

## Heterosis and Combining Ability in Pearl Millet

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### SUMMARY

The current study, named "Heterosis and combining ability research in pearl millet," was carried out at the National Agricultural Research Project (NARP) Breeding division in Aurangabad. The data was collected on five competitive plants chosen at random from each treatment. The combining ability (GCA and SCA) was tested using the Kempthorne technique (1957). The difference in mean performance between parents and hybrids studied for the 10 characters was found to be significant, showing that the hybrids and their parents had a large level of variability. The resulting thirty-two hybrids along with 12 parents and two checks i.e., AHB 1200 Fe and AHB 1269 were evaluated or studied in a randomized block design (RBD) with two replications during kharif, 2020. In general, based on the observations in terms of per se performance, heterosis, and combining ability (GCA and SCA), it is possible to conclude that the hybrids ICMA 06777 x AUBI 15157 and ICMA 98222 x AUBI 15051, which produced significantly higher grain yield than the standard hybrid checks AHB 1200 Fe and AHB 1269, exhibited high heterotic effects and significant specific combining ability.

### INTRODUCTION

Pearl millet or bajra is the world's sixth most important cereal food crop. It is commonly known as pearl millet, cat tail, spiked or bulrush millet. It belongs to the family Poaceae (Gramineae), subfamily Panicoideae. Pearl millet or bajra is a highly cross-pollinated crop with protogynous (pistil mature before stamens) flowering and wind-borne pollination mechanism, which fulfils one of the essential biological requirements for a hybrid development programme. Pearl millet has a balanced genetic load and suffers from significant inbreeding depression. As a result, breeding efforts are focused on creating hybrids, synthetic, and composite populations. The quantum leap in pearl millet productivity (from 303 kg to 850 kg/ha) was made possible through the production of hybrids using the cytoplasmic genetic male sterility system. The first Pearl millet hybrid, HB-1, was released in India in 1965.



**Fig. 1: Ear head with matured Pollen Grain**

One of them is a line x tester analysis, which is extensively used to analyse the combining ability of the parents to be chosen for heterosis breeding. It also gives a guideline for determining the value of source populations and relevant crop improvement strategies. This understanding aids in the commercialization of

heterosis. The recombination of several desired qualities scattered across distinct genotypes is critical for the increase of yield and associated parameters in any crop. Pearl millet needs to be improved in terms of characteristics such as early flowering, grain yield per plant, grain yield per ha, ear head length and girth, number of tillers/plants, effective tillers, and fodder yield.

## Material and Methods

### Experimental Material

The parental materials consisting of 4 male sterile lines used as female, 8 inbreds or tester used as male and 2 checks were used and obtained from National Agricultural Research Project (NARP), Aurangabad. The crosses were done in line x tester fashion during *Kharif* 2020.

The following important parents are used in the crossing programme and cross produced for the studies in Pearl millet.

Parents:-

Female (A line):-    1) ICMA 98222                      2) ICMA 91444  
                                  3) ICMA 06777                      4) ICMA 00888

Male (R line):-        1) AUBI 15615                      2) AUBI 15003  
                                  3) AUBI 15026                      4) AUBI 15051  
                                  5) AUBI 15157                      6) AUBI 15236  
                                  7) AUBI 15039                      8) AUBI 15308

Checks:-

1) AHB 1200 Fe                      2) AHB 1269



**Fig 2 : Hybridization techniques in Pearl millet**

### Crossing Programme

The crossing programme for obtaining crossed or hybrid seed was undertaken during *Kharif* 2020 at the field of National Agricultural Research Project (NARP), Aurangabad. 4 male sterile lines (female) and 8 inbreds (male) were crossed in line x tester fashion ( $4 \times 8 = 32$ ). These crossed seed obtained were utilized as F1 or hybrid seed in the present research or investigation. The experiment or programme was laid out in a Randomized Block Design (RBD) with 2 replications.

### Result

Observations on ten different characters or traits were recorded to determine heterosis, combining ability and gene action. Analysis of variance revealed or observed that, mean sum of squares for replications were non-significant for all the characters. The mean sums of squares due to treatments were highly significant for all the characters. This were indicated or shown the presence of considerable genetic variability in the experimental material used in present investigation. The highest contribution in the hybrid or F1 sum of square was recorded by Ear head length, 1000 grains weight and Grain yield / plant.

### CONCLUSION

In the Pearl Millet, the relationship between Specific Combining Ability (SCA) and mean performance indicates that the crosses producing significantly higher grain yield per plant than the both standard hybrid check produce significant specific combining ability SCA effects for grain yield per plant.

### REFERENCES

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