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RESEARCH ARTICLE

Heterosis for yield components in rice (*Oryza sativa* L.)

■ **S.B. Verma**

SUMMARY

Heterosis was estimated as per cent increase or decrease of F_1 values over either heterobeltiosis and over best variety Sarjoo 52. The relative magnitude of heterosis over better parent and standard variety has been studied for ten characters in twenty four hybrids. The nature and magnitude of heterosis differ from character to character depend upon hybrid combinations. Out of 24 F_1s fifteen and eleven hybrid exhibited significant positive heserosis over better parent and standard variety for grain yield. The cross IR 58025 A x NDRK 5026 (BP) and PMS 10 A x Swarna (SV) were best hybrids.

Key Words : Heterobeltiosis, Rice, Hybrid yield

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Rice is most important food crop of global importance. It belongs family gramineae having chromosome no (2 n = 2 x = 24). Development of more heterotic hybrid with good advantage exceeding 1.5 tonnes/ha, combining resistance to major pest and diseases and quality acceptable to different consumer section. Increase participation of private sector in hybrid breeding and seed production to promoted by favourable policy guidelines extending equal opportunity to public and private sector institution in respect of access to germ-plasm uniform treatment in testing and notification of private and public breed material and encouraging export hybrid seed.

AUTHOR FOR CORRESPONDENCE

S.B. Verma, Department of Genetics and Plant Breeding (Agricutural Botany), Udai Pratap Autonomous College, **Varanasi (U.P.) India**
Email : sbvermaupc@gmail.com

Presence of exploitable heterosis and sound seed production technique are important pre requisites for success of hybrid rice breeding programme. The genetic tools male sterile, maintainer and restorer lines essential to develop hybrid rice are available and it is only matter of time that parental lines adopted to different rice growing countries will be available (Virmani, 1986).

MATERIAL AND METHODS

The experimental material used for this investigation comprised of populations of 24 F_1s their parents 3 female and 8 male lines and one standard variety Sarjoo 52 was used. The F_1 hybrids and their parents were evaluated in *Kharif* season 1997 in the farm of Genetics and Plant Breeding Farm. NDUA and T, Kumarganj, Faizabad. The experiment was conducted in Randomized Block Design with 3 replication, each treatment had 4 rows of

2.5 meter long with 20 x 15 cm spacing in each replication. The recommended agronomic practices were followed. The data were recorded on 5 randomly selected plant for each treatment in each replication for 10 characters.

RESULTS AND DISCUSSION

The estimates of mean square were highly significant for all 10 characters due to presence of large variation in the material. Mean performance and heterosis range for the most of heterotic crosses identified on the basis of better parent and standard parents are presented in Table 1. The highest range of heterosis was noted for grain yield characters. The heterosis values over better parent and standard variety along with their respective mean and range given in Table 2. The mean heterosis over better parent and standard variety were (53.79%) and (8.05%), respectively. The maximum heterosis was observed in cross PMS 8A x NDRK 5023 (BP) and PMS 10 A x Swarna (SV). Grain yield per plant is complete trait. It is multiplicative product of several basic components yield through heterosis may not be reflected in increased higher yield. However, the increased grain yield is definitely because of either increase in one or more than yield components including improvement in seed setting. In present study fifteen hybrids exhibited positive and significant heterosis over better parent (BP) and eleven hybrid exhibited positive and significant heterosis over standard variety. Out of 24 F_1s 15 promising hybrids were identified and their restorability and heterotic expression for different characters were analysed. Table 2. The positive standard heterosis was reported by Saini *et al.* (1974); Maurya and Singh (1978); Virmani *et al.* (1982); Rangaswami and Natarajamoorthy (1988); Rao (1965); Geeta *et al.*, 1994 and Ramlingam *et al.* (1994).

