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PATHOGENICITY OF RADOPHOLUS SIMILIS ON ARECA CATECHU

P. K. KOSHY AND P. SUNDARARAJU

Nematology Laboratory, Central Plantation Crops Research Institute, Regional Station, Kayangulam, Krishnapuram 690 533, *Kerala, India*

ABSTRACT : Pathogenicity of the burrowing nematode, *Radopholus similis*, on arecanut seedlings was studied at five population levels (0, 10, 100, 1000 and 10,000 nematodes per plant), replicated five times, under pot conditions. In general, reduced plant growth and intensity of root lesions and rotting was directly proportional to increase in nematode population. Significant reduction was recorded in shoot and root length and weight, number of leaves and collar girth of inoculated plants compared to uninoculated ones. The nematode appears to be an important potential pathogen of arecanut.

Keywords : Burrowing nematode, Radopholus similis

The burrowing nematode, *Radopholus similis* (Cobb, 1893) Thorne, 1949 was reported from the root zone of arecanut by Kumar *et al.* (1971). Later Koshy *et al.* (1975 and 1976) reported lesions and rotting of arecanut roots. But no detailed investigations have been carried out to determine the extent of damage to the roots. Therefore, the present investigations were initiated to study the pathogenic effects of the burrowing nematode on arecanut.

MATERIALS AND METHODS : Twenty five cement pots (75 cm) were pressed into soil leaving the top 6" above the soil surface in a randomised manner at 3' intervals in the field at Central Plantation Crops Research Institute (CPCRI), Research Centre, Palode. Each pot was filled with 80 kg of laterite soil and treated with DBCP at the rate of 60 l ai/ha. After two months, one year old seedlings of arecanut var. South Kanara were planted in September, 1977. A thick growth of cover crop, *Pueraria javanica*, reduced the heat and soil splashings. During summer months, normal shade and watering was resorted to.

The nematode inoculum was collected from infested arecanut roots on the CPRCI Farm, Palode according to the method described by Koshy *et al.* (1975). The nematode suspension collected on 400 mesh sieve was placed on double layer tissue paper supported by an aluminium wire gauze on a petridish containing water to obtain active nematodes. The run out water free of nematodes or eggs, from the four hundred mesh sieve was used for treating the control plants. A logarithmic series of inoculum (0, 10, 100, 1000 and 10,000) was used for inoculating plants on or very near to the roots in December, 1977 with five replications. For treatments using 10 and 100 nematodes, active females and larvae were hand picked. Observations on plant growth characters were recorded after every six months.

After three years of inoculations, plants were depotted and plant growth characters were recorded along with visual observations of lesions and rotting of roots on a 1-6 scale (1 = no infection, 2 = small, elongate lesions on white roots with necrotic root tips, 3 = prominent lesions of dark brown to black with necrotic root tips, 4 = coalescing lesions with necrotic root tips, 5 = partial decay of roots with necrotic root tips and 6 = Severe decay of roots with necrotic root tips).

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After indexing, roots were cut into small pieces, mixed thoroughly and three aliquots of 10 g each were collected from each seedling, stained in boiling acid fuschin lactophenol for three minutes, cleared and churned for 40 seconds using a Waring blender for population assessment. The total root population was computed with an average per ml population. Nematodes from 250 g soil from each pot was extracted by Cobb's sieving method followed by the modified Baermann's funnel method.

RESULTS AND DISCUSSION : The inoculated plants exhibited general yellowing with visible reduction in growth and vigour compared to control plants after one year. Considering the perennial nature of the crop and the massive root system, the size of the pot (75 cm) and three years duration of the experiment was less than the optimum. But it was decided to terminate the experiment since the plants were getting pot bound. Even with this limitation, reduction in plant growth was obtained at 1000 and 10,000 levels (50 per cent or more), thus indicating the nematode's potential as a pathogen of arecanut. The root system of all inoculated plants showed lesions, root rotting, blackening of root tips and reduction in number of lateral roots (Table 2). As a result, there was significant reduction in the volume and weight of the root system which ultimately resulted in poor growth of plants. The analysis of the final data revealed that with every increase in nematode inoculum there was a corresponding decrease in plant growth and a positive correlation was recorded with damage to root system. An initial inoculum level of 10,000 nematodes per seedling contained in 80 kg of soil caused growth reduction at the rate of 30.1, 52.9, 30.6, 56.6, 30.6 and 41.1 per cent with respect to shoot length, shoot weight, root length, root weight, number of leaves and collar girth whereas an initial inoculum level of 10 nematodes reduced the growth to 15.2, 11.8, 3.6, 20.0, 15.3 and 8.6 per cent with respect to shoot length, shoot weight, root length, root weight, number of leaves and collar girth (Table 1). The wide spread occurrence of *R. similis* in the major arecanut growing tracts of South India (Koshy *et al.* 1976 and 1978) suggests the possibility of the

