



Original Research Article

Studies on the pathogenic potential and life cycle of *Rotylenchulus reniformis* on *Coleus blumei*

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A B S T R A C T

Keywords

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The significant reduction in the plant growth was observed at or above inoculum level of 2000 immature females of *R. reniformis*/kg soil. Hence, this inoculum level was considered as the minimum damaging threshold level for coleus. The population of reniform nematode increased with the increasing levels of inoculum. The maximum nematode population was recorded at the highest inoculum level and the minimum population at the lowest inoculum level. The reproduction factor was significantly reduced with the increase in inoculum levels. Symptoms like chlorosis, stunted growth and sparsely developed roots were found during the experimental studies. *Rotylenchulus reniformis* required 27 days to complete the life cycle on *Coleus blumei*.

Introduction

Coleus blumei (flame nettle) is a perennial aromatic herb of Southeastern Asia. This magical herb used to treat various ailments like stomach pains, ulcers, dysentery and used as a contraceptive to prevent pregnancy. Coleus is typically grown as an ornamental plant. Ornamental plants which are grown to decorate parks, gardens and homes like other crops also have a wide nematode fauna which causes tremendous economic losses. Sasser and Freckman (1987) reported 11.1% losses in ornamental plantations throughout the world. The literature reveals that no information is available on the host parasitic relationship, particularly between initial inoculum levels and subsequent

damage to the plant. Keeping this in view, an attempt has been made to study the pathogenicity and life cycle of this nematode on coleus.

Materials and Methods

Two week old seedlings of *Coleus blumei* were transplanted singly in 6" earthen pots containing 1kg sterilized soil+ river sand+ farm yard manure (3:1:1) mixture and three days after transplantation, seedlings were inoculated with 500, 1000, 2000, 4000 and 8000 immature females of *R. reniformis*. Inoculations were done by making 4-5 holes near the rhizosphere of each seedling. After inoculations, the holes

were closed with soil followed by light irrigation, uninoculated plants served as control.

The experiment was terminated after sixty days of inoculations. Observations were recorded on plant growth characters (length, fresh weight and dry weight of plant) and population of nematodes in soil and root. For interpretation of results, the reduction in plant growth was calculated in terms of dry weight reduction. Reproduction factor (R) was calculated by the formula $R = Pf/Pi$ where (Pf) represent the final and (Pi) initial population of the nematode. To estimate nematode population in roots, 1g root was macerated with enough water in a waring blender for 30 seconds, thus releasing the females in the water for counting. External symptoms of the plants infected with nematode were also recorded during experimental period.

Similarly, to study the life-cycle of *R. reniformis* on coleus, two week old seedlings were inoculated with 500 immature females of reniform nematodes. Observations on the development of reniform nematode were recorded after 2, 3, 5, 10, 15, 20, 25 and 27 days of inoculation. Roots were stained with 0.01 % acid fuchsin in lactophenol to study unswollen or fully swollen females with matrix and egg masses. The egg masses were picked and pressed under a coverslip on glass slide and the numbers of eggs per egg mass were counted. Estimation of nematodes from soil was also done. Data obtained were analysed statistically.

Results and Discussion

The data presented in Table-1 revealed that with the increase in inoculum levels of *R. reniformis*, there was corresponding increase in the plant growth reduction.

Highest reduction in plant growth was recorded at a level of 8000 immature females/kg soil and the lowest was at 500 immature females/kg soil. The inoculum levels upto 1000 immature females of *R. reniformis* did not significantly reduce the plant growth of coleus. However, the inoculum of 2000 immature females/kg soil caused significant reduction in growth.

About one month after inoculation, drying and shedding of leaves due to nematode infestation resulted in fewer leaves giving plants an unhealthy appearance. At harvest, plant exhibits yellowish green dull color stunted growth. The roots of plants inoculated with 2000 and above nematodes, were developed brownish color spots at feeding site of nematode.

The final population of *R. reniformis* was highest in and around plants inoculated with 8000 immature females/kg soil and lowest at an initial inoculum level of 500 immature females/kg soil. The reproduction factor significantly decrease with an increase in the inoculum levels (Table 2). Thus the rate of nematode multiplication showed declining trend with the increasing initial inoculum levels, suggesting it to be a density dependent phenomenon. The results revealed that with the increase in the inoculum levels of *R. reniformis* there was corresponding decrease in the rate of nematode multiplication. The high rate of multiplication at lower inoculum levels possible due to some positive factors like lack of competition, abundance of food and ability of host to support these levels of population. The progressive decrease in the plant growth and multiplication of reniform nematode with the increasing inoculum of nematodes has also been reported by Khan (1981), Shekhar *et al.*, (1996) and Khan and Dar (2002).

