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COMBINING ABILITY OF NEW MALE STERILE LINES OF DIVERSE SOURCES IN PEARL MILLET FOR YIELD AND YIELD COMPONENTS

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ABSTRACT

Nine male sterile lines of pear milet and six inbreds were evaluated for their combining ability in a line x tester mating design. The GCA and SCA variance focussed the importance of non-additive effects for days to 50 per cent flowering, panicle girth and grain yield per plant indicating heterosis breeding for yield improvement. For plant height and humber of productive tillers, both the components were almost equal. Among lines, 834A and Pb405A were good combiner for yield and 338A and Pb302A for early flowering. The testers PIB 223IP, PT 1921 and K560-230 were good combiner for grain yield per plant. The hybrid 834AxPIB 2231P showing highest mean expression and *sca* effect for grain yield offered scope for exploitation of heterosis.

KEY WORDS : Combining Ability, Pearl Millet, Male Sterile Lines.

In pearl millet *Pennisetum glaucum*(L.) R.Br.) there is a need to study the combining ability of parental lines for identifying prepostent parents and potential hybrids since the development of hybrids possessing high yield is being felt owing to the manifestation of heterosis for yield. The present study was undertaken to assess the combining ability of nine male sterile lines of diverse sources and six inbred lines for yield components in pearl millet.

MATERIALS AND METHODS

Six inbred lines of pearl millet derived from diverse sources were crossed with nine new male sterile lines *viz*., 81A, 834A, 3383A, Pb302A, Pb305A, Pb403A, Pb405A, PT732A and ms1A representing different cytoplasmic bases. The resulting F1 hybrids were grown at Regional Research Station, Virdhachalam, TamilNadu is a randomised block design with three replications during *kharif* 1987, in single row of three m length

Table 1. Analysis of variance for different characters

Source	Characters					
	Days to 50 per cent flowering	Plant height	Number of productive tillers	Panicle length	Panicle girth	Grain yield
Hybrids	12.95**	1373.09**	1.96**	29.41**	2.41**	124.72**
Lines	16.11**	4276.75**	4.75**	55.83**	7.17**	266.12**
Testers	41.53**	3394.78**	6.49**	92.31**	2.98**	333.78**
Line x Tester	8.74**	539.64**	0.84**	16.26**	1.39**	79.31**
Error	0.65	68.91	0.15	3.38	0.22	9.87
GCA	0.89	146.49	0.21	2.57	0.16	10.21
SCA	2.70	156.91	0.23	4.29	0.39	20.15
GCA : SCA	0.33:1	0.93:1	0.91:1	0.60:1	0.41:1	0.51:1

* Significant at p=0.05 ** Significant at p=0.01

and spaced 45cm apart. The parental genotypes were also randomised and sown in adjacent plots with three replications. Observations on six traits viz., days 50 per cent flowering, plant hight, number of productive tillers per plant, length of panicle, girth of panicle and grain yield per plant were recorded on ten randomly selected plants. The combining ability analysis was carried out following Kempthorne (1957).

RESULTS AND DISCUSSION

The male sterile lines chosen for the present study are based on different sources of cyctoplasm. The lines 81A, 834A and 3383A represent A_1 cytoplasm; Pb302A and Pb305A belong to A_2 cytoplasm, Pb403a and Pb405A to A_3 cytoplasm, ms 1A belongs to V cytoplasm while PT732A is yet to be characterised. The data on analysis of variance for combining ability is given in Table 1. The variance due to lines was significant for all the characters studied, indicating greater variation among lines selected for the study. The testers were also genetically differentiated with each other in respect of many morphological and economic attributes as indicated by the significant variances for all the characters. The differences between hybrids were also significant for all the traints, indicating that the hybrids varied considerably among themselves. The variances due to interaction between lines and testers were highly significant for all the characters, indicating the importance of

