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EFFECT OF SEED TREATMENTS WITH CERTAIN OILCAKES OR NEMATICIDES ON THE GROWTH OF TOMATO AND ON RHIZOSPHERE POPULATION OF NEMATODES AND FUNGI

by

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Organic amendments in the form of oilcakes have been used successfully for the control of plant parasitic nematodes by incorporation into the soil before sowing or transplanting (Khan *et al.*, 1966; Khan, 1977; Singh and Sitaramaiah, 1966 and 1971). The economic benefits might be further improved by seed treatment with the oilcakes. This has been investigated with castor, mustard, neem, mahua and groundnut oilcakes and compared with certain nematicide seed treatments of tomato cv. Marglobe.

Materials and methods

The oilcakes used were castor (*Ricinus communis* L.), mustard (*Brassica campestris* L.), neem (*Azadirachta indica* Juss.), mahua (*Madhuca indica* Gmel.), groundnut (*Arachis hypogaea* L.) and the nematicides, Furadan 3 G (Carbofuran), 5% Rogor G (Dimethoate) and Temik 10 G (Aldicarb). Slurries were prepared by mixing 1 or 2 g of the oilcakes and 0.1 or 0.2 g of nematicides with talc and gum paste. These amounts were then applied to 10 g seeds, which were spread on petriplates to dry. Untreated seeds and seeds coated with gum + talc slurry only were used as controls.

Tomato cv. Marglobe seeds were sown in naturally infested soil.

Table I - *Effect of seed coating with oilcakes and nematicides on the growth and phenolic content of tomato plants and on the population of plant nematodes in their rhizosphere.*

Treatment	Growth of plant				Number of nematodes/Kg of soil.							O-dihydroxy phenols %	Total free phenols %
	Dose in (g)	Total length (cm)	Fresh wt. (g)	Dry wt. (g)	Trh.	Hop.	Hel.	Mel.	Tota Tylenchids	% reduction	Total Saprozoic		
Control	—	40.0	15.7	3.8	5060	2635	1470	2005	11970	—	9660	.014	.21
Talc	—	40.7	14.6	3.7	5065	2320	1690	2065	11940	0.3	10710	.015	.21
Castor	2.0	60.6	23.6	5.2	2520	1050	815	735	5120	54.2	11025	.019	.24
	1.0	55.1	18.3	4.6	3150	1470	840	830	6290	43.7	10080	.015	.23
Mustard	2.0	70.3	30.0	6.3	2705	1030	510	840	4885	56.3	12600	.015	.26
	1.0	61 8	23.2	4.4	2940	1260	525	1365	6090	45.5	11235	.012	.24
Neem	2.0	64.6	32.0	7.0	2310	1365	315	1155	5145	53.9	11340	.015	.26
	1.0	54.0	24.2	5.0	2835	1575	735	1380	6525	41.6	12705	.013	.23
Mahua	2.0	58.5	26.7	5.3	2845	1470	420	1155	5890	47.3	10815	.017	.22
	1.0	50.9	21.4	4.1	3065	1890	735	1470	7160	35.9	11130	.014	.21
Groundnut	2.0	62.5	28.9	6.0	2565	1350	315	1260	5490	50.9	11340	.016	.24
	1.0	56.5	23.4	5.1	3055	1785	840	1385	7065	36.8	10920	.015	.22
Furadan	0.2	55.5	23.0	4.6	1870	1035	315	1155	4375	60.8	8505	.017	.20
	0.1	51.5	19.7	3.9	1980	1145	420	1470	5015	55 1	7980	.019	.19
Rogor	0.2	60.3	26.4	5.2	2185	1245	315	945	4690	58.0	9660	.014	.20
	0.1	55.8	21.4	4.1	2520	1350	630	1065	5565	50.2	11025	.014	.21
Temik	0.2	53.3	24.2	4.4	1869	1130	—	825	3824	65.8	8560	.017	.18
	0.1	42.9	18.0	2.8	2180	1355	420	1155	5120	55.2	9345	.019	.20
L.S.D. « 5%		4.9658	2.5368	.3119								.0062	.0157
L.S.D. « 1%		5.4534	2.7873	.3427								.0068	.0172

Trh. *Tylenchorhynchus brassicae*; Hop. *Hoplolaimus indicus*; Hel. *Helicotylenchus indicus*;
Mel. Larvae of *Meloidogyne incognita.*

After 60 days the plants were uprooted and growth was measured in terms of total length and fresh and dry weight of plants. The population of plant-parasitic nematodes in the roots and the soil was determined by using the method of Oostenbrink (1960). The population of rhizosphere fungi was determined by using the metod of Parkinson (1957). The frequency of fungi was calculated as follows:

$$\text{Frequency} = \frac{\text{Number of plates containing a particular fungus}}{\text{Total plates inoculated}} \times 100$$

For estimation of total free phenols and 0-dihydroxyphenols the plant roots were air dried ($50 \pm 5^{o}C$) and ground to approximately 400 μm particle size. Total free phenols were extracted following the method of Biehn *et al.* (1968) and estimated by using Folin-Ciocalteau reagent (Bray and Thorpe, 1954) at 660 nm, and 0-dihydroxyphenols by the method of Johnson and Schaal (1952) using Arnows reagent at 530 nm, in a Bausch and Lomb Spectronic-20 colorimeter.

