

**Research Article****Exploitation of heterosis in two line hybrids for different physio-chemical traits**

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**Abstract**

Four aromatic varieties viz., ADT 41, Pusa Basmati 1, Basmati 370 and Taroari Basmati and the three TGMS lines (TS 29, TS 6, and GD 98013) were crossed to generate 12 F<sub>1</sub> hybrid with normal fertility. Observations were recorded for quality characters viz., head rice recovery, kernel length, kernel breadth, L/B ratio, linear elongation ratio, amylose content, gel consistency, alkali digestion and volume expansion ratio and grain yield per plant. Overall two hybrids TS 29 x ADT 41 and TS 29 x Pusa Basmati 1 were found to be superior and could be utilized commercially for exploitation of heterosis.

**Key words:** Rice, heterosis, quality.

**Introduction**

Hybrid technology has successfully been used to increase the yield. Many high yielding rice hybrids have been developed in India, but in most cases quality is not to the desirable extent and therefore, lacked acceptability by consumers and millers. The increasing demand of quality rices in the local and international markets has prompted attention on quality improving breeding. In rice quality has now become prime objective of most of breeding programme. The quality characteristics of rice includes the total head rice recovery, kernel length, kernel breadth, cooking, eating quality and aroma.

In rice heterosis for grain yield and its components have been reported by various workers but little information is available on quality characters. Therefore, it is essential to develop quality rice hybrids by using TGMS lines and aromatic restorers that will be expected to aromatic if aroma is governed by dominant gene as reported Bijral and Gupta (1998). In view of above considerations, the present study has been planned to develop basmati rice hybrids as well as non-aromatic hybrids with better rice quality and to estimate the heterosis for various quality characters and yield.

Four aromatic varieties viz., ADT 41, Pusa Basmati 1, Basmati 370 and Taroari Basmati and the three TGMS lines (TS 29, TS 6, and GD 98013) were crossed to generate 12 F<sub>1</sub> hybrid with normal fertility. These F<sub>1</sub> along with parents and Pusa Basmati 1 as the standard control were evaluated at Agricultural College and Research Institute, Madurai in randomized block design with three replications. Each entry was planted in a single row of 3m length with a spacing of 20x15 cm at one seedling per hill. The recommended agronomic practices were adopted to raise a good crop. Observations on various quality characters viz., head rice recovery, kernel length, kernel breadth, L/B ratio, linear elongation ratio, amylose content, gel consistency, alkali digestion and volume expansion ratio were recorded from a composite seed sample of ten randomly selected plants from each replication and grain yield was taken from randomly selected plants. The head rice recovery were computed as per method of Ghosh et al. (1971). Kernel elongation was measured from cooked kernels with the help of graph paper and aroma was detected from leaves as well as ripened kernels by using method of Nagaraju *et al.* (1991). For kernel length and kernel breadth traits ten polished kernel with tips intact from each replication of the bulk samples of each genotypes were measured by vernier caliper. Average of length and breadth were taken in millimeters and L/B ratio was calculated. The volume expansion ratio was computed as per Juliano *et al.* (1965). Gelatinization temperature is estimated by the

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extent of alkali spreading and clearing of milled rice soaked in 1.7 % KOH for 23 hours. The gel consistency is done as per the method of Cagampang *et al.* (1973). The range of standard heterosis were estimated as per cent increase or decrease of  $F_1$  values over standard check. The data on standard heterosis for various quality character and yield per cent of 12 hybrids are presented in Table 1 and Fig 1.

