Studies on the Effect of Organic Soil Amendments on Plant Parasitic Nematodes

ABSTRACT

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In a field study, the oil-seed cakes of castor, margosa/neem, mustard, rocket-salad/dhuan and groundnut (peanut) and two nematicides, viz., carbefuran and aldicarb significantly reduced the population of plant parasitic nematodes. But nematicides had slight edge over the oil-seed cakes. There was a direct correlation between the reduction in nematode population due to various treatments and improvement in plant growth of tomato, eggplant and okra and yield of carrot.

In an integrated approach, by and large, deep ploughing (40 cm deep) together with soil application of the oil-seed cakes and the nematicides brought about greater reduction in the populations of plant parasitic nematodes and an increase in plant growth/yield as compared to the effect of these treatments when applied in normal ploughed (20 cm deep) plots.

The beneficial effect of oil-seed cakes and nematicides persisted in the field even after a lapse of six months when tomato was grown in the following season. Once again the combined effect of oil-seed cakes/nematicides and deep ploughing was found to be more beneficial.
Soil amendments with fresh floral parts and decomposed fruits, leaves and bark of margosa/\textit{neem} and Persian lilac/\textit{bakain} were found to be highly satisfactory in reducing the natural infestation of plant parasitic nematodes around tomato and eggplant. In separate experiments the root-knot development caused by \textit{Meloidogyne incognita} and populations of \textit{Rotylenchulus reniformis} on tomato and eggplant and \textit{Tylenchorhynchus brassicae} on cabbages and cauliflower were also controlled efficiently by the above treatments. Highest inhibition was observed in case of treating the soil with the fruits of margosa and Persian lilac. As a consequence of reduced populations of plant parasitic nematodes and root galling, the growth of the test plants was improved significantly.

Water extracts of leaves, flowers, fruits, bark, roots and gum of margosa and Persian lilac killed high percentage of commonly occurring plant parasitic nematodes \textit{in vitro} tests. The sensitivity of different nematode species was, however, different against different extracts. The mortality increased with an increase in the concentration of water extracts and the exposure period. Hatching of larvae of \textit{Meloidogyne incognita} was also considerably reduced to varying degree in all the above extracts. Similar results were obtained with respect to nematode mortality and hatching in the solutions of some chemicals of margosa, viz., azadirachtin, nimbidic acid, nimbin, kaempferol and quercetin and two nematicides, viz., carbofuran
and aldicarb.

Dipping of roots of tomato and eggplant seedlings in different concentrations of leaf extracts of margosa and Persian lilac and solutions of some chemicals of margosa, viz., azadirachtin, nimbidic acid and nimbin significantly inhibited the penetration of the root-knot larvae into the roots and the subsequent root gallings. Similar results were also obtained with the decrease in the population of *Rotylenchulus reniformis* on tomato and eggplant. Root-gallings caused by *Meloidogyne incognita* and population of *Rotylenchulus reniformis* were gradually decreased with an increase in the concentrations of the leaf extracts and solutions of neem chemicals and the duration of the dip treatment. Plant growth was improved as a result of reduced root galling and the population build-up of nematodes due to root-dip treatments.

Chopped shoots of some latex-bearing plants, e.g., *Euphorbia neriifolia*, *E. tirucalli*, *Calotropis procera*, *Pedilanthus tithymaloides*, *Thevetia peruviana* and *Nerium indicum* significantly reduced the root-knot development caused by *Meloidogyne incognita* and the populations of common plant parasitic nematodes in a naturally infested field soil around tomato and eggplant. Similar results were also obtained in single pathogenic conditions, e.g., *Rotylenchulus reniformis* on tomato and eggplant and *Telenchus brassicae* on cabbage and cauliflower. Plant growth in all the treatments was improved.
The plant latices of *Euphorbia neriifolia*, *E. tirucalli*, *Calotropis procera*, *Pedilanthus tithymaloides*, *Thevetia peruviana* and *Nerium indicum* brought about high percentage of kill of commonly occurring plant parasitic nematodes. There was a linear relationship between the mortality of the test nematodes and the concentration of the latices. The mortality of the test nematodes increased with an increase in the concentration of latices and the exposure period. Hatching of larvae of *Meloidogyne incognita* was also significantly inhibited to a varying degree in all the latices tested. These results with respect to toxicity of plant latices to various nematodes and inhibitory properties against the larval hatching of *M. incognita* were comparable to the effects of two test nematicides, viz., carbofuran and aldicarb.

When the roots of seedlings were dipped in the plant latices of *Calotropis procera*, *Euphorbia neriifolia* and *E. tirucalli* prior to inoculation, there was a significant inhibition in the penetration of larvae and the subsequent root galling caused by *Meloidogyne incognita* on tomato and eggplant. Root-dipping also caused a significant inhibition in the population build-up of *Rotylenchulus reniformis* on tomato and eggplant and *Tylenchorhynchus brassicae* on cabbage and cauliflower. Plant growth was improved due to the root-dip treatment.

Different soil amendments with chopped leaves, flowers and
stems of *Tagetes lucida*, *J. minuta* and *J. tenuifolia* were found highly satisfactory in reducing the root-knot development and populations of *Rotylenchulus reniformis* on tomato and eggplant, and *Tylenchorhynchus brassicae* on cabbage and cauliflower. In another experiment, the populations of various plant parasitic nematodes inhabiting the naturally infested field soil, were also reduced significantly by the above soil amendments. The plant growth in all the cases was improved over untreated controls.

Water extracts of different parts of *Tagetes lucida*, *J. minuta* and *J. tenuifolia* were found highly deleterious to different nematodes. There was a direct relationship between the mortality of the test nematodes and the concentration of the extract. The mortality increased with an increase in the concentration of the extracts and the exposure period. All the water extracts significantly arrested the larval hatching of the root-knot nematodes, *Meloidogyne incognita*. In a comparative study with two nematicides, viz., carbofuran and aldicarb the water extracts of different plant parts of marigolds were found equally toxic against nematodes and inhibitory for larval hatching.