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EFFECT OF DOSAGES AND DECOMPOSITION PERIOD OF NEEM DERIVATIVES FOR THE CONTROL OF ROOT-KNOT NEMATODES (*MELOIDOGYNE JAVANICA*) IN TOMATO PLANT

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ABSTRACT

The effect of dose and period of decomposition of neem seed powder, neem cake and neem dry leaf power on root-knot infection and growth of tomato plant was studied. It was observed that all neem derivatives significantly not only reduced the intensity of root-knot disease but also improved plant growth. The significant effects of these organic amendments increased gradually as the dose and period of decomposition increased. Maximum reduction in the reduction of root-knot index and improvement in plant growth was recorded where neem cake was used @ 1.0% and allowed to decompose for 20 days.

Key-words: Neem derivatives, dosages, decomposition, nematodes

INTRODUCTION

Use of phytotherapeutic substances for the control of plant parasitic nematodes is well known (Singh and Sitaramaiah, 1966; Hameed, 1970; Egunjobi and Larinde, 1975; Egunjobi and Onayemi, 1981; Ram & Gupta, 1982). However, the dose and period of decomposition are very important in the use of organic amendment because higher doses cause phytotoxicity to the host plant and decomposition of organic amendment helps in changing physical, chemical and biotic conditions of soil (Ahmad *et al.,* 1972) The nematoxic substances are released during the process of decomposition (Akhtar and Alam, 1990) and toxicity gradually increased with an increase in the decomposition period (Alam *et al.,* 1982). Experiments were therefore carried out to find the suitable dose and time of application of different neem derivatives for the control of root-knot nematode and growth of tomato plant.

MATERIALS AND METHODS

Leaf and seed samples were collected, dired, passed through an electric grinder and sieved through 60 mesh screen. Oil cake was prepared by extracting oil from the powdered neem seeds in a Soxhlet's apparatus for 8 h. using n-hexane (bp 60-80 ºC) as a solvent. The extract was concentrated on a rotary evaporator under reduced pressure at 30 ºC and made solvent free in a desiccator to extract oil from neem seed powder. The residue, after oil extraction was used as neem cake

The ground material viz., neem seed powder, neem cake and neem dry leaf powder were mixed separately in the soil @ 0.1, 0.5 and 1.0 w/w. Soil was transferred in 8 cm diam., plastic pots @ 250 g/pot. The pots were watered daily to allow decomposition of organic matter. Five sets of each treatment were prepared separately. Tomato seedlings raised in sterilized soil were transplanted @ one seedling/pot at 0, 5, 10, 15 and 20 days of decomposition period. One day after transplantation, the seedlings were artificially infested with egg masses of root-knot nematode (*M. javanica* @ 10 egg masses/pot). A set of pots, where soil was not amended with neem derivatives served as control. There were five replicates of each treatment and the pots were randomized on experimental bench. After 60 days of transplantation, plants were uprooted and growth parameters were recorded. Root-knot index was rated with 0-5 scale of Taylor and Sasser (1978). The data were analyzed statistically by Duncan's Multiple Range Test.

RESULTS AND DISCUSSION

All the neem derivative treatments reduced root-knot development. Reduction percentage increased gradually as time of decomposition increased (Fig. 2). Maximum reduction (RKI 1.0/plant) was observed in neem cake used @ 1.0% w/w followed by neem seed powder @ 1.0% w/w (RKI 2.0/plant) after 20 days of decomposition of amendment as compared to control (RKI 3.2/plant).

Plants showed a gradual improvement in different growth parameters as the dose of the treatment and period of decomposition increased. It is interesting to note that greater length and weight of root and shoot were recorded in all sets where neem cake was used @ 1.0% w/w. Maximum root and shoot length (29.9 and 30.0 cm respectively) was observed when plants were transplanted after 20 days of decomposition in soil amended with neem cake @1.0% w/w. Similar results were observed in root and shoot weight and a significant ($p<0.001$) increase (7.5 and 24.2 g/plant respectively) was observed when the soil was amended with neem cake @ 1.0% and allowed to decompose for 20 days. Plants grown in neem derivatives amended soil also significantly ($p<0.001$) produced higher number of floral buds as compared to control (Fig.1, 2). It is interesting to note that the effect of dry leaf powder reduced in pots where plants were transplanted after 20 days of decomposition as compared to pots where plants were transplanted after 15 days of treatment.

