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EFFICACY OF NEMATICIDES FOR FIELD CONTROL OF NEMATODES INFESTING CERTAIN VEGETABLE CROPS

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Efficacy of nematicides *viz.*, DD, 1, 3-D, DBCP, Phorate, Fensulfothion and Dimethoate was tested against some important genera of plant parasitic nematodes. All these nematicides significantly suppressed populations of all the nematodes to varying degrees around roots of tomato, eggplant, chilli, okra, cabbage, cauliflower and table beet. Fensulfothion proved to be most effective in reducing the population of nematodes around table beet and cabbage while DBCP was most successful in tomato and cauliflower and DD in eggplant, chilli and okra. Beneficial effects of these nematicides were evident by manifold increase in the yield or plant growth. DD gave best results with respect to the plant growth/yield in tomato, eggplant, chilli, okra and table beet, Fensulfothion in cabbage and Phorate in cauliflower.

Effectiveness of nematicides in controlling plant nematodes of different crops is well recognised (Wong *et al.*, 1970; Reddy & Seshadri, 1971; Robbins *et al.*, 1972; Brodie & Good, 1973; Whitehead *et al.*, 1973; Alam *et al.*, 1975, 1977; Kirmani *et al.*, 1975, 1977). However, evaluation of nematicides has not been generally done in vegetable crops and therefore, the present investigations were undertaken.

MATERIALS AND METHODS

A field naturally infested with moderate populations of *Meloidogyne incognita, Rotylenchulus reniformis, Tylenchorhynchus brassicae, Hoplolaimus indicus, Helicotylenchus indicus, Tylenchus filiformis* and *Trichodorus mirzai* was prepared and divided into small beds, each measuring 1 sq m. These beds were given compost at the rate of 110 kg N/ha. Different nematicides *viz.*, DD (1, 2 Dichloropropane + 1, 3 dichloropropene), 1, 3-D/Telone (1,3-Dichloropropene) and DBCP/Nemagon 60% EC (1, 2 Dibromo-3-chloropropane) were applied to the soil with the help of hand injector at the rates of 450, 225 and 20 l/ha respectively; while Phorate 10G (0, 0 Diethyl-S-(ethylthiomethyl) phosphorodithioate), Fensulfothion 5G (0, 0 Diethyl-0-(4 methyl-sulfinyl-phenyl-monothiophosphate) and Dimethoate 5G (0, 0 Dimethyl-s-(N-methylcarbamoylmethyl) phosphorodithioate) were directly mixed with the soil at the rate of 25 kg/ha.

Later the field was irrigated. All the treatments were randomly arranged with three replications. After three weeks of treatment, seeds of okra (*Abelmoschus esculentus Moench.*) cv. Pusa Sawani and table beet (*Beta vulgaris* L.) cv. Globe were directly sown and four week old seedlings, raised in autoclaved soil, of tomato (*Lycopersicon lycopersicum* (L.) Karsten). cv. Marglobe, eggplant (*Solanum melongena* L.) cv. Pusa Purple Long, chilli (*Capsicum annuum* L.) cv. NP-46A, cabbage (*Brassica oleracea capitata* L.) cv. Pride of India and cauliflower (*B. oleracea botrytis* L.) cv. Snowball were transplanted. Necessary cultivation practices were observed. Nematode populations of each treatment were determined with the help of Oostenbrink's elutriator and Baermann funnels (Southey, 1970), both prior to treatment as well as at the termination of the experiment (three months).

