species were unaffected by submergence. *Cleome viscosa* L. was defoliated and died although it was only partially submerged (Table 1).

In wetland fields with 90 cm floodwater for 4 days, 6 species were unaffected. *Eclipta prostrata* (L.) L. at vegetative stage was defoliated, except for the terminal leaf. It later recovered from flooding. Submergence at flowering stage did not damage it (Table 2). □

TABLE CONTINUED

Weed species	Growth stage	Plant height (cm)	Nature of submergence	Remarks
Grasses				
Cynodon dactylon (L.) Pers.	Vegetative	10	Submerged	- do -
Echinochloa colona (L.) Link	Flowering	28	- do -	- do -
Panicum trypheron Schult.	Flowering	35	- do -	- do -
Sedge				
Cyperus rotundus L.	Flowering	18	-do-	-do-

Table 2. Effect of complete submergence in 90-cm floodwater depth for 4 days on wetland rice weeds.

Weed species	Growth stage	Plant height (cm)	Remarks
Broadleaf weeds			
Altemanthera sessilis (L.) R. Br. ex. Roth	Flowering	19	Unaffected
Ammannia baccifera L.	Vegetative	18	- do -
Caesulia axillaris Roxb.	Vegetative	25	- do -
Eclipta prostrata (L.) L.	Vegetative	20	Defoliation of all leaves except terminal leaf
E. prostrata (L.) L.	Flowering	29	Unaffected
Grasses			
Echinochloa colona (L.) Link	Flowering	65	- do -
Echinochloa crus-galli (L.) Beauv. var. *breviseta* (Doell) Nelr.	Flowering	80	- do -
Echinochloa crus-galli (L.) Beauv. var. *crus-galli*	Vegetative	57	- do -
Sedge			
Cyperus iria L.	Vegetative	45	- do -

Pest management and control NEMATODES

Nematode pests associated with deep water rice in Bangladesh

M. L. Rahman and Brian Taylor, ODA-BRRI Deepwater Rice Project, Bangladesh Rice Research Institute, Joydebpur, Dhaka, Bangladesh

Ufra disease caused by *Ditylenchus angustus* (Butler, 1913) *Filipjev,* 1936. Experiments at Matlab Bazar, Comilla, in 1980 and 1981 showed that delayed sowing or, even better, transplanting of deepwater (floating) rice reduced ufra disease incidence and produced higher yields than when standard practice was followed. In 1982, treatment with the nematicide carbofuran was tried with delayed planting. Transplanting in late Apr successfully established the crop and also reduced ufra disease incidence. Applying 1.5 kg carbofuran ai/ha further reduced the disease (see table). Larger scale testing of the technique is planned for 1983.

Disease resurgence has been monitored since its setback by the 1979 drought. In most of the known ufra areas, disease incidence has stabilized. In some areas, however, disease severity has lessened, which may be related to the adoption of deepwater rice - boro - deepwater rice cultivation.

Of 600 entries screened for ufra resistance in the deepwater tank, 85 were found highly resistant. In a pot screening test of 101 of the IRDWON II and III breeding series, 6 entries had no visible infestation and 6 had less than 10% infestation. Forty-seven entries from the 1981 screening were field tested, but disease incidence was too low for satisfactory results. Ten 1981 entries have been highly resistant in all tests.

Root-knot disease caused by *Meloidogyne graminicola (Golden & Birchfield, 1965)* Dry season populations of *M. graminicola* declined sharply 1 month after the deepwater rice harvest. Crop losses caused by rice root-knot nematode were studied in pots and in the field. Populations of 2,000 nematodes/plant caused severe stunting of root and shoot development in pots and reduced yield more than 60%. Field populations of 1,000 nematodes/kg soil caused poor plant growth and yields.

Carbofuran 3 kg ai/ha incorporated at sowing significantly reduced infestation, but did not significantly increase yields at Rajbari, Joydebpur.

Forty-one entries were screened in a preliminary pot test. Although no entries resisted infection, 5 had low infection, as judged by gall counts and microscopic examination of root tissues.

Yield and ufra disease incidence of deepwater rice under different planting and nematicide treatments.

Treatment	Yield (t/ha)	Ufra disease (incidence (%)
Broadcast seed	0.24	77.2
Broadcast seed with carbofuran	0.44	58.3
Transplanted	0.59	52.9
Transplanted with carbofuran	0.94	36.7

White tip disease caused by Aphelenchoides besseyi Christie, 1942. Deepwater rice areas were widely surveyed for white tip disease symptoms. Only one new area of infestation — Dubail, Tangail — was recorded.

