Outstanding rices selected from 100 varieties tested for tolerance for high level of salt (17.5 mmho/cm at 25°C) at the seedling stage. RRS, Chinsurah, West Bengal, India.

Variety	Treatment[a]	Root				Shoot			
		Length (cm)	Fresh wt (mg)	Dry wt (mg)	Water content (mg)	Length (cm)	Fresh wt (mg)	Dry wt (mg)	Water content (mg)
Patnai 23	N	16.6	215.0	19.0	196.0	14.4	172.5	27.0	145.5
	S	7.7	85.0	8.5	76.5	4.3	100.0	14.0	86.0
Dheral	N	23.6	103.7	28.3	75.5	25.7	211.3	64.3	147.0
	S	9.0	41.3	13.5	27.7	8.4	129.2	48.0	71.2
TN(I)	N	13.9	212.5	26.3	186.2	9.5	110.0	32.3	78.0
	S	2.2	6.5	3.0	33.4	0.6	12.5	4.3	7.2
IR8	N	15.5	231.7	27.5	203.2	12.5	166.6	40.5	125.1
	S	5.3	42.7	9.3	33.4	1.8	69.2	12.3	46.9
BPI76	N	14.4	135.0	18.5	116.5	7.8	102.5	23.5	79.0
	S	1.6	7.5	2.5	5.0	6.0	11.0	3.5	7.5
Marichsail	N	13.0	147.5	24.3	123.2	17.5	252.5	59.7	192.8
	S	6.7	41.5	12.0	29.5	6.5	121.7	41.0	80.7
Getu	N	15.6	172.5	21.5	151.0	11.9	135.0	23.5	111.5
	S	15.1	95.5	11.0	84.5	8.0	92.5	15.0	77.5
Damoder	N	16.4	93.0	22.0	71.0	16.5	167.5	31.0	136.5
	S	8.3	47.5	12.0	35.3	7.1	90.0	20.0	70.0
Dasal	N	17.8	165.0	30.0	135.0	15.6	160.0	29.0	131.0
	S	7.3	67.5	14.5	53.0	7.1	147.5	18.0	129.0
Dholabokra	N	21.6	217.5	26.5	191.0	22.4	252.5	48.5	204.0
	S	5.6	108.5	15.5	93.0	18.8	145.0	37.0	108.0
Hamilton	N	25.2	220.0	24.0	196.0	22.5	405.0	46.0	359.0
	S	15.9	197.5	13.0	184.5	13.7	215.0	37.5	177.5
SR 26 B	N	15.5	216.5	19.5	197.0	19.1	222.5	47.5	175.0
	S	6.5	100.0	10.0	90.0	6.6	135.0	20.0	115.0

[a] N = normal water, S = saline water.

dry weight, closely followed by Hamilton and Dholabokra. Dholabokra had the maximum value for root dry weight.

Among the high yielding varieties, IR8 performed best. TN1 gave minimum values for most of the characteristics.

Hamilton was highly salt tolerant and BPI 76 was the least. Hamilton performed best on most of the characteristics. Because salinity appears to affect the rice plant most adversely at the seedling stage, this greenhouse technique can be profitably used to select salt-tolerant varieties. ■

GENETIC EVALUATION AND UTILIZATION

Deep water

Genetic control of submergence tolerance in rice

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The inheritance of submergence tolerance in rice was studied by analyzing the segregation pattern and estimating the genetic parameters of crosses involving the cultivars FR 13A, Kurkaruppan, Thavalu, Gods Heenati, IR36, and B2433b-Kn-10-1-1-1.

Tests for submergence tolerance were conducted under artificial conditions by submerging 10-day-old seedlings for 7 days in 30-cm water. Water temperature was kept constant at 30°C, and light intensity was maintained at 400 lux at the tray level.

Segregation analyses indicated that at least three dominant genes were involved in the control of tolerance for submergence. Two had duplicate gene action, and the third was complementary to either of the first two.

Estimation of the genetic parameters showed that additive and nonadditive gene effects were important in the inheritance of submergence tolerance. Dominance and nonallelic interactions were present in all crosses analyzed, and the nonallelic interactions were mostly of the duplicate type.

Estimates of broad sense heritability were low to moderate, indicating that a large portion of the phenotypic variance was due to nongenetic effects. ■

Response of traditional deepwater rice to nitrogen application

M. R. Khan and B. S. Vergara, International Rice Research Institute

Fertilization is a rare practice in most traditional, deepwater rice fields. Reports indicate positive nitrogen (N) response by some improved, deepwater rice lines in terms of grain yield. But such a response under variable water depths, especially in terms of uptake and utilization, is not well known.

IRRI greenhouse and field experiments indicate that high basal N in deepwater rice produces increased plant length and number of basal tillers. Those attributes are desirable in areas prone to early flooding where rapid elongation of the culm above water level is used to combat flood damage.

High basal tillers are retained in subsequent growth stages under both shallow (25-cm) and medium-deep (75-cm) water levels in a nonelongating type, such as IR42; and in deep (1 30-cm) water level in an elongating type such as Kalar Harsall. The high survival rate of basal tillers ultimately results in increased grain yields due to a higher number of panicles and spikelets per panicle (Table 1). High basal N also stimulates early nodal rooting and nodal tillering — which contributes to grain yields directly or indirectly by absorption of nutrients from floodwater — and additional panicles. This has been substantiated by production of additional nodal tillers and higher grain yields from topdressing with 40 ppm N

Table 1. Yield and yield components of Kalar Harsall at 3 levels of nitrogen under deepwater (130-em) conditions.

