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BIOTOXICITY OF *PARTHENIUM HYSTEROPHORUS* EXTRACTS AGAINST *MELOIDOGYNE INCOGNITA* AND *HELICOTYLENCHUS DIHYSTERA*

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There are many reports of the biotoxicity of the extracts of different plant parts incorporated in the soil (Egunjobi and Afolami, 1976; Veech, 1981; Nandal and Bhatti, 1983; Jain and Hasan, 1983). Gommers (1973) surveyed a wide range of compositae and concluded that there are several nematicidal principles in the family which can suppress populations of *Pratylenchus penetrans.*

The present investigation was carried out to explore the nematicidal properties of *Parthenium hysterophorus* L. « Congress Grass » (Family: Compositae) an obnoxious and widely distributed perennial herbaceous weed.

Materials and Methods

Aqueous extracts (10% w/v and 12 hours of incubation at room temperature) of fresh leaves, stem and roots of *Parthenium hysterophorus* were prepared seperately by grinding the materials in water. The extracts thus obtained after filtering through muslin cloth was centrifuged at 3000 g to clarify the solution. This was termed the standard solution at 1:10 concentration which was diluted with distilled water to give concentrations of 1:25, 1:50 and 1:100. A stock solution of 5000 ppm of parthenin (bitter principle, $C_{15}H_{18}O_4$) and saponin (glycoside, triterpene) isolated from *P. hysterophorus* by the Central Analytical Laboratory of this Institute was prepared in distilled water and further diluted to 50, 500 and 2500 ppm. Ten ml

of each concentration were poured into 40 mm diameter sterilized petri dishes. Five healthy egg masses of *Meloidogyne incognita* (Kofoid *et* White) Chitw., freshly dissected from heavily infested eggplant (*Solanum melongena* L.) roots were transferred to the dishes. After 3 days the total number of hatched larvae were counted.

To determine the toxicity to nematodes about 100 larvae of *M. incognita* and 100 individuals (all stages) of *Helicotylenchus dihystera* (Cobb) Sher, were transferred to 10 ml of extract contained in the 40 mm petri dishes. After 3, 6, 12, 24 and 48 hours of exposure immobile and mobile nematodes were counted and average per cent mortality was calculated. Mortality was checked by transferring immobile nematodes to water (no nematodes that had become completely immobile were at any time observed to recover their mobility, moreover they very soon showed degenerative changes in the oesophageal region and we believe that immobility in these experiments is a good indication of death). In the hatching and toxicity experiments distilled water served as controls. Each treatment was replicated 10 times. The experiments were undertaken at a room temperature of 25-30 °C.

In a third experiment, 10 cm diameter pots were filled with root knot nematode infested soil (5 larvae/g soil). Chopped green plants of *P. hysterophorus* weighing 25, 50, 100 and 150 g were mixed into the soil and watered. After seven days four cowpea (*Vigna unguiculata* L.) var. HFC 42-1 seeds were sown in each pot and thinned to one seedling per pot after 10 days. Each treatment was replicated 3 times. Fresh and dry shoot and root weights and number of galls/plant were taken 45 days after sowing and statistically analysed.

Results and Discussion

At each concentration the aqueous leaf extract killed more nematodes than the root and stem extracts. At the lowest effective concentration (1:50) of leaf extract, 100% mortality (mean of 10 replications) was observed after 25 and 48 hours of exposure for *M. incognita* and *H. dihystera*, respectively. However, at 1:50 concentration of root extract the mortality of the two species was 92 and 100% respectively after 48 hours. The effectiveness of these extracts increased with concentration and duration of exposure.

Of the two compounds, parthenin and saponin, only the former

was found to have a toxic effect on nematodes. Seventy and 100% nematode mortality occurred within 3 hours of exposure at higher concentrations of 2500 and 5000 ppm of parthenin. At the concentration of 500 ppm of parthenin nematode mortality was 35 and 50% for *M. incognita* and 40 and 60% for *H. dihystera* respectively for exposure of 24 and 48 hours. In 50 ppm concentration mortality was 20 to 30% for both the nematodes after 48 hours. Nematodes kept in distilled water (control) remained active even after 96 hours and no mortality was observed.

At the lowest concentration (1:100) af leaf, stem and root extract, the per cent of *M. incognita* larval hatch was 28, 36 and 64%, respectively and at 1:50 it was 14, 16 and 40. Hundred per cent inhibition with respect to the control (distilled water) was observed when the egg masses were subjected to 1:10 and 1:25 concentrations of the three extracts. Parthenin at 5000 and 2500 ppm completely inhibited larval hatch but at 50 and 500 ppm the hatch was 66 and 80% respectively. Interestingly saponin was found to be effective in restricting the larval hatch of *M. incognita* at 5000 and 2500 ppm although it did not cause mortality to adults and larvae of both nematode species at any of the concentrations.

It is apparent from these observations that the plant extracts as well as the parthenin were more effective as inhibitors of egg hatching than as nematicides.

The effect of chopped green *P. hysterophorus* plant, when incorporated into *M. incognita* infested soil at various doses, on cowpea growth and gall formation is shown in table I. Significant increases in the fresh and dry weights of cowpea shoots were recorded in soil

Table I - *Effect of* P. hysterophorus *on* M. incognita *development and plant growth of cowpea.*

Treatments Doses g/kg soil	Fresh weight (g)		Dry weight g) Shoot	Number of galls per plant
	Shoot	Root		
25	13.3	6.4	5.9	40
50	14.1	7.6	6.5	26
100	17.1	9.0	7.5	16
150	18.1	10.5	8.0	10
Control	11.3	5.5	4.7	43
C. D. at 5%	1.02	1.121	0.912	

amended with 50, 100 and 150 g/kg. The number of galls per plant in different treatments was reduced in comparision to control except at the 25 g/kg treatment.

In certain regions of the tropics, particularly in India where this weed is freely available, its nematicidal effect may be exploited, as a means of decreasing nematode populations below the economically damaging levels by incorporating chopped leaves into the nematode infested soil, particularly in nursery beds. Also it may serve as green manure because of the presence of nitrogen in the leaves (2.25% on dry weight basis). In particular, the weed could be useful under conditions where the use of chemicals for nematode control is not desirable and/or economical.

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