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CONTROL OF ROOT-KNOT NEMATODE BY BARE-ROOT DIP IN UNDECOMPOSED AND DECOMPOSED EXTRACTS OF NEEM CAKE AND LEAF

by
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Summary. Both decomposed and undecomposed extracts of neem cake and leaves as bare-root dip treatment caused significant reduction in root-knot development of pre-infected tomato seedlings as well as those inoculated with 2nd stage juveniles of *Meloidogyne incognita* after dip treatment. Inhibition in root-knot development was, however, more pronounced in preinfected seedlings than in seedlings inoculated after dip treatment. Decomposed extracts were comparatively more effective than undecomposed extracts and oil cake extracts more effective than leaf extracts.

The addition of waste materials from animal and plant origin to soil has been recognized as an alternative means of nematode control. These materials include agricultural wastes in the form of green manures and dried-crop residues (Akhtar and Alam, 1990a, 1992) in general, and industrial by-products such as oil cakes of neem and castor (Akhtar and Alam, 1991) in particular. We investigated whether bare-root dip in oil-cake and leaf extracts of neem could be of value in controlling root-knot nematodes on tomato.

Materials and methods

Twenty five g powdered neem cake were dissolved in 100 ml distilled water and allowed to decompose in a beaker for 15 days at 20±2 °C after which the suspension was filtered. Similarly suspension (extract) from decomposed and undecomposed neem leaves were obtained by macerating 25 g leaves in 100 ml distilled water. All these extracts were designated 'S'. Further dilutions, viz., S/2, S/10 were also prepared by adding distilled water.

Two-week-old seedlings of *Meloidogyne incognita* susceptible tomato (*Lycopersicon esculentum* Mill.) cv. 'Pusa Ruby' were transplanted singly to small clay pots (5 cm-diam.) containing sterilized soil-manure mixture to which 1000 freshly-hatched 2nd stage juveniles (J_2) of root-knot nematode *Meloidogyne incognita* (Kofoid *et* White) Chitw. were added. Some plants were left uninoculated. After a further week all of the seedlings were removed from the pots and dipped in the various extracts (Table I) for 30 minutes. They were then transplanted into 15 cm diam. clay pots containing 1 kg sterilized soil-manure mixture and the non-infected seedlings were inoculated with 1000 J_2. Non-infected and non-inoculated seedlings served as control. There were five replicates for each treatment. Three months after inoculation, the plants were carefully uprooted and washed. Plant growth was measured (fresh weight of shoot and root) and the extent of root-galling were determined on a 0-5 scale (Sasser *et al.*, 1984).

Results and discussion

Prophylactic as well as therapeutic use of water extracts of neem significantly inhibited root-knot development on the susceptible tomato plants (Table II) which decreased significantly with the increase in concentration of extracts of oil cake and leaves. However, decomposed extracts were more effective than undecomposed extracts. Oil cake extract gave relatively better results than leaf extract. Enhanced plant growth with increase in concentration of the extracts was correlated with the degree of control of the nematode.

There was increased inhibition of root-knot development in pre-infected plants compared with plants which

TABLE I - *Effect of bare-root dip of healthy tomato cv. 'Pusa Ruby' seedlings in neem extracts on root-knot development and plant growth after inoculation with* Meloidogyne incognita.

Treatment			Oil cake extract				Leaf extract			
Inoculation	Condition of extracts	Conc. of extracts	Weight (g)			Root-knot index (0-5 scale)	Weight (g)			Root-knot index (0-5 scale)
			Shoot	Root	Total		Shoot	Root	Total	
Inoculated	Undecomposed	S	29.0	17.6	46.6	2.6	24.3	10.2	34.5	2.5
"	"	S/2	27.3	12.2	40.5	2.8	20.9	8.4	29.3	3.0
"	"	S/10	21.9	10.3	32.2	3.0	10.5	8.0	26.5	3.5
"	Decomposed	S	34.6	17.6	52.2	2.0	30.1	16.3	46.4	2.3
"	"	S/2	25.3	14.9	40.2	2.5	27.7	12.2	39.9	2.5
"	"	S/10	15.3	8.1	23.4	3.0	26.4	11.2	37.6	3.0
"	Undipped	–	9.3	4.9	14.2	5.0	9.3	4.9	14.2	5.0
Uninoculated	Undipped	–	39.2	21.1	60.3	–	39.2	21.1	60.3	–
C.D. (P=0.05)					4.62	0.22			4.77	0.50
C.D. (P=0.01)					6.50	0.29			6.49	0.67

TABLE II - *Effect of bare-root dip of previously infected with* M. incognita *tomato cv. 'Pusa Ruby' seedlings in neem extracts on root-knot development and plant growth.*

Treatment			Oil cake extract				Leaf extract			
Infection	Condition of extracts	Conc. of extracts	Weight (g)			Root-knot index (0-05 scale)	Weight (g)			Root-knot index (0-05 scale)
			Shoot	Root	Total		Shoot	Root	Total	
Infected	Undecomposed	S	30.5	15.6	46.1	2.5	23.2	10.9	34.1	2.7
"	"	S/2	26.6	11.9	38.5	3.0	20.5	9.9	30.4	3.2
"	"	S/10	23.4	10.5	33.9	3.2	19.4	8.3	27.7	3.5
"	Decomposed	S	32/4	16.1	48.5	2.2	29.2	15.7	44.9	2.5
"	"	S/2	28.7	12.5	41.2	2.5	26.6	15.2	41.8	3.0
"	"	S/10	24.2	13.9	38.1	3.0	20.4	12.9	33.3	3.7
"	Undipped	–	17.0	8.4	23.4	5.0	17.0	8.4	23.4	5.0
Uninfected	Undipped	–	40.3	21.9	62.2	–	40.3	21.9	62.2	–
C.D. (P=0.05)					6.29	0.62			8.68	0.81
C.D. (P=0.01)					9.06	0.85			12.49	1.04

were inoculated after root-dip treatment indicating that the chemicals absorbed by roots had acted against the nematodes already present in the roots. Where nematodes were added after treatment, the potential of the chemicals might have diminished to some extent by the time the nematodes had established an effective host-parasitic relationship.

The water extracts of neem oil cake and leaves rendered the root of a susceptible plant highly unfavourable to *M. incognita*. Similar results have been noted by Akhtar and Alam (1990b, 1993) with bare-root dip of tomato in plant-product extracts. However, our results have confirmed and extended their findings in case of previously infected seedlings. Thus our study has given more relevance in the control of root-knot nematodes because farmers normally raise seedlings in field soil and these seedlings often become infected with the nematode. Moreover, it was also found that decomposition extracts are more

beneficial than undecomposed extracts. Therefore, it appears that more effective chemicals are released during the course of decomposition and these are absorbed by plant roots.

The reduction in root-knot development due to root-dip treatment could be attributed to the unfavourable conditions in the roots causing poor penetration and later retardation in biological activities such as feeding and/or reproduction of root-knot nematode.

Since the use of oil cake as soil amendments involves considerable expenditure to farmers, our results indicate the possibility of reducing the cost of application.

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