RESULTS AND DISCUSSION

All tested nematicides were effective in suppressing nematode populations in all the test crops to varying degrees (Table I). In tomato, the highest reduction in the population was observed with DBCP (61.0%) followed by Dimethoate (54.5%), 1, 3-D (53.2%), Phorate (49.4%), Fensulfothion (31.2%) and DD (26.0%). DD proved best with eggplant (90.3%) and it was followed by DBCP (89.4%), 1, 3-D (86.7%), Phorate (80.5%), Fensulfothion (71.7%) and Dimethoate (54.9%). DD was most effective also in suppressing nematode populations in chilli (90.8%) and okra (86.6%). In cabbage the highest suppression was noted with Fensulfothion (79.3%) followed by 1, 3-D (78.2%), Phorate (77.0%), DD and DBCP (69.0%) and Dimethoate (66.7%). DBCP gave highest suppression of nematodes around cauliflower (73.6%) followed by DD (65.9%), 1, 3-D (60.4%), Fensulfothion (56.0%), Dimethoate (50.5%) and Phorate (48.4%). Highest kill of nematodes around the roots of table beet was observed in Fensulfothion (69.6%) followed by DD (66.6%) 1, 3-D (56.5%), Dimethoate (46.4%), Phorate (43.5%) and DBCP (37.7%).

Almost all the nematicides increased plant weight/yield of the test crops (Table I). DD was most effective in increasing the plant growth/yield of tomato, eggplant, chilli, okra and table beet. Highest increase in the weight of cabbage was obtained in Fensulfothion and in cauliflower by Phorate.

The number of different nematodes in untreated beds after cultivation of various crops, shows a manifold increase in the population of larvae of the root-knot nematode, *M. incognita* when tomato, eggplant, chilli, okra or table beet were grown; reniform nematode, *Rotylenchulus reniformis* when eggplant, okra or cabbage were grown; and the stunt nematode, *Tylenchorhynchus brassicae*

TABLE I

Effect of Nematicides on the population of Nematodes and Plant Growth/Yield of Certain Vegetable Crops in field

Crops/ Treatments	Population of nematodes per 200 g soil										Plant weight*/ yield per acre** (kg)
	Hop	Hel	Rot	Trh	Tyl	Mel	Tri	Total	%Reduction	Sap	
1	2	3	4	5	6	7	8	9	10	11	12
Tomato cv. Marglobe :											
DD	40	—	80	480	80	400	60	1160	26.0	1700	1.000*
1, 3-D	80	—	20	380	80	120	40	720	53.2	1020	0.900
DBCP	40	—	40	300	20	120	80	600	61.0	2500	0.500
Phorate	180	—	80	340	60	60	60	780	49.4	1780	0.700
Fensulfothion	40	—	80	640	60	180	60	1060	31.2	1500	0.620
Dimethoate	20	—	100	440	40	60	40	700	54.5	1480	0.600
Untreated	120	—	100	620	120	520	60	1540	—	1040	0.200
Initial pop.	200	—	80	360	160	120	80	1000		1600	
Eggplant cv. Pusa Purple Long :											
DD	—	—	100	—	—	120	—	220	90.3	2860	1.148*
1, 3-D	20	—	160	20	—	100	—	300	86.7	1940	0.672
DBCP	20	—	120	—	20	80	—	240	89.4	3140	0.847
Phorate	40	20	80	60	20	220	—	440	80.5	1840	0.574
Fensulfothion	80	—	120	—	20	420	—	640	71.7	2760	0.602
Dimethoate	220	20	240	140	40	360	—	1020	54.9	3750	0.518
Untreated	380	20	580	340	220	720	—	2260	—	2740	0.252
Initial pop.	480	240	280	780	160	200	—	2140		1140	