Results and discussion

Seedlings raised from seeds coated with the different oilcakes or nematicides grew well. Seedling emergence was similar to the untreated controls, indicating that seed coating had no adverse effect on germination. Oilcake slurries applied at the rate of 2 g per 10 g seeds were generally more effective in promoting the growth of plants (Table I), the largest increase in the growth occurring with mustard, neem, groundnut, castor and mahua cake.

All of the treatments resulted in considerable reductions in the numbers of plant parasitic nematodes compared with the untreated controls. The nematicides were generally more effective than oilcakes (Table I). The frequency of saprophytic fungi invariably increased and that of parasitic fungi decreased in oilcake treated pots (Table II). Conversely the frequency of both parasitic and saprophytic fungi decreased in the nematicide treatments. Khan *et al.*, (1973) obtained similar results with oilcakes incorporated into the soil, but seed treatments are easier to apply and the cost/benefits are improved.

In roots of plants developing from oilcake coated seeds, the phenol concentration was higher than in those in the nematicide

Table II - *The frequency and population of soil fungi in the rhizosphere of plants grown from seeds treated with oil-cakes and nematicides (Average of 10 replicates).*

Fungi	Frequency of fungi (per cent)																	
	Control	Talc	Castor		Mustard		Neem		Mahua		Groundnut		Furadan		Rogor		Temik	
Dose in (g)	—	—	2.0	1.0	2.0	1.0	2.0	1.0	2.0	1.0	2.0	1.0	0.2	0.1	0.2	0.1	0.2	0.1
Alternaria humicola	80	70	70	40	60	70	30	10	—	20	80	40	—	—	—	30	—	30
Aspergillus flavus	100	100	100	90	100	80	90	60	80	90	50	60	70	50	80	100	60	70
A. funiculosus	70	80	80	60	90	50	70	30	80	70	70	40	—	—	30	40	—	30
A. luchuensis	—	—	—	—	70	40	70	—	—	—	60	30	—	—	—	—	—	—
A. niger	80	—	100	100	90	70	100	80	100	80	90	80	80	90	100	80	70	60
A. ustus	—	70	60	—	—	—	40	—	—	—	70	20	—	—	—	—	—	—
Chaetomella horrida	—	40	—	—	60	40	—	—	60	40	—	—	—	—	—	—	—	—
Cladosporium herbarum	50	—	60	70	50	30	80	50	—	—	60	50	—	—	50	20	—	20
Fusarium chlamydosporum	—	50	60	60	—	—	50	60	70	50	70	50	10	30	—	50	50	—
F. oxysporum	50	—	—	—	—	—	70	50	60	40	70	60	30	50	50	60	40	50
Fusarium sp.	—	—	50	70	60	70	60	50	—	—	50	40	—	—	—	—	—	—
Mortierella alpina	—	—	40	50	30	—	70	40	—	—	40	—	—	—	40	30	—	—
M. isabellina	—	—	—	—	—	—	—	—	70	50	—	—	—	—	—	—	—	—
Mucor globosus	60	50	80	90	70	60	90	100	80	60	70	80	50	60	30	40	60	70
M. subtilissimus	—	—	—	70	80	—	—	—	—	—	30	40	60	70	—	—	—	—
Sclerotium rolfsii	40	—	70	—	80	30	—	—	—	—	60	50	30	40	—	—	—	30
Torula allii	—	—	—	—	40	—	50	20	—	—	—	—	—	—	40	10	—	—
Trichoderma lignorum	—	10	—	—	—	—	—	—	70	50	—	—	—	—	—	—	—	—
Zygorhynchus japonicus	—	30	80	—	60	40	80	70	60	40	—	—	50	30	30	20	30	40
Syncephalastrum sp.	—	—	—	—	—	—	60	30	—	—	30	20	—	—	—	—	—	—
Phycomyces sp.	—	—	30	—	30	—	—	—	—	—	—	—	—	—	—	—	20	—
Population of fungi (per g. soil)	1300	1250	2200	1750	2425	1450	2525	1625	1825	1500	2125	1550	750	1050	1025	1200	825	1000

treatments or in the untreated controls. The concentration of phenols in the roots increased with the increase in the dose of oilcakes. This suggests that the reductions of nematode and fungi in the rhizosphere of such plants might be due to the higher concentration of phenols leaching from the roots (Singh and Chaudhury, 1973; Giebel, 1974).

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SUMMARY

The efficacy of different oilcakes and certain nematicides applied as seed coating was determined. The oilcakes not only reduced the population of plant parasitic nematodes and fungi, which may partly be due to higher concentration of phenols in plants, but also promoted the growth of the tomato plants. The oilcake seed treatment is as effective as incorporation into the soil but more economical.

RIASSUNTO

Effetto del trattamento ai semi con alcuni panetti oleosi o nematocidi sulla crescita di pomodoro e sulle popolazioni di nematodi e funghi nella rizosfera.

È stata saggiata l'efficacia di diversi panetti oleosi e di alcuni nematocidi somministrati come concianti del seme. I panetti oleosi non solo hanno ridotto le popolazioni dei nematodi fitoparassiti e dei funghi nella rizosfera, ma hanno anche stimolato lo sviluppo di piante di pomodoro. Sembra che questo effetto sia da attribuirsi all'aumento del contenuto fenolico delle piante. Il trattamento al seme con panetti oleosi è altrettanto efficace quanto l'incorporazione degli stessi al terreno, ma di questa è più economico.

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