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Combining ability studies in rice involving diverse cytosteriles

D. S. SAWANT*, V. N. SHETYE AND S.S. DESAI
Agricultural Research Station, Shirgaon, Ratnagiri - 415 629 (M.S.) India

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SUMMARY

The present study with five CMS lines of four different sources and eight testers by Line x Tester model revealed higher SCA variance than GCA variance for all the characters and thus predominance of non-additive gene action was found to be evident. Considering GCA effects, the parents IR 58025 A (WA source line), G 46 A (Gambiaca source line), Ratnagiri 3, IR 46, IR 54 and IR 5 (testers) were identified as good general combiners for yield and its component characters. These lines and testers were found to be a better source for exploitation under heterosis breeding. Considering the SCA effects, the crosses IR 58025 A/ Panvel 1, G 46 A / Panvel 1 and PMS 2 A / IR 54 were found to be better than other crosses which can be exploited through heterosis breeding.

Key words : Rice, CMS line, Combining ability , Hybrid rice

Selection of parents for hybridization assumes greater importance in heterosis breeding programme. The superiority of parents has to be assessed based on GCA of parents and its ability to produce specific combining hybrids. A knowledge on the combining ability of parents and hybrids will facilitate appropriate choice of parents in breeding programme. Additive and non-additive gene action in the parent, estimated through combining ability analysis, is useful in determining the possibility for commercial exploitation of heterosis. Hence the present experiment was undertaken to study combining ability effects of five CMS lines of four different sources and eight proven restorers for yield and it's contributing characters in rice.

MATERIALS AND METHODS

Thirteen parents {five cms lines of four different sources viz., IR 58025 A, PMS 2 A (Wild rice with abortive pollen), IR 68885 A (Induced by gamma irradiation of IR 62829 B), G 46 A (Gambiaca) and D 297 A (Dissi); eight proven restorers as tester viz., IR 36, IR 64. Panvel 1, IR 46, IR 54, Ratnagiri 3, Swarna and IR 5} and their 40 hybrids were grown in a randomized block design with two replications at Agricultural Research Station Shirgaon (Ratnagiri) during June 2002. All the 40 hybrids alongwith five isogonics maintainers and eight male parents, were grown in three 3-m row plots with a spacing of 20x15 cm. Seedlings were planted at the rate of one hill^{-1}. Agronomic practices adopted were similar for all the treatments. Observations were recorded on randomly selected ten plants in each genotype in each replication for eight characters. For the estimating of general and specific combining ability variances the line x tester analysis as outlined by Kempthorne (1957) was followed.

RESULTS AND DISCUSSION

The analysis of variance for combining ability (Table 1) revealed that the variances due to lines, testers, parents, hybrids, parents x hybrids and line x tester were highly significant for all the characters, indicating the presence of adequate variability in the experimental material. All the characters showed greater SCA variances than GCA variances indicating the predominance of non-additive gene action, which results from dominance, epistasis and various

Table 1: Analysis of variance for combining ability (line x tester analysis)

Source	df	Plant height (cm)	No. of productive tillers/plant	Days to 50% flowering	Panicle length (cm)	No. of fertile spikelets/ panicle	Spikelet fertility %	test weight (g)	grain yield/plant (g)
Parents(P)	12	105.90**	8.85*	303.21**	1.64**	469.21**	26.25**	29.18**	41.17**
Hybrids(H)	39	170.61**	17.68**	178.61**	8.58**	3025.88**	93.17**	12.45**	172.37**
PxH	1	1727.76 **	245.96**	30.00**	140.07**	12336.9**	129.95**	5.67**	1528.22**
Lines(L)	4	366.64**	65.82**	68.92*	19.44**	4394.79**	185.88*	39.26**	426.95**
Testers(T)	7	662.34**	34.96**	886.11**	20.29**	10589.47**	154.24*	25.86**	446.68**
LxT	28	19.67*	6.48**	17.41**	4.11**	939.43**	64.66**	5.26**	67.43**
Error	52	11.45	3.73	1.62	0.09	231.49	9.18	0.09	13.67
GCA		3.99	0.30	4.27	0.12	55.20	0.75	0.19	2.78
SCA		4.11	1.38	7.90	2.01	353.97	27.74	2.59	26.88
GCA/SCA		0.97	0.22	0.54	0.06	0.16	0.027	0.07	0.10

*P = 0.05; ** P = 0.01

*Author for correspondence