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*Section of Plant Pathology and Nematology, Department of Botany, Aligarh Muslim University, Aligarh - 202001 -India*

# EFFECT OF OIL CAKES ON THE MOVEMENT OF NEMATICIDES IN SOIL

by

R. P. SINGH, A. M. KHAN and S. K. SAXENA

The application of fumigants in combinations with organic soil amendments have been suggested as a means of achieving integrated control of nematodes (Good, 1972). However, little is known about the influence of organic amendments on the mobility of nematicides in soil. The present study attempts to assess the effect of extracts of various oil cakes on the mobility in treated soil of three nematicides, dazomet, oxamyl and dichlorofenthion.

## MATERIALS AND METHODS

A Ganga Khadir soil from the Aligarh district was used throughout the investigations; the physical properties are given in Table I. The movement of the nematicides was determined by a soil TLC technique described by Helling and Turner (1968), expressing movement as frontal Rf-valus (Table II). The apparatus consisted of an applicator with adjustable thickness, uniform glass plates, glass tank and sprayer.

The plates were spotted with nematicides e.g. dazomet(3,5-dimethyl tetrahydro-1,3,5,2H, thiadiazine-2-thione), oxamyl [methyl N'-N'-dimethyl -N( methyl carbomoyl) oxy-1 thiooxamimidate] and dichlorofenthion ( 0-2,4 dichlorophenyl o,o-diethyl phosphorothioate) using a Lambda pipette and were sprayed with 0.5% Brilliant green in acetone as a detector for dazomet and oxamyl, and with 0.5% silver

