



CONTROL OF ROOT-KNOT NEMATODE *MELOIDOGYNE INCOGNITA* USING LEAF POWDER OF MEDICINAL PLANT ON OKRA

¹Naresh Nayak and ²Mridula Khandelwal

¹Assistant professor, ²Assistant professor

¹Department of Botany, Govt. College Kota (Raj.)

²Department of Botany, University of Kota, Kota (Raj.)

Abstract: Experiment was set up by using pots having one Kg. steam sterilized soil. Twenty one day old okra (*Abelmoschus esculentus*) plant were transplanted in each pots. Leaf powder of five medicinal plant Viz. *Asperagus asparagoides*, *Catharethus roseus*, *Solanum nigrum*, *Occimum sanctum*, *Aegle marmelos* were used to control root knot nematode, *M. incognita* in okra. There was marked increase in root-shoot length, root-shoot weight of fresh and dry plant. Number of leaves, number of fruit and size increased. Leaf powder (LP) + Nematode (N) treatment as compare to Nematode (N) alone treatment. Leaf powder (LP) + Nematode (N) treatment was also characterized by reduction in root knot index in comparison to nematode alone. Leaf powder (LP) of *Asperagus* (Asp) + Nematode (N) combination was found to be more effective to reduce root knot index. It was also observed that applied dose of 20 gm. Leaf powder was more effective than 10 gram dose.

Index Terms - *M. Incognita*, Nematode, Okra, Leaf Powder

Introduction: Root-Knot nematode *Meloidogyne spp.* is one of the three most economically damaging genera of plant parasitic nematode on horticultural and field crops. The root knot nematode *Meloidogyne incognita* is one of the important pest on Okra. The crop is largely grown in small plots or as inter crop both for cash and domestic consumption by farmers all over India. Root-knot nematode, *Meloidogyne spp.* causes yield losses in several crops (Perry and Moens, 2013). Bhatti and Jain, (1977) recorded 90.9 % loss in okra due to *M. incognita*. interrelationship between *M. incognita* and *Rotylenchulus reniformis* on okra was reported (Anvar and Alam, 1989).

Extract of *Argemone maxicana* applied to okra growing in micro plot infected with *M. incognita* and *M. javanica* showed nematicidal properties. The nematode population reduced from 29 to 64 percent (Nath *et al*, 1982; Patel *et al*, 1985; Bala *et al*, 1986; Paruthi *et al*, 1987; Abubakar, 1999) studied the effect of some green leaves on root knot infestation on okra.

The present investigation was undertaken to know the efficacy of medicinal plant leaf powder. (*Asperagus asparagoides*, *Catharethus roseus*, *Solanum nigrum*, *Occimum sanctum*, *Aegle marmelosa*) against root knot nematode *M. incognita* on okra.

Material & Method: Healthy seed of okra *Abelmoschus esculentus* (L.) were shown in an earthen pot containing sterilized soil. After 21 days of showing nursery plant of equal size were selected and transplanted in to pots of 1 kg. Soil capacity before filling the pots the soil was steam sterilized and mixed with dried leaves powder of medicinal plant in the dose of 10 and 20 gm/kg of soil. The mixture was allowed to decompose for 10 days before transplanting the nursery. Each treatment of every leaf powder was replicated four times and two sets left as control and untreated. After transplanting all the treatment except control were inoculated with 1000 second stages juveniles (J2) of *Meloidogyne incognita*. Observation after 60 days of inoculation the plant were made on the root and shoot length of fresh and dry plant, root and shoot weight of fresh and dry plant. Number of leaves, number of fruit, and size of fruit. Disease incidence i.e number of gall per plant. The fresh weight shoot root were determine with the help of physical balance. To determine the dry weight of shoot and root the plant parts were separately cut into pieces and kept in an oven.

Result: The efficacy of dried leaves powder of medicinal plant infecting Okra with their different plant growth rate is shown in table 1 & 2. Among the dried five different type of medicinal plant's leaf powder maximum improvement in plant growth was observed in plant treated with *Asperagus* (Asp) 20 gm.+ Nematode (N) Compared to plants treated with 10 gm/kg soil. The root shoot length, fresh and dry weight increased and root knot index decreased in Leaf powder (LP) + Nematode (N) treated plant. The order of effectiveness of different medicinal leaf powder was Asp + N > Cath + N > Sola + N > Occi + N > Aeg + N. Lowest reduction was observed in treatment with 20 gm/kg of soil thus treatment plant even at lowest dose showed much reduction in disease incidence when compared with untreated one.

