

Combining ability studies in B x R crosses for selection of superior female parents for 'A' line development in pearl millet

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SUMMARY

Combining ability analysis was carried out in a line x tester fashion using 12 newly developed B-lines as females and seven broad based restorer lines as males for final selection of superior B-lines before embarking for their conversion into male sterile version 'A' lines in pearl millet. Both GCA and SCA variances were significant for all the characters. The ratio of SCA and GCA was greater than unity in all the characters, suggested the predominant role of non-additive gene action in the inheritance of these traits, which favored a hybrid breeding programme. Female (B-lines) parents B₁₂, B₁₁, B₁₀ and B₈ and male parents R₁ and R₂ were identified as the best general combiners for grain yield and some important yield components. The cross combinations viz., B₂ x R₃, B₁₂ x R₂ and B₁₂ x R₁ were the most promising having good specific combining ability (SCA) effects, coupled with high *per se* performance and heterobeltiosis for grain yield per plant. Thus, it was suggested that these three hybrids would be evaluated under multiplication trials alongwith the standard hybrid for their direct released as a high yielding hybrids. Comparing both GCA effects of the new 'B' lines and the performance of their hybrids, four B-lines viz., B₁₂, B₁₁, B₁₀ and B₂ were identified as females' potentiality suitable conversion into male sterile versions. These four B-lines could be further used viz., B₂ for development of early maturing high yielding hybrids and B₁₀, B₁₁ and B₁₂ for development of medium duration hybrids in hybrid programme to enhance the yield levels of pearl millet hybrids.

Key words : Combining ability, *Pennisetum glaucum*, Line x tester, Grain yield.

Development of superior B-lines can have more impact on increasing grain yield and /or forage yield than any other inbred type, especially if the B-lines are used to develop cytoplasmic male sterile (CMS) lines. A desirable B-line should perform well so as to reduce the cost of seed production, maintain complete male sterility, have good general combining ability, produce adequate pollen to maintain its isogenic A-line, and have the much-needed resistance to biotic and abiotic stresses that will make it a successful inbred line (Hanna and Rai, 1999). In the process of developing new CMS lines, it could be advantageous to determine the combining ability of potential B-lines before committing time and effort to sterilize all of the potential females (Schert and Johnson, 1984; Lee *et al.*, 1992 and Hanna and Rai, 1999). Combining ability studies elucidates the nature and magnitude of gene action involved in the inheritance of character by providing the information on the components of variance, which are important to decide upon the parents and crosses to be selected for eventual success. Line x tester analysis has been a popular mating method to assess the combining ability of parents. The published records do not show that 'B' line in any pearl millet breeding programme were tested for combining ability before embarking on their conversion into CMS line. Line

x tester analysis using 7 to 9 known restorers of high yielding released hybrids may be much more reliable to assess the combining ability of new B-lines before embarking on their conversion into CMS line. Accordingly, the present investigation was undertaken to study the combining ability and gene action on grain yield and its component traits for final selection of superior B-lines before embarking for their conversion into 'A' lines, which is useful for enhancing yield levels of pearl millet hybrids.

MATERIALS AND METHODS

Twelve newly developed maintainer lines as females and seven broad based restorer lines as males (Table 1) were crossed in a line x tester fashion during summer-2003 at Millet Research Station, Junagadh Agricultural University, Jamnagar. The resultant eighty four cross combinations alongwith their 19 parents were sown on 7th July during *kharif* 2003 in a randomized block design replicated thrice at Instructional Farm, College of Agriculture, Junagadh Agricultural University, Junagadh (Gujarat), India. Each entry was grown in a single row of 4.0 m length each with inter and intra row spacing of 60 x 15 cm. The recommended agronomic practices and plant protection measures were adopted for raising the good crop. Observations were recorded on ten randomly

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