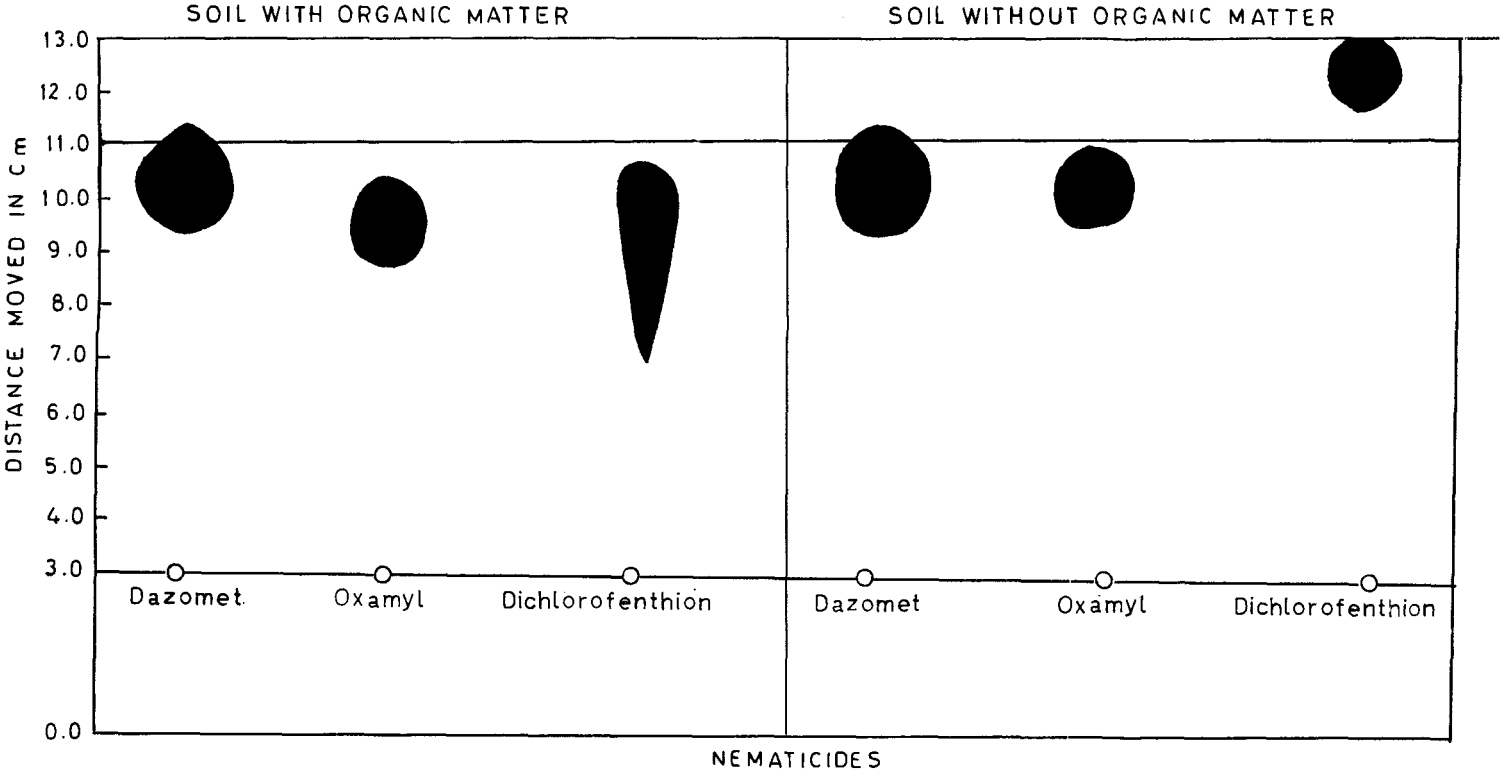


FIG. 1 MOVEMENT OF NEMATICIDES WITH AND WITHOUT ORGANIC MATTER

nitrate in acetone for dichlorofenthion. The plates were air-dried and then examined. Dazomet and oxamyl appeared as pale yellow spots against a dark green background without exposure to UV light; dichlorofenthion appeared as black spots after the plates had been exposed to UV light for 5-10 minutes (Singh *et al.*, 1978).

A second experiment utilised natural soil, autoclaved soil and the soil in which the organic matter had been removed by treatment with 30% hydrogen peroxide. Distilled water was used as a developer.

In a third experiment, the plates were coated with natural soil or soil without organic matter in layers of 0.5 mm thickness and with 1%, 3% and 5% extracts of castor (*Ricinus communis* L.), groundnut (*Arachis hypogaea* L.) and neem (*Azadirachta indica* Juss.) cake as developers.

The soil slurries preparade by mixing 100 ml extracts of 1%, 3% and 5% of oil cakes with 100 g natural soil, were coated on the plates. Distilled water was used as developer.

## RESULTS AND DISCUSSION

The model diagram of mobility of nematicides used in the present study, in the presence and absence of organic matter is given in Fig. 1 and values are summarised in Table II. Removal of organic matter resulted in a slight increase in Rf-values of dazomet while considerable increase in oxamyl and dichlorofenthion, thereby indicating that removal of organic matter increased the mobility of nematicides probably because the soil particles are dispersed as suggested by Helling (1971) and Helling *et al.* (1973). The presence of organic matter in the soil prevented the leaching of nematicides. On the other hand, the autoclaved soil (soil free from microorganisms) caused a decrease in the Rf-values of all the three nematicides. It might be due to the fact that the absence of micro-organisms increases the capacity of the soil to adsorb the nematicides thereby decreasing their mobility.

It is clear from Table III that when the natural soil was used as an adsorbent and 1%, 3% and 5% extracts of castor, groundnut and neem cakes used as developers, the Rf-values of all the nematicides increased with the increase in the concentrations of oil-cakes extracts in the developers. The maximum movement was observed when extracts of neem cake were used as developers and minimum when castor cake extract was used as a developer.

Table I - *Physico-chemical properties of the soil used.*

| Sand (%) | Silt (%) | Clay (%) | pH | EC (mmho s/cm) | Organic matter (%) | CEC (meq 100g soil) | $CaCo_3$ (%) | Bulk density | Real specific gravity | Porosity |
|---|---|---|---|---|---|---|---|---|---|---|
| 32.3 | 57.6 | 10.1 | 9.0 | $2.3 \times 10^{-4}$ | 02.6 | 9.0 | 8.85 | 1.28 | 2.60 | 50.76 |

Table II - *Effect of organic matter and microorganisms on the Rf-values of three nematicides in soil using distilled water as developer.*

| Nematicides | Rf-values | | |
|---|---|---|---|
| | Natural soil | Soil without organic matter | Autoclaved soil |
| Dazomet | 0.84 | 0.88 | 0.70 |
| Oxamyl | 0.75 | 0.81 | 0.62 |
| Dichlorofenthion | 0.78 | 1.00 | 0.40 |
| L.S.D. 5% | 0.0303 | 0.0075 | 0.0228 |
| 1% | 0.0501 | 0.0124 | 0.0377 |