In the present study the hybrids PMS 8 A x NDRK 5023 showed the highest heterosis for yield per plant (221.08%) better parent and (72.67%)

Table 1 : Range of mean and heterosis and most heterotic crosses for 10 characters in rice

Characters	Range mean		Heterosis		Best parents based on -x	Based hybrid on mean performance	Best hybrid based on better parent
	Parent	Crosses	Better parent	Standard parent			
Seedling growth (cm)	19.0-30.0	21.5-38.0	-24.45-26.67	-37.3-21.15	NDRK 5023	IR 58025 A X NDRK 5023	IR 58025 A X NDRK 5023
Days to 50% flowering	92.0-114.0	92-111	-10.48-20.65	-3.83-16.03	SWARNA	IR 58025 A X NDRK 5026	PMS 10 A X NDRK 5026
Plant height (cm)	63.22-98.6	70.6-98.2	-5.25-34.49	-26.48-9.17	NDR 507	PMS 10 A X SWARNA	IR 58025 A X NDRK 5027
No of total tillers/plant	6.00-13.01	7.5-18.07	-36.36-64.24	-20.73-87.54	NDRK 5026	PMS 10 X SWARNA	PMS 10 A X SWARNA
Panicle bearing tiller/ plant	6.00-17.00	7.64-18.07	-46.08-164.4	-30.81-87.58	IR 58025 A	PMS 10 X SWARNA	PMS 8 A X NDRK 5032
Panicle length (cm)	21.41-27.8	22.0-29.5	-15.82-16.65	-9.20-21.16	NDRK 5032	PMS 8 A X NDRK 5032	PMS 10 A X SWARN A
Total spikelets/ panicle	8.75-214.4	15.3-307.4	-17.17-43.37	-19.99-62.46	NDRK 5031	IR 58025 A X NDRK 5031	IR 58025 A X NDRK 5031
Spikelet's fertility %	0.00-95.4	52.6-88.9	36.65-6.96	-43.29-4.2	NDR 507	IR 58025 A X SWARNA	PMS 10 A X NDRK 5032
Test weight (g)	0.00-27.6	20.7-26.7	-16.62-28.71	-13.97-6.85	NDRK 5032	PMS 10 A X NDRK 5026	PMS 10 A X SWARNA
Grain yield (g)	0.00-26.53	16.7-52.5	-47.04-221.08	-61.05-83.14	NDRK 5031	PMS 10 X SWARNA	PMS 8 A X NDRK 5023

