Nematol. medit. (1984), *12*: 145-148.

Central Rice Research Institute, Cuttack 753 006, India

VERTICAL DISTRIBUTION OF *HETERODERA ORYZICOLA* IN RICE FIELDS AND INFLUENCE OF SOME EDAPHIC FACTORS AND FERTILIZER APPLICATION ON THE NEMATODE

by
A. JAYAPRAKASH and Y. S. RAO

The cyst nematode, *Heterodera oryzicola* Rao *et* Jayaprakash is a serious pathogen of upland rice in Kerala State (Rao and Jayaprakash, 1977; 1978). The vertical distribution of the nematode in the soil of fields in the vicinity of Pattambi Rice Station (Kerala State) and also the influence of edaphic factors like soil porosity, moisture and application of fertilizers on the behaviour of the pest were investigated under greenhouse conditions.

Soil samples were taken to a depth of 25 cm (plough layer) with an auger (25 × 2.5 cm diam) in four cyst nematode infested rice fields. The cores obtained, cut into 4 cm long sections, and *H. oryzicola* cysts were extracted from each and the root content noted.

Roots occurred from 6.5 to 16.5 cm and cysts of the nematode were detected to a depth of 24 cm (Fig. 1). Maximum number of cysts, at all the four locations, were at 4-12 cm depth and the population declined abruptly at lower depths. Very low cyst numbers were noted below 24 cm.

Sandy loam soil was fractioned into 9 categories on soil particle sizes and these were then blended in different proportions to give soils with porosity of 35.5 to 59.6%. Three polypots were each filled with 100 g of each grade and 30 ml water added. One seed of rice cv. Sattari was sown and when sprouts were 10 days old 100 second stage larvae of *H. oryzicola* were added to each pot. Fresh root weights and final populations were recorded 30 days later. The fresh weight of roots increased from 375 to 690 mg as soil porosity increased

