Nematol. medit. (1986), *14*: 295-298.

Department of Nematology, Haryana Agricultural University
Hisar (India) - 125 004

THE EFFECT OF CERTAIN EDAPHIC FACTORS ON THE NEMATICIDAL ACTIVITY OF PLANT EXTRACTS

by
S. N. NANDAL and D. S. BHATTI

There are several reports of the toxic nature of plant extracts to various plant parasitic nematodes (Sayre *et al.*, 1964; Nene and Kumar, 1967; Deshmukh and Prasad, 1969; Abivardi, 1971; Gommers, 1972; Desai *et al.*, 1973; Egunjobi and Afolami, 1976).

We have explored previously the possible nematicidal properties of thirty weeds and shrubs commonly found locally in cultivated fields (Nandal and Bhatti, 1983); leaf extracts of eleven plant species were effective in controlling *Meloidogyne javanica* juveniles. This paper describes *in vitro* studies with *M. javanica* (Treub) Chitw. on the effect of temperature, pH, ageing and longevity of the extracts from the eleven plant species viz., *Amaranthus gracilis* Desf., *Bougain villia* L., *Calotropis procera* (Ait.) R. Br., *Cannabis sativa* L., *Chenopodium album* L., *Clerodendron enermi* L., *Datura stramonium* L., *Ricinus communis* L., *Tribulus terrestris* L., *Vernonia cineraria* Less. and *Xanthium strumarium* L.

Materials and Methods

Extracts were obtained by grinding 2g of fresh whole leaves in 5 ml of distilled water. Plant debris were removed by filtering through four-ply muslin and the water extracts were then kept in plastic bottles in a refrigerator for 12 hours before use in the experiments. The supernatant was taken as stock solution.

The effect of ageing was investigated by keeping the stock solution of fresh plant leaf-extracts in corked plastic bottles for 5, 10, and 15 days at room temperature. A 10 ml suspension of juvenile *M. javanica* (containing 200 juveniles) was poured into each petri-dish (5 cm size). Measured quantities of stock solutions of each plant-leaf extract were added to make 1:5 and 1:20 dilutions. Water alone served as a control. Each treatment was replicated three times. The petri-dishes were kept in an incubator at $27 \pm 1°C$ for 48 hours and mortality was then recorded by counting dead and live nematodes with the aid of a microscope.

To determine the effect of temperature, freshly prepared leaf extracts were subjected to different temperatures, i.e., 40,50 or 100°C for 5 minutes. Nematicidal activity was then investigated as for ageing.

The extracts were adjusted to pH 4, 8 or 10 by adding 1 N HCl or 6 N NaOH. The original pH of the extracts was also noted. The extracts were then kept at room temperature for one hour to let the pH stabilise. The original pH of each extract served as a control. Nematicidal activity was investigated as for ageing.

To study the longevity of the extracts, an experiment was begun in April, 1978 in the laboratory. One hundred and fifty glass beakers (100 ml capacity) were filled with steam sterilized river sand. Leaf extracts of four plant species - *Calotropis procera, Datura stramonium, Ricinus communis* and *Xanthium strumarium* in 1:5 and 1:20 dilution each, were added to each beaker in sufficient quantity to drench the river sand. One hundred 2nd stage *M. javanica* juveniles were added to each beaker at 0, 1, 2, 4 and 6 weeks after the addition of the leaf extracts; there were 3 replicates for each time interval. The control samples were drenched with sterilized water only. The beakers were kept in the laboratory and the river sand was kept moist by adding appropriate amounts of the leaf extracts or sterile water during the experiment. After 72 hours, the river sand in each beaker was mixed carefully with water and passed through a set of sieves (1.7 mm and 0.05 mm). The juveniles in the suspension were extracted in a Baermann funnel. Those juveniles that were extracted were counted as alive and the per cent recovery calculated.

Results and Discussion

Ageing for 5, 10 and 15 days did not adversely affect the nematicidal component of the plant leaf extracts and gave 94 to 100 per cent kill at both dilutions.

Toxicity of the 11 leaf extracts at 1:5 dilution was unaltered by subjecting them to a range of temperatures and 100 per cent kill occurred in all cases except at 1:20 dilutions when mortality was 95-100 per cent.

Plant leaf extracts of different pH were equally effective in killing 94 to 100 per cent of second-stage juveniles.

Data in Table I indicate that up to one week, all the leaf extracts were equally effective in killing juveniles at both the dilutions (except *X. strumarium* at 1:5 dilution). However, from the 2nd week onwards, a significant decrease in the efficacy of all the plant leaf extracts was noticed. Thereafter, 1:5 was more effective, sometimes significantly, compared to 1:20. *D. stramonium* gave the least recovery of juveniles even after 6 weeks and differed significantly from all other treatments.

Table I - *Persistence of toxicity of plant-leaf extracts against* Meloidogyne javanica *(mean of three replicates; angular transformed values).*

	Per cent juvenile recovery after 72 hours exposure to plant extracts									
	0 Week		1 Week		2 Weeks		4 Weeks		6 Weeks	
	1:5	1:20	1:5	1:20	1:5	1:20	1:5	1:20	1:5	1:20
Calotropis procera	5.7	5.7	5.7	5.7	7.9	18.9	27.8	34.4	35.6	41.5
Datura stramonium	5.7	5.7	5.7	5.7	24.3	29.2	27.2	33.8	31.5	33.6
Ricinus communis	5.7	5.7	5.7	5.7	21.1	25.1	26.3	37.5	39.8	46.7
Xanthium strumarium	5.7	5.7	12.7	5.7	31.9	33.1	42.1	47.9	53.8	50.2
Control (no leaf extract)	70.1	54.0	51.4	52.1	52.5	54.4	54.4	58.9	54.3	54.4
C.D. for comparing:	plants 5% = 1.04, 1% = 1.51 - time intervals 5% = 2.02, 1% = 2.69 - dilutions 5% = 4.43, 1% = 5.90									

LITERATURE CITED

ABIVARDI C., 1971. Studies on the effect of nine Iranian anthelminthic plant extracts on root-knot nematode - *Meloidogyne incognita*. *Phytopath. Z.*, *71*: 300-308.

DESAI M. V., SHAH H. M. and PILLAI S. N., 1973. Nematicidal property of some plant species. *Indian J. Nematol.*, *3*: 77-78.

DESHMUKH M. G. and PRASAD S. K., 1969. The effect of water soluble extracts of oil-cakes on the population of *Hoplolaimus indicus* Sher, 1963. *Indian J. Entom.*, *31*: 273-276.

EGUNJOBI O. A. and AFOLAMI S. O., 1976. Effect of *neem* (*Azadirachta indica*) leaf extracts on population of *Pratylenchus brachyurus* and on the growth and yield of maize. *Nematologica*, *22*: 125-132.

GOMMERS F. J., 1972. Nematicidal principles from roots of some compositae. *Acta Bot. Nederl., 21*: 111-112.

NANDAL S. N. and BHATTI D. S., 1983. Preliminary screening of some weeds/shrubs for their nematicidal activity against *Meloidogyne javanica. Indian J. Nematol., 13*: 123-127.

NENE Y. L. and KUMAR K., 1967. Nematostatic property of *Erigeron linifolius* extracts. *Indian Phytopath., 20*: 172-174.

SAYRE R. M., PATRICK Z. A. and THORPE H. J., 1964. Substances toxic to plant parasitic nematodes in decomposing plant residue. *Phytopathology, 54*: 905.

Accepted for publication on 2 August 1986.