localization by the inscet, thus preventing an erroneous sap intake from parenchymal tissues. ■

GENETIC EVALUATION AND UTILIZATION

Drought resistance

Studies on physiological aspects of drought in rice

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Different aspects of drought resistance in rice were studied in the field and greenhouse at IRRI.

The water-retention capacity at wilting stage of seedlings of different varieties ranged from 2 to 4.11 g/g dry matter. BR3 had the highest water-retention capacity and IR442, the lowest. Wilted seedlings of IR442 could hardly recover when watered.

When watered in the greenhouse 24 hours after wilting at the active tillering stage. the seedlings recovered from 32 to 72% of their length within 3 days. When watered 48 hours after wilting BR3 had the highest leaf-recovery efficiency and Kataktara, the lowest. No variety recovered when watered 72 hours after wilting.

The wilting rates of rice varieties subjected to water stress developed by 1.5% NaCl at the active tillering stage varied widely.

When grown under prolonged desiccation in the field, BR3 gave the highest yield and Chandina the lowest. Root length development varied from 13 to 65 cm among varieties grown under moisture stress in polyvinyl chloride (PVC) pipes.

A variety's drought resistance may vary under different conditions. Drought tolerance and drought avoidance mechanisms may be functions of separate genes. For example, in the PVC-pipe experiment, IR26 had higher resistance in terms of leaf tolerance for wilting, but its roots developed poorly and its ratio of root to shoot length was low. Dular and Mala were moderately tolerant of leaf wilting, although their avoidance capacity was high, as shown by their deep root systems and high root-to-shoot length ratios. Therefore, evaluation for these two drought-resistance mechanisms should be separate. ■

Soluble silicic acid and insoluble silica contents in rice varieties carrying different BPH resistance genes. IRRI, 1979.

Gene	Variety	Soluble silicic acid (mg Si/wet g)	Insoluble silica[a]	
			mg SiO_2/dry g	mg SiO_2/wet g
No gene	IR8	0.121	94	10.7
	IR20	0.113	106	11.0
	IR22	0.128	113	12.8
	IR24	0.121	104	11.4
	TN1	0.125	100	11.3
Bph 1	IR26	0.116	114	10.5
	IR2058-78	0.110	100	13.4
	Mudgo	0.115	97	10.8
	CO 10	0.109	112	14.9
	MTU15	0.101	116	13.4
bph 2	IR32	0.127	115	13.0
	H5	0.118	96	8.8
	H105	0.118	107	11.0
	CR94-13	0.125	114	11.4
	ASD7	0.106	91	11.6
Bph 3	Kuruhondarwala	0.110	112	11.4
	Gangala	0.109	107	10.8
	Rathu Heenati	0.120	105	11.4
bph 4	Heenhoranamawee	0.124	91	9.8
	Babawee	0.109	105	9.3
	Lekam Samba	0.096	91	10.6
	Kalukuruwee	0.103	107	11.2
	Kahata Samba	0.121	102	9.6
Unknown gene	PTB21	0.107	98	13.0
	PTB33	0.119	124	13.5
	Sudu Hondarwala	0.116	100	11.9
	Sinna Sivappu	0.114	91	11.8
	Balamawee	0.113	102	11.6
	Av	0.115	104.3	11.5

[a] In leaf sheaths after ethanol extraction.

GENETIC EVALUATION AND UTILIZATION

Deep water

Deepwater rice yields in Bangladesh

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Results of the first systematic assessment of Bangladesh deepwater rice yields in 1977 were described earlier (IRRN 35 October 1978). The study was continued in 1978.

Growth conditions for deepwater rice were generally favorable; inundation was later but more rapid, and water depths were 30 cm lower than in 1977. No significant flood damage was reported.

The overall mean yield for 75 crop-cuts was 1.3 t/ha, 9% higher than the mean yield estimated by farmers. The mean yield for the Old Meghna floodplain was higher than that for the lower Ganges and lower Jamuna floodplain. Yields tended to be slightly lower than those of 1977, but the difference was statistically significant only on the lower Ganges floodplain.

Thirty-one varieties were sampled; 15 were new varieties not included in the 1977 survey. The mean yield of 9 varieties exceeded 2.5 t/ha. Varieties were strongly zone specific and, in many areas, particular varieties are grown every year along a topographic sequence at different water depths. As in 1977, highest yields were associated with water depths of 1.5 to 1.8 m. Late-maturing varieties yielded lower than medium and early varieties.

