



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

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ABSTRACT

Heterosis in rice was studied for yield and component traits in 32 hybrids involving 12 parents comprises of 8 lines and 4 testers. Analysis of variance showed significant differences in parents vs crosses for all the characters except thousand grain weight. Greater variability in the parents indicated the possibility of getting higher heterosis in the crosses. The high manifestation of heterosis for grain yield per plant is evident by significant superiority of hybrids over mid parent was ranging from -19.75 to 30.33 % in several crosses. The high heterobeltiosis for yield per plant was observed in the cross ASD 17 x IR 50. This cross had also high heterobeltiosis for days to first flower, plant height, number of productive tillers per plant and number of grains per panicle. Similarly, the cross IR 55408-01 x IR 50 showed superiority over standard variety for grain yield and also showed significant heterosis for almost all the characters. The development of pure lines from segregating population is very important for evolving high yielding varieties. The crosses exhibiting good heterotic expression in F_1 are likely to give better segregants in later generations were additive gene effects were high.

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Key words: Rice, heterosis, relative heterosis, heterobeltiosis, standard heterosis.

1. INTRODUCTION

Heterosis is the hybridization between unrelated strains in self-pollinated crops that generally leads to an increased vigour and fertility. This aspect is of great significance in breeding. Most of the improved varieties hybrids utilize this phenomenon of hybrid vigour (Singh *et al.* 1999). Estimation of heterosis over better parent (heterobeltiosis) may be useful in identifying the heterotic cross combinations but the crosses can be of immense practical value, if they show superiority over the standard or the best variety of the area. In the present study, investigation were undertaken to assess the extent of exploitable heterosis in hybrid rice involving eight lines and four testers.

MATERIALS AND METHODS

The experimental materials consists of lines *viz.*, AD 95137, AD 95128, ASD 17, ADT 39, IR 42, IR 55423-01 and BPT 5204 were used as male in the crossing and ADT 36, IR 50, Jeeraga Samba and CO 43 were used as female for crossing programme in line x tester fashion. IR 50 was used as check variety. All the 32 F_1 , 12 parents along with the check variety were raised in randomized block design with three replications. All the recommended agronomic practices were followed. Data were recorded on five randomly selected plants from each replication. The observations were recorded six characters *viz.*, days to first flower, plant height, number of productive tillers per plant, number of grains per panicle, thousand grain weight and grain yield per plant.

RESULTS AND DISCUSSION

The range of heterosis showing significant heterosis over mid parent, better parent and standard variety for all the characters have been presented in Table 1. The estimates of heterosis for yield ranged from -19.75 to 30.33 % over the mid-parent, -27.30 to 24.90 % over the better parent and -26.47 to 44.38 % over the check variety. In the present study, maximum heterotic effect was obtained by the cross IR 55408-01 x IR50 over the mid parent and check variety and the cross ASD 17 x IR 50 over better parent for almost all the characters. This was in accordance with the earlier findings of Deo raj *et al.* (2007). The improvement of yield by the exploitation of hybrid vigour in one or two characters may not reflect the direct increase of yield. However, increased grain yield is certainly the result of heterotic effect of combination of characters. The hybrid, IR 55408-01 x IR 50, recorded the maximum heterotic values for number of productive tillers per plant, number of grains per panicle, thousand grain weight and grain yield per plant. For earliness, the cross IR 55408-01 x Jeeraga samba showed the reliable heterosis percentage. Similar result was reported by Singh and Maurya (1999). Considering other characters like thousand grain weight and plant height the cross combination BPT 5204 x Jeeraga samba showed the desirable mean and heterosis percentage (Table 2).

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Table 1 Range of relative heterosis , heterobeltiosis and standard heterosis for different characters in rice

S. No.	Characters	Relative heterosis	Heterobeltiosis	Standardheterosis
1	Days to first flower	-11.39 to 11.81	-18.60 to 2.90	-13.04 to 10.14
2	Plant height	-11.05 to 29.32	-22.20 to 1.87	-10.09 to 61.41
3	No. of productive tillers per plant	-22.94 to 47.81	-25.53 to 41.84	-21.52 to 49.21
4	No. of grains per panicle	-34.33 to 54.87	-41.14 to 42.15	-14.70 to 53.20
5	Thousand grain weight	-24.64 to 29.10	-42.53 to 7.48	-34.94 to 26.42
6	Grain yield per plant	-19.75 to 30.33	-27.30 to 24.90	-26.47 to 44.38

Table 2 Hybrids with high (desirable) mean and heterosis percentage.

S. No.	Characters	Hybrids
1	Days to first flower	IR 55408-01 x Jeeraga samba, ASD 17 x IR 50
2	Plant height	IR 42 x IR 50, BPT 5204 x IR 50
3	No. of productive tillers per plant	ASD 17 x IR 50, IR 55408-01 x IR 50
4	No. of grains per panicle	ASD 17 x IR 50, IR 55408-01 x IR 50
5	Thousand grain weight	BPT 5204 x Jeeraga samba, IR 55408-01 x CO 43
6	Grain yield per plant	IR 55408-01 x IR 50, ASD 17 x IR 50

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