The results of the present studies showed that incorporation of different neem derivatives in soil significantly reduced root-knot indices and improved plant growth in tomato plants. Neem cake was found most effective as compared to other treatments. Such similar observations have been made where neem cake was found most effective against *M. incognita* in papaya (Routaray and Das, 1988) and tomato (Darekar *et al*., 1990; Singh *et al.*, 1990). Neem and other oil cakes not only reduced the population of nematodes viz., *M.incognita, Rotylenchulus reniformis, Tylenchorhynchus brassicae* and *Helicoty lenchus indicus* and root rot fungi viz., *Macrophomina phaseolina, Rhizoctonia solani* and *Gusarium oxysporum* f.sp. ciceri but also significantly improved plant growth (Tiyagi and Alam, 1995). Similar results were observed against *Pratylenchus zeae* in sugrarcane (Metha *et al*., 1994). Neem cake not only effectively controlled *M. incognita* and improved plant growth but also increased the population of nematicidal fungi in soil (Goswami, 1993).

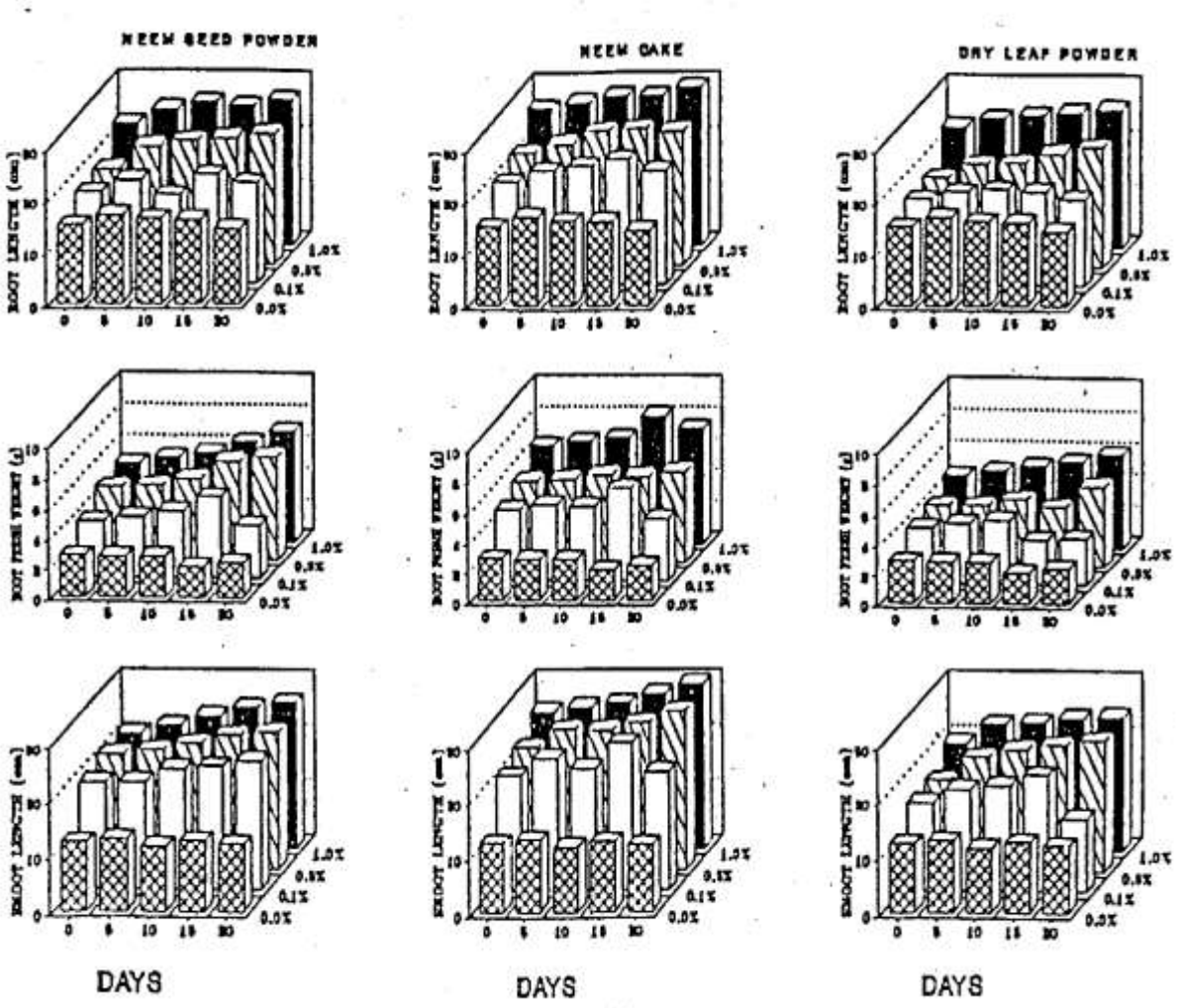

Fig.1. Effect of dosages and decomposition period of neem derivatives on the growth of tomato plants.