Table 2. General combining ability effects of parents

Genotype	Characters					
	Days to 50 per cent flowering	Plant height	Number of productive tillers	Panicle length	Panicle girth	Grain yield
Lines						
81A	0.69*	2.17	-0.09	0.68	0.19	1.99
834A	0.75**	-8.43**	-0.57**	1.94**	0.09	5.04**
3383A	-1.86**	-10.43**	0.85**	-0.67	-0.23	1.11
Pb302A	-1.25**	-16.39**	0.52**	-0.64	-0.87**	-3.12**
Pb305A	-0.20	-1.16	-0.11	1.17	-0.23	0.81
Pb403A	0.52	-16.43**	0.49**	-4.05**	-0.94**	-7.43**
Pb405A	0.75**	21.18**	-0.39**	-0.30	0.52**	4.18**
PT732A	0.19	2.74	-0.08**	0.70	0.63**	-2.07*
ms 1A	0.41	26.80**	-0.62**	1.17	0.85**	-0.52
Testers						
P1B2231P	-0.59**	-3.91	-0.33**	0.93	-0.02	3.16**
K560-230	1.41**	2.25	-0.24**	-0.49	0.32*	1.86*
PT1921	1.23**	21.31**	-0.24*	1.27*	0.33**	2.12*
PT3832	-0.10	-3.87	-0.26*	1.51**	-0.14	0.29
JL104	0.01	-5.18*	0.13	0.25	0.07	-0.86
Local	-1.96**	-10.60**	0.95**	-3.47**	-0.56**	-6.56**

* Significant at p=0.05 ** Significant at p=0.01

Table 3. Best parents and Hybrids based on mean performance and combining ability effects.

Characters	Line		Tester		Hybrids	
	Mean	gca	Mean	gca	Mean	sca
Days to 50 per cent flowering (early)	ms1A	3383A	Local	Local	Pb302A x Local	Pb302A x Local
Plant height						
i) Tall	Pb305A	ms1A	PT1921	PT1921	ms1A x PT1921	ms1A x PT1921
ii) Dwarf	PT732A	Pb403A	P1B2231P	Local	Pb403A x JL104	Pb405A x P1B2231
Number of Tillers	3383A	3383A	Local	Local	Pb302A x Local	Pb305A x JL104
Panicle length	834A	834A	PT3832	PT3832	834A x P1B2231P	834A x P1B2231P
Panicle girth	834A	ms1A	K560-230	PT1921	834A x P1B2231P	81A x Local
Grain yield	834A	834A	PT3832	P1B2231P	834A x P1B2231P	834A x P1B2231P

specific combining ability effects for these characters. The proportion of GCA to SCA variance focussed the importance of non-additive effects for days to 50 per cent flowering, panicle length, panicle girth and grain yield per plant indicating the need for heterozygosity in the population and heterosis exploitation for yield improvement. Similar result was reported by Tyagi *et al.* (1975) and Basavaraju *et al.* (1980) for days to 50 per cent flowering, Tyagi *et al.* (1975) Mukerji *et al.* (1981) and Mithila (1987) for panicle length and Mithila (1987), Virk (1988) and Vijayalakshmi (1990) for grain yield. For plant height and number of productive tillers additive and non additive components were almost equal.

The estimated *gca* effects of parents for different characters are given in table 2. The parent 834A was the best combiner among lines, for yield and showed good combining ability for late flowering, dwarfness and panicle length. The parent pb405A was a good combiner for late flowering, tallness, panicle girth and grain yield per plant. The parents 3383A and pb302A were good combiner for early flowering, dwarf stature and number of productive tillers per plant but the latter parent (Pb302A)showed significant negative effects for panicle girth and grain yield. PT 732A and ms1A were the best combiner for panicle girth. Among the testers, P1B2231P was a good combiner for early flowering and grain yield. PT1921 was the best combiner for lateness, panicle length, panicle girth and grain yield. K560-230 was good combiner for lateness, panicle girth and grain yield per plant. The highest *per se* performance and maximum *sca* effect for grain yield was recorded by the hybrid 834A x P1B2231P (Table 3). The parents involved in the cross were good combiners. The outstanding performance of the hybrid was due to exploitatio of *gca* and *sca* effects.

The studies indicated that the genotype havi high *gca* for lateness, high / average *gca* for panic length / panicle girth as in 834A was go combiners for yield. The parents showing *g* effects in desired direction can also be used as o of the parents for hybridisation programme. T other parent involved should be a high combine for seed yield. The parent showing very high *gc* for a particular character could be used for specific component improvement programme. A the yield and its major components are under th influence of non-additive gene effects, heterosi breeding could be profitably employed for th improvement of yield in pearl millet.

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