Half of the fields were pure stands of deepwater rice, a third were mixed with aus rice (in shallower sites), and 15% were mixed with other crops (millet, sesame, chilli). Two fields were transplanted deepwater rice following boro rice, 88% were double or triple cropped. A rabi crop of pulses, mustard, or wheat followed deepwater rice in 81%, of the fields. Deepwater rice yields were 23% higher in pure stands but total rice production was higher in deepwater rice mixed with aus rice. Fertilizer applied to 35% of the pure stands and 26% of the mixed stands yielded no higher than those in the unfertilized fields. Ninety-five percent of the fields were weeded an average of 1.9 times. Annual production was often 3 to 4 t/ha of milled product.

No farmer reported using plant protection measures; damage by ear-cutting caterpillars, rats, and ufra nematode was minor. Whiteheads from 75 counts averaged 4.3% The survey probably underestimated damage by rats and ufra and completely overlooked yield loss from infestations of yellow rice borer in the vegetative phase.

A comparison of 9 sites and 13 varieties for 1977–78 showed no significant changes in the proportion of mixed cropping and cropping patterns. No changes in fertilizer use or amount of weeding were evident. ■

The overwinter decay of *Ditylenchus angustus*

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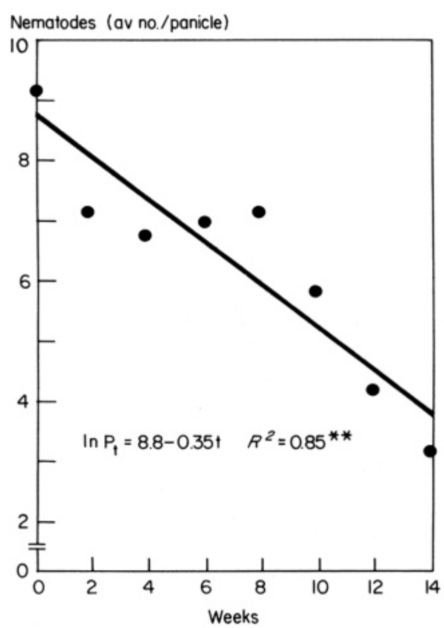
Ufra disease is caused by the rice stem nematode *Ditylenchus angustus* Filipjev, which usually overwinters in crop residue left after harvest in deepwater rice fields in southern Bangladesh. Panicles with typical ufra symptoms (incomplete emergence) were collected from an infested field in late November 1978, randomly sorted into bundles of 10, and left in the laboratory. Every 2 weeks starting early in January, the average number of active nematodes per panicle in one bunch was estimated by extracting the nematodes from each panicle into 10 ml water and counting them with a Peters 1-ml nematode counting slide.

Although there was some indication of variation in the rate of decay of the nematode population (perhaps associated with changes in age structure), the data may be represented by a simple exponential decay model (see figure). The average half-life of the nematode population was about 2 weeks. By mid-April, the population had decayed to less than 1% of that present in January. At the end of April, no live *D. angustus* were detected, although a few free-living nematodes (saprophage *Panagrolaimus*) were still active.



The average number of individual *Ditylenchus angustus* per panicle (logarithmic scale) against time (in weeks from 5 Jan 1979).

D. angustus appears well adapted to the deepwater rice cropping pattern in Bangladesh. Much of the crop is sown with the early April rains. Even if infested crop residues are burned during the winter, the nematode manages to survive from one season to the next. This phenomenon helps explain ufra's peculiar distribution – its patchiness in individual fields and its frequent occurrence in southern Bangladesh where deepwater rice is generally harvested relatively late (late November, early December) and sown early (March). It also suggests that ufra in deepwater rice may be controlled at least partly by any procedure that prolongs the winter decay phase, even by only a few weeks. For example, farmers might plant varieties that flower early (although they may have to be harvested by boat), sow later (risking early flood damage), or transplant after the floods arrive (if the water level does not rise too quickly). ■

Crop losses in deepwater rice due to yellow rice borer

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The yellow rice borer *Tryporyza incertulas* (Walker) caused greater damage to Bangladesh deepwater rice in 1978 than in 1977. An average of 25.3% of 4,300 stems removed from 43 farmers' fields were infested in the stem elongation stage. In 10 fields infested