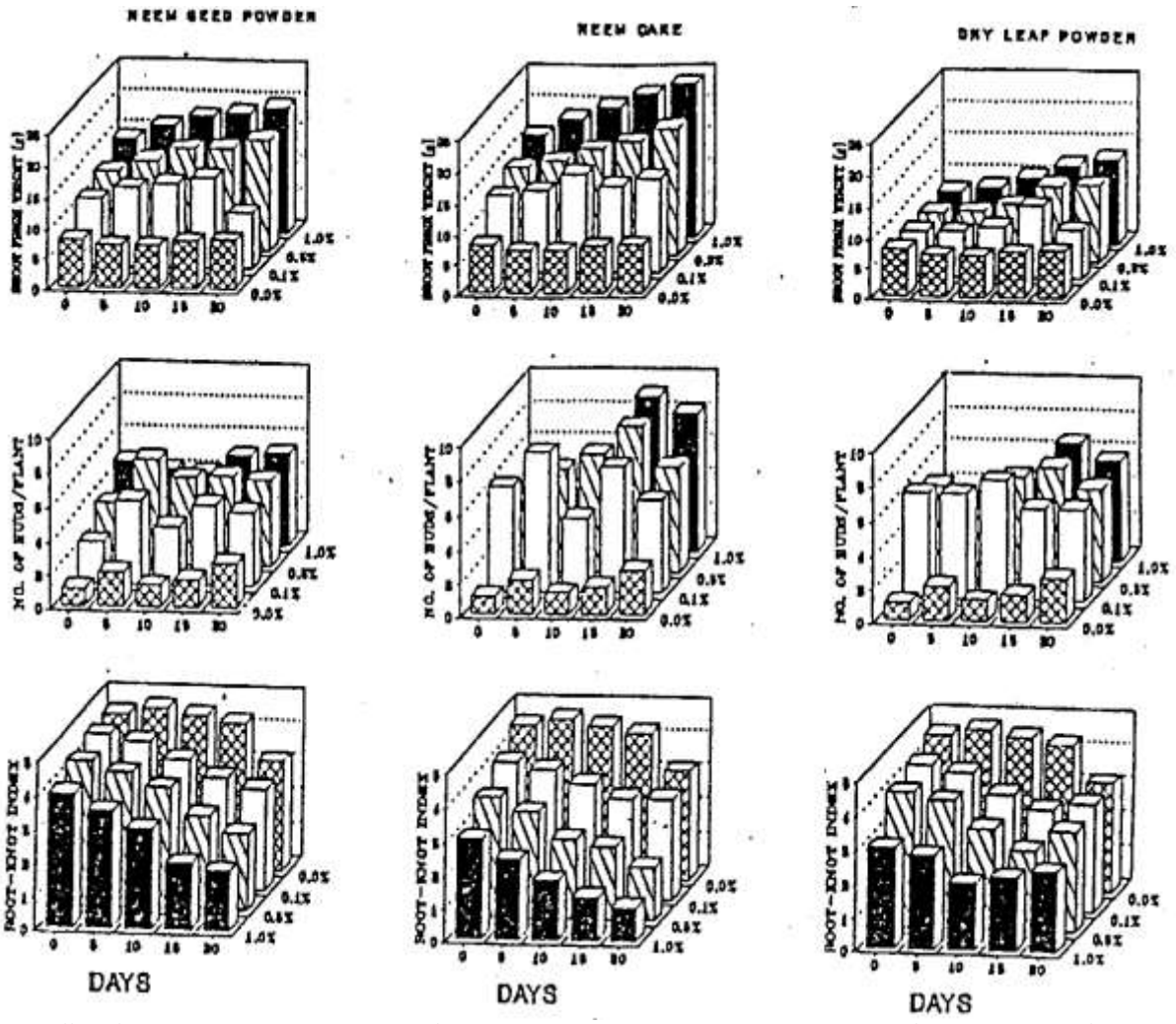

Fig.2. Effect of dosages and decomposition period of neem derivatives on *Meloidogyne javanica* root knot infection and growth of tomato plants.

It has been observed that the efficacy of different neem derivatives in the control of root-knot nematode gradually increased as the period of decomposition increased for upto 15 to 20 days of amendment. These results are in conformity with those of Goswami and Vijayalakshmi (1987a) who reported that the toxicity of neem and undi *(Calophayllum inophyllum)* cake increased up to 3 weeks. Similar observations have also been reported by Alam *et al*., (1982) where toxicity gradually increased with an increase in the decomposition period. Increased toxicity may be due to the release of toxic compounds (Patrick and Toussoum, 1965) or due to fungal metabolites produced by certain saprophytic fungi which become active during the process of decomposition (Kirmani *et al*., 1978). It would herefore suggest that where organic amendment is used, a 15-20 day decomposition period of amendment is most suitable for the control of nematode disease and improvement in plant growth.

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