TABLE -1

CONTROL OF *M. incognita* USING LEAF POWDER OF MEDCINAL PLANT (OBSERVATION ARE MEAN OF FOUR REPLICATES)

	Plant length in cm.				Plant weight in gm.				Root-knot index (R.K.I)
	Fresh		Dry		Fresh		Dry		
	Shoot	Root	Shoot	Root	Shoot	Root	Shoot	Root	
Healthy(H)	38.4	35.2	37.2	30	31.5	9.2	7.94	2.71	0
Nematode only (N)	14	13.2	13	11.1	6	2.1	1.70	0.51	5
Aeg(10)+N	26	24.2	24.7	22.8	20	7	5.2	1.97	1
Aeg(20)+N	28	29.2	26.8	27.9	21.6	10.5	6	2.67	0.35
Healthy(H)	38.4	35.2	37.2	30	31.5	9.2	7.94	2.71	0
Nematode only(N)	14	13.2	13	11.1	6	2.1	1.70	0.51	5
Asp(10)+N	28	32.4	27.1	31.2	17.4	10	4.92	2.54	0.35
Asp(20)+N	34	35.8	32.3	34.1	23	12	6.2	4.2	0
Healthy(H)	38.4	35.2	37.2	30	31.5	9.2	7.94	2.71	0
Nematode	14	13.2	13	11.1	6	2.1	1.70	0.51	5

only(N)									
Sola(10)+N	26.8	24.6	25.2	22.9	17.0	5.8	5.1	1.48	0.44
Sola(20)+N	29.8	32.9	28.4	31.4	24.9	6.8	7.2	1.52	0.20
Healthy(H)	38.4	35.2	37.2	30	31.5	9.2	7.94	2.71	0
Nematode only(N)	14	13.2	13	11.1	6	2.1	1.70	0.51	5
Cath(10)+N	24.2	16	23.1	14.6	13	4	3.2	.97	0.25
Cath(20)+N	32.1	30.2	31.2	28.6	17.5	4.8	4.72	1.78	0
Healthy(H)	38.4	35.2	37.2	30	31.5	9.2	7.94	2.71	0
Nematode only(N)	14	13.2	13	11.1	6	2.1	1.70	0.51	5
Occi(10)+N	11	10	9.9	8.2	6.0	1.8	1.43	.38	1
Occi(20)+N	13.7	20.8	12.4	18.3	4.2	1.8	1.25	.35	0.50

Sola(10)+N= Solanum nigrum leaf powder 10 gm +nematodes

Cath(10)+N= Catharanthus leaf powder 10 gm +nematodes

Occi(10)+N= Occimum leaf powder 10 gm +nematodes

Aeg(10)+N= Aegle leaf powder 10 gm +nematodes

Asp(10)+N= Aperagus leaf powder 10 gm + nematodes

TABLE-2

CONTROL OF *M. incognita* USING LEAF POWDER OF MEDICINAL PLANT (OBSERVATION ARE MEAN OF FOUR REPLICATES)

	Number of leaves in			Number of Fruits in			Maximum size of Fruit in cm.
	30 Days	45 Days	60 Days	30 Days	45 Days	60 Days	
Healthy(H)	8	11	15	1	2	3	13.2
Nematode only(N)	6	8	9	0	1	1	6.9
Asp(10)+N	7	9	12	0	0	1	8.7
Asp(20)+N	7	9	13	0	1	2	12.8
Healthy(H)	8	11	15	1	2	3	13.2
Nematode only(N)	6	8	9	0	1	1	6.9
Sola(10)+N	7	8	12	0	1	2	11.2
Sola(20) +N	6	12	15	0	1	2	12.6
Healthy(H)	8	11	15	1	2	3	13.2
Nematode only(N)	6	8	9	0	1	1	6.9
Cath(10) +N	7	8	11	1	2	2	9.7
Cath(20)+N	8	12	14	1	2	2	10
Healthy(H)	8	11	15	1	2	3	13.2
Nematode only(N)	6	8	9	0	1	1	6.9
Occi(10)+N	7	9	12	1	1	1	8.2
Occi(20)+N	8	11	14	1	2	2	10.4

Healthy(H)	8	11	15	1	2	3	13.2
Nematode only(N)	6	8	9	0	1	1	6.9
Aeg(10)+N	6	9	11	1	1	3	9.3
Aeg(20)+N	5	9	12	1	2	3	11.2

