

COMBINING ABILITY AND HETEROSIS OF PEARL MILLET (*Pennisetum glaucum* (L.) R.Br.) FORAGE YIELD COMPONENTS

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Ninety hybrids were obtained by crossing nine male sterile lines with ten pollinators in a Line x Tester mating design and were subjected to combining ability and heterosis study, for forage yield components. It was observed that the male sterile line 851A was the best general combiner for forage purpose. Among the crosses 732A x PT 5574, 851A x PT 5568, ICMA 91444 A x PT 5575, 851A x PT 5572, 851A x PT 5576 and ICMA 91444A x PT 5567 showed high significant heterobeltiosis and these crosses may be utilized for improving forage yield components.

Keywords : Combing ability; Heterosis; Pearl millet; *Pennisetum glaucum*.

Introduction

Pearl millet (*Pennisetum glaucum* (L.) R.Br) is a protogynous and cross pollinated crop, amenable for development of heterozygous population, which can be utilized for production of high grain yielding hybrids, high forage and fodder value hybrids. The knowledge of combining ability effects and the corresponding variances is important in the choice of selecting parents and it can be further used for exploiting heterosis to produce high performing new recombinants. Taking this into account, the present investigation was undertaken to gather information on the extent of heterosis and combining ability in pearl millet forage yield components.

Materials and Methods

Nine male sterile lines of pearl millet derived from diverse cytoplasmic sources such as A1, A2 and 732A (ICMA 91444A, ICMA 92444A, ICMA 92666A, ICMA 92777A, 851A, 852A, 302A, 306A and 732A) were crossed with ten testers (PT 5567, PT 5568, PT 5569, PT 5570, PT 5571, PT 5572, PT 5573, PT 6574, PT 5575 and PT 5576) during rabi'96. The resulting ninety hybrids were grown in a randomized block design with three replications during kharif'97. Observations were recorded on five randomly selected plants in each replication, on plant

height, number of tillers, leaf length and leaf width. The Line x tester design was adopted following Kempthorne¹.

Results and Discussion

The analysis of variance showed that significant differences existed for all the characters in hybrids, lines, testers and Line x tester interaction (Table 1) except for leaf length in Line x tester interaction. The SCA variance for all the characters indicated a predominance of non-additive gene action. This in conformation with the earlier findings of Mangath². The estimation of gca effect of parents revealed that 851A and PT 5571 showed significance for plant height (Table 2). High positive significant sca effect was observed in the cross 306A x PT 3570 followed by 851A x PT 5568. For the leaf length the line 852A followed by 851A and in the testers PT 5576 exhibited significant gca effect. The significant sca effect for leaf length was observed in the cross 851A x PT 5572 followed by 851A x PT 5573. For gca effect of leaf width, the parents 732A, 851A and PT 5576 showed significance and for the sca effect, the cross 851A x PT 5573 recorded high significance. For number of tillers/plant, the parents ICMA 92666A and PT 5576 showed significant sca effect and the cross ICMA 92777A x PT 5576 followed

Table 1. An analysis of variance for forage yield components.

	Plant height	Number of Tillers	Leaf length	Leaf width
Hybrids	501.11**	1.11**	75.66**	0.46**
Lines	1013.10**	1.71**	38.85**	9.47**
Testers	1177.21**	1.37**	103.34**	0.56**
Line x Tester	6546.50**	3.17**	11.09**	1.38**
Error	11.09	0.32	15.17	0.12
GCA Variance	45.27	0.008	6.01	0.01
SCA Variance	129.61	0.432	20.94	0.150

Table 2. Estimates of general combining ability effects.

Parents	Plant Height	Number of Tillers	Leaf length	Leaf width
ICMA 91444A	-3.49	-0.15	-2.06*	-0.03
ICMA 92444A	-4.19	-0.31*	-4.47**	-0.14
ICMA 92666 A	1.15	0.25*	1.16	-0.07
ICMA 92777A	1.33	0.20	-1.95*	-0.22**
851 A	12.97**	0.13	3.93**	0.88**
852 A	-3.43	-0.09	5.03**	0.22**
302 A	-4.61*	-0.02	0.16	-0.13
306 A	-0.10	-0.14	-3.18**	-0.05
732 A	0.34	0.12	1.42	0.35**
SE	1.63	0.09	0.67	0.06
CD (P=0.05)*	4.57	0.25	1.88	0.17
CD (P=0.01)**	6.04	0.33	2.48	0.22
MALE				
PT 5567	-3.99	0.39**	-4.98**	-0.35**
PT 5568	0.27	-0.16	-0.71	-0.12
PT 5569	0.50	0.20	-1.98	-0.23*
PT 5570	2.46	0.05	2.74**	0.07
PT 5571	23.51**	-0.05	-0.54	0.20*
PT 5572	-4.55	0.09	1.24	-0.04
PT 5573	-5.90*	-0.55**	1.20	0.19*
PT 5574	-14.54**	-0.24	-1.46	0.12
PT 5575	-4.62	-0.23	-0.65	-0.01
PT 5576	6.59**	0.50**	4.84**	0.23*
SE	1.73	0.09	0.72	0.07
CD (P=0.05)*	4.85	0.25	2.01	0.19
CD (P=0.01)**	6.41	0.33	2.26	0.25

Table 3. Crosses showing significant sca effect.

Plant height	Number of tillers	Leaf length	Leaf width
306A X PT5570	ICMA 92777A X PT5576	851A X PT5572	851A X PT5573
851A X PT5568	851A X PT5571	851A X PT5573	732A X PT5571
852A X PT5576	306A X PT5567	732A X PT5569	ICMA 91444A X PT5567
ICMA 91444A X PT5569		ICMA 92444A X PT5574	ICMA 92777A X PT5575
		ICMA 92777A X PT5568	

Table 4. Crosses showing significant heterobeltiosis for forage yield components.

Plant height	Number of tillers	Leaf length	Leaf width
732A X PT5574	851A X PT5576	851A X PT5572	ICMA 91444A X PT5567
851A X PT5568	851A X PT5568	ICMA 92444A X PT5570	852A X PT5574
306A X PT5570	851A X PT5572	ICMA 92444A X PT5574	852A X PT5576
ICMA 92444A X PT5574		ICMA 92777A X PT5568	ICMA 92666A X PT5570
			ICMA 91444A X PT5569

by 302A x PT 5572 recorded high significant sca effect. Similar type of study using combining ability to understand the nature of genetic variance present in the material and selecting suitable parents and the best hybrids in crossing programme was done³.

Among the hybrids, positive significant heterobeltiosis for plant height was observed in the cross 732A x PT 5574 followed by 851A x PT 5568. The cross ICMA 91444A x PT 5575 followed by 851A x PT 5572 recorded significant heterosis for leaf length. Out of ninety hybrids, the significant heterobeltiosis were recorded for leaf width in the crosses ICMA 91444A x PT 5567 and 852A x PT 5574. For the number of tillers/plant, the cross 851A x PT 5576 exhibited significant heterobeltiosis. Heterobeltiosis for identifying high performing pearl millet cross combination for forage yield com-

ponents was also reported⁴.

The present study indicated that it would be worth it to utilize the male sterile line 851A in breeding programme for development of superior forage value pearl millet hybrids. Among the hybrids 732A x PT 5574, 851A x PT 5568, ICMA 91444A x PT 5575, 851A x PT 5572, 851A x PT 5576 and ICMA 91444A x PT 5567 had the positive significant heterobeltiosis. These crosses may be utilized for improving forage yield components.

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