JASEM ISSN 1119-8362

Full-text Available Online at www.bioline.org.br/ja

J. Appl. Sci. Environ. Manage. *December*, 2009
Vol. 13(4) 91 - 93

Essential oil products of some medicinal plants as bio control agents against egg hatching and larval mortality of *Meloidogyne incognita*

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ABSTRACT: Petroleum ether extracts of six different medicinal plants *Adhatoda vesica, Plumeria rubra*, *Mussenda globra, Mellia azedarach, Xylosoma longifolia* and *Andrographis panniculata* were tested against egg and second stage juveniles of *Meloidogyne incognita* in terms of percentage of mortality and rate of inhibitory action in egg hatching. Among these six petroleum ether extracts leaves extracts of *Andrographis panniulata* was found most effective in both larval mortality and egg hatching followed by *Mellia azedarach* petroleum extracts. Although their effect in egg and larvae of *M. incognita* differ but these six petroleum ether extracts were found effective and can be used for the control of root knot nematode *M. incognita* @ JASEM

Plant parasitic nematodes cause disease of plant and lead to the lost of economically important plants. They can easily be controlled by application of chemical, physical, biological and cultural practices and land management practices and also by growing resistance varieties. Use of essential oils obtained from locally growing plants for nematode control practices has been tried out by different workers, Lela et al (1992) and Gokte et al (1991) etc. Thus the present investigation has been taken up to evaluate the nematicidal properties of petroleum ether extracts of leaves of six medicinal plants viz. *Adhatoda vesica, Plumeria rubra*, *Mussenda globra, Mellia azedarach, Xylosoma longifolia* and *Andrographis panniculata* against egg and second stage juveniles of *M. incognita* in terms of larval mortality and in egg hatching in vitro condition.

MATERIALS AND METHODS

a) Plant extract preparation: Healthy leaves of *Adhatoda vesica, Plumeria rubra*, *Mussenda globra, Mellia azedarach, Xylosoma longifolia* and *Andrographis panniculata* were collected. The collected plant parts were washed with water and the clean plant parts were oven dried at 58±2^{0}C for 48 hours. The dried materials were made into powder with the help of a clean grinder, 20 gm of each plant leaves powder were taken and placed in a thimble and extracted using organic solvents i.e. petroleum ether for 6 hours in a Soxhlet extraction unit (AOAC,1980) to a separate beaker. The solvent was completely evaporated from the extract in oven till it become a semisolid material. A stock solution of 1000 ppm was prepared in distilled water with 1% Triton X-100 as emulsifier and from it further dilutions such as 1,10,100 and 1000 ppm were prepared by adding required amount of distilled water.

b) Effect on egg hatching and larval mortality: One hundred eggs of *M. incognita* removed from infected roots of brinjal were transferred to a cavity block containing 5ml of oil extracts of different concentrations. Eggs put in distilled water were treated as control. All treatment was replicated three times. Mean egg hatching was counted at intervals of 12, 24, 48 and 72 hours after the treatment In a similar experiment set up instead of eggs freely hatched second stage juveniles of *M. incognita* were transferred to the cavity block (100 juveniles/ cavity block) containing different concentration of oil extracts(5ml/cavity block).
Juveniles put in distilled water were treated as control. There were three replication for each treatment .Juvenile mortality rate was counted at intervals of 12, 24, 48 and 72 hours after treatment. Those larvae which did not response to the touch by a fine needle were counted as dead.

RESULTS AND DISCUSSION

Effect of petroleum ether extracts obtained from leaves of six different medicinal plants viz. *Adhatoda vesica, Plumeria rubra*, *Mussenda globra, Mellia azedarach, Xylosoma longifolia* and *Andrographis panniculata* on eggs and second stage juveniles of *M. incognita* was shown in Table 1 and 2. Egg hatching was maximum in control although among treated one highest hatching rate was observed in 1 ppm concentration at 48 hours in all these six plant extracts Table1. Among these six petroleum extracts, *Andrographis panniculata* extracts shows most inhibitory effect i.e 13, 1.7, 1, 0, 0 at 12 hours in all different concentration followed by *Mellia azedarach* extracts having 13, 2.4, 1.1, 1, 0 and *Plumeria rubra* extracts with hatching rate of 13, 2.5, 1.3, 1 and 0. Rate of hatching was maximum at 48 hours and minimum at 12 hours which shows that hatched rate was directly proportional with exposure period. Rate of hatching was inversely proportional with concentration of extracts as it was decreased with increase in extract concentration as highest rate observed in 1 ppm and lowest rate at 1000 ppm concentration in oil extracts tested.

