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Short Communication

Grain and cooking quality characteristics of two-line hybrids in rice (*Oryza sativa* L.)

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A set of 20 two line rice (*Oryza sativa* L.) hybrids obtained by crossing thermo-sensitive genic male sterile (TGMS) lines with male parents was evaluated in this study for grain and cooking quality parameters *viz.*, grain length (GL), grain breadth (GB), length/breadth ratio (L/B), kernel length after cooking (KLAC), kernel breadth after cooking (KBAC), linear elongation ratio (LER = kernel length after cooking/length of polished grain) and breadth-wise expansion ratio (BER = kernel breadth after cooling/breadth of polished grain). Gelatinization temperature (GT) was worked out by measuring the alkali spreading cooling value (ASV) of the milled grains [1]. Amylose content (AC) and gel consistency (GC) were estimated by following the procedure described by Juliano [2]. The three-line hybrid, ADTRH 1 and the popular good quality rice variety, Improved white ponni were used as checks. The results obtained on grain and cooking quality parameters of two-line hybrids are given in Table 1.

All hybrids had medium to long kernels except TS29 × CR689-612, which had extra long kernels (7.55mm of brown rice length) which was intermediate to its parents, TS29 (6.9mm) and CR689-612 (7.95mm). The hybrids of TS16 and TS29 had long kernels of more than 6.6 mm length. Appreciable variation was not observed among grains of a hybrid, even though they are F2 seeds. The hybrids showed intermediate or better performance over their parents for these traits indicating the possibility of evolving hybrids with better grain quality by selecting the parents with desirable kernel length and shape. It appeared that the TGMS lines, TS16 and TS29 were suitable for developing hybrids with long slender rice.

Generally, rice with more linear elongation and less breadth wise expansion is preferred. Kernel length after cooking in some of the hybrids was on par with the variety Improved white ponni, the most preferred variety by the consumers of Tamilnadu. The hybrid TS29 × CR689-612 was the best followed by TS29 × IR63883, TS18 × CB96026, TS18 × CB96073 and TS16 × CB97033 for this trait. None of the hybrids was superior to Improved white ponni for linear elongation ratio but some were either superior or on par with the three-line hybrid, ADTRH 1.

Rice with high gelatinization temperature requires more water and time to cook than with low or intermediate gelatinization temperature. All hybrids in this study had high to intermediate GT, though most of their parents had high and some had low GT. High amylose varieties cook dry, flaky, fluffy and have high volume expansion but become hard after cooling. Intermediate amylose rice cook fluffy and remain soft on cooling whereas, low amylose varieties cook sticky. Hence, the varieties with intermediate amylose content are preferred. Hybrids with high, intermediate and low amylose content were identified in this study. The hybrids, TS46 × MRST9 and TS47 × BPI76 had more than 25 per cent amylose content as that of Improved white ponni. The hybrids, TS46 × BPI76, TS46 × TNAU91002, TS18 × BPI76, TS29 × IR63883 and TS29 × CB96073 had intermediate amylose content.

The hybrid, TS18 × CB96026 with the highest yield of 52.75 g/plant had medium slender grains with KLAC of 14mm as that of Improved white ponni. The LER of kernel was more than 2.0 with the BER of 1.11. This hybrid had intermediate to high GT, intermediate amylose content and soft gel consistency. As this hybrid had highly desirable quality parameters coupled with high yield potential, this is an ideal candidate for commercial exploitation. The other hybrids identified with similar properties were TS29 × IR63883, TS29 × CR689-612, TS18 × CB95066, TS46 × TNAU841434 and TS47 × TNAU841434. All these hybrids had appreciable grain yield and acceptable grain quality characters as that of Improved white ponni.

In most of the cases, the parent(s) having desirable grain and cooking qualities produced hybrids with

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Table 1. Quality parameters of two-line rice hybrids and their parents

