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Management of *Meloidogyne incognita* by using Different Extract Forms of *Acorus calamus*

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Abstract

The effect of different extract form of *Acorus calamus* L. were tested against second stage larvae of *Moloidogyne incognita*. Hundred percent larval mortality were found with aqueous extracts of rhizome of *A. calamus* at 5 and 10 percent concentration in 96 and 72 hours of treatments. At dry powder form of the rhizome cent percent larval mortality was found at 10 percent concentration in 120 hours exposure period. The oil extract of rhizome also caused significant mortality of the larvae at 500 ppm and 300 ppm.

Key Words: *M. incognita*, *A. calamus*, nematicidal activity, mortality

Introduction

Root- knot nematodes are the most widely spread pathogens infecting different economically important plants. This nematode can develop galls and lesions in the roots, thereby causing stunted growth of the plants. According to Sasser (1980) and Sasser and Carter (1982) if root-knot nematodes were not controlled average crop yield loss was about 25% with damage in individual field ranging as high as 60 percent. Management of the root-knot nematode is very important for more productivity in agricultural crop. A number of workers reported about the nematicidal properties of several plants products against *M. incognita*. Sukul *et al.* (1974) reported that the ethanol extract of garlic was highly toxic to the second stage larvae of *M. incognita* at 40 percent concentration. Distilled oils of Indian basil and sacred basil were effective against root. Knot nematode (Gokte *et al*., 1991). The toxic effect of leaf extract of *Origanum vulgare* against *M. incognita* increases with the increases of concentration and duration of exposure (Ramraj *et al*., 1991). Alagumalai *et al*. (1991) also reported that the population and reproductive potential of *M. incognita* was significantly reduced by the leaf extract of *Vinca rosea*. The methanol extracts of *Catharanthus roseus* roots and *Gloriosa superba* seeds showed high and moderate nematicidal activities against *M. incognita*, respectively (Chandravadana *et al.,* 1996). The toxic effect of different medicinal plants of Manipur against plant parasitic nematodes have been reported (Romabati and Dhanachand, 1999, Romabati *et al*., 1999)

Management of root-knot nematode using plant products has assumed greater significance since such approaches are ecofriendly and cheaper than the chemical treatments, Therefore the present study has been taken up to investigate the nematicidal properties of *A. calamus* against local root-knot nematode population.

Materials and Methods

Acorus calamus was collected from both natural and cultivated habitats. The rhizome part of the plants were taken and washed with water then chopped into small pieces. The plant materials were dried in an oven at 58 $\pm 2^0$C. The dried materials were grand with the help of a electric grinder. The aqueous extract were prepared by soaking the dry powder in distilled water (10 percent w/v) for 24 hours and filtered through Whatman filter paper No.1. The filtrate was used as stock solution. From this stock solution different concentration i.e. 10, 5, 1 and 0.5 percent were prepared by adding required amount of water. For larval mortality test 100 freshly hatched second stage larvae of *M. incognita* were transferred to cavity block containing 10 ml of different concentrations of plant extracts. Treatment with distilled water was taken as control. All the treatments were replicated thrice. Larval mortality was recorded at intervals of 24, 48, 72, 96 and 120 hours. Deaths of nematodes were ascertained after transferring them to plain water.

To study the effect of dry powder on the larvae, the powder was mixed with 100g sterilized soil. Different quantities i.e. 20g, 10g, 5g, 1g and 0.5g each of the powder were taken for the experiments. Each mixture of the powder and soil was filled in 10 cm. diameter plastic pots. The soil without the plant materials serve as control. The potted soil was inoculated with 100 freshly hatched second stage larvae of *M. incognita* at different depths. The soil samples were analyzed for counting nematode larvae after 24, 72 and 120 hours of treatments with

the help of cobb's (1918) sieving and decanting method followed by modified Baermann's funnel technique.

The oil of rhizome of *A. calamus* was extracted by chloroform: methanol following the method of Folch et al. (1957). the oils were semi-solid materials and there were considered as 100 percent technical materials. From these materials 1000 ppm was prepared separately by using 1 percent triton x-100 as emulsifier. The 1000 ppm was used as stock solution. From this stock solution different concentrations i.e. 500, 300, 200 and 100 ppm were prepared. Each treatment was replicated thrice and for control both distilled water andemulsified distilled water were used. Once hundred freshly hatched second stage larvae of *M. incognita* were transferred to cavity block containing 10 ml of different concentrations of oils. Larval mortality rate were counted at 24, 48, 72, 96 and 120 hours of intervals.

To study the effect of dry powder a pot experiment was carried out using tomato (*Lycopersicon esculentum*) as host plant for M. incognita. Different quantities i.e 20g, 10g, 5g, 1g and 05g of the rhizome powder were taken for the experiments. Each quantity was thoroughly mixed with 100g sterilized soil. The mixture of the powder and soil was filled in 10 cm diameter pots. Three-week-old seedlings of tomato were transplanted to each pot containing the mixture. The soil without the plant materials serve as control. The plants were inoculated with 100 freshly hatched second stage larvae of *M. incognita* at different depths. The soil samples were analyzed for counting nematode larvae after 15, 20 and 25 days of treatment with the help of Cobb's (1918) sieving and decanting method followed by modified Baermann's funnel technique and the population were counted with the help of a Syracuse disc.

