STUDIES ON HETEROSIS AND COMBINING ABILITY FOR GRAIN YIELD AND ITS COMPONENTS IN DURUM WHEAT

(Triticum durum L.)

ABSTRACT

Key words: Triticum durum L., heterosis, combining ability, gene action.

The present investigation was carried out to generate information on heterosis, combining ability and gene action for yield and its components in durum wheat (Triticum durum L.) through line × tester analysis. The experimental material comprised of 10 lines, 4 testers and resultant 40 hybrids along with standard check variety HI 8737. The experiment was conducted in a randomized block design with three replications at Wheat Research Station, Junagadh Agricultural University, Junagadh during Rabi 2017-18. The observations were recorded on 12 characters viz., days to heading, days to maturity, plant height, number of effective tillers per plant, length of main spike, number of spikelets per main spike, grain filling period, number of grains per main spike, 100-grain weight, grain yield per plant, biological yield per plant and harvest index.

Analysis of variance revealed significant differences among all the parents as well as crosses for all the characters studied. Variances due to parents vs. hybrids were also found significant for all the characters except harvest index.

The conspicuous heterotic effects were observed for grain yield per plant and its components. A total of 13 and 10 hybrids manifested significant desirable heterobeltiosis and standard heterosis, respectively for grain yield per plant. The heterobeltiosis for grain yield ranged from -36.70 to 56.21%, while standard heterosis ranged from -30.14 to 39.93%. The cross MACS 4054 × DDW 39 (56.21%) exhibited the highest desirable heterosis over better parent followed by GDW 1255 × UPD 2949 (39.73%) and DBPY 2012-06 × WHD 960 (35.60%). The cross DBPY 2012-06 × WHD 960 (39.93%) exhibited highest significant heterosis towards positive direction over standard check, followed by MACS 4054 × DDW 39 (39.47%) and GDW 1255 × UPD 2949 (37.18%). These hybrids also exhibited desirable heterosis for important yield attributes suggesting that the heterosis for grain yield was associated with heterosis for component characters.

The analysis of variance for combing ability and the estimates of variance components indicated that the mean squares due to lines were significant for all characters which revealed significant contribution of lines towards general combining ability variance components for most of traits. The mean squares due to testers were also
found significant for all the characters except number of spikelets per main spike, grain filling period and 100-grain weight suggesting the larger contribution of testers towards component of gca variance. The mean sum of squares due to lines × testers interaction observed significant for all yield attributing traits which revealed the significant contribution of hybrids for specific combining ability variance components. This indicated the involvement of non-additive type of gene actions in the inheritance of these characters.

The potency ratio ($\sigma^2_{gca}/ \sigma^2_{sca}$) suggested the preponderance of non-additive gene actions for all the characters i.e. days to heading, days to maturity, plant height, number of effective tillers per plant, length of main spike, number of spikelets per main spike, grain filling period, number of grains per main spike, 100-grain weight, grain yield per plant, biological yield per plant and harvest index.

The best general combiners for various characters were DBPY 2012-06 for grain yield per plant, MACS 4054 for days to heading, 100-grain weight, grain yield per plant, biological yield per plant and harvest index, UAS 428 for plant height, grain filling period and number of grains per main spike, GW 2010-275 for length of main spike and number of spikelets per main spike, UPD 2949 days to maturity and WHD 960 for number of effective tillers per plant.

The best specific combiners were DBPY 2012-06 × WHD 960 for grain yield per plant and biological yield per plant, HI 8498 × WHD 960 for days to maturity, length of main spike, grain yield per plant and harvest index, MPO 1215 × UPD 2949 for days to heading and plant height and GDW 1255 × UPD 2949 for biological yield per plant and harvest index.

On the basis of combining ability and heterosis, the parents viz., MACS 4054, UAS 428, WHD 960 and GW 2010-275 whereas hybrids viz., DBPY 2012-06 × WHD 960, HI 8498 × WHD 960 and GDW 1255 × UPD 2949 were found to offer best possibilities of their further exploitation for developing high yielding varieties of durum wheat.

The prevalence of non-additive gene actions suggested that the use of transgressive segregants followed by selection or may be heterosis breeding prove to be effective in simultaneous exploitation of these gene actions for improvement of grain yield and its attributes in durum wheat.