1	2	3	4	5	6	7	8	9	10	11	12
Chilli cv. NP-46A :											
DD	20	—	—	120	—	60	—	200	90.8	1540	0.798*
1, 3-D	60	20	100	100	20	300	—	600	72.5	1840	0.546
DBCP	—	—	20	80	—	180	—	280	87.2	1960	0.512
Phorate	40	20	—	320	—	340	—	720	67.0	920	0.448
Fensulfothion	—	20	—	460	—	280	—	760	65.1	2740	0.518
Dimethoate	—	—	40	440	—	300	—	780	64.2	1560	0.448
Untreated	220	240	340	640	100	640	—	2180	—	820	0.154
Initial pop.	480	240	280	780	160	200	—	2140		1120	
Okra cv. Pusa Sawani :											
DD	—	—	20	100	—	100	—	220	86.6	2240	0.504*
1, 3-D	—	—	180	180	—	120	—	480	70.7	440	0.364
DBCP	—	—	80	180	—	180	—	440	73.2	820	0.468
Phorate	60	20	100	80	—	240	—	500	69.5	1440	0.420
Fensulfothion	—	20	440	160	20	380	—	1020	37.8	1580	0.294
Dimethoate	100	60	140	220	80	560	—	1160	29.3	2760	0.364
Untreated	300	—	400	200	180	560	—	1640	—	720	0.161
Initial pop.	480	240	280	780	160	200	—	2140		1120	
Cabbage cv. Pride of India :											
DD	40	—	40	380	60	20	—	540	69.0	600	0.520*
1, 3-D	60	—	20	260	20	20	—	380	78.2	700	0.680
DBCP	100	—	—	240	120	40	40	540	69.0	480	0.600
Phorate	—	—	40	340	—	20	—	400	77.0	1280	1.040
Fensulfothion	140	—	—	180	20	—	20	360	79.3	1220	1.080
Dimethoate	60	—	60	300	40	60	60	580	66.7	700	0.720
Untreated	240	—	160	960	140	160	80	1740	—	1240	0.360
Initial pop.	200	—	80	360	160	120	80	1000		1600	

Cauliflower cv. Snowball :											
DD	40	—	—	400	40	20	120	620	65.9	1220	0.640*
1, 3-D	40	—	20	480	60	—	120	720	60.4	1220	0.760
DBCP	20	—	—	360	20	—	80	480	73.6	1460	0.800
Phorate	160	—	—	540	100	40	100	940	48.4	860	0.800
Fensulfothion	100	—	—	500	80	40	80	800	56.0	900	0.760
Dimethoate	120	—	40	500	100	20	120	900	50.5	1020	0.440
Untreated	300	—	120	980	240	20	160	1820	—	700	0.340
Initial pop.	200	—	80	360	160	120	80	1000		1600	
Table beet cv. Globe :											
DD	40	—	20	260	80	40	20	460	66.6	560	10126.6**
1, 3-D	60	—	40	240	40	200	20	600	56.5	1580	9810.1
DBCP	80	—	—	220	80	340	140	860	37.7	1040	6012.7
Phorate	220	—	20	180	20	220	120	780	43.5	740	6645.6
Fensulfothion	60	—	20	240	—	80	20	420	69.6	1400	7911.4
Dimethoate	220	—	20	320	40	80	60	740	46.4	2800	6012.7
Untreated	300	—	20	400	80	360	220	1380	—	1480	5063.3
Initial pop.	200	—	80	360	160	120	80	1000		1600	

Each value is an average of three replicates.

Hop=*Hoplolaimus indicus*, Hel=*Helicotylenchus indicus*, Rot=*Rotylenchulus reniformis*, Trh=*Tylenchorhynchus brassicae*, Tyl=*Tylenchus filiformis*, Mel=*Meloidogyne incognita* larvae, Tri=*Trichodorus mirzai*, Total=Total parasitic, %Reduction=Per cent reduction of parasitic forms over untreated control, Sap=Total saprozoic.

when tomato, cabbage and cauliflower were grown, indicating differential response of crops towards nematode populations. It is interesting to note that the efficacy of nematicides also differ with different crops. Although all the nematicides resulted in an increase in the plant weight/yield but those highly effective in reducing the nematode populations did not necessarily bring about highest increase in the yield/plant growth of the crop. For example, Fensulfothion was most effective in reducing the populations of Tylenchids around the roots of table beet and cabbage, DBCP for tomato and cauliflower; and DD for nematodes of eggplant, chilli and okra but the most beneficial nematicide with respect to the improvement in plant growth/yield was DD for tomato, eggplant, chilli, okra and table beet, Fensulfothion for cabbage and Phorate for cauliflower.

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