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HETEROSIS IN INDUCED SEMI-DWARF MUTANTS OF RICE*

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ABSTRACT

Heterotic potential in twenty one cross combinations was studied in rice for grain yield and important yield components. Seven crosses exhibited significant heterosis over the respective better parents and ten crosses over the standard variety, IR. 50 for grain yield per plant. Among hybrid combinations CO 29 10+25 KR x T(N) 1 exhibited maximum standard heterosis (169%) for grain yield, M 102 x IR 50 for 100 grain weight (41%), M 210 x IR 50 for number of grains per panicle (104%), TKM 6 x IR 50 for number of productive tillers per plant (45%) and M 6 x TKM 9 for plant height (-5%).

KEY WORDS : Heterosis, mutants, Rice

MATERIALS AND METHODS

The experiment was laidout with seven lines consisting of six semidwarf mutants (TKM 6-5+30 KR, CO 29-10+25 KR, M2, M6, M102 and M 210) and one tall variety (TKM 6) and three testers (TKM 9, IR 50 and T (N)1). Hybridization was carried out by wet cloth method and artificial pollination. The F^1 seeds with their parents were sown in a raised seed bed and seedlings were transplanted in the mainfield adopting a randomzied blocks design replicated thrice with a spacing of 20 x 10 cm. during Rabi 1985. Each genotype is planted in a single row of 0.7 m length and observations were recorded. Heterosis was estimated in F^1 generation as percentage increase or decrease over the mid parent (relative heterosis) as suggested by Williams and Gilbert (1960), the better parent (heterobeltiosis) as suggested by Fonseca and Petterson (1968) and over the standard variety IR 50 (standard heterosis). The specific combining ability effects (sca) was also computed.

RESULTS AND DISCUSSIONS

The analysis of variance revealed significant differences among the female parents for all the characters studied except grain yield per plant and significant differences among the male parents for all the characters except 100-grain weight and grain yield per plant (Table 1).

Significant heterosis was observed in all kinds of heterosis estimation for number of productive tillers per plant, number of grains per panicle, 100 grain weight and grain yield per plant. In all these cases both positive and negative heterosis were observed (Table 2).

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TABLE 1 : Analysis of Variance for Yield Components in Rice

Source of Variation	d.f.	Mean squares				
		Plant-height (cm)	No. of Productive tillers/plant	No. of grains/ panicle	100-grain weight (g)	Grain yield/ plant (g)
Replication	2	0.875	1.036	966.330	0.001	3.884
Female	6	2710.797**	12.371*	5510.623**	0.430**	49.594
Male	2	99.406*	16.153*	1683.717*	0.026	36.638
Femalex Male	12	21.990**	2.815	340.252	0.028*	18.147
Error	60	7.998	1.342	453.342	0.011	10.331

* Significant at 5% ** Significant at 1% levels

Heterosis for grain was first reported in rice by Jones (1926) followed by so many other workers (Brown 1953), Madhusudhana Rao (1965), Srivastava and Seshu (1982), Panwar et al. (1983) and Anandakumar and Sree Rangasamy (1984).

Heterosis for plant height, number of productive tillers, number of grains per panicle, 100-grain weight and yield were observed by Sukanya Subramanian and Rathinam (1984), Anandakumar and Sree Rangasamy (1985) and Kim (1985). In the present study, highest standard heterosis for plant height was recorded by M 6 x TKM 9 (-5%), for number of productive tillers per plant by TKM 6 x IR 50 (45%), for number of grains per panicle by M 210 x IR 50 (104%) and 100 grain weight by M 102 x IR 50 (41%) might be due to the additive genetic effects (Table 3).

TABLE 2 : Expression of Heterosis for Yield and its Components in Hybrids of Semidwarf Induced Mutants of Rice.

	Plant height	No. of productive tillers/plant	No. of grains/panicle	100-grain weight	Grain yield per plant
Range in Percent :					
Relative heterosis	-11 to 27	-5 to 65	-8 to 75	-14 to 17	-14 to 104
Heterobeltiosis	-6 to 77	-30 to 46	-12 to 53	-28 to 3	-15 to 102
Standard heterosis	-5 to 77	-35 to 45	-11 to 104	-6 to 41	-2 to 169
Number of hybrids superior to :					
Mid parent	2	12	7	1	13
Better parent	-	2	2	-	7
Standard variety	-	3	3	11	10

It is revealed that the hybrid Co 29-10 + 25 kR x T(N)I among the hybrids studies was found to be the best yielder with the highest sca effect (3.954) and standard heterosis (169%) and hence this cross combination may be exploited further for improvement programme.

TABLE 3 : Hybrids with Highest per se Performance, their corresponding sca effects and highest standard heterosis for different characters.

Characters	Hybrids with highest per se performance	Sca effects	Highest heterosis over standard variety IR 50 (in percentage)
Plant height	M 6 x TKM 9 (66)	-2.949	-5
Number of productive tillers per plant	TKM 6 x IR 50(10)	1.732*	45
Number of grains per panicle	M 210 x IR 50(200)	14.849	104
100 grain weight	M 102 x IR 50(2.588)	0.158*	41
Grain yield per plant	CO 29-10+25 KR x TN(1) (22)	3.954*	169

NB : numbers in parenthesis show values for each hybrid for the concerned character.
* : Significant at 5 percent level.

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