Hence, it may be concluded that the different plant extracts of *A. calamus* can be used for the management of root-knot nematode *M. incognita.*

Results and Discussion

The laboratory study on the effect of aqueous extract of *A. calamus* rhizome revealed high nematicidal properties against the second stage larvae of *M.incognita* (Table 1). Cent percent larval mortality was recorded at 10 and 5 percent concentrations of aqueous rhizome extract of *A. calamus* after 72 and 96 hours of exposure period respectively. At 1.0 and 0.5 percent extract concentrations after 120 hours of treatment 98.00 and 72.33 percent larval mortality respectively were recorded. The results showed that treatments at all the concentrations of the aqueous rhizome extract gave significant larval mortality as compared with control after 24, 48,72, 96 and 120 hours of treatment.

The effect of dry powder of *A. calamus* rhizome against the second stage larvae of *M. meloidogyne* was shown in table 2. The larval population was highly reduced after 15days at all the doses of treatments. Hundred percent larval mortality was observed at the dose of 20g and 10 g plant powder per 100 g soil after 20 and 25 days of treatment. The lowest dose i.e. 0.5g plant powder per 100 g soil also showed significant reduction of nematode population after 25 days of treatment.

The rhizome oil extract of *A. calamus* also showed high toxic effect against root-knot nematode larvae (Table 3).cent percent larval mortality was recorded after 96 and 120 hours of exposure period at the concentration of 500ppm and 300ppm respectively percent was found at 100ppm after 24 hour of exposure period. The high rate of mortality may be due to the presence of β- arsarone in acorus oil. These results were shown that the rhizome of *A. calamus* have high nematicidal activities again second stage larval of *M. incognita*

Table 1: Effect of aqueous rhizome extract of *A. calamus* on second stage larvae of *M. incognita*

Extract Concentration	Mean Percent mortality per duration of treatment (hr)				
(%)	24	48	72	96	120
10	98.33*	99.33	100.00	100.00	100.00
	(83.93)	(86.17)	(90.00)	(90.00)	(90.00)
5	87.66	97.66	98.00	100.00	100.00
	(69.54)	(82.98)	(82.00)	(90.00)	(90.00)
1	60.33	74.33	81.00	89.33	98.00
	(50.97)	(59.66)	(64.23)	(82.05)	(82.00)
0.5	36.67	42.66	49.33	62.66	72.33
	(37.13)	(40.78)	(44.62)	(52.34)	(58.28)
Control	0.00	0.00	0.00	0.00	2.00
	(0.00)	(0.00)	(0.00)	(0.00)	(7.95)
SEm ±	1.83	1.61	0.83	1.21	1.84
CD at 5%	(5.97)	(5.25)	(2.71)	(3.95)	(5.99)

*Average of 3 replications. Figures in parenthesis are arc sine transformed values.

Table 2: Effect of *A. calamus* rhizome powder on *M. incognita* larvae

Treatment (g plant powder/100g soil	Mean Percent mortality per duration of treatment (days)		
	15	20	25
20	99.66*	100.00	100.00
	(88.09)	(90.00)	(90.00)
10	98.00	99.00	100.00
	(82.67)	(84.26)	(90.00)
5	94.66	97.33	98.66
	(77.20)	(80.73)	(83.46)
1	79.66	88.66	94.33
	(63.21)	(70.35)	(76.84)
0.5	66.00	74.00	80.00
	(54.33)	(59.38)	(63.46)
Control	1.33	3.00	3.33
	(6.54)	(9.35)	(10.15)
SEm ±	1.14	1.13	1.48
CD at 5%	(3.59)	(3.56)	(4.66)

*Average of 3 replications. Figures in the parenthesis are arc sine transformed values.

Table 3 : Effect of *A. calamus* oil extract on *M. incognita* larvae

Treatment(ppm)	Mean Percent mortality per duration of treatment (hr)				
	24	48	72	96	120
500	87.66*	92.66	98.33	100.00	100.00
	(69.92)	(74.43)	(83.96)	(90.00)	(90.00)
300	75.66	85.66	98.00	99.00	100.00
	(60.46)	(67.93)	(81.87)	(84.26)	(90.00)
200	42.00	56.66	90.66	95.00	98.33
	(40.38)	(48.87)	(72.21)	(77.12)	(82.67)
100	29.33	41.66	81.66	89.66	93.00
	(32.76)	(40.20)	(64.66)	(71.25)	(74.82)
Emulsified water	0.00	0.00	0.00	0.00	0.00
(control)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Distilled water	0.00	0.00	0.00	0.00	0.00
(control)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SEm+	1.17	1.68	1.26	0.36	0.71
CD at 5%	(3.69)	(5.29)	(3.97)	(1.13)	(2.24)

Average of 3 replications. Figures in parenthesis are arc sine transformed values.

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