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GENE ACTION FOR KARNAL BUNT RESISTANCE IN WHEAT

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Karnal bunt of wheat (*Triticum aestivum* L.) caused by *Neovossia indica* (Mitra) Mundkur is now a serious disease in India, Pakistan and Mexico. It results in appreciable yield losses and deterioration of grain and flour quality. The development of boot inoculation technique [1] has made it possible to screen wheat genotypes resistant to Karnal bunt under artificial inoculation. The genetics of Karnal bunt resistance, however, is not well understood. Gill et al. [2] using nulli-tetrasomics and ditelosomics of *T. aestivum* cv. Chinese Spring reported that there are many minor and major genes causing resistance/susceptibility to Karnal bunt distributed among all the homoeologous groups. The present study is another attempt to determine the nature of gene action for Karnal bunt resistance in a set of diallel crosses of wheat involving resistant, moderately resistant, and susceptible cultivars. This will help in planning breeding procedures for breeding Karnal bunt resistant varieties of wheat.

The material for this study comprised four resistant (Fec 28, Cebeco 148, HD 29 and HD 30), three moderately resistant (DGP 247, WL 6975 and WL 1562), and two susceptible (WL 711 and HD 2009) cultivars of breadwheat. The nine parents were crossed in diallel fashion (without reciprocals) during rabi 1987–88. During rabi 1988–89, the 36 F_1s along with their nine parents were grown at the Punjab Agricultural University, Regional Research Station, Gurdaspur. The experiment was laid out in randomized complete block design with three replications. The row length was 2.25 m with 30 and 15 cm spacings, between rows and plants, respectively. Four heads from each of the five plants tagged in a row were inoculated with the Gurdaspur culture of Karnal bunt raised on PDA medium at boot stage in February, 1989, using the boot inoculation technique [1]. Perfo-spray was used to maintain high humidity in the field. On maturity, the inoculated heads were harvested and threshed. The overall percentage of infection (number of infected grains divided by the total number of grains harvested) was calculated for each line. The data on Karnal bunt (%) was transformed on the $\sqrt{x + ½}$ scale. The Tukey's test revealed additivity of the transformed data. Analysis of variance for combining ability was done on the transformed data following Method 2, Model 1 of Griffing [3].

Significant differences were detected among the parents and their F_1s. However, the comparison of parents vs. hybrids was non-significant, indicating little nonadditive effects among the parents. Only gca variance was significant, indicating the preponderance of additive gene action for Karnal bunt resistance. Combining ability analysis further revealed that HD 29 and HD 30 were good combiners for Karnal bunt resistance (Table 1). These varieties should be extensively utilized in wheat improvement for Karnal bunt resistance. Simple breeding procedures would be effective as Karnal bunt resistance is controlled by additive gene effects.

Table 1. General combining ability effects of parents for Karnal bunt resistance in wheat

Parent variety	Combining ability effects
Fec 28	–0.018
Cebeco 148	–0.006
HD 29	–0.211*
HD 30	–0.171*
DGP 247	+0.017
WL 6975	–0.009
WL 1562	–0.029
WL 711	+0.182*
HD 2009	+0.246**

**,*P ≤ 0.01 and ≤ 0.05, respectively.

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