

Relative Efficacy of Different Oil-Cakes on the Incidence of Root-knot Nematodes*

by
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Root-knot nematodes (*Meloidogyne* spp.) have become a serious problem in many vegetable growing tracts of our country. The ubiquity of such nematodes in poor soils particularly those devoid of organic matter is perhaps mainly responsible for the extensive infestation consequently leading to low yield and poor quality of a number of vegetable crops. Unbalanced application of fertilizers not only leads to severe repercussion on plant itself but in many cases it increases the reproductive rates of nematodes (Oteifa and Khalil, 1961). The deficiency of phosphorus and potash in some Bihar soils was reported to be responsible for heavy infestation of the nematodes in tomatoes, brinjal and *bhindi* (Lall and Hameed, 1965). In recent years, the use of organic matter in different forms has been reported to reduce nematode population in soil (Hutchinson, 1960 and Mankau, 1963). The organic matter being either directly toxic to the nematode (Ellenby, 1945), or may interfere with respiration and oxidation processes in the nematode body (Renninger, *et al.*, 1958) or alter the oxygen, nitrogen, and pH status of the soil (Mankau, 1963). Linford *et al.* (1938) observed reduction of soil populations of root-knot nematodes as a result of decomposition of organic matter in the soil which in turn supported building up of large populations of plants and animal forms destructive to nematodes including nematode capturing fungi, non-trapping fungal parasites, predaceous nematodes and predaceous mites. These collectively destroyed root-knot nematodes as well as free living forms in early weeks of decomposition. Recently, a number of soil cakes have been tested by various workers against these nematodes. Lear (1959) tested castor cake against *M. javanica* Treub. Singh (1963-'64) reviewed the role of different organic matters used as biological control agents against different plant parasitic nematodes while reporting the efficacy of '*karanj*' (*Pongamia pinnata*) cake as compared to fumigants, green manuring, *etc.* against *M. javanica*. In view of this a pot experiment was conducted at Bihar Agricultural College, Sabour during winter 1964 to study the relative efficacy of different types of easily available oil cakes and the effect of their decomposition against *Meloidogyne* spp.

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Materials and Methods: Six oil-cakes namely, (1) *karanj*, (2) castor (*Ricinus communis*), (3) Linseed (*Linum usitatissimum*), (4) mustard (*Brassica campestris*), (5) Groundnut (*Arachis hypogea*), (6) Safflower (*Carthamus tinctorius*) and (7) control (without any cake) were procured from the nearby village market. The effect of decomposition of these oil cakes on the population of the nematodes was tested by planting two weeks old tomato seedlings (raised in autoclaved soil at 15 lb. for 90 minutes) at three different period of intervals *viz.*, (1) planting just after inoculation (2) 15 days after inoculation and (4) 30 days after inoculation. There were altogether 21 treatment combinations including the control and each treatment was replicated four times. For conducting the experiment 84 earthen pots (4" size of 2 kg cap.) were washed thoroughly with water and 5 per cent formaldehyde and filled with autoclaved soils (1800 gm. of soil per plot). All 84 pots were divided into 3 main sets each containing 28 pots to receive plantation at three different intervals. The dosage of oil cakes was fixed as per recommendation of Lear (1959) which worked out as 5 gm. per 1800 gm. of soil. The cakes were powdered and a fixed quantity was taken and mixed thoroughly in earthen pots, watered and finally, inoculated by placing one gelatin capsule containing 50 egg masses of *Meloidogyne* spp. in the middle at $\frac{1}{2}$ " below the surface. The pots were irrigated immediately after inoculation in order to facilitate the development of the nematodes under different treatments. Out of three sets of pots the first set of 28 pots were planted with 2 weeks old tomato seedlings at the rate of one seedlings per pot just after inoculation, the second set with another stock of 2 weeks old tomato seedlings 15 days after inoculation. The pots were watered and maintained under identical conditions. After 40 days following plantation in each case, the plants were uprooted, washed, and observations were recorded by counting root galls and root weight in each plant. The number of galls per gram of root was worked out for each treatment and replication. The results are presented in table 1.

TABLE 1. *Relative efficacy of different oil cakes against Meloidogyne spp.*

	Number of galls per gram of root weight*		
	Planting just after inoculation	Planting 15 days after inoculation	Planting 30 days after inoculation
1	2	3	4
1. <i>Karanj</i>	96.51	54.67	337.38
2. Mustard	88.41	19.99	184.02
3. Linseed	102.39	86.43	205.89

TABLE 1. (Contd.)

	Number of galls per gram of root weight *		
	Planting just after inoculation	Planting 15 days after inoculation	Planting 30 days after inoculation
4. Safflower	237.68	113.66	395.14
5. Castor	168.79	151.98	416.63
6. Groundnut	89.23	92.81	187.09
Control	626.34	567.47	933.81

F test significant; S. E. / pot = 43.801; C. D. (5 %) for main sets of pots = 23.48 (between planting dates) and C. D. (1 %) for sub plots = 46.99 (between treatments).

* Total of four replications.

Results and Discussion: A careful study of Table 1. reveals that planting 15 days after inoculation had a distinct effect on decreasing the nematode incidence in all treatments. In case of tomato planting just after inoculation the number of galls produced has also been found to be relatively less. The incidence of the nematodes later showed an increasing trend in all cases. This shows that oil cakes definitely reduce the incidence of the nematodes, and that too only at certain stages of their decomposition. As stated, the toxic effect of oil cakes on the nematodes was found to be maximum when plantings were made after 15 days; thereafter, there is a simultaneous increase in incidence of the nematodes which may be because of the reduced toxic potency of oil cakes on them. On the other hand the nematodes multiplied progressively as the time interval increased. Statistically the results showed significant differences between the dates of planting of tomato seedlings and a high significant difference in the performance of various oil cakes. Further, the number of galls per plant were found to be minimum in mustard cake (19.99 galls per plant). The other oil cakes found next in order of efficacy were *karanj* (54.67 galls/plant) and linseed (86.43 galls/plant) followed by groundnut (92.81 galls/plant). The result agrees with the findings of Singh (1963—'64) as far as the efficacy of *karanj* is concerned. The application of mustard cake in tomatoes, possibly under field conditions at about two weeks before tomato planting may have profound effect in minimising the incidence of the nematodes. It appears that a period of about two weeks is needed for effecting maximum reduction of the nematodes by mustard cake. This toxic effect may also be due to the presence of allyl isothiocyanate in the mustard cake as observed by Ellenby (1945) or due to the simultaneous encouragement of the population of predatory nematodes and fungi, etc. which are yet to be investigated.

Summary: The relative efficacy of six different oil cakes and the time of their application on the incidence of Root-knot nematodes in tomatoes have been investigated in a pot experiment at Bihar Agricultural College, Sabour during winter 1964. The results showed that the application of mustard cake at least two weeks before planting tomato seedlings minimises the incidence of *Meloidogyne* spp. 'Karanj', linseed and groundnut cakes in order of efficacy also gave encouraging results.

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