Table 2 : Heterosis for 10 characters in promising crosses of rice

Characters	Heterosis type	PMS 8 A x NDRK 5023	PMS 10 A x SWARNA	IR 58025 A x SWARNA	IR 58025 A x NDRK 5026	IR 58025 A x MT 20-1-	PMS 10 A x NDR 507	PMS 8 A x NDR 5027	PM 58 A x NDRK 5032	PMS 10 A x NDRK 5023	PMS 8 A x NDR 507	Oer all mean	C.D. (P−0.05) C.D. (P=0.01)
Seedling growth (cm)	BP	-4.56	-23.87**	0.00	25.93**	3.70	16.67**	-4.22	14.03**	-23.33**	0.15	3.03	1.56
	SV	8.71**	-37.30**	13.92**	8.40**	-10.73**	1.85	-10.73**	6.27*	-26.67**	-6.60*	-8..17	2.07
Days to 50% flowering	BP	4.90**	3.74**	20.65**	00.00	16.30**	-2.80**	4.58**	3.08**	-0.31	2.94**	4.93	1.82
	SV	11.85**	16.03**	16.03**	-3.83**	11.85**	8.71**	3.48**	4.88**	11.50**	9.76**	7.43	2.42
Plant height (cm)	BP	45.72**	4.40	28.08**	15.97**	5.25**	34.49**	20.24**	8.36**	33.33**	4.77	15.28	2.10
	SV	9.36**	-26.48**	-9.80**	9.17**	-10.81	7.87	-9.77**	-18.68**	6.94**	-21.37**	-6.51	2.79
Total no of tillers/ plant	BP	41.67**	64.24**	7.69	30.67**	29.33**	6.32	-26.64**	35.15**	11.52	-36.36**	8.29	1.43
	SV	76.47**	87.54**	45.33**	76.47**	4.50	28.03**	-8.62	74.74**	27.34**	-20.73*	35.51	1.95
Panicle bearing tillers/ plant	BP	108.33**	50.58**	17.65**	0.00	-46.08**	-2.08	18.96*	164.40**	-0.56	-31.11**	12.28	1.27
	SV	73.01**	87.58**	45.33**	76.47**	-4.84	21.97**	-8.62	74.74**	23.88**	-20.48**	29.52	1.70
Panicle length cm	BP	-4.67	17.14**	-11.12**	9.92**	-11.12**	16.65**	6.67	6.06	-4.35	-4.00	-1.18	1.34
	SV	2.15	12.81**	5.08	17.39**	-5.08	11.43*	10.96*	21.61**	-9.20*	-0.95	3.41	1.78
Total spikelets/ Panicle	BP	22.56**	6.95**	15.21**	-7.66**	1.47	-1.98	5.88**	-12.09**	2.36	21.92**	4.51	2.95
	SV	7.68**	11.17**	19.76**	-6.21**	3.07	-15.82**	-6.98**	-3.28	-12.09**	7.12**	3.01	3.91
Spikelets fertility %	BP	16.95**	-3.79*	2.55	-7.20**	-4.18**	11.78**	-15.42**	-6.29**	-15.57**	-11-56**	-10.55	1.91
	SV	16.47**	-10.12**	-4.20**	-8.65**	-5.73**	9.18**	-14.85**	16.79**	-15.09**	-9.02**	-13.75	2.55
Test weight (g)	BP	-3.83	28.71**	24.75**	7.60*	0.78	13.68**	-7.77**	5.74	5.67	-4.06	2.13	1.46
	SV	13.97**	-10.96**	-13.70	2.74	-10.96**	3.56	4.11	6.85*	-5.48	-12.60**	-5.78	1.94
Grain yield per plant (g)	BP	221.08**	200.57**	192.60**	174.55**	104.00**	87.35**	85.71**	69.33**	68.65**	67.59**	53.89	1.67
	SV	72.67**	83.14**	78.28**	75.58**	77.91**	37.79**	36.05**	47.67**	-9.30	23.26**	8.05	2.23

* and ** indicate significance of values at P−0.05 and 0.01, respectively

standard heterosis followed by PMS 10 A x Swarna (200.57%) better parent and (83.14%) standard heterosis, IR58025A x Swarna (192.60%). Better parent and 78.28 per cent standard heterosis, IR 58025 A x NDRK 5026 (174.55%) better parent and (75.58%) standard heterosis and IR 58025 A x MT 20-1-1 (104.00%) better parent and (77.915%) for standard heterosis.

REFERENCES

Geeta, S., Kirubhakarn Sundararaj, A.P.M. and Palnisamy, S. (1994). Grain charaacteristics in rice hybrids. *Crop Res.*, **7** (2): 303-305.

Maurya, D.M. and Singh, D.P. (1978). Heterosis in rice. *Indian J. Genet. & Plant Breed.*, **38**: 71-6.

Ramlingam, J.Vivekanandan, P. and Subramanian, M. (1994). Heterosis in early rice. *Annal. Agric. & Res.*, **15** (2): 194-198.

Rangaswami, M. and Natarajamoorthy, K. (1988). Hybrid rice heterosis in Tamil Nadu. *Int. Rice Res. Newslett.*, **13**: 5-6.

Rao, G.M. (1965). Studies on hybrid vigour in interracial hybrids of rice (*Oryza sativa* L.) *Andhra Agric. J.* **12**: 1-12.

Saini, S.S., Kumar, I. and Vagneja, M.R. (1974). A study of heterosis in rice (*Oryza sativa* L.) *Euphytica*, **23**: 219-224.

Virmani, S.S., Aquino, R.C. and Khush, G.S. (1982). Heterosis breeding in rice, *Oryza sativa* L. *Theor. Appl. Genet.*, **63**: 373-380.

Virmani, S.S. (1986). Prospects of hybrid rice in developing countries. Rice: progress assessment and orientation in the 1980s. *Int. Rice comm. Newsl.*, **34** (2): 143-152.