

Gene action for grain yield and its attributes in maize (*Zea mays* L.)

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ABSTRACT

Line x tester analysis involving 10 females and 3 males from diverse origin was carried out in maize (*Zea mays* L.). Pooled analysis of variance over environments revealed mean square due to lines, testers and lines x testers was significant for all traits except due to testers for ear length. s^2_{sca} in general were relatively greater than s^2_{gca} for maximum traits thus indicating preponderance of non-additive variance in expression of traits under study. G x E interaction for genotypes were found to be significant for most traits. Four hybrids have been identified as desirable specific combiner for maturity traits and eleven hybrids for grain yield per plant. Among them PMI-86 x PMI-401 was detected desirable cross combination also for 100 grain weight, grain depth and ear diameter. Most of crosses showing significant sca effects involved inbred line PMI-401 as tester. The perusal of results indicated that superior crosses for different traits involved all types of combiners as parents. For grain yield per plant crosses showing high sca effects in favourable direction involved either High x High, High x Low or Low x Low general combines as parent.

Key words : Combining ability, Gene action (*Zea mays* L.), Maize, Grain yield.

INTRODUCTION

The aim of plant breeder is to identify elite inbred lines that will combine well and produce productive progenies that could be successfully exploited for synthesising promising hybrids or even synthetics, particularly when commercial exploitation of hybrid is not feasible technically and viable commercially. Since the quantitative characters are considerably influenced by the environment, a multi-environment study is likely to bring out genotype environment interaction for estimating the gene effects precisely and predicting the advance. The present study has been carried out over two locations (environments) to know the type of gene action governing grain yield and its component traits and to identify parents and crosses which could be exploited in future breeding programmes.

MATERIALS AND METHODS

Ten vigorous, diverse and advance stage inbred lines of maize viz., PMI-13, PMI-14, PMI-56, PMI-73, PMI-86, PMI-88, PMI-94, PMI-96, PMI-105 and PMI-114 coded as $L_1, L_2, L_3, L_4, L_5, L_6, L_7, L_8, L_9$ and L_{10} were mated with three well adapted testers of varying genetic base viz., T_1 (C-15) composite, T_2 (PS-66) synthetic and T_3 (PMI-401) inbred line respectively in line x tester mating design during rabi 2001-02 at winter Nursery Hyderabad. Thirty F_1 's along with 13 parents were evaluated at two environments i.e., high altitude Maize Research Station, Pahalgam (2220 m asl). and Experimental Farm of Division of Plant Breeding and

Genetics, Shalimar (1700 m asl) of the Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir during kharif 2002 in complete randomised block design with two replication in a single row plot of 5 m length having 60 x 25 cm crop geometry. Observations were recorded on ten randomly selected plants in each plot. The combining ability analysis was conducted as per the procedure developed by (Kempthorne 1957).

RESULTS AND DISCUSSION

The pooled analysis of variance over environments (Table1) revealed that mean square due to lines, testers and lines x tester was significant for all traits except due to testers for ear length, reflecting thereby presence of adequate diversity in the genetic material chosen for study. The mean squares due to interaction of lines, testers and lines x testers with environment were ranged from significant to highly significant for all characters except ear diameters/grain depth and kernel rows per ear. Significant differences were also observed across environments for sca effects for most traits. Pooled analysis over environments showed significant gca and sca variances for most of the traits. Based on estimates, higher magnitude of σ^2_{sca} in relation to σ^2_{gca} implied the greater importance of non-additive gene effects in inheritance of grain yield per plant and most of its component traits over environment. These results were in conformity with earlier finding of Vasal *et al.* (1993) and Joshi *et al.* (1998). Such results in present study favours production of hybrid cultivars and detection of

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