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Gene action and combining ability over environments for grain yield and its attributes in bread wheat (*Triticum aestivum* L.)

B. A. DHADHAL, K. L. DOBARIYA*, H. P. PONKIA AND L. L. JIVANI
Dept. of Agril. Botany, College of Agriculture, Junagarh Agricultural University, JUNAGADH (GUJRAT) INDIA

ABSTRACT
Gene action and combining ability analysis using line x tester (11 lines and 3 testers) mating design in bread wheat revealed that both additive and non-additive gene actions were important for grain yield per plant, days to heading, days to maturity, number of effective tillers per plant, length of main spike, number of spikelets per spike, number of grains per spike, 1000-grain weight and harvest index. The inheritance of grain yield per plant, days to heading, days to maturity, length of main spike, number of spikelets per spike and 1000-grain weight was mainly under the control of additive gene action. The lines HUW 234, GW 322, GW 273, 7C Nad 63 tab's, MP 3077 and tester PBW 373 were good general combiners for grain yield and some of its components. Eight crosses showed significant and desirable sca effects for grain yield per plant. The cross Chilero x GW 173 was the most promising as it had high sca effects for length of main spike, number of spikelets per spike, number of grains per spike and 1000-grain weight. Biparental mating or few cycles of recurrent selection is suggested to exploit both additive and non-additive gene actions and to obtain transgressive segregants for grain yield per plant in advanced generations.

Key words : Bread wheat, Combining ability, Gene action and Line x tester analysis.

INTRODUCTION

The selection of the parents to be incorporated in hybridization programme is a crucial step for breeders, particularly if the aim is improvement of complex quantitative characters, such as yield and its components. The use of parents of known genetic worth ensures much better success. The combining ability studies are useful for the evaluation of newly developed lines for their parental usefulness and to know the gene actions involved in the inheritance of various characters. The genotype-environment interaction is particularly important in the inheritance of quantitative characters, which controlled by the polygenic systems and are greatly modified by the environmental influences. Thus, in order to have unbiased estimates of various genetic components, it is imperative that the experiment should be repeated over environments. Keeping all these facts in view, the present study was conducted by using line x tester mating design involving 11 lines and 3 testers of bread wheat over two dates of sowing.

MATERIALS AND METHODS

Eleven diverse lines of bread wheat *viz.*, DL 803-3, LBP 98-301, H 943, HUW 234, GW 322, GW 273, MP 3077, Chilero, MACS 2496, LOK 1 and 7C Nad 63 tab's were hybridized with three testers *viz.*, GW 496, GW 173 and PBW 373. All the 14 parents and 33 F_1s were grown in a Randomized Block Design with three replications during 2004-2005 under two dates of sowing i.e. timely (15th November) and late (5th December) sown conditions at Wheat Research Station, Junagadh Agricultural University, Junagadh. Row to row and plant-to-plant distances were kept 22.5 cm and 10 cm, respectively. Each genotype was accommodated in a single raw of 2 m length. The observations on five randomly selected plants were recorded from each entry and replication and their mean values were finally subjected to statistical analysis. The observations were recorded for days to heading, days to maturity, number of tillers per plant, length of main spike, number of spikelets per spike, number of grains per spike, grain yield per plant, harvest index, 1000-grain weight and protein content. The analysis of variance to test the variation among the parents and crosses was done as per Panse and Sukhatme (1984). Pooled analysis of variance over two dates of sowing was carried-out as per Comstock and Robinson (1952). The combining ability analysis was performed according to the method suggested by Kempthrone (1957).

RESULTS AND DISCUSSION

The analysis of variance for combining ability pooled over environments revealed that the mean squares due

* Author for correspondence.