J Indian Bot Soc 66 143 -145

# Physiological changes in Some Rice Varieties due to Lance nematode

## B.N. Routaray & S. N. Das

Department of Nematology, Orissa University of Agriculture & Fechnology, Bhubaneswar-751 003.

(Accepted. December, 1985)

Distinct changes were observed in the growth characteristics of some rice varieties (Oryza sativa) due to infestation of lance nematodes (Hoplolaimus indicus) under semisterile pot culture condition. The variety Annapurna was most severely affected in respect of plant height followed by Rajeswari Kumar Hema and Jaya. Maximum shortening in flowering time was noticed in Kumar closely followed by Annapurna, Rajeswari, Jaya and Hema. Maximum decrease in crude-protein content of grains was found in variety Heam and other varieties in descending order were Annapurna, Rajeswari, Jaya and Kumar.

Although the lance nematodes are associated with rice (*Steiner*, 1934; Atkins *et al.*, 1955; Israel *et al.*, 1965; Rao, 1970) their pathogenic effects recognized only in recent years (Ramana & Rao, 1978; Rao *et al.* 1978). In this connection five exotic as well as high yielding varieties of rice were exposed to artificial infestations of a commonly occurring lance nematode species (Hoplolaimus indicus Sher, 1963) so as to obtain additional information on host-parasite interactions, particularly relating to plant height, flowering time and 'crude-protein content of grains.

MATERIALS & METHODS-Therice seedlings of cultivars Annapurna, Hema, Kumar, Rajeswari and Jaya were raised in an autoclaved soil previously dressing the seeds with Agrosan G.N. (1:300 w/w). The experimental soil was collected from the green house area of Central Research Farm of the university and drenched with aqueous formaldehyde solution cm x 20 cm) were surface sterilised with formaldehyde solution and each pot was filled with 5 kg of nematode free soil. The test nematode species were wet-screened from rhizosphere soil obtained from a cotton field following Cobb's sieving technique and improved Baermann funnel method. The namatodes were further isolated by hand-picking and were kept in clean test tubes containing a few ml of water. They were surface sterilised by holding in the aqueous solution of mercurochrome (1%) for 1 h followed by three washings and centrifugation in sterile water. The experiment was conducted in randomised design having two treatments for each variety: (1) control or no nematode (only 15 ml of distilled water was used during inoculation), (2) 1000 surface sterilised nematodes obtained by hand picking from the nematode suspension and were kept separately for inoculation in the sterilised specimen tubes containing 15 ml of distilled water, based on the findings of Ramana & Das (1969) and Das et al (1970). Each experiment

#### (1:10, v/v) for denematization. Thirty cement pots (20

## was replicated.

After soaking the pot soil in water, a hole of 3 cm depth was made with the help of a clean glass rod (1 cm dia) at the centre of each pot. Depending upon the treatment allocation, the test nematodes were released into the holes and 28 day old healthy seedlings were transplanted at the rate of 3 per pot. Watering, intercultural operations, and plant protection measures etc were taken up as and when necessary. Annapurna was the most affected one. Both ragi (Ramana & Das,1969) and sugarcane (Das *et al* 1970) wedre asserted by this nematode. Reduction in height of rice plant due to *H.indicus* infestation has been reported by Birat (1965); Banarji & Banarji (1966).

**B.** Flowering time: The maximum reduction in flowering time was recorded in the cultivar Kumar and there was no significant difference in flowering

Rice varieties	Average percentage of reduction in		
	Plant height	Flowering time	Crude-Protein content
Annapuma	21.4	3.80	1.44
	(27.5)*	(11.2)	(6.9)
Hema	16.0	0.93	1.55
	(23.6)	(5.6)	(7.1)
Kumar	16.6	3.90	0.27
	(24.1)	(11.4)	(3.0)
Rajeswari	20.9	1.54	1.38
	(27.2)	(7.1)	(6.8)
Jaya	11.7	0.94	1.05
	(20.0)	(5.6)	(5.9)
F'	Sig.	Sig.	Sig.
SE	0.69	0.577	0.387
CD (0.05)	1.53	1.28	0.862

Table 1. Response of some rice varieties to Hopolaimus indicus infetstation

\*Figures within parenthesis indicate corresponding angular values.

Observations were recorded on plant height at harvest, flowering time (i.e., when 50% of the tillers flowered) and crude-protein contents of grains follwing modified Kjeldahl's method (Jackson, 1973).

