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EFFECT OF *HELIANTHUS ANNUS* AND *VICIA SATIVA* EXTRACTS ON THE DEVELOPMENT OF ROOT-KNOT NEMATODE IN BRINJAL ROOTS*

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Rood-dip treatment of brinjal seedlings, prior to inoculation with *Meloidogyne incognita*, with S and S/100 concentrations of root, stem, leaf, flower/fruit extracts of *Helianthus annus* and *Vicia sativa* caused retarded development and reproduction of the nematode. The 'S' concentrations of leaf extracts of both the plants were significantly more inhibitory than the extracts of their other parts. The completion of nematode life cycle was delayed by six days on treated seedlings and egg mass production was significantly reduced.

Keywords : Antinematode prohibitins; Plant extracts; Root-knot nemotode.

Introduction

Resistance of plants to parasites is largely determined by their ability to inhibit the invader either during penetration of the host or during their development in the tissues because of the presence of certain inhibitory susbstance. It is now well known that nematicidal and nematostatic principles (antinematode prohibitins) naturally occur in many different plant species which may confer some degree of resistance against nematodes (Gommers, 1973; Husain and Masood, 1975 a,b; Egunjobi and Afolami, 1976; Bhatti, 1988). The use of such toxic plants and plant products, therefore constitute one of the promising alternatives of the hazardous and expensive chemical control Considerable work has been done on the in-vitro effect of plant exudates and extracts on hatching and mortality of nematodes but not much work has been done on the utilization potential of plant exudates and extracts on nematode development. The present study deals with the effect of extracts of different parts of *Helianthus annus* and *Vicia sativa* on the development of *Meloidogyne incognita* in brinjal roots.

Materials and Methods

Different plant parts of *Helianthus annus* and *Vicia sativa* were separately washed with tap water and rinsed in

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Table 1 Effect of different parts of *Helianthus annus* and *Vicia sativa* on development of *M. incognita* in brinjal plants.

		Helianthus annus						
		2 days	4 days	12 days	18 days	24 days	30 days	No. of egg mass/root
	Control	Infective stage larva	2nd stage larva (Sexually undif-ferentiated)	Late 2nd stage female larva Late 2nd stage male larva	4th stage female larva 4th stage male larva	Adult female Early Adult	Adult female Adult male	40
Flower	S	Infective stage larva	Infective stage larva	2nd stage female larva 2nd stage male larva	Late 2nd stage female larva 2nd stage male larva	Immature female 4th stage male larva	Adult female Adult male	19
	S/100	Infective stage larva	Infective stage larva	Late 2nd stage female larva 2nd stage male larva	Late 2nd stage female larva Late 2nd stage male larva	Immature female Early adult	Adult female Adult male	28
Leaf	S	Infective stage larva	Infective stage larva	2nd stage larva (Sexually undifferentiated)	2nd stage female larva 2nd stage male larva	4th stage female larva Late 2nd stage male larva	Adult female Early adult	7
	S/100	Infective stage	Infective stage larva	2nd stage larva (Sexually undifferentiated)	Late 2nd stage female larva Late 2nd stage male larva	4th stage female larva 4th stage male larva	Adult female Adult male	13

Root	S	Infective stage larva	Infective stage larva	2nd stage larva (sexually undifferentiated)	2nd stage female larva 2nd stage male larva	4th stage female larva 4th stage male larva	Adult female Adult male	10
	S/100	Infective stage larva	Infective stage larva	2nd stage female larva 2nd stage male larva	Late 2nd stage female larva 2nd stage male larva	Immature females 4th stage male larva	Adult female Adult male	19
Stem	S	Infective stage larva	Infective stage larva	2nd stage female larva 2nd stage male larva	Late 2nd stage female larva 2nd stage male larva	4th stage female larve 4th stage male larva	Adult female Adult male	14
	S/100	Infective stagel larva	nfective stage larva	Late 2nd stage female larva 2nd stage male larva	Late 2nd stage female larva 2nd stage male larva	Immature female Early adult	Adult female Adult male	24

Vicia sativa

Fruit	S	Infective stage larva	Infective stage larva	Late 2nd stage female larva 2nd stage male larva	Late 2nd stage female larva Late 2nd stage larva	Immature female Early adult	Adult female Adult male	21
	S/100	Infective stage larva	2nd stage larva (Sexually undifferentiated)	Late 2nd stage female larva Late 2nd stage male larva	4th stage female larva 4th stage male larva	Immature female Early adult	Adult female Adult male	32

Contd.....

