

## Floral characters of CMS and maintainer lines in hybrid rice

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We screened five male sterile lines and their maintainers for pistil and stamen length during 1986 wet season (kharif). Fifty spikelets/line were measured.

Among the A lines, IR46830A had the longest pistil, V41A the shortest. Among B lines, Zhen Shan 97B had the longest stamen, IR54752B the shortest. V20A and Zhen Shan 97B had the longest filament (see table).

The long Zhen Shan 97B stamen, prominently protruding from the gap

## Expression of floral characters in A, B, and R lines of hybrid rice.

Line	Stamen (mm)				Pistil (mm)			
	Filament length	Anther length	Anther breadth	Stamen length	Ovary length	Style length	Stigma length	Pistil length
V20A	2.75	2.78	0.32	5.53	0.801	0.840	1.280	2.921
V20B	3.59	2.39	0.50	5.98	0.944	1.024	1.240	3.208
V41A	2.12	2.03	0.37	4.15	0.704	0.640	0.816	2.160
V41B	3.05	2.08	0.41	5.13	0.816	0.832	0.936	2.584
Zhen Shan 97A	2.99	2.12	0.48	5.11	0.576	0.872	1.112	2.560
Zhen Shan 97B	3.48	2.57	0.48	6.05	0.728	0.984	0.992	2.704
IR46830A	2.65	2.13	0.38	4.78	1.104	0.881	1.080	3.065
IR46830B	3.30	2.21	0.42	5.51	1.267	1.216	1.320	3.803
IR54752A	1.33	1.68	0.34	3.01	0.760	0.720	0.826	2.306
IR54752B	1.70	1.73	0.36	3.43	0.770	0.760	0.880	2.410
SE	0.44	0.22	0.09	0.45	0.21	0.17	0.17	0.28

between lemma and palea, facilitated easy transfer of pollen to the stigma of corresponding A lines in the adjoining row.

In general, all the male sterile (A) lines had smaller stamens and pistils than their respective maintainers. □

## Effect of row ratio and leaf clipping on MR365A outcrossing and seed yield

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We evaluated the effect of row ratio and leaf clipping on outcrossing rate and seed yield of MR365A (a CMS line developed at IRRI) during 1984-85 wet

season, in a split-plot design with three replications. Seedlings (21 d) were transplanted at 1 seedling/hill with 20 × 20-cm spacing.

Among the three male-to-female ratios tested, seed yields of 1B:4A and 1B:2A were significantly higher than that of 2B:4A (Table 1). Seed set was not significantly different among the ratios.

Leaf clipping increased seed set, but significantly reduced grains/panicle,

perhaps because of lower panicle exertion. Filled grains/panicle and seed yield/m<sup>2</sup> were not affected by leaf clipping (Table 2). There was no interaction between row ratio and leaf clipping. □

**Table 1. Effect of row ratio on seed yield, seed set, number of grains, and number of filled grains of MR365A.**

Row ratio	Seed yield (g/m <sup>2</sup> )	Seed set/panicle (%)	Grains/panicle (no.)	Filled grains/panicle (no.)
2B:4A	67.6 b	23.76 a	94.16 b	22.28 b
1B:4A	85.4 a	22.82 a	98.96 ab	22.33 b
1B:2A	88.5 a	23.41 a	107.32 a	24.95 a
CV (%)	6.5	17.29	7.81	15.04

**Table 2. Effect of leaf clipping on seed yield, seed set, number of grains, and number of filled grains of MR365A.**

Leaf clipping	Seed yield (g/m <sup>2</sup> )	Seed set/panicle (%)	Grains/panicle (no.)	Filled grains/panicle (no.)
Clipped	83.21 a	25.14 a	92.19 b	23.26 a
Unclipped	77.75 a	21.52 b	108.10 a	23.12 a
CV (%)	15.96	10.15	8.69	12.55

## Somatic embryogenesis in rice cultivar IR50

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Initiation and development of embryos from somatic tissues in rice have been achieved by culturing seed-derived callus of IR50. Mature dehulled seeds were inoculated on Murashige and Skoog (MS) medium with varying concentrations of 2, 4-dichlorophenoxyacetic acid (2, 4-D) and kinetin (see table). Medium pH was adjusted to 5.8. The cultures were kept in light for 14 h daylength at 24 ± 2 °C.

Calli were initiated from the hypocotyls of the seedlings within 15 d after inoculation. Callus induction increased with increasing concentrations of 2, 4-D to 2 mg/liter. Higher concentrations inhibited callus growth.

**Effect of 2,4-D and kinetin on callus induction and plant regeneration with IR50 seeds in MS medium.**

Callus induction medium				Regeneration medium <sup>a</sup>			
2,4-D (mg/liter)	Kinetin (mg/liter)	Seeds inoculated (no.)	Seeds producing calli (no.)	Callus production (%)	Calli transferred (no.)	Calli regenerated (no.)	Regeneration (%)
0.0	0.0	74	—	—	—	—	—
0.5	0.0	68	10	14.7	36	3	8.3
0.5	0.5	74	12	16.2	38	4	10.5
0.5	1.0	72	12	16.6	42	6	14.3
1.0	0.0	74	31	41.8	44	8	18.2
1.0	0.5	73	34	46.6	44	11	25.0
1.0	1.0	72	36	50.0	42	7	16.6
1.5	0.0	68	37	54.4	40	9	22.5
1.5	0.5	74	42	56.7	38	8	21.4
1.5	1.0	69	42	60.8	42	6	14.3
2.0	0.0	72	46	63.8	32	2	6.2
2.0	0.5	68	42	61.7	44	18	40.9 <sup>b</sup>
2.0	1.0	67	29	43.2	42	+	—
5.0	0.0	72	26	36.1	32	+	—
5.0	0.5	74	28	37.8	32	+	—
5.0	1.0	74	25	33.7	36	+	—

<sup>a</sup> Regeneration medium = basal medium + 1 mg kinetin/liter + 1 mg NAA/liter. + = rhizogenesis.

<sup>b</sup> Formation of somatic embryos.

Callus pieces were transferred to regeneration medium containing kinetin and NAA at a concentration of 1 mg/ liter each. Regeneration was better from calli induced from the C medium containing 2 mg 2,4-D/liter and 0.5 mg kinetin/ liter through the process of somatic embryogenesis (established by histological studies).

The somatic embryos formed had two distinct poles and were attached to the callus piece through their broader surface. Embryoids of different shapes were also traced out during early stages of embryogenesis. Other treatments did not yield somatic embryos. □

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**A medium-duration, high-yielding, scented hybrid rice**

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We have identified tall, late-maturing, scented cultivar Basmati 370 as a

complete restorer for the CMS line IR46830A.

Hybrid IR46830A/ Basmati 370 was evaluated for yield and quality components (Table 1,2). The hybrid flowered earlier and was shorter than the better parent. Positive and significant heterosis over the better parent was recorded for most characters. Increase in grain yield/ plant was due

primarily to more effective tillers/ plant and higher 1,000-grain weight. Although yield of the hybrid was not significantly higher than that of check variety Pant Dhan 4, better quality attributes make it more suitable for commercial production. Its medium growth duration would make it suitable for a rice - wheat cropping pattern. □

**Table 1. Mean performance of the hybrid IR46830A/Basmati 370, and estimates of heterosis over the better parent and check variety Pant Dhan 4. <sup>a</sup> Pantnagar, India, 1988.**

Character	Mean for F <sub>1</sub>	Heterosis <sup>b</sup>	
		Better parent	Check
Days to 50% flowering	95.0	-24.60*	-20.16*
Plant height (cm)	137.2	-12.50*	-30.66*
Effective tillers/ plant (no.)	20.8	44.45*	23.80*
Length of panicle (cm)	32.2	5.59	20.81*
Primary branches/ panicle (no.)	12.2	19.60*	-9.83
Secondary branches/ panicle (no.)	40.4	36.50*	34.50*
Spikelets/panicle (no.)	202.6	35.25*	30.20*
Grains/panicle (no.)	164.0	19.80*	17.64*
1000-grain weight (g)	22.9	31.24*	-0.62
Grain yield/plant (g)	63.0	83.89*	16.50

<sup>a</sup> Av of 5 plants. <sup>b</sup>\* = significant at 5% level.

**Table 2. Mean value for 5 grain quality traits in Basmati 370, hybrid IR46830A/Basmati 370, and Pant Dhan 4. <sup>a</sup> Pantnagar, India, 1988.**

Character studied	Basmati 370	Hybrid	Pant Dhan 4
Length of grain (mm)	7.88	7.38	6.34
Breadth of grain (mm)	1.72	2.04	2.10
L/B ratio	4.58	3.61	3.11
Alkali digestion value	2.25	3.00	3.50
Aroma	Strong	Intermediate	—

<sup>a</sup> Av of 5 replications.

**Evaluation of some F<sub>1</sub> rice hybrids developed using MR365A as CMS line**

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We evaluated yield and heterosis of eight F<sub>1</sub> rice hybrids developed using MR365A (CMS line developed at IRRRI

Jan-May 1984. The hybrids, Cisadane, and IR36 were transplanted at 20- × 20-cm spacing in 2- × 5-m plots, with 2 replications. Fertilizer was 135-45-45 kg NPK/ha.

Hybrid combinations MR365A/ IR36, MR365A/IR52, and MR365A/BR10 yielded about 1 t/ha more than Cisadane and showed significant heterosis (14.63-27.65%) (see table). For