (8.89%) was comparable. For all traits, the mean square of general combining ability (GCA) was higher than specific combining ability (SCA), indicating that additive genetic effects were predominant. The GCA effects of the parents indicated Gimmza-7 and Long stem-Long spike which possessed largest SD were good general combiners for 1000-KW and GYPS as well. A highly significant correlation was found between stem traits especially SD with 1000-KW and GYPS under F ( $r=0.57^{**}$ ,  $0.38^{**}$ ), D ( $r=0.41^{**}$ ,  $0.40^{**}$ ), and D+H ( $r=0.56^{**}$ ,  $0.50^{**}$ ), respectively. The highest narrow sense heritability ( $h^2$ ) was account for SD under F (0.88), D (0.85), and D+H (0.86). Our results indicated such strong associations of SD with 1000-KW and GYPS under stress demonstrated clearly an important role of this character in sustaining grain filling and supporting grain growth. It is possibly through providing greater stem capacity for storing assimilates that are formed before and then to be remobilised to grains after anthesis. In addition, selection for SD under stress is feasible and fruitful since it showed high  $h^2$  compared with other stem traits.

**Keywords:** Combined heat and drought stress, combining ability, stem diameter, wheat