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CONTROL OF ROOT-KNOT, RENIFORM AND STUNT NEMATODES BY NIMBIN SEED DRESSING

by
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Summary. The application of nimbin as seed dressing significantly reduced the root-knot development/nematode population, with a consequent improvement in plant growth at all levels of nematode inoculation on tomato, eggplant and okra attacked by *Meloidogyne incognita* and *Rotylenchulus reniformis* and on cabbage and cauliflower attacked by *Tylenchorhynchus brassicae*.

Neem (margosa), *Azadirachta indica* A. Juss., is well known for its nematicidal properties. Various plant parts and seed-cake have been used as soil amendment against nematodes. Singh *et al.* (1980) used neem cake as a seed dressing and obtained good control of root-knot nematode. Siddiqui and Alam (1988, 1989a,b) later found that azadirachtin, a triterpenoid from neem, was one of the active components of the oil-seed cake when used for seed dressing. In the present study we have examined the efficacy of another triterpenoid from neem, nimbin, as a seed treatment against the root-knot nematode, *Meloidogyne incognita* (Kofoid *et* White) Chitw., the reniform nematode, *Rotylenchulus reniformis* Linford *et* Oliveira and the stunt nematode, *Tylenchorhynchus brassicae* Siddiqi.

Materials and methods

One gram nimbin was dissolved in 10 ml of 90% alcohol and the solution was further diluted 1:100 with distilled water. Gum arabica at 5 g in 100 ml solution was added to serve as a sticker. Seeds of tomato (*Lycopersicon esculentum* Mill.) cv. 'Pusa Ruby', eggplant (*Solanum melongena* L.) cv. 'Pusa Purple Long', okra (*Abelmoschus esculentus* Moench.) cv. 'Pusa Sawani', cabbage (*Brassica oleracea capitata* L.) cv. 'Pride of India' and cauliflower (*Brassica oleracea botrytis* L.) cv. 'Maghi' were treated with the solution. The treated seeds were then air dried before sowing. Excepting okra, treated and untreated seeds were sown in pots containing autoclaved soil. Three weeks after germination, the seedlings were transplanted singly to 15 cm clay pots containing 1 kg autoclaved soil and the pots were then inoculated with different inocula of the nematodes (ee Tables). With okra, treated as well as untreated seeds were sown directly and the plants were inoculated three weeks after germination. Each treatment was replicated five times. After two months, the plants were uprooted, washed and their lengths and weights determined. For *M. incognita* — inoculated plants the root-knot index was determined on a 0-5 scale of Taylor and Sasser (Sasser *et al.*, 1984). The final soil populations of *R. reniformis* and *T. brassicae* were determined by using Cobb's sieving and decanting and modified Baermann funnel techniques (Southey, 1986).

Results and discussion

The growth of tomato, eggplant and okra was reduced by root-knot and reniform nematodes (Tables I-II) and cabbage and cauliflower by the stunt nematode (Table III). Reduction in plant growth was more pronounced with increasing inocula. The growth of plants raised from seeds treated with nimbin and inoculated with 500 or 5000 nema-todes was higher than those raised from untreated seeds and inoculated with the nematodes. There was no reduction in growth at the lowest inoculum level, i.e. 50 nematodes/plant (Tables I-III).

The results indicate that nimbin gave full protection against the test nematodes. The nematode species represent three different modes of feeding, viz., *M. incognita* is an endoparasitic species, *R. reniformis* is a semi-endoparasitic species while *T. brassicae* is an ectoparasitic species and thus nimbin has a broad spectrum of efficacy against nematodes.

Reduction in nematodes numbers and corresponding

improvement in plant growth have been obtained by seed treatment with different oil-cakes (Singh *et al.*, 1980) or with different extracts of neem and a close relative Persian lilac, *Melia azedarach* L. (Siddiqui and Alam, 1987). Triterpenoids present in the treatments may have been the active principle involved.

TABLE I - *Effect of seed treatment with nimbin on root-knot development and plant growth of tomato, eggplant and okra in soil infested by* Meloidogyne incognita.