Sola(10)+N= Solanum nigrum leaf powder 10 gm +nematodes

Cath(10)+N= Catharanthus leaf powder 10 gm +nematodes

Occi(10)+N= Occimum leaf powder 10 gm +nematodes

Aeg(10)+N= Aegle leaf powder 10 gm +nematodes

Asp(10) +N= Asperagus leaf powder 10 gm +nematodes

Discussion: Medicinal plant and green manuring has been a common practice in Indian agriculture, It is a promising and easy method of altering soil environment there by achieving biological control of the plant pathogen by means of soil amendment with the decomposable matter. Reports indicated that addition of a variety of organic material to soil resulted in definite reduction of the nematode population of plant parasitic nematodes (Muller and Gooch, 1982; Trivedi and Barker, 1986). (Gouge *et al*, 1994; Aktar and Alam, 1990, 1992) and many other efforts have been made to control the root knot nematode by using leaves of *Cassia fistula*, *C. occident*, *Corotalaria juncea*, *Azadirachta indica*. The low rate of *S. glaseri* suppressed *Meloidogyne incognita* penetration in tomato roots and high rate of *S. glaseri* reduced egg population production (Perez and Lewis, 2004). Application of different leaf powder significantly reduce the growth and development of the nematode population (Peet, 1996; Wang et al, 2004).

Asperagus asparagoides has a great additional property. Asperagus has different organoleptic and culinary characteristic. However green Asperagus is distinguished by its high level of the antioxidant, vitamin A and C as well as by its vitamin B and folic acid content. It also act as precursor of B group vitamins. Hence the maximum reduction in root knot index due to its medicinal properties in our finding also the treatment plants have much reduction in disease infestation rate and also increase in plant growth parameters.

Acknowledgement –

One of the authors Naresh Nayak is highly grateful to Dr, J. L. Sharma Head, PG Department of Botany, Government College, Kota for Laboratory facilities, supervision and guidance and is also thankful to University Grants Commission for financial assistance.

References :

- Abudakar, U. 1999. Studies on the nematode of cowpea *Vigna unguiculata* of the Savanna region of Northern Nigeria and Control of *Meloidogyne incognita* using Selected plant extract and aniamamureso unpublished P.hD Thesis, Usmanu Danfodiya Univ., Sokoto p. 108.
- Aktar M, and Alam M.M. 1992. Effect of crop residue amendment to soil for the control of plant parasitic nematodes. *Bioresour. Technol.* 14: 81-83.
- Aktar, M. And Alam, M.M., 1990. Control of plant parasitic nematode with agro wastes soil amendment. *Pakistan J. Nematol.* 8: 25-28.
- Anver, S. and Alam. 1986. Studies on inter-relationship between *Meloidogyne hapla* and *Meloidogyne incognita* on Okra. *Indian J. Nematol* 19: 1-4.

- Bala, S.K., Bhattacharya, P. Mukherjee, K.S. and Sukul, N.C. 1986. Nematicidal properties of the plant *Xanthium strumarium* and *Parthenium hyseterophorus*. *Environment and Ecology* 4: 139-141(Enq ref) Dept. Zool. VisvaBharti, Univ. Santiniketan 731235 India.
- Bhatti, D.S. Sultan and jain, R.K, 1977. Estimation of loss in Okra, tomato and brinjal yield due to *Meloidogyne incognita*. *Indian J. Nematol* 7:37-41.
- Gouge , D.H. Otto, A.A., Schiroki, A., and Hague, N.G.M., 1994. Effect of steinernematids on the root - knot nematode *Meloidogyne javanica*. Tests of agronomical and cultivars No. 15. *Ann. Appl. Biol.* 124, 134-135.
- Muller, R. and Gooch, P.S. 1982. Organic amendments in nematode control, examination of the literature, *Nematropica* 12: 312-326.
- Nath, R., Khan, M.N., Kamalwanshi, R.S. and Dweredi, R.P. 1982. Effect of *Argemone maxicana* on *Meloidogyne javanica* in Okra. *Indian J. Nematole.* 12: 205 208.
- Paruti , L.J., Jain, R.K. and Gupta D.C. 1987. Effect of different period of degradation of subabbol leaves alone and it combination with nematicide on root knot nematode incidence in Okra. *Indian J. Nematol.* 17:30.
- Patel, H.R., Thakur, N.A., and Patel, C.C. 1985. Inhibitory effect of *Clerodenderon enermi* on root knot of Okra. *Madras Agricultural Journal* .72: 470-472.
- Perry, R.N and Moens, M. 2013. Plant Nematology published by *Cab Intl*, 2013 ISBN 10:1780641532/ISBN 13: 9781780641539.
- Peet, Mary. 1996. Sustainable Practices for Vegetable Production in the South. Focus Publishing, Newburyport, MA. P. 75-77.
- Perez, E.E. and Lewis. 2004. Suppression of (*Meloidogyne incognita* and *Meloidogyne hapla*) with entomopathogenic nematodes on green house peanuts and tomatoes. *Biological control*, 2004, Vol. 30, No. 2. pp. 336-341.
- Trivedi, P.C. and Barker K.R. 1986 Management of Nematodes by cultural practices *nematropica* 16:213-236.
- Wang. K.H., R. McSorley, R.N. Gallaher. 2004. Effect of *Crotalaria juncea