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Table 1: Effect of the essential oil extracts of six medicinal plants on egg hatching of *M.incognita (The value is mean of 3 replications)*

Plant	Duration	Percentage of egg hatching per extract concentration				
		0	1ppm	10ppm	100ppm	1000ppm
	12	13	8.4	7.1	5.2	4.2
A. vesica	24	27	15.6	13.4	10.1	8.4
	48	41	20.1	18.6	13.2	11.2
	12	13	6.1	5.2	3.1	2.0
M. globra	24	27	13.9	11.1	8.4	6.5
	48	41	17.8	14.3	11.2	10.1
	12	13	5.1	3.4	2.5	1.6
X. longifolia	24	27	12.4	9.2	7.6	5.2
	48	41	16.1	13.8	10.4	8.6
	12	13	2.5	1.3	1	0
P. rubra	24	27	5.4	4.2	3.1	1.5
	48	41	12.3	7.8	5.2	3.5
	12	13	1.7	1	0	0
A. panniculata	24	27	4.2	3.1	1	0
	48	41	10.1	6.4	4.2	1
	12	13	2.4	1.1	1	0
M. azedarach	24	27	8.2	3.4	2.5	1
	48	41	12.1	9.1	5.3	3.0
C.D. (5%)			*1.44**	*0.73**	*1.57**	
			*2.76***	*3.20***	*1.62***	*0.84***
			*0.94****	*2.84****	*0.94****	*0.73****
C.D. (1%)			*2.02**	*1.02**	*2.20**	
			*3.87***	*4.49***	*2.27**	*1.17***
			*1.32****	*3.99****	*1.32****	*1.02****

C.D. for 12 hrs observation, ** C.D. for 24 hrs observation, * C.D. for 48 hrs observation*

Table 2: Effect of the essential oil extracts of six different medicinal plants on second stage juveniles of *M. incognita. (The value is mean of 3 repliations)*

Plant	Duration	Percentage of larval mortality per extract concentration				
		0	1ppm	10ppm	100ppm	1000ppm
	12	3.4	24.2	34.1	50.3	80
A. vesica	24	3.4	28.1	46.2	70	84.2
	48	3.4	43.4	56.1	80.2	98.1
	12	3.4	26.1	38.8	57.6	80.4
M. globra	24	3.4	33.6	49.1	71.4	88.6
	48	3.4	43.4	56.1	80.2	98.1
	12	3.4	33.1	45.2	68.4	90.3
X. longifolia	24	3.4	38.6	60	79.6	94.0
	48	3.4	50.4	52.1	84.1	100
	12	3.4	50.3	70.2	90.3	100
P. rubra	24	3.4	61.2	72.5	94.2	100
	48	3.4	71.4	88.2	98.6	100
	12	3.4	60.6	89.4	97.8	100
A. panniculata	24	3.4	73.2	91.6	100	100
	48	3.4	84.8	95.2	100	100
	12	3.4	51.4	73.5	93.2	100
M. azedarach	24	3.4	62.6	78.1	95.6	100
	48	3.4	74.8	90.4	100	100
C.D. (5%)			*0.84**	*0.94**	*1.46**	*1.19**
			*0.94***	*1.26***	*1.10***	*2.01***
			*1.03****	*1.26****	*1.26****	*1.26****
C.D. (1%)			*1.17**	*1.32**	*2.05**	*1.67**
			*1.32***	*1.77***	*1.55***	*2.82***
			*1.45****	*1.77****	*1.77****	*1.77****

C.D. for 12 hrs observation, ** C.D. for 24 hrs observation,* C.D. for 48 hrs observation*

In terms of larval mortality also we get same results as that of hatching i.e. among these six tested plant oil extracts, *Andrographis panniculata* oil extracts was found cent percent larval mortality within 12 hours followed by *Mellia azedarach* extracts which shows 98% and *Plumeria rubra* shows 95% (Table 2). Among these tested six plant species oil extracts obtained from *Adhatoda vesica* was found least effective against *M. incognita* in terms of juvenile mortality in comparison with others. Rate of mortality was directly proportional with exposure period and concentration of extracts being maximum at 48 hours in 1000 ppm concentration of all oil extracts. Thus, among these six plant species oil extracts obtained from *Adhatoda vesica* was least effective on juvenile mortality as well as on egg hatching.

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The present investigation are in adjustable conformity with the findings of Chandravadana et al (1996) who tested twenty one oil extracts obtained from 12 edible plants species against root knot nematode larvae in terms of their mortality rate and found effective. The work also supported the findings of Nidiry et al (1994) who investigated seed extracts of *G. superba* against *M. incognita* juvenile for their larval mortality and found inhibitory effect. Recently Saravanpriya and Sivakumar (2005) also tried out different methanol extracts of plant against *M. incognita* and found effective. Thus from the above findings it can be concluded that the incorporation of plant products such as oil of pre selected plants could provide a suitable and cheaper alternative for management of *M. incognita* and such method of nematode management can also applied in field studies also.

Acknowledgement: The author greatly acknowledged to the Head, Department of Zoology and Principle, DMC of Science for providing laboratory facility during the course of studies.

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