Inoculum level	Treatment	Length (cm)		Weight (g)		Root-knot index
		Shoot	Root	Shoot	Root	
Tomato						
0	U	28	13	6.0	4.5	
	T	30	16	8.1	4.8	
50	U	27	13	5.1	4.0	0.3
	T	29	13	6.9	5.1	
500	U	22	13	4.7	3.2	1.5
	T	23	13	5.5	3.6	0.9
5000	U	19	12	4.2	2.3	5.0
	T	21	13	5.0	2.5	2.3
C. D. (P = 0.05)		0.47	0.36	0.34	0.24	0.49
C. D. (P = 0.01)		0.67	0.51	0.50	0.33	0.69
Eggplant						
0	U	25	13	14.0	8.0	
	T	27	15	14.1	9.3	
50	U	22	12	13.3	7.1	0.1
	T	26	13	16.0	9.2	
500	U	19	9	9.3	5.0	1.0
	T	22	11	10.0	5.1	0.8
5000	U	13	7	7.0	4.5	5.0
	T	14	7	7.5	6.2	2.6
C. D. (P = 0.05)		0.38	0.21	0.27	0.33	0.76
C. D. (P = 0.01)		0.57	0.31	0.39	0.49	1.08
Okra						
0	U	64	17	20.1	13.3	
	T	66	18	23.2	14.4	
50	U	61	18	19.0	12.0	0.5
	T	65	18	21.5	13.8	
500	U	51	21	16.0	11.0	1.0
	T	55	25	20.1	14.4	0.4
5000	U	38	17	12.0	4.1	5.0
	T	41	20	16.0	6.0	2.0
C. D. (P = 0.05)		0.51	0.46	0.51	0.36	0.56
C. D. (P = 0.01)		0.76	0.65	0.72	0.53	0.79

U = Untreated seed, T = Treated seed.

TABLE II - *Effect of seed treatment with nimbin on the population of* Rotylenchulus reniformis *and plant growth of tomato, eggplant and okra.*

Inoculum level	Treatment	Length (cm)		Weight (g)		Final population
		Shoot	Root	Shoot	Root	
Tomato						
	U	22	12	16.3	11.0	
	T	24	14	18.0	11.5	
50	U	21	11	15.5	10.3	110
	T	23	12	16.0	11.3	20
500	U	15	9	10.3	8.0	850
	T	17	9	13.6	8.8	340
5000	U	10	6	7.0	4.0	6430
	T	13	7	8.4	6.0	4360
C. D. (P = 0.05)		0.83	0.22	0.30	0.25	73.88
C. D. (P = 0.01)		1.17	0.33	0.45	0.36	105.08
Eggplant						
0	U	22	15	18.0	14.0	
		25	16	20.3	15.5	
50	U	19	12	17.3	12.3	70
	T	20	14	19.0	14.0	
500	U	14	12	12.0	8.1	800
	T	17	15	15.6	10.2	190
5000	U	12	9	7.6	7.0	5803
		14	11	9.1	8.2	4255
C. D. (P = 0.05)		0.40	0.56	0.46	0.50	83.17
C. D. (P = 0.01)		0.59	0.83	0.68	0.75	18.30
Okra						
0	U	69	18	23.4	12.3	
	T	76	23	30.0	16.0	
50	U	60	17	21.4	12.0	100
	T	68	23	28.3	17.0	20
500	U	46	14	17.0	11.3	1100
	T	54	25	21.4	14.0	410
5000	U	28	12	10.0	7.3	8750
	T	35	19	15.0	10.3	4000
C. D. (P = 0.05)		0.84	0.25	0.26	0.25	75.75
C. D. (P = 0.01)		1.24	0.37	0.39	0.38	107.74

U = Untreated seed, T = Treated seed.

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TABLE III - *Effect of seed treatment with nimbin on the population of* Tylenchorhynchus brassicae *and plant growth of cabbage and cauliflower.*

Inoculum level	Treatment	Length (cm)		Weight (g)		Final population
		Shoot	Root	Shoot	Root	
Cabbage						
0	U	17	14	33.2	12.0	
	T	20	17	36.9	13.5	
50	U	17	13	33.0	10.0	120
	T	17	15	35.0	11.0	40
500	U	13	11	29.1	8.7	750
	T	14	13	32.6	9.3	370
5000	U	9	9	23.8	5.5	6410
	T	11	9	26.2	7.0	4250
C. D. (P = 0.05)		0.27	0.27	0.28	0.29	70.58
C. D. (P = 0.01)		0.40	0.41	0.42	0.43	100.39
Cauliflower						
0	U	22	14	40.2	9.7	
	T	23	17	42.8	10.3	
50	U	22	15	37.2	7.5	125
	T	23	15	38.0	9.0	50
500	U	18	14	33.9	7.0	770
	T	20	14	36.2	8.1	415
5000	U	12	10	28.2	7.0	6890
	T	15	11	30.3	8.1	4600
C. D. (P = 0.05)		0.30	0.29	0.31	0.29	77.26
C. D. (P = 0.01)		0.45	0.44	0.45	0.43	109.90

U = Untreated seed, T = Treated seed.

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