International Journal of Agricultural Sciences
Volume 9 | Issue 1| January, 2013 | 49-53

RESEARCH PAPER

Combining ability analysis over environments in diallel crosses in bread wheat (*Triticum aestivum* L.)

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Abstract : Combining ability analysis was undertaken in a 12 x 12 half diallel progeny of bread wheat for grain yield and its component characters under timely (E_1) and late sown (E_2) conditions. The mean squares due to gca and sca showed highly significant differences for all the characters in both the environments, suggesting the importance of both additive and non-additive gene action. However, variances due to sca were higher in magnitude than gca for most of the traits except plant height and length of main spike in both the environments indicating the predominance of non-additive gene action. The low predictability ratios for most of the traits in both the sowing dates also confirm the results. However, the predictability ratios for plant height and length of main spike were near unity suggesting the importance of additive gene action in the inheritance of these characters. The estimates of gca effects of the parents revealed that GW 496 (in both the environments), GW 273, MACS 2496 and PBW 373 (in E_1) while J 24 and HUW 234 (in E_2) were observed to be good general combiners for grain yield and some contributing traits. The perusal of sca effects revealed that the crosses GW 496 x HD 2189, DL 788-2 x GW 173 and GW 496 x MACS 2496 were found to be good specific combiners with considerable *per se* performance in both the environments. The crosses GW 496 x PBW 373 in E_1 and GW 496 x HD 2189 in E_2 gave the highest sca effects as well as *per se* performance in respective generation. These crosses also showed desirable sca effects for the important yield contributing traits like number of tillers per plant, length of main spike, number of grains per plant, flag leaf area, biological yield per plant and harvest index. The crosses showing high sca effects for grain yield per plant involved high x high, high x low and low x low general combiners indicating the involvement of additive x additive, additive x dominance and dominance x dominance type of gene action in the inheritance of these characters. The simple pedigree selection in succeeding generations and non-conventional breeding methods like biparental mating coupled with few cycles of recurrent selection could be utilized for the exploitation of additive and non-additive gene action, respectively.

Key Words : Diallel analysis, gca, sca, Over environments, Bread wheat, Combining ability

View Point Article : Padhar, P.R., Chovatia, V.P., Jivani, L.L. and Dobariya, K.L. (2013). Combining ability analysis over environments in diallel crosses in bread wheat (*Triticum aestivum* L.) . *Internat. J. agric. Sci.*, **9**(1): 49-53.

Article History : Received : 28.12.2011**; Revised :** 12.08.2012**; Accepted :** 10.10.12

INTRODUCTION

Wheat (*Triticum aestivum* L.) is usually accorded a premier place among the cereals. It is grown over a range of latitudes and is known for its remarkable adaptation. There has been a steady and highly significant increase in wheat yields, largely due to the release of new varieties and improved production technologies. The success of any plant breeding programme mostly depends on the exact knowledge of the genetic architecture of the population being handled, the basic genetic mechanisms involved in generating variability and the selection of parents along with the information regarding nature and magnitude of gene action controlling various characters of agronomic importance. The concept of combining ability, which is a landmark in the adoption of appropriate breeding methods, is of great use for improving crop varieties. Generally, wheat is grown in the month of November but it is also grown after the harvesting of monsoon crops in the month of December. Hence, development of high yielding varieties under timely as well as late sowing are required. Therefore, the present study was carried out to estimate the combining ability of the 12 bread wheat varieties and their 66 crosses for

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