Parents/hybrids	Grain yield/ plant (g)	BRL (mm)	BRB (mm)	LER	BER	ASV	AC (%)	GC (mm)
TS 6	7.73	5.38	2.45	1.93	1.25	5.00	15.10	61.00
TS 16	9.24	6.55	2.30	1.71	1.27	7.00	17.20	100.00
TS 18	5.75	6.30	2.25	1.88	1.19	7.00	22.10	100.00
TS 29	7.10	6.90	2.15	2.08	1.25	4.00	18.00	87.50
TS 46	6.74	5.48	2.35	2.24	1.13	3.00	12.00	94.00
TS 47	7.65	5.75	2.30	2.55	1.05	6.00	21.50	91.50
Moroberekan	16.90	5.20	2.50	1.88	1.25	3.00	10.20	100.00
BPI 76	25.49	6.05	2.90	2.34	1.35	3.00	23.60	100.00
CB 95066	23.60	6.05	2.60	2.20	1.29	3.00	23.70	100.00
CB 96073	26.10	6.45	2.10	1.67	1.60	4.00	27.10	100.00
Norin PL 9	23.99	6.00	2.20	2.07	1.05	5.00	19.90	95.00
CB 96026	23.85	6.00	2.30	1.55	1.41	2.00	22.70	92.00
CB 97033	28.41	6.40	1.85	1.75	1.56	5.00	24.30	99.00
TNAU 841434	24.15	6.13	2.40	1.72	1.30	2.00	20.00	82.00
Co 47	32.71	5.80	2.35	1.99	1.28	3.00	25.70	97.50
CR 689-612	21.45	7.95	1.85	2.01	1.72	6.00	11.90	93.50
IR 44962	22.11	6.85	2.45	2.05	1.15	2.00	19.00	96.50
IR 48749	32.93	6.95	2.15	2.22	1.31	7.00	24.10	97.50
IR 63883	23.04	6.95	2.25	1.74	1.24	5.00	18.60	93.50
MRST 9	18.59	5.50	2.15	1.59	1.43	5.00	21.90	98.50
TS 16/CB 96073	46.55	6.60	2.30	1.88	1.33	4.30	17.50	99.00
TS 16/CB 97033	39.93	6.60	2.25	2.26	1.28	4.50	20.70	71.50
TS 29/IR 63883	42.19	6.95	2.20	2.22	1.10	3.20	22.00	99.50
TS 29/CB 96073	38.03	6.60	2.00	2.14	1.45	2.93	20.00	100.00
TS 29/CR 689-612	40.25	7.55	2.25	2.13	1.32	4.60	13.60	98.50
TS 18/BPI 76	47.00	6.00	2.50	1.96	1.23	2.80	22.90	90.50
TS 18/CB 96026	52.75	6.05	2.40	2.46	1.11	3.00	19.10	98.50
TS 18/CB 96073	38.28	6.40	2.30	2.33	1.30	3.20	16.80	99.50
TS 18/CB 95066	46.08	6.40	2.25	2.21	1.28	2.73	17.10	98.50
TS 18/MRST 9	48.70	5.95	2.30	2.41	1.38	3.30	16.00	89.50
TS 18/IR 44962	39.18	6.60	2.30	1.96	1.09	2.83	17.80	94.00
TS 18/IR 48749	37.81	6.20	2.35	2.33	1.33	3.10	15.70	96.00
TS 46/BPI 76	50.91	6.00	2.70	1.70	1.20	3.96	24.90	100.00
TS 46/Moroberekan	43.25	6.20	2.40	2.05	1.36	3.73	19.10	99.50
TS 46/Norin PL 9	35.91	6.00	2.35	2.28	1.35	3.27	14.60	99.00
TS 46/TNAU 841434	45.60	6.20	2.35	2.41	1.17	3.86	13.50	93.50
TS 46/Co 47	36.46	5.95	2.35	2.32	1.34	3.00	20.20	71.50
TS 46/MRST 9	36.38	5.85	2.40	2.06	1.00	4.20	25.10	96.50
TS 47/TNAU 841434	40.73	6.20	2.30	2.22	1.28	4.96	18.40	99.50
TS 47/BPI 76	40.20	5.90	2.60	2.36	1.30	4.20	25.60	98.00
Checks								
ADTRH 1	-	7.15	1.95	1.93	1.26	3.06	21.50	99.50
Improved white ponni	-	5.25	1.75	2.75	1.24	5.00	25.40	95.50
SE	2.83	0.03	0.06	0.04	0.32	-	0.76	1.21
SE(d)		0.05	0.08	0.06	0.04	-	1.08	1.71
CD		0.11	0.17	0.12	0.09	-	2.17	3.45

acceptable quality attributes. For example, the line TS29 and the tester CR689-612 with desirable quality traits produced most of the high quality hybrids. It indicated that the grain quality of rice hybrids depends on the grain quality of parents as reported by many workers [1, 3, 4]. It is therefore important that only parents with acceptable physio-chemical properties need to be chosen to produce hybrids with good quality. The parents with wide variation for grain quality should be avoided as it may result in variation among grains of F_1 hybrid. In this connection, the TGMS system has lot of scope to breed better quality hybrids as it offers wide choice for selection of parents.

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