TABLE 1 : Growth of arecanut c.v. South Kanara at different inoculum levels of *Radopholus similis*

(av. of 5 replications)

Inoculum levels	Shoot		Root		Number of leaves	Collar girth (mm)
	length (cm)	weight (gm)	length (cm)	weight (gm)		
0	225.80	2520.00	101.20	972.00	14.40	28.20
10	191.60 (15.15)*	2224.00 (11.75)	97.60 (3.56)	778.00 (19.96)	12.20 (15.28)	25.80 (8.51)
100	174.40 (22.76)	1542.00 (38.81)	81.60 (19.37)	602.00 (38.07)	13.20 (8.33)	21.20 (24.82)
1000	161.00 (28.70)	1250.00 (50.40)	69.60 (31.23)	456.00 (53.09)	11.80 (18.06)	18.40 (34.75)
10,000	157.80 (30.12)	1188.00 (52.86)	70.20 (30.63)	422.00 (56.58)	10.00 (30.56)	16.60 (41.13)
Gen. Mean	182.12	1744.80	84.04	646.00	12.32	22.04
S. E.	25.28	501.22	14.27	211.70	2.05	4.13
C. D. 1%	46.71	925.96	26.38	391.09	N. S.	7.62
C. D. 5%					2.76	

*Figures in parenthesis are percentage reduction over control.

nematode acting as a limiting factor in arecanut production. Intercropping arecanut gardens with banana, ginger and turmeric which are reported to be good hosts of *R. similis* (Sundararaju *et al.* 1979 and Sosamma *et al.* 1979) specially under irrigated condition (Koshy *et al.* 1975 and 1976) is likely to aggravate the situation further, causing considerable yield reduction of the main and intercrops. Though there was reduced multiplication of nematodes at higher inoculum levels, a positive correlation was recorded with damage to root system.

TABLE 2 : Host infestation and multiplication of *Radopholus similis* at different inoculum levels on arecanut c.v. South Kanara

Treatments	Root lesion index	(Av. of 5 replications) Nematode population			
		Soil	Root	Total	No. of times multiplied
10	2.40	652.0	48,520.0	49,172.0	4917.20
(1.0)	(0.3802)	(2.8142)	(4.6859)	(4.6917)	
100	4.00	537.0	175,570.0	1,76,107.0	1761.07
(2.0)	(0.6021)	(2.7300)	(5.2445)	(5.2458)	
1000	4.80	5072.0	198,110.0	2,03,182.0	203.18
(3.0)	(0.6812)	3.7052)	(5.2969)	(5.3079)	
10,000	5.20	392.0	152,530.0	1,52,922.0	15.29
(4.0)	(0.7160)	(2.5933)	(5.1834)	(5.1845)	
SEm	1.06	4,451.46	70,700.87	70,785.59	
Significance	**	NS	*	*	
C. D. at 5%	—	—	97,434.34	97,551.08	
C. D. at 1%	1.75	—	—	—	

NS : Not significant

*Significant at P = 0.05

**Significant at P = 0.01

Regression equations :

Root lesion index $Y = -0.3232 + 0.1087 \times (R^1 = 0.8647)$

Soil $Y = 2.8826 - 0.0312 \times (R^1 = 0.0064)$

Root $Y = 4.7165 + 0.1545 \times (R^2 = 0.5013)$

Total multiplication $Y = -4.7224 + 0.1540 \times (R^2 = 0.5013)$

(Figures in parentheses are log transformed values)

REFERENCES

Koshy, P. K., V. K. Sosamma and C. P. R. Nair (1975). Preliminary studies on *Radopholus similis* (Cobb, 1893) Thorne, 1949 infesting coconut and arecanut palms in South India. *Indian J. Nematol.* **5** : 26-36.

Koshy, P. K., V. K. Sosamma and P. Sundararaju (1976). Yellow leaf disease : Nematological studies. *Arecanut and Spices Bull.* **8** : 37-41.

Koshy, P. K., P. Sundararaju and V. K. Sosamma (1978). Occurrence and distribution of *Radopholus similis* (Cobb, 1893) Thorne, 1949 in South India. *Indian J. Nematol.* **8** : 49-58.

Kumar, A. C., P. R. Kasi Viswanathan and G. I. D'Souza (1971). A study on plant parasitic nematodes of certain commercial crops in coffee tracts of South India. *Indian Coffee* **36** : 1-3.

Sosamma, V. K., P. Sundararaju and P. K. Koshy (1979). Effect of *Radopholus similis* on turmeric. *Indian J. Nematol.* **9** : 27-31.

Sundararaju, P., V. K. Sosamma and P. K. Koshy (1979). Pathogenicity of *Radopholus similis* on ginger. *Indian J. Nematol.* **9** : 91-94.