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Endoparasitic Nematodes Infecting Roots of Black Pepper (*Piper nigrum*) in Two Districts of Karnataka, India[1]

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Black pepper (*Piper nigrum* L.), one of the important foreign exchange earning crops, is grown mostly in Kerala and Karnataka in South India. *Radopholus similis* (Cobb) Thorne, *Meloidogyne incognita* (Kofoid and White) Chitwood, and *Trophotylenchulus piperis* Mohandas, Ramana and Raski, are the three endoparasitic nematode species reported to infect the roots of black pepper in Kerala (Ramana & Mohandas, 1987).

Ramana *et al.* (1987) reported a positive correlation between the population levels of *R. similis* (>250 nematodes/gram of roots) and the incidence of slow wilt (slow decline) of black pepper in Kerala. This disease is a major constraint in the production of black pepper in India. No information on the nematode fauna and their population densities in the roots of black pepper in Karnataka was available. Therefore, a survey was conducted during 1985 and 1986 to identify endoparasitic nematodes infecting the roots of black pepper in Uttara Kannada and Dakshina Kannada, the two major pepper growing districts in Karnataka. A total of 78 root samples from 40 gardens (24 in Uttara Kannada and 16 in Dakshina Kannada) were collected and analyzed for endoparasitic nematodes.

Radopholus similis, *M. incognita*, and *T. piperis* were recorded in the roots (Table 1). The occurrence of *T. piperis* on black pepper in Karnataka is reported for the first time. Among the three nematode species, *M. incognita* was most widely distributed, occurring in 73% of the gardens surveyed and in 54% of the root samples examined. The next important nematode species in its occurrence was *R. similis* which was found in 65% of the gardens and in 46% of the root samples. The occurrence of *T. piperis* was low (recorded in 18% of gardens and in 10% of root samples) compared to the occurrence of *M. incognita* and *R. similis*. In general, the occurrence of these nematode species was low in Uttara Kannada compared to that in Dakshina Kannada.

Infection by *M. incognita* alone was maximum (28%) compared to that by *R. similis* alone (18%) (Table 2). None of the root samples were infected with *T. piperis* only. Further, the concomitant infection by *R. similis* and *M. incognita* was high (19%) compared to that for *R. similis* with *T. piperis* (4%). Other combination rates were: *M. incognita* with *T. piperis* = 1%; all three nematode species = 5%.

The occurrence of different population levels of the three nematode species in the roots is given in Table 3. More than 25% of the root samples yielded high numbers of *M. incognita* (>1000 nematodes/gram of roots) and *R. similis* (>250 nematodes/gram of roots), indicating the gravity of the nematode problem on black pepper in Karnataka. Among the two districts of Karnataka, the nematode incidence was high in Dakshina Kannada where ca. 46% of the root samples showed high population of *R. similis* and *M. incognita*.

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References

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Table 1. Occurrence of plant-parasitic nematodes in the roots of black pepper in Karnataka, India.

Nematode	Uttara Kannada		Dakshina Kannada		Total	
	No. gardens/ 24 †	No. samples/ 48 ‡	No. gardens/ 16 †	No. samples/ 30 ‡	No. gardens/ 40 †	No. samples/ 78 ‡
Meloidogyne incognita	15(63)	20(42)	14(88)	22(73)	29(73)	42(54)
Radopholus similis	14(58)	19(40)	12(75)	17(57)	26(65)	36(46)
Trophotylenchulus piperis	3(13)	3 (6)	4(25)	5(17)	7(18)	8(10)

† No. of gardens surveyed; figures in parentheses are percentages.
‡ No. of root samples examined.

Table 2. Frequency of occurrence of three nematode species in the roots of black pepper in Karnataka.

Nematode	Frequency of occurrence		
	Uttara Kannada 48 †	Dakshina Kannada 30 †	Total 78 †
MI alone ‡	13(27)	9(30)	22(28)
RS alone	11(23)	3(10)	14(18)
TP	0	0	0
MI + RS	5(10)	10(33)	15(19)
MI + TP	0	1(3)	1(1)
RS + TP	1(2)	2(7)	3(4)
MI + RS + TP	2(4)	2(7)	4(5)
None	16(33)	3(10)	19(24)

†No. root samples examined; figures in parentheses are percentages.
‡MI = *Meloidogyne incognita*; RS = *Radopholus similis*; TP = *Trophotylenchulus piperis*.

Table 3. Occurrence of different population levels of two nematode species in the roots of black pepper in Karnataka.

District/ samples examined	No. of samples which yielded different population of †					
	Meloidogyne incognita			*Radopholus similis*		
	0	Low	High	0	Low	High
Uttara Kannada/48	28 (58) ‡	11 (23)	9 (19)	29 (60)	13 (27)	6 (13)
Dakshina Kannada/30	8 (27)	8 (27)	14 (47)	13 (43)	3 (10)	14 (47)
Total/78	36 (46)	19 (24)	23 (30)	42 (54)	16 (21)	20 (26)

† 0 = No nematodes; Low = <1000 nematodes/g of roots for *M. incognita*, or <250/g of roots for *R. similis*; High = >1000 nematodes/g of roots for *M. incognita*; or >250/g of roots for *R. similis*.
‡ Figures in parentheses are percentages.