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Control of root-knot nematode (*Meloidogyne incognita*) on tomato plants by using root extracts of plants.

Muhammad Zameer Kayani [1], Ghulam Sarwar [2] and Sher Muhammad [3]

Abstract
Meloidogyne incognita eggs were exposed to root extracts of *Melia azadirach* Linn (Dharek), *Azadirachta indica* A. Jass (Neem), *Ricinus communis* Linn (Castor) and *Datura alba* Linn (Datura). Standard root extracts of Neem and Dharek exhibited 100% inhibition of egg hatching and larval mortality. Egg inhibition and larval mortality decreased with an increase in the dilution of the extracts. Similarly with an increase in exposure time, juvenile mortality was also increased.

Keywords: Root extracts, *Meloidogyne incognita*, egg hatching, larval mortality, Pakistan.

1 Introduction

Root-knot nematode *Meloidogyne incognita* is a widely distributed pest in the world. Its approximate distribution in agricultural soils of Pakistan is 52% among Meloidogyne species (MAQBOOL, 1986). It attacks almost all the cultivated plants and can cause high losses (AGRIOS, 1973). The indiscriminate use of synthetic nematicides for controlling nematodes is likely to give rise to problems of phototoxicity, environmental pollution and nematode resistance. The unsafe use of pesticide that may result in acute poisoning and deaths is a problem especially in developing countries (FERRER and CABRAL, 1995, IGBBEDIOH,1991, WHO, 1990). There is ,therefore, a great need and scope to explore naturally occurring nematicides which may be less toxic to man and animals but as effective against nematodes of various crops as synthetic ones. The nemato-toxicity of root extracts of different plants have been reported by many workers (SWARUP and SHARMA, 1976., HASEEB and BATOOL, 1990). The present study has been conducted to evaluate the control of root-knot nematode *Meloidogyne incognita* on tomato plants by using root extracts of some plants.

1 Green Belt Project Rawalpindi, Pakistan.
2 Soil Salinity Research Institute, Pindi Bhattian District Hafizabad, Pakistan.
3 National Agricultural Research Centre, Islamabad, Pakistan.

2 Materials and methods

2.1 Preparation of extracts

Root extracts were prepared by grinding 25 g of thoroughly washed and choped roots of each of Dharek (*Melia azadirach)*, Neem (*Azadirachta indica)*, Castor (*Ricinus communis)* and Datura (*Datura alba*) separately in an electric grinder in 100 ml of distilled water. These were then centrifuged and filtered through Whatman No. 1 Filter Paper and arbitrarily termed as standars "S". Other dilutions viz. S/5, S/10 and S/20 were prepared by adding requisite amount of distilled water.

2.2 Extraction of juveniles

Root-knot nematode *Meloidogyne incognita* was identified on the basis of perineal pattern (SASSER, J.N.,1954). Its culture was maintained on tomato cultivar Money maker and second juveniles were extracted from roots using Whitehead and Hemming tray method (WHITEHEAD, A.G AND J.R. HEMMING, 1965).

2.3 Extraction of eggs

Egg masses collected from tomato roots were vigorously shaken with 200 ml of 5.2 % sodium hypochloride (NaOCl) in stoppered flasks for 2 minutes. Eggs were washed by rinsing with tap water through a 200 mesh (75 µm) sieve, collected on a 500 mesh (26 µm) sieve and transferred into distilled water forming egg suspension.

2.4 Effect of root extract on egg hatching

In order to see the effect of root extracts on egg hatching, a small drop of egg suspension was placed in the petriplate and eggs were counted under the stereoscope. Five ml of the standard "S" root extract of Dharek(*Melia azadirach*)was added to it. The same procedure was repeated for all the extracts and their subsequent dilutions. Petriplates containing distilled water served as controls. Each treatment was replicated three times. The petriplates were incubated at room temperature. Hatching was observed after 6 days and percent inhibition was calculated as follow :

$$\text{Percent inhibition of egg hatching} = \frac{\text{Total No. of eggs - No. of eggs hatched}}{\text{Total No. of eggs}} \times 100$$

2.5 Effect of root extracts on larval mortality

Five ml of each of root extracts, their subsequent dilutions and distilled water (serving as control) was separately poured into petriplates and 1 ml of nematode suspension containing 20 freshly hatched juveniles were added to each petriplate. All the treatments were replicated thrice. The petriplates were incubated at room temperature. Percent mortality was calculated after 12, 24 and 48 hours as follows :

$$\text{Percent mortality} = \frac{\text{Number of larvae killed}}{\text{Total number of larvae}} \times 100$$

3 Results and Discussion

3.1 Egg hatching

The data showed that the standard root extracts of the test plants gave the maximum inhibition of egg hatching; Neem (*Azadirachta indica*) and Dharek (*Melia azadirach)* showing 100 % inhibition followed by Datura [*Datura alba* (94.48%)] and Castor [*Ricinus communis* (91.47%)]. Other dilutions viz. S/5, S/10 and S/20 ,though significant, were less effective as compared to S (Table 1). It is evident that as extract was diluted, toxicity was decreased resulting in correspondent decrease in inhibition and minimum inhibition was observed in distilled water. The inhibitory effect of the extracts might be due to the chemicals present in the extracts which possess ovicidal and larvicidal properties. These chemicals either affected the embryonic development or killed the eggs or even dissolved the eggs. It has been reported that extracts contained amino acids and these amino acids single and in combination inhibited hatching.

3.2 Larval mortality

Root extracts of test plants were effective in causing larval mortality, standard extracts being more efficacious than other concentrations. Standard extracts of Neem (*Azadirachta indica*) and Dharek (*Melia azadirach*) showed 100 % mortality even after 12 hours of exposure time. The juvenile mortality increased with increase in exposure time (Table 1).

4 Conclusion

It has been concluded from this study that certain plant extracts are a source of cheap and effective nematicides of root-knot nematodes.

Table 1: Effect of root extract on egg hatching, larval mortality and exposure time (hours) on *Meloidogyne incognita.*

		Egg hatching		Larval mortality %		
Plants	Concentration	Total No.of eggs	% inhibition after 6 days	12 hours	24 hours	48 hours
Melia azadirach	S	17.66	100.00	100.00	100.00	100.00
	S/5	20.66	90.22	70.00	76.67	85.00
	S/10	19.00	70.90	13.33	26.75	43.33
	S/20	16.33	69.80	5.00	6.67	15.00
	distill. water	22.66	17.32	0.00	1.67	1.67
Azadirachta indica	S	21.00	100.00	100.00	100.00	100.00
	S/5	18.33	91.04	91.67	91.67	95.00
	S/10	14.66	88.62	13.33	35.00	56.67
	S/20	13.66	85.84	1.67	6.67	16.67
	distill. water	14.00	15.13	0.00	0.00	0.00
Ricinus communis	S	18.33	91.47	60.00	68.33	76.67
	S/5	22.33	74.92	20.00	28.33	36.67
	S/10	21.00	56.57	13.33	20.00	26.67
	S/20	21.33	43.53	6.67	8.33	13.33
	distill. water	24.66	13.85	0.00	1.67	1.67
Datura alba	S	23.66	94.48	70.00	76.67	86.67
	S/5	17.00	72.63	16.67	26.67	50.00
	S/10	22.66	62.97	10.00	13.33	23.33
	S/20	17.33	50.00	3.33	6.67	13.33
	distill. water	22.00	14.81	0.00	0.00	0.00

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