		2 days	4 days	12 days	18 days	24 days	30 days	No. of egg mass/ root
Leaf	S	Infective stage larva	Infective stage larva	2nd stage larva (Sexually undifferentiated)	Late 2nd stage female larva 2nd stage male larva	4th stage female larva Late 2nd stage male larva	Adult female Adult male	9
	S/100	Infective stage larva	Infective stage larva	2nd stage larva (Sexually undifferentiated)	Late2nd stage female larva 2nd stage male larva	Immature female 4th stage male larve	Adult female Adult male	15
Root	S	Infective stage larva	Infective stage larva	2nd stage larva (Sexually undifferentiated)	Late 2nd stage female larva 2nd stage male larva	4th stage female larva 4th stage male larva	Adult female Adult male	13
	S/100	Infective stage larva	Infective stage larva	Late 2nd stage female larva 2nd stage male larva	Late 2nd stage female larva Late 2nd stage male larva	Immature female Early adult	Adult female Adult male	23
Stem	S	Infective stage larva	Infective stage larva	2nd stage female larva 2nd stage male larva	Late 2nd stage female larva 2nd stage male larva	Immature female 4th stage male larva	Adult female Adult male	16
	S/100	Infective stage larva	Infective stage larva	Late 2nd stage female larva 2nd stage male larva	4th stage female larva Late 2nd stage male larva	Immature female Early adult	Adult female Adult male	28

distilled water before preparing their aquous extracts. Extracts were prepared by crushing 30g of each part separately in 30ml distilled and sterilized water in a mortar with the help of pastle. The slurry thus obtained was squeezed through several layers of cheese cloth and kept in the freezer for 24 hours after which it was centrifuged for 20 min at 8000 rp m. The pellet was discarded and the supernatant was collected and designated as standard solution 'S' and its hundred fold dilution was also prepared by adding required amount of water. Root-dip treatment to 2 week old brinjal seedlings was given by these concentrations of each extract for 30 min. The treated seedlings were transplanted in ice-cream cups containing sterilized soil-sand-manure mixture. A set of untreated seedlings was kept as control. Each of these seedling was inoculated with 100 freshly hatched second stage juveniles of *M. incognita*. After 2, 4, 12, 18, 24, and 30 days 3 seedlings from each treatment were taken out and their root system removed, washed gently, and stained in 0.03% acid fuchsin in lactophenol. The stained developmental stages of the nematode were dissected out with the help of fine needles while observing under the stereoscopic microscope. Specinens were mounted in glycerine and the developmental stage in each case was studied.

Results and Discussion

Eggplant seedlings, pretreated with S and S/100 concentrations of different plant part extracts of both the test plants showed varying degree of retarded development and reproduction of *M. incognita* in comparison to the untreated seedlings. *Helianthus annus* extracts were more inhibitory than those of *Vicia sativa*. The 'S' concentration of each plant part extract caused significantly more retarded development of the nematode and the production of eggmasses than its corresponding 100 fold dilution.

Amongst extracts of *H. annus*, its leaf extract was more inhibitory to nematode development and eggmass production than its root, stem and flower extracts. The number of eggmass produced in the respective treatments of its 'S' concentration was 7, 10, 14, and 19 againts 40 in the control. Similarly, the leaf extract ('S') of *Vicia sativa* caused more retarded development than its root, stem and fruit extracts. The number of eggmasses produced in these respective treatments was 9, 13, 16 and 21. The details of the developmental stages obtained after 2, 4, 12, 18, 24 and 30 days of nematode inculation in the different treatments are presented in Table 1. The nematode completed its life cycle within 24 days on untreated brinjal seedlings while on treated seedlings the completion of life cycle was delayed by

six days. Moreover, the number of females that reached maturity in the roots of treated seedlings was significantly less than in the control as evident with the number of egg masses produced.

The antinematode activity of different plant parts of the test plants can be attributed to the natural occurrence of nematotoxic chemicals (prohibitins) such as flavones, flavonoide flavonic glycosides, steroids, alkaloids, terpenes and thiophenes etc. Our results support the chemi cal concept for nematode suppression and their control as proposed for several members of Compositae (Gommers, 1973).

Prohibitins are not uniformly distributed in plants but are localized in some special tissues and organs. The nature of such tissues varies from species to species and within a particular species different tissues may contain different concentrations of prohibitins. Moreover, there are reasons to believe that different types of prohibitins may occur in the different parts of the same plant (Mahadevan, 1982). This explains the significantly variable antinematode effect of the extracts of different plant parts of the same plant as observed in our investigations.

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References

Bhatti D S 1988, *Final Tech. Rep. Project No. In–ARS*–1977, Haryana Agric. Univ., Hissar pp 231

Egunjobi O A and Afolami, S O 1976, *Nematologica* 22 125

Gommers F J 1973, *Nematicidal principles in compositae* Dissertation.Agric. Univ, Wageningen, The Netherlands, pp 73

Husain S Israr and Masood A 1975 1, *Acta Bot. Indica* 3 142

Husain S Israr and Masood A 1975 b, *Geobios* 2 74

Mahadevan A 1982, *Biochemical Aspects of Plant Disease Resistance* Today & Tomorrows Printer and Publishers, New Delhi, pp 397