### **RESULTS & DISCUSSION: A. Plant height:** (1974) the flowering time of There was general stunting due to nematode infesta tion in all the varieties (Table 1). The cultivar Jaya by *Hirschmanniella oryzae*. was least affected.

time of variety Kumar and Annapurna. There was not much change in the flowering time of other varieties. Early flowering in castor due to infestation by *Rotylenchulus reniformis* was reported by Sivakumar & Seshadri (1971). However, according to Fortuner (1974) the flowering time of rice plants was delayed by 1 - 3 days in field conditions due to the infestation

#### RICE VARIETIES AND LANCE NEMATODE

infested by nematodes contained relatively lower amounts of nitrogen (Feldman et al. 1961 Mishra 1975). The total nitrogen/aminoacids/protein content of roots, infected by different nematodes was high (Safyanov & Belyacva . 1966; Ramana & Rao 1978). Excessive amounts of plant nutrients (N,K) which accumulated in the roots resulted from metabolic alterations, as the elements were mobilised to the site of infection (Bergeson, 1966).

We conclude that the translocation of nitrogen might have been disturbed, which caused a marked decline in crude-protein content in the aerial parts of the plant.

ISRAEL P, Y S RAO & Y R V J RAO 1965 Studies on nematodes of rice and rice soils-1 Oryza 1 125-127. JACKSON ML 1973 Soil Chemical Analysis Second Printing Prentice-Hall New Delhi pp 187-190. MISHRA B 1975 Effect of some soil ammendments on the intensity of root-knot development and nitrogen status of tomato plants M Sc(Ag) Thesis OUAT Bhubaneswar.

RAMANA K V & S N DAS 1969 Pathogenicity of Hoplolaimus indicus Sher, 1963 on ragi (Eleusine coracana) All India Nematology Symposium ppl. RAMANA K V & Y S RAO 1978 Evaluation of damage and yield losses due to the lance nematode (Hoplolaimus indicus Sher) in rice, Andhra Agr J 24 124-128.

#### REFERENCES

ATKINS J G M, G FIELDING & J P HOLLIS 1955 Parasitic or suspected plant parasitic nematodes found in rice soils from Texas and Louisiana Plant Dis Reptr.39 221-222.

BANARJISN&DKBANARJI 1966 Occurrence of nematodes, Hoplolaimus indicus in West Bengal Curr Sci.34 597.

BERGESON G B 1966 Mobilisation of minerals to the infected site of root-knot nematodes *Phytopathol*ogy 56 1287-1289.

BIRAT R S S 1965 New records of parasitic nematodes on rice (Oryza sativa L.) in Bihar, Sci Cult 31 494.

DAS S N, H SAHU & K V RAMANA 1970 Hostrange and pathogenicity of Hoplolaimus indicus Sher, 1963 on sugarcane with some observations on its survival in fallow soil. Indian Phytopath Soc Bull. 6 43-51.

FELDMAN A W, E P DUCHROME & R F SUIT 1961 N P and K in leaves of citrus infected with Radopholus similis Plant Dis Reptr 45 564-568. FORTUNER R 1974 Evaluation of damage caused by

RAOYS 1970 Study of the plant parasitic nematodes affecting rice production in the vicinity of Cuttack (Orissa) India (U S PL 480 Project) Final Technical Report CRRI Cuttack.

RAO Y S, K V RAMANA & N K MAHAPATRA 1978 Behaviour of nematodes in rice roots (Abstract). In International Congress of Plant Pathology (3rd) Munchen GFR.

REBOIS R V & W C JOHNSON 1973 Effect of Rotylenchulus reniformis on yield nitrogen potassium phosphorus and aminoacid content of seed of Glycine max J Nematol 5 1-6.

ROSS J P 1964 Interaction of *Heterodera glycines* and Meloidogyne incognita on soybcans Phytopathology **54** 304-307.

SAFYANOV S P & K G BELYAEVA 1966 Effect of Ditylenchus destructor on the content of Carbohydrate and nitrogenous substances in potato tubers Zoo Zh 45 1876-1877.

SIVAKUMAR C V & A R SESHADRI 1971 Pathogenicity of reniform nematode, Rotylenchulus reniformis to castor Indian J Nematol 1 227-236.

STEINER C 1934 Root-knot nematode and other nematodes attacking rice and some associated weeds Phytopathology 24 916-928.

#### Hirschmanniella oryzae, an endoparasitic nematode of irrigated rice roots Agr Trop 29 708-714.