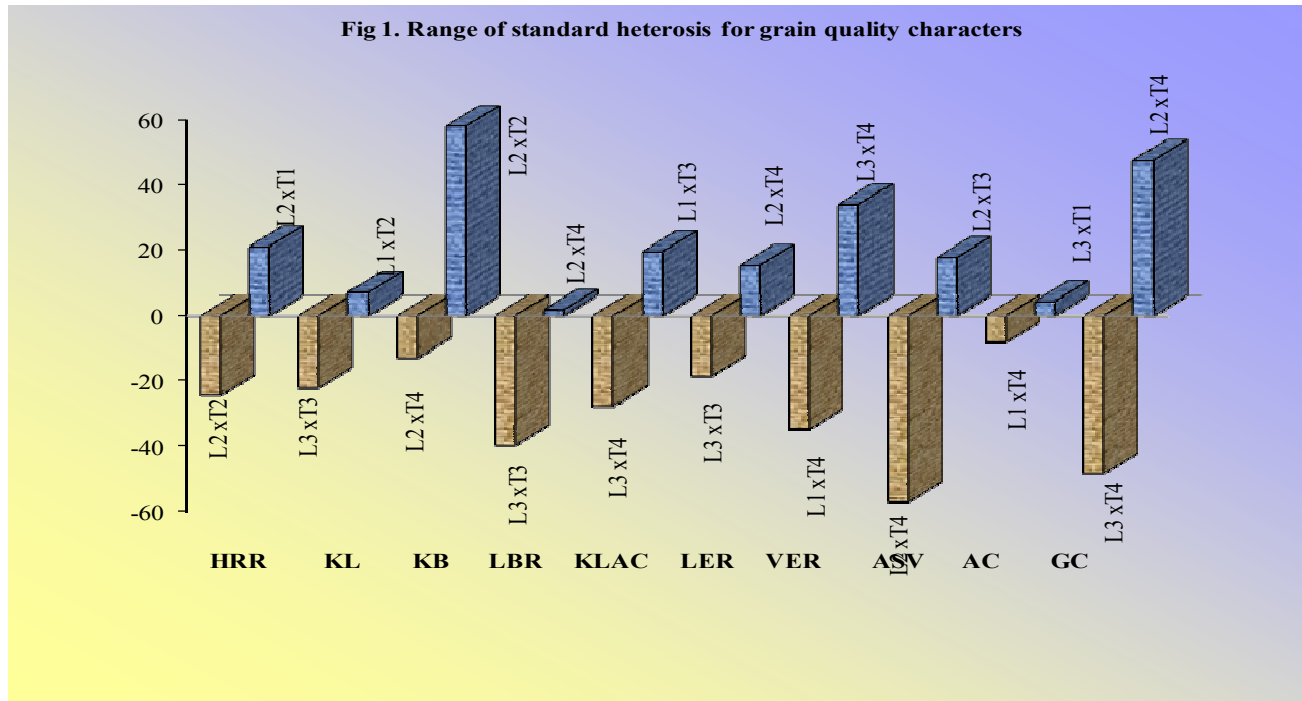
The hybrids exhibited significant positive as well as negative standard heterosis for head rice recovery. The hybrids TS 29 x ADT 41, TS 29 x Pusa Basmati 1 and TS 6 x ADT 41 showed significant positive standard heterosis for head rice recovery. None of the hybrids showed positive significant heterosis for kernel length trait. The hybrid TS 6 x TB showed negative significant heterosis for kernel breadth and the rest of the hybrids showed significant positive heterosis for kernel breadth. Significant negative heterosis was observed for L/B ratio in all the hybrids except two hybrids viz., TS 29 x ADT 41 and TS 6 x Taroari Basmati. The hybrid GD 98013 x ADT 41 showed positive significant heterosis for amylose content. These results are in accordance with the findings of Yolanda and Das (1995). Aroma was not expressed in leaves of hybrids showed a recessive gene which would be expected to segregate in  $F_2$  seed with one fourth of aromatic grains. For gel consistency hybrids showed significant positive as well as significant negative standard heterosis. The hybrid TS 6 x B370 showed positive significant standard heterosis and rest of the all hybrids showed significant negative heterosis. Two hybrids viz., TS 29 x Pusa Basmati and TS 29 x Basmati 370 showed positive significant standard heterosis for alkali spreading value. Overall two hybrids TS 29 x ADT 41 and TS 29 x Pusa Basmati 1 were found to be superior and could be utilized commercially for exploitation of heterosis.

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**Table 1. Estimates of standard heterosis for different traits**

Hybrids	HRR	KL	KB	LBR	KLAC	LER	VER	ASV	AC	GC
TS 29 x ADT 41	17.77*	5.71	6.45*	-5.75	5.52*	-0.50	0.97	-7.14*	0.83	-3.71*
TS 29 x Pusa Basmati 1	9.69*	7.14	12.90*	-5.09	4.73*	-2.50	2.78*	0.00	-2.08	-1.02
TS 29 x Basmati 370	-0.64	-11.43	22.58*	-29.20*	19.63*	-10.50*	39*	-28.57*	-7.90*	-9.99*
TS 29 x Taroari Basmati	-9.16*	-2.85	22.58*	-20.80*	-17.12*	-15.00*	-34.77*	-45.71*	-8.11	-46.17*
TS 6 x ADT 41	21.16*	-1.43	9.68*	-10.18*	6.09*	-5.00*	-6.40*	-17.86*	-2.91	-29.73*
TS 6 x Pusa Basmati 1	-24.39*	-13.57*	58.06*	-45.35*	17.19*	-4.50*	-4.87*	-21.43*	-1.04	-28.23*
TS 6 x Basmati 370	-3.74*	-7.86	3.23	-10.84*	-14.97*	-8.00*	-18.36*	17.86*	-7.07*	-30.32*
TS 6 x Taroari Basmati	0.33	-11.43	-12.90*	1.77	-25.21*	15.50*	-32.96*	-57.14*	-5.20*	47.67*
GD 98013 x ADT 41	-4.16*	-0.71	35.48*	-26.55*	-1.15	-0.50	-6.54*	0.00	4.37*	-21.95*
GD 98013 x Pusa Basmati 1	1.75	2.86	12.90*	-8.85*	1.93	-1.00	-3.62*	0.00	-1.25	-15.97*
GD 98013 x Basmati 370	-19.96*	-22.14*	29.03*	-39.82*	-28.51*	-18.50*	8.92*	-17.14*	0.62	-34.21*
GD 98013 x Taroari Basmati	-4.03*	-15.99*	22.58*	-30.53*	29.66*	-17.50*	34.08*	-50.00*	2.91	-48.27*



Lowest Highest