Table III - *Effect of different concentrations of extracts of oil cakes, used as developers, on the Rf-values of the three r nematicides in soil.*

| Nematicides | Rf-values of nematicides in soil | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Concentration of extracts of oil cakes (per cent) | | | | | | | | |
| | Castor | | | Ground nut | | | Neem | | |
| | 1 | 3 | 5 | 1 | 3 | 5 | 1 | 3 | 5 |
| A. *Natural soil* (0.26% OM) | | | | | | | | | |
| Dazomet | 0.80 | 0.81 | 0.82 | 0.80 | 0.88 | 0.94 | 0.88 | 0.94 | 0.95 |
| Oxamyl | 0.84 | 0.86 | 0.87 | 0.82 | 0.84 | 0.90 | 0.84 | 0.89 | 0.90 |
| Dichlorofenthion | 0.76 | 0.80 | 0.81 | 0.76 | 0.79 | 0.83 | 0.72 | 0.74 | 0.84 |
| L.S.D. 5% | 0.017 | 0.046 | 0.017 | 0.017 | 0.018 | 0.018 | 0.018 | 0.015 | 0.017 |
| 1% | 0.028 | 0.076 | 0.028 | 0.028 | 0.030 | 0.030 | 0.030 | 0.025 | 0.030 |
| B. *Soil without organic matter* | | | | | | | | | |
| Dazomet | 0.84 | 0.90 | 0.92 | 0.90 | 0.92 | 0.93 | 0.94 | 0.96 | 0.98 |
| Oxamyl | 0.90 | 0.93 | 0.95 | 0.90 | 0.94 | 0.96 | 0.90 | 0.95 | 1.00 |
| Dichlorofenthion | 0.78 | 0.85 | 0.90 | 0.85 | 0.88 | 0.90 | 0.78 | 0.80 | 0.95 |
| L.S.D. 5% | 0.017 | 0.020 | 0.007 | 0.007 | 0.007 | 0.017 | 0.017 | 0.017 | 0.021 |
| 1% | 0.030 | 0.033 | 0.012 | 0.012 | 0.012 | 0.028 | 0.028 | 0.028 | 0.035 |

Table IV - *Effect of different concentrations of extracts of oil cakes when used as adsorbent on the Rf-values of three nematicides in natural soil and distilled water as developer.*

| Nematicides | Rf-values of nematicides in soil with different concentrations of oil-cake extracts | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Oil-caket exstracts (per cent) | | | | | | | | |
| | Castor | | | Ground nut | | | Neem | | |
| | 1 | 3 | 5 | 1 | 3 | 5 | 1 | 3 | 5 |
| Dazomet | 0.94 | 0.85 | 0.84 | 0.97 | 0.90 | 0.90 | 0.98 | 0.96 | 0.92 |
| Oxamyl | 0.96 | 0.91 | 0.90 | 0.98 | 0.93 | 0.90 | 0.99 | 0.98 | 0.94 |
| Dichlorofenthion | 0.92 | 0.90 | 0.90 | 0.85 | 0.83 | 0.83 | 0.95 | 0 90 | 0.88 |
| L.S.D. 5% | 0.017 | 0.017 | 0.017 | 0.017 | 0 017 | 0.015 | 0.007 | 0.007 | 0.007 |
| 1% | 0.028 | 0 028 | 0.028 | 0.028 | 0.028 | 0.024 | 0.012 | 0.012 | 0.012 |

Similarly, when the soil without organic matter was used as the static phase, the Rf-values of all the nematicides increased with the increase in the concentration of the extracts. The movement of all the nematicides was higher in soil without organic matter. The order of movements of nematicides in both cases was neem > groundnut > castor. It appears that organic matter plays a vital role on the movement of nematicides when used as leachates.

When different extracts of oil-cakes were mixed with soil and later used as an adsorbent, the Rf-values of all the nematicides decreased with an increase in the concentration of the extracts in the adsorbent phase (Table IV), thus confirming that soil organic matter adversely affect the movement of nematicides by adsorbing them. Scott and Philips (1972) have obtained similar results in the diffusion of herbicides and Helling (1970) in the movements of S-triazines in soils. Increase in the movements of nematicides, however, was observed when extracts of oil cakes were used as leachates.

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