The Gazaria beel at Manikganj, where the disease was a problem in 1981 was comprehensively surveyed. More than 56% of the fields were infested. In most, 5 to 10% of the rice stems showed disease symptoms. Disease incidence at flowering stage of Rajboalia was not reflected in the number of infected panicles at harvest. Nevertheless, the disease affected all yield components. □

Soil and crop management

Efficiency of different urea fertilizers in lowland rice

C. S. Khind and M.F. Kazibwe, Soils Department, Punjab Agricultural University, Ludhiana, India

Applied fertilizer nitrogen (N) efficiency in lowland rice is low. We evaluated the effect of water regime and urea fertilizers on rice dry matter yield and N uptake in the greenhouse using a completely randomized design in three replications. The soil was sandy loam (Typic Ustochrepts) with pH 8.5, EC 0.15 mmho/cm, 0.23% organic carbon, 0.04% total N, and 4.54 meq CEC/ 100 g. The N levels were 0 and 115 mg/kg. The urea materials were 3 splits of prilled urea (PUS), urea in mudball (MBU), urea supergranules (USG), sulfur-coated urea (SCU), neem cake-coated urea (NCU), and lac-coated urea (LCU). A no-nitrogen check also was planted. The water regimes consisted of continuous soil submergence with and without drainage. Drainage was maintained at a percolation rate of 5 mm/h by using pinch corks at drainage outlets.

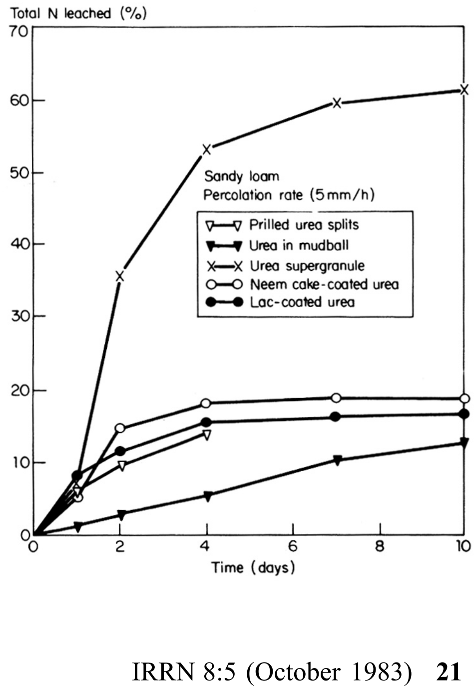
Soil samples of 8 kg each at the 15-cm depth were air-dried, ground, and treated with 26 mg P/kg and 50 mg K/kg applied as single superphosphate and muriate of potash respectively. The soil was placed in 10-liter pots, flooded, puddled, and where appropriate, treated with 115 mg N/kg. Urea materials, except PUS, were either deep-placed 5-7 cm or broadcast and incorporated 5-7 cm deep. Four 27-day-old PR106 seedlings were planted in each pot. The pots were flooded to maintain 5 cm of standing water and, where appropriate, drainage was imposed. Plants were harvested 60 d after transplanting and dry matter yields were recorded. N uptake was computed using dry matter data and Kjeldahl N in the rice plants.

Without drainage, dry matter yields and N uptake were significantly depressed

Effect of drainage and urea materials on dry matter yields and N uptake of rice plants. [a]

Urea material	Without drainage		With drainage	
	Dry matter (g/pot)	N uptake (mg/pot)	Dry matter (g/pot)	N uptake (mg/pot)
Check	9.8 a	118 a	17.2 a	262 a
Prilled urea 3 splits	37.2 c	850 cd	36.3 c	625 b
Urea in mudball	36.4 c	897 d	32.8 bc	603 b
Urea supergranule	40.3 c	910 d	21.2 a	366 a
Sulfur-coated urea	29.3 b	691 b	32.9 bc	695 b
Neem cake-coated urea	28.5 b	721 bc	29.5 b	650 b
Lac-coated urea	29.5 b	705 b	29.6 b	577 b
Interaction [b]	DU**	DU**	DU**	DU**

[a] CV for dry matter = 9.9%; CV for N uptake = 12.7%. In a column, means followed by the same letter are not significantly different at the 5% level. [b] **P = 0.01, D = drainage treatment, U = urea material.



Cumulative leaching losses of total N (urea + NH_4^+ -N) from a lowland rice soil.