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# PATHOGENICITY OF *RADOPHOLUS SIMILIS* ON GINGER

BY

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Pathogenicity of the burrowing nematode, *Radopholus similis* on ginger was studied with five different levels of population viz. 0, 10, 100, 1000, and 10,000 nematodes per plant. In general, reduced plant growth, intensity of root lesions and rotting were directly proportional to the increase in nematode population. Significant reduction was recorded in root and rhizome weight as well as in the length of root and shoot. As high as 73.6 per cent reduction in the rhizome weight was recorded with an initial inoculum level of 10,000 nematodes over a period of six months. A negative correlation of nematode multiplication was seen with an increase in initial inoculum level. The present studies establish the potential of burrowing nematode as a pathogen of ginger crop.

Ginger is a known host of the burrowing nematode, *Radopholus similis* (Hart, 1956; Koshy & Sosamma, 1975; Butler & Vilson[illegible]975 and Vilsoni *et al.*, 1976). But no detailed investigations to determine the extent of damage have been carried out so far. The present paper deals with pathogenic effects of the burrowing nematode on ginger.

## MATERIALS AND METHODS

Ginger rhizomes, variety "Maran", weighing three gram each with a single bud were sown in August, 1977 in 60 earthen pots (18 x 17 cm) each containing 3 kg steam sterilised sandy loam soil. At three leaf stage, 20 plants of uniform growth were selected. The inoculum was collected from infested coconut roots on the C.P.C.R.I. Farm, Kayangulam according to the method described by Koshy *et al.* (1975). The run out water from the sieve was used for treating the control plants. Active larvae and gravid females were hand picked from the nematode suspension and four plants each were inoculated on or very near to the roots for 10 and 100 inoculum levels. For other levels an aliquot of 5 ml was drawn and counts were made using a stereoscopic binocular microscope. After assessing the nematode population in 1 ml, the required

quantity of nematode suspension was used to obtain 1000 and 10,000 inoculum levels. The pots were arranged in a randomised manner at a place of even light in a green house with a temperature range of 27° to 34°C and watered daily with boiled and cooled water.

Observations were recorded at the end of six months following inoculations in September, 1977. The plants were depotted carefully with intact root system and washed free of soil for observations on plant growth. Occurrence of lesions and rotting was also assessed. Nematodes from 250 g of soil from each pot were extracted by Cobb's sieving and sifting method and finally collected on a 400 mesh sieve followed by the modified Baermann's funnel method. Rhizomes and roots were separately cut into 1 to 2 cm bits, mixed thoroughly and an aliquot of three one gram samples each, of root and rhizome, were drawn, stained in boiling acid fuchsin—lactophenol for three minutes, cleared in lactophenol and churned in a waring blender for 40 seconds for nematode population estimation.

## RESULTS AND DISCUSSION

In general, *R. similis* inoculated plants were stunted with reduced vigour. Marginal and tip necrosis of leaves were noticed at the two higher inoculum levels of 1,000 and 10,000. The site of infection could easily be identified by the presence of sunken water soaked lesions. Though the effect of different inoculum levels was not statistically significant in the case of number of tillers and leaves but tillering and production of leaves was reduced by 55.0 and 63.4 per cent respectively at an initial inoculum level of 10,000 nematodes per plant.

With every increase in inoculum levels, there was a corresponding decrease in plant growth but significant only in the case of root and shoot length and root and rhizome weight. A reduction of 73.6 per cent of rhizome weight was recorded at an initial inoculum level of 10,000 namatodes per plant after a period of six months. At this stage the plants started exhibiting signs of death due to severe rotting of rhizomes and roots. It is interesting to note that even an initial inoculum level of 10 nematodes per plant caused 39.89 per cent reduction in rhizome weight with a final increase in population to 13,569. This indicates that the burrowing nematode is highly pathogenic to ginger which is a suitable host for *R. similis* multiplication. Vilsoni *et al.* (1976) reported widespread occurrence of *R. similis* in the ginger growing areas of Fiji which was abandoned by the banana industries because of the decline problem caused by the burrowing nematode. As high as 50 per cent field incidence with corresponding yield reduction was reported.

TABLE I

*Effect of different inoculum levels of* R. similis *on growth of ginger and population build up (av. of 4 replications)*

| Inoculum levels | No. of tillers | No. of leaves | Shoot length (cm) | Shoot weight (g) | Root length (cm) | Root weight (g) | Rhizome weight (g) | Total nematode population (Soil + Root + Rhizome) | Multiplication factor |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 3.00 | 38.25 | 56.25 | 25.00 | 29.25 | 17.75 | 44.50 | 0 | 0.0 |
| 10 | 3.00 (0.0)+ | 33.00 (13.73) | 46.00 (18.22) | 14.25 (43.00) | 24.00 (17.95) | 7.75 (56.34) | 26.75 (39.89) | 13,569 | 1,356.9 |
| 100 | 2.25 (25.00) | 25.25 (33.99) | 42.50 (24.44) | 13.00 (48.00) | 23.35 (20.51) | 8.00 (54.93) | 25.75 (42.13) | 18,711 | 187.1 |
| 1000 | 2.00 (33.33) | 21.50 (43.79) | 39.25 (30.22) | 12.50 (50.00) | 13.75 (52.99) | 4.50 (74.65) | 18.75 (57.87) | 34,780 | 34.7 |
| 10000 | 1.50 (50.00) | 14.00 (63.40) | 34.25 (39.11) | 5.75 (77.00) | 11.25 (61.54) | 3.00 (83.10) | 11.75 (73.60) | 39,006 | 3.9 |
| Gen. Mean | 2.55 | 26.40 | 43.65 | 14.10 | 20.30 | 8.20 | 25.50 | 21,213 | — |
| S. E. | 0.91 | 15.46 | 8.20 | 10.00 | 6.74 | 5.33 | 10.95 | 7,578.32 | — |
| C. D. | — | — | 12.64* | — | 10.37* | 8.21* | 16.87* | 16,37077** | |

+Figures in parentheses are the percentage reduction over control.

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A negative correlation was observed between initial and final population levels. Such relationships have been established with *R. similis* on turmeric (Sosamma *et. al.*, 1979). Sosamma *et al.* (1979) reported on the pathogenicity of the same coconut isolate of *R. similis* on turmeric where an initial inoculum level of 10,000 nematodes per plant caused 55.0 per cent reduction in rhizome weight after a period of eight months as against 73.6 per cent reduction after a period of six months in the present study. This shows that *R. similis* is more pathogenic to ginger than to turmeric. Intercropping *R. similis* infested coconut gardens with ginger and turmeric is likely to cause severe economic loss.

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