Nematol. medit. (1990), *18*: 195-197.

Central Rice Research Institute – Cuttack 753 006, India

INFLUENCE OF ROOT-KNOT NEMATODE INFECTION ON RICE UNDER SIMULATED RAINFED LOWLAND CONDITIONS

by
J.S. PRASAD*, M.S. PANWAR and Y.S. RAO

Summary. The influence of *Meloidogyne graminicola* infection on rice under the simulated rainfed lowland conditions at inoculum levels 0,1 and 2 nematodes/g soil was studied. Seedling mortality was significantly higher in treatment with 2 nematodes/g soil in all the rice varieties. Plant height was reduced by 5.1 to 19% and 4.2 to 55.4% in the nematode infected plants at 5 and 15 days after submergence respectively.

The root-knot nematode, *Meloidogyne graminicola* Golden *et* Birchfield, attacks rice in upland, well-drained soils (Rao, 1985) and deepwater rice (Sukapanpotharam *et al.*, 1980; Bridge and Page, 1982; Dang-Ngoc Kinh and Huang, 1982; Rahman and Taylor, 1983). Recently this nematode was found to survive in direct seeded or transplanted rice under submerged soil conditions in India and populations increased five-fold (Prasad *et al.*, 1985). About 17 million ha of the rice crop grown in the lowland crop suffers from water-logging after germination. The influence of *M. graminicola* on a group of rice varieties suited to intermediate and waterlogged conditions was investigated in a greenhouse by introducing water after germination to simulate the field conditions.

Materials and methods

Seed of five rice varieties viz., CN 492, CR 1018, CR 1030, FR 13A and Jaladhi-I were sown at the rate of one seed per jar (75 cm tall x 30 cm dia) filled with sterilised soil to within 10 cm of the top. The soil was moistened and 10 days after germination, the seedlings were inoculated with infective second stage juveniles of *M. graminicola* at the inoculum level of 0, 1 and 2 nematodes/g soil. There were five replicates. Ten days after inoculation the plants were covered with water to 12 cm depth over the soil surface and after 15 days the water depth was brought down to 2 cm over the soil surface. At 5 and 15 days after submergence, the seedling mortality and plant height were recorded. The endoparasitic stages of the nematode were counted in the roots thirty five days after inoculation. The experiment was conducted in a greenhouse (26 ± 5°C; RH 75 ± 10%) in a randomised block design and the data collected were subjected to statistical analysis.

* Present address: Directorate of Rice Research, Rajendranagar, Hyderabad-500 030, India.

Results and discussion

Five days after submergence, mortality of seedlings in the '0' nematode treatment was significantly higher in var. FR 13A than the other varieties (Table I). No significant differences were observed amongst the varieties 15 days after submergence. At 5 days after submergence, seedling mortality was similar in both of the nematode inoculated treatments but significantly higher than the control treatment, whereas at 15 days after submergence seedling mortality was significantly higher in the treatment with 2 nematodes/g soil than the other nematode treatment and the control.

The mean plant height in the five varieties at 5 days after submergence ranged from 10.5 cm in Jaladhi-I to 18.9 cm in FR 13A. The varieties FR 13A and CN 492 were significantly taller than the other varieties (Table II). The nematode inoculum level had no significant influence on plant height. Significant reduction in plant height was observed in Jaladhi-I, CR 1030 and CR 1018 at both levels of inoculum.

At 15 days after submergence plant height was significantly less than the controls in CR 1018 (18.9 cm), Jaladhi-I (20.9 cm) and FR 13A (23.1 cm) which were similar (Table II). There was significantly greater reduction in plant height at 2 nematodes/g soil than at 1 nematode/g soil.

Observations on nematode populations 35 days after submergence revealed that the number of juveniles, adults

and adults with egg masses were significantly higher at 2 nematodes/g soil (Table III). The greatest increase of juveniles occurred in var. Jaladhi-I followed by CN 492 and CR 1030 which were similar. The highest number of adults was recorded in CR 1018, followed by Jaladhi-I and CR 1030 which were comparable. The number of egg masses in Jaladhi-I and CR 1018 were similar and higher than those on other varieties.

TABLE I - *Mortality of seedlings as influenced by* Meloidogyne graminicola *infection in submerged rice condition.*

Variety	Mortality of seedlings (angular values)					
	5 days after submergence			15 days after submergence		
	Control	1 nematode/g soil	2 nematodes/g soil	Control	1 nematode/g soil	2 nematodes/g soil
Jaladhi-I	28.1 (20)	39.2 (40)	39.1 (40)	32.7 (30)	44.3 (50)	51.0 (60)
CR 1030	39.1 (40)	39.1 (40)	44.9 (50)	39.2 (40)	39.1 (40)	50.8 (60)
CR 1018	39.2 (40)	39.2 (40)	45.1 (50)	39.2 (40)	39.2 (40)	45.0 (50)
FR 13A	45.9 (50)	50.8 (60)	51.1 (60)	39.0 (40)	39.0 (40)	51.0 (60)
CN 492	39.2 (40)	38.8 (40)	44.4 (50)	39.2 (40)	39.2 (40)	45.0 (50)
Mean	38.1	41.5	45.1	37.9	40.3	48.6
CD at 5%						
Varieties		7.03			N.S.	
Treatments		5.45			4.82	
Interaction		N.S.			N.S.	

Figures in parenthesis indicate the percentage mortality of seedlings.

TABLE II - *Influence of* M. graminicola *infection on plant height (cm) of submerged rice varieties.*

Variety	5 days after submergence			15 days after submergence		
	Control	1 nematode/g soil	2 nematodes/g soil	Control	1 nematode/g soil	2 nematodes/g soil
Jaladhi-I	15.8	8.1 (48.73)	7.8 (50.63)	29.8	19.9 (33.22)	13.3 (55.37)
CR 1030	21.7	12.3 (43.32)	11.4 (47.47)	33.7	32.3 (4.15)	14.7 (26.71)
CR 1018	13.7	12.5 (8.76)	13.0 (5.11)	25.3	17.9 (29.25)	13.6 (46.25)
FR 13A	22.4	19.0 (15.18)	15.5 (30.8)	26.4	19.9 (24.62)	23.3 (11.74)
CN 492	19.1	13.4	12.8	29.6	23.9	17.8
CD at 5%						
Inoculum levels		2.9			3.3	
Varieties		3.7			4.2	
Interaction		6.5			7.3	

Figures in parenthesis indicate percentage reduction with respect to the control.

TABLE III - *Reproduction of* M. graminicola *in some submerged rice varieties.*

Variety	Nematode population in each root system 35 days after inoculation					
	Juveniles		Adults		Adults with egg masses	
	1 nematode/g soil	2 nematodes/g soil	1 nematode/g soil	2 nematodes/g soil	1 nematode/g soil	2 nematodes/g soil
Jaladhi-I	78	164	60	135	54	140
CR 1030	72	133	52	142	49	128
CR 1018	55	134	64	150	60	137
FR 13A	48	133	44	125	46	131
CN 492	59	142	49	135	50	135
CD at 5%						
Inoculum levels		2.9		2.9		3.9
Varieties		4.7		4.6		6.3
Interaction		6.7		6.5		8.8

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Accepted for publication on 13 July 1990.