Table.1 Effect of different inoculum levels of *Rotylenchulus reniformis* on the growth of *Coleus blumei*.

Inoculum levels	Plant length (cm)			Plant fresh weight (g)			Plant dry weight (g)			%reduction over control
	Shoot	Root	Total	Shoot	Root	Total	Shoot	Root	Total	
Control	62.1	29.2	91.3	102.0	42.1	144.1	34.2	10.9	45.1	—
500	61.7	27.7	89.4	99.5	40.2	139.7	33.0	10.4	43.3	3.7
1000	60.5	27.1	87.6	96.2	39.1	135.3	32.2	9.4	41.6	7.7
2000	50.8	22.5	73.3	79.0	32.1	111.1	26.3	7.3	33.6	25.4
4000	42.8	19.5	62.3	67.5	26.4	93.9	21.8	6.6	28.4	37.0
8000	40.9	17.4	58.3	64.4	24.5	88.9	20.4	6.4	26.8	40.5
C.D (P=0.05)	<u>9.20</u>			<u>12.27</u>			<u>6.05</u>			
C.D (P=0.01)	14.42			19.24			9.48			

Table.2 Effect of different inoculum levels of *Rotylenchulus reniformis* on nematode multiplication.

Inoculum levels	Nematodes/Kg soil	Females/root system	Total	R=Pf/Pi
500	9978	79	10057	20.11
1000	17149	120	17269	17.26
2000	26090	191	26281	13.14
4000	41061	264	41325	10.33
8000	44218	352	44570	5.57
C.D (P=0.05)	<u>1.74</u>			
C.D (P=0.01)	2.88			

Table.3 Studies on the life cycle of *Rotylenchulus reniformis* on coleus.
Percentage of developmental stages of reniform nematode

Days after Inoculation	Females unswollen	Females with slight swellings	Females fully swollen	Females with matrix	Females with egg sac	No. of eggs /egg sac	No. of pre-adult females/kgsoil	Total recovery of females
2	7.0	--	--	--	--	--	--	7.0
3	12.6	---	--	--	--	--	--	12.6
5	25.2	3.8	--	--	--	--	--	29.0
10	4.2	30.6	--	--	--	--	--	34.8
15	--	8.8	29.6	2.4	--	--	--	40.8
20	--	--	14.0	30.2	6.0	16	--	50.2
25	--	--	4.6	7.4	44.6	62	--	56.6
--	--	1.8	59.0	47	34	60.8		
CD (P=0.05)	<u>5.24</u>							
CD (P=0.01)	7.31							

From the present study, it could be concluded that the pathogenic threshold level of *R. reniformis* on *Coleus blumei* was 2000 immature females/kg soil. Padhi and Misra (1987) noted that the inoculum threshold level of *R. reniformis* varied from 100 to 1000 inoculum level on different crops. This variation may be possibly due to different crop plants used or changed in experimental conditions.

It is clear from the data presented in (Table 3) that 7.0 % unswollen females of *R. reniformis* were recorded inside the roots of coleus plants on 2nd day of inoculation with maximum penetration 25.2 % achieved on 5th day. The slight swelling of immature females 3.8 % began on 5th day of inoculation. The maximum number of slight swollen females 30.6 % was recorded on 10th day. The greatest number of fully swollen females 29.6 % of reniform nematode was observed on 15th day of inoculation followed by 20th day (14.0 %) and 25th day (4.6 %). The adult females with gelatinous matrix and females with egg masses were first observed on 15th and 20th day of inoculation respectively. Immature females of second generation were observed on 27th day.

From the present investigations, it can be concluded that the reniform nematode required 27 days to complete its life cycle on *Coleus blumei*. The total duration of life cycle of *R. reniformis* on different hosts have been worked out by previous workers which is ranged from 24-29 days on Cotton (Oteifa and Salem, 1972), 19 days on Castor (Bishnoi and Yadav, 1989) and 15 days on Soybean (Shekhar *et al.*, 1996). The variation in the duration of life cycle of reniform nematode might be due to number of ecological factors, especially host's status, moisture, temperature etc.

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