Yield and yield components	Nitrogen level[a] (g/pot)			CV (%)
	2	4	6	
Total grain wt (g)	13 a	25 b	30 c	10.7
Panicles (no.)	I4 a	18 ab	23 b	16.6
Spikelets (no./panicle)	51 a	73 b	68 b	12.9
Panicle wt (g)	18 a	32 b	39 c	7.3
Total dry wt (g)	109 a	175 b	213 c	3.2

[a]In a row, means followed by a common letter are not significantly different at 1% level.

Table 2. Effect of topdressing with 40 ppm nitrogen 2 weeks after treatment on Kalar Harsall grown with low nitrogen level in steel drums. IRRI, 1980.

Character	N topdressed (ppm)	
	0	40
Plant ht (cm)	280	325
Basal tillers	14	13
Nodal tillers	0	9
Total tillers	14	22
Nodal root wt (g)	3.5	11.5
Panicle wt (g)	9.6	16.8
Total dry wt (g)	76.9	146.3
Panicle number	12	18
Nitrogen (%) in		
Culm	0.28	0.51
Dead leaf sheath	0.43	0.83
Green leaf	1.28	1.83
Dead leaf	0.33	0.73
Panicle	0.90	1.79

in water when the plants were grown with low basal N (Table 2).

For profitable returns, fertilization of deepwater rice fields should be based on initial nutrient status of the soils, rainfall, onset and magnitude of floods, and the nutrient content of floodwaters. A moderate dose of basal N should equip the plant with morphophysiological features that lead to a higher survival rate and hence, increased yields in excess-water stress. ■

Varietal difference in plant length of some deepwater rices under medium-deepwater and deepwater conditions and at low and high nitrogen levels

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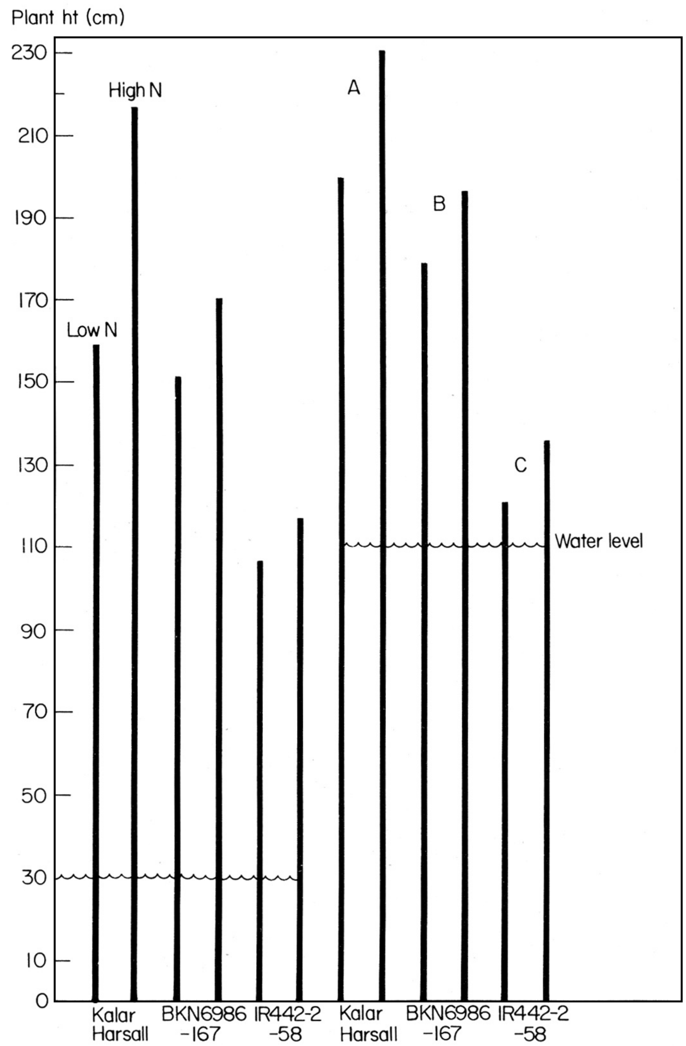
Three distinct types of phenotypic responses in terms of plant length were observed in deepwater rices of diverse origin, grown in low and high nitrogen (N) levels under medium-deep (30 cm) and deep (110 cm) water (see figure).

- Type A - a characteristic response of traditional rices (Kalar Harsall, Leb Mue Nahng 111, Chenab sel. 64-117) that elongate well above the water level at either 30 or 110 cm water depth with high N;
- Type B - characteristic of improved types (RD19, BKN6986-167, and BR223-B-38) with limited elongation ability, which tends to increase in height with high N, but not as much as Type A (the plant parts above water level of this type are optimum);
- Type C - typified by the reaction of IR442-2-58 (including B1050-Mr-18-2 and IR42) with intermediate height and very poor elongation ability, which tends to elongate only to a small degree with high N. The plant parts above water level of this type of response correspond to the optimum range (70-100 cm) under irrigated conditions. At 110-cm water depth, plants with this type of response are barely above water level (10 cm), and higher N cannot help them survive.



Variation in plant height at flowering stage due to low and high N levels at medium-deep (30 cm) and deep (110 cm) water. A = traditional tall (Kalar Harsall), B = improved (BKN6986-167), and C = modern intermediate tall (IR442-2-58).

Type A response is typical of traditional indica varieties at shallow water conditions — application of high basal N has a negative effect because plants