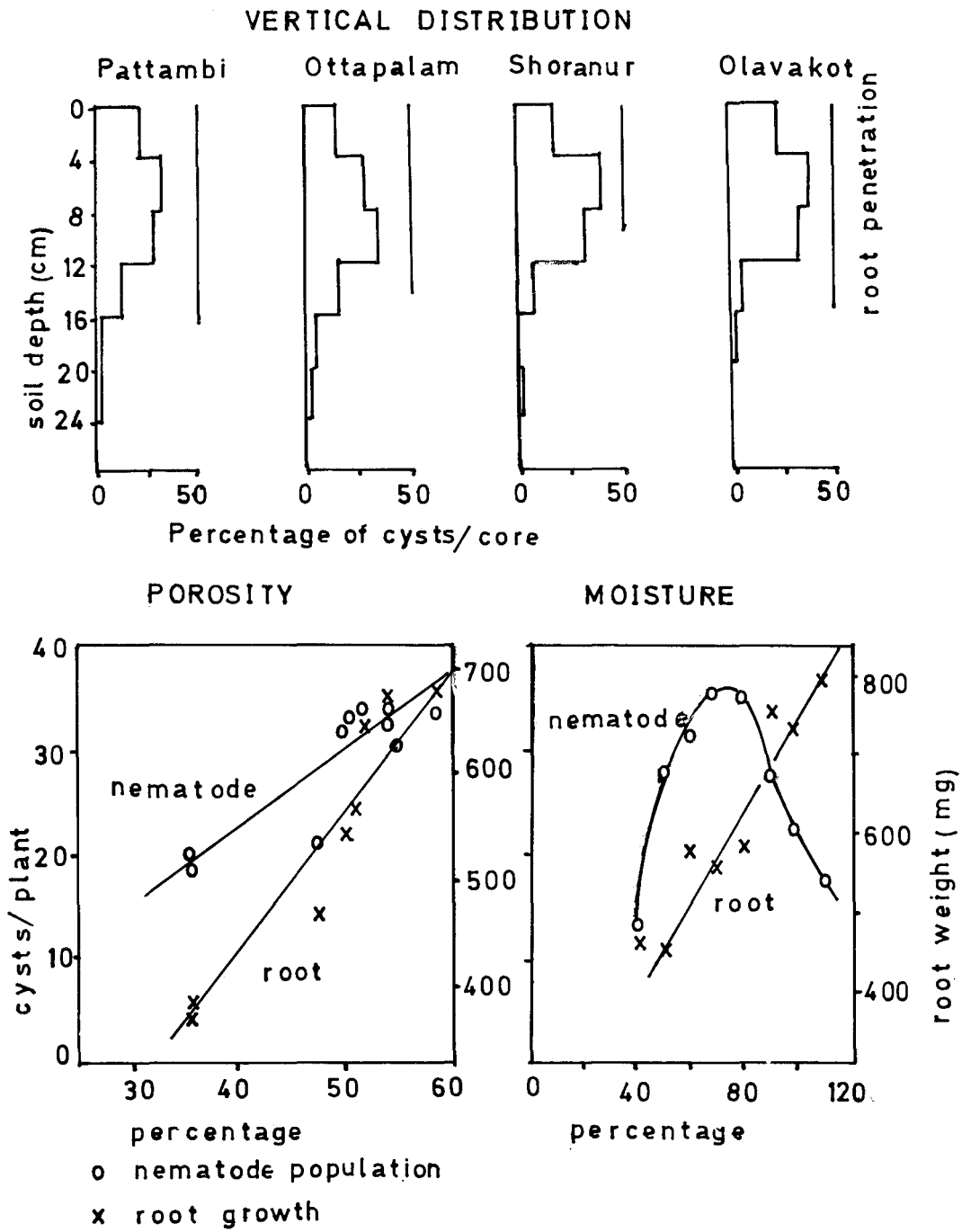

Fig. 1 - Vertical distribution of *Heterodera oryzicola* cysts in rice fields and influence of edaphic factors on nematode population and root growth.

from 35 to 60% and the total population of *H. oryzicola* cysts increased from 20 to 35 (Fig. 1).

The influence of soil moisture was investigated by filling polypots with 100 g of sandy loam soil (sand:silt:clay-78:12:10) and adjusting moisture levels 20 to 110% of field capacity by addition of water. There were 8 incremental steps of each water regime and 3 replicates of each treatment. A single seed of rice cv. Sattari was sown per pot. Water lost daily was calculated by weighing the pots and resorted by adding water. Ten days after germination, nematodes were added to the pots as above and final populations were estimated 30 days after inoculation.

The plants died at a soil moisture of less than 30% f.c. Between 40 and 110% moisture, root weight increased from 445 to 750 mg and maximum numbers of cysts were present at 60-90% moisture content (Fig. 1).

In glazed pots filled with autoclaved soil (1 kg) seeds of rice cv. Sattari were sown singly. When sprouts were 10 days old, the following 12 fertilizer treatments were introduced in 6 replicates by mixing the given fertilizers, calculated on hectare basis. Zero, 40

Table I - *Influence of fertilizer application to soils on the increase of* H. oryzicola *in rice plants (average of 6 replicates).*

Treatment fertilizer in Kg/ha	Fresh weight of roots at harvest (g)	No. of white females/cysts in roots and soils/plot
N_0	1.25 a	36 a
N_0P_4O	1.54 a	35 a
N_0K_4O	1.76 a	43 a
$N_0P_{40}K_{40}$	1.94 a	53 a
N_{40}	2.12 a	128 b
$N_{40}P_{40}$	2.22 a	125 b
$N_{40}K_{40}$	2.59 b	106 b
$N_{40}P_{40}K_{40}$	2.99 b	149 c
N_{80}	3.25 bc	150 c
$N_{80}P_{40}$	3.48 bc	153 c
$N_{80}K_{40}$	3.87 c	139 bc
$N_{80}P_{40}K_{40}$	4.32 d	197 d

Figures followed by the same letters are not statistically significant at 5 per cent levels of Duncan's multiple-range test.

and 80 kg nitrogen per ha alone and in combination with 40 kg phosphorus (P) or 40 kg potash (K) or 40 kg each of P and K. One hundred second stage larvae of *H. oryzicola* were added to each pot when plants were 25 days old. At harvest of the plants, the grain yield, root weight and nematode population were determined.

Application of N at 40 and 80 kg/ha increased cyst populations significantly over that in untreated soil or phosphorous or potassium applied at 40 kg/ha either alone or in comibnation (Table I). The combination of P and K with N at 80 kg/ha resulted in higher number of cysts than any other treatment. Fresh weight of roots also increased with corresponding increase in levels of N. Only in combination with nitrogen, P and K significantly increased root weight.

The distribution of cysts in the soil was related to the root distribution. In the tests on influence of soil porosity, the root growth had increased with the increase in soil porosity and this in turn had increased nematode activity as has been reported earlier with the cereal cyst nematode (Southy, 1956). The tests with soil moisture regimes showed 60 to 90% soil moisture were ideal and perhaps for the same reason, serious infestations of the nematode occur in upland fields and light and low infestations are reported from low and wet lands in Kerala state (Rao and Jayaprakash, 1978). High levels of fertilizers increased the root weight which was conducive to an increase in *H. oryzicola* populations.

LITERATURE CITED

RAO Y. S. and JAYAPRAKASH A., 1977 - Leaf chlorosis in rice due to root infestation by a new cyst nematode. *Intern. Rice Res. News Lett., 2*: 5.

RAO Y. S. and JAYAPRAKASH A., 1978 - *Heterodera oryzicola* n. sp. (Nematoda: Heteroderidae) a cyst nematode on rice (*Oryza sativa* L) from Kerala state, India. *Nematologica, 24*: 341-346.

SOUTHEY J. F., 1956 - National survey work for cereal root eelworm (*Heterodera major*). *Nematologica, 1*: 64-71.

Accepted for publication on 27 September 1983.