

Solution pollination in rice breeding

K. D. Dhiman, Indian Council for Agricultural Research, NEH Region, Sikkim Centre, Tadong, Gangtok 737102, India

Mature anthers of rice release pollen grains quickly when exposed to sunlight or electricity, but pollination is somewhat difficult and inefficient. We have adopted a solution pollination technique in which mature anthers are collected in a beaker or petri dish and kept in the sun 15-20 min and then vigorously shaken in distilled water until the water becomes yellowish with pollen suspension.

One drop of the suspension is applied by syringe on freshly emasculated or 1-d-old emasculated florets, which are then covered with paper bags. Fertilization percentage was two to four times as high as when pollen is dusted on the stigma of emasculated florets (see table). *J*

Comparison of solution pollination with pollen dusting.^a

Variety	Fertilized florets (no.)	
	Solution pollinated	Pollen dusted
Chirakey	45	17
Addey	47	15
Giza 14	56	20
DR92	58	25
Jaya	42	10
IR8	46	22

^a100 florets each of all varieties were pollinated by solution pollination and pollen dusting.

A new crossing technique

J. Taillehois, Institute for Research on Tropical Agriculture (IRAT), Montpellier, France, and E. M. Castro, Brazilian National Research Center for Rice and Beans, CP 179, 74000 Goiania Go, Brazil

We have developed a new crossing technique that saves greenhouse space and permits handling a large number of crosses. Female panicles are cut with as long a culm as possible and transferred to a bottle containing tap water. The leaves are then clipped from the culm and the panicles are treated normally

(emasculatation and pollination). After pollination, the panicles are transferred to water-saturated vermiculite. Soon after, roots appear at the nodes. Culms

are dark green and the seeds grow normally. Seed set and appearance are similar to that observed with classical methods. *J*

Genetic Evaluation and Utilization

AGRONOMIC CHARACTERISTICS

Heterosis for root pulling resistance in F₁ rice hybrids

I. J. Ekanayake, D. P. Garrity, and S. S. Virmani, Plant Breeding Department, IRRI

Root pulling resistance (RPR) is the vertical force required to pull a plant from the soil. Studies done at IRRI have shown a clear association between high RPR and tolerance for drought stress during the vegetative growth phase. Deep, thick, and dense root system character contribute to high RPR in rice plants grown in puddled soil.

Superior root growth may be one manifestation of F₁ hybrid vigor in rice. We compared RPR in three F₁ hybrid combinations with that of their parents to assess heterosis for root growth.

The experiment, in randomized complete block design with three replications, measured RPR of seedlings grown in the field. One seedling per hill was transplanted at 0.25 × 0.25 m spacing in well-puddled and leveled soil. Alternate seedlings were pulled in the middle rows of 5-row plots 27 d after transplanting (DT). A modified spring balance with 25-kg capacity was attached to the base of the seedling with a clamping device. Pulling resistance was recorded as the assembly was pulled vertically away from the soil surface. Plant heights and tiller counts were taken at the time of sampling.

F₁ plants were more vigorous than their parents. Table 1 indicates that F₁ plants tillered profusely compared to the check cultivar IR54, but had almost similar seedling heights. RPRs of the parents were 11.3-11.8 kg 27 DT. The rooting performance of the cross combinations was substantially higher than that of the parents (Table 1).

Table 1. Means for root pulling resistance, plant height, and tiller number in F₁ hybrids and parents.^a IRRI, 1982 dry season.

Hybrids and parents	Root pulling resistance (kg)	Plant (ht.) (cm)	Tillers (no.)
Zhen Shan 97/IR54	17.3 a	45.5 c	11.2 a
V20/IR54	15.8 b	46.6 b	10.0 a
V41/IR54	16.1 b	45.1 b	11.3 a
V20	11.6 c	39.4 d	9.9 a
Zhen Shan 97	11.3 c	49.4 a	9.2 ab
IR54 (check)	11.8 c	44.5 c	7.8 b

^a In a column, means followed by a common letter are not significantly different at the 5% level by Duncan's multiple range test.

Table 2. Heterosis for root pulling resistance in F₁ hybrids compared with that of the check cultivar and the midparent. IRRI, 1982 dry season.

Hybrid	Heterosis ^a (%)	
	Midparent	Check (IR54)
Zhen Shan 97/IR54	47.9**	49.1**
V20/IR54	38.0**	36.2**
V41/IR54	—	38.3**

^a **Significant at 1% level using t test. In Zhen Shan 97/IR54, V20/IR54, and V41/IR54, heterosis vs the check is a measure of heterobeltiosis since IR54 is the high parent.

Significant and positive heterosis for root pulling resistance was observed in all hybrids (Table 2). Zhen Shan 97/IR54 hybrid had 47% higher RPR than the midparent. In this cross, heterobeltiosis compared to the high parent cultivar (check) was 49%.

The high RPR observed in the F₁ hybrid seedlings indicates substantially superior root growth. Previous studies showed that plants with high RPR had improved drought resistance. These data suggest that F₁ hybrids are superior to their parents in adapting to drought-prone areas. *J*