

## Genetic architecture of grain yield and its components in pearl millet

K.J. VAGADIYA, K.K. DHEDHI, H.J. JOSHI, H.B. VEKARIYA AND A.S. BHADELIA

Accepted : April, 2010

### SUMMARY

Combining ability was studied in a line x tester fashion for grain yield and 13 component traits using four male sterile lines and 12 restorers in pearl millet. The predictability ratio of *gca* and *sca* revealed the preponderance of non-additive gene action in the inheritance of all the traits *viz.*, grain yield per plant, days to flowering, length of protogyny, number of nodes per plant, plant height, ear head girth, ear head length, number of effective tillers per plant, ear heads weight per plant, days to maturity, 1000-grain weight, harvest index, threshing index and fodder yield per plant. Female parent JMSA-20073 and male parents J-2290, J-2498 and H-77/833-2 were identified as the best general combiners for grain yield per plant along with many other component traits. Majority of their crosses had depicted significant and desirable *sca* effects, coupled with high *per se* performance for grain yield. Among the 48 crosses, 19 displayed significant and positive *sca* effects for grain yield. Of these, three hybrids *viz.*, ICMA-95444 x J-2405, JMSA-20073 x J-2474 and ICMA-98444 x J-2498 were the most promising having good specific combining ability effects in addition to high *per se* performance and heterobeltiosis for grain yield. These cross combinations also registered significant *sca* effects in desired direction for many of the yield attributing characters. Heterotic hybrids were more frequently observed in crosses involving at least one of the good combiner parents.

**Key words :** Combining ability, Pearl millet, Line x Tester, Grain yield

The choice of right type of parents for hybridization in achieving a good cross combination with the aim of improving yield potential is very important. The *per se* performance of a parent may not necessarily reveal it to be a good or poor combiner. Combining ability studies are regarded useful to select best combining parents, which upon crossing would produce more desirable segregates. Such studies also elucidate the nature and magnitude of gene action in the inheritance of grain yield and its components, which will decide the breeding programme to be followed in segregating generations. Therefore, identification and assessment of the parental combinations with respect to their general and specific combining abilities and gene actions involved in the inheritance of grain yield and various component characters are of utmost importance for a successful hybridization programme. The selection of suitable outstanding parents with favourable alleles, which upon crossing would give heterotic hybrids. Accordingly, the present investigation was undertaken to have an idea on the nature of gene action involved in the inheritance of quantitative traits and to select the parents

with good *gca* and crosses with good *sca* effects through line x tester analysis in pearl millet.

### MATERIALS AND METHODS

In the present investigation, four male sterile lines and 12 diverse restorer lines (Table 2) were crossed in a line x tester mating design during summer-2009. The resulting 48 hybrids along with fertile counter part of four male sterile lines and 12 male parents were sown on 13th July during *Kharif* 2009 in a randomized block design replicated thrice at Pearl millet Research Station, Junagadh Agricultural University, Jamnagar (Gujarat), India. Each entry was grown in a single row of 5.0 m length each with inter and intra row spacing of 60 x 15 cm. The recommended agronomic practices and plant protection measures whenever necessary were adopted for raising the good crop. Observations were recorded on ten randomly selected competitive plants for each entry, in each replication for 14 characters (Table 1). Mean values were analyzed using the line x tester model suggested by Kempthorne (1957).

### RESULTS AND DISCUSSION

The analysis of variance for combining ability (Table 1) revealed that the mean square due to females was significant for plant height and ear head length; and mean square due to males was significant for plant height; while, the remaining traits exhibited non-significant indicating there is very little contribution of females and males towards general combining ability (*gca*) variance

#### Correspondence to:

K.K. DHEDHI, Pearl Millet Research Station, Junagadh Agricultural University, JAMNAGAR (GUJARAT) INDIA  
Authors' affiliations:

K.J. VAGADIYA, H.B. VEKARIYA AND A.S. BHADELIA, Department of Botany, College of Agriculture, Junagadh Agricultural University, JUNAGADH (GUJARAT) INDIA

H.J. JOSHI, Pearl Millet Research Station, Junagadh Agricultural University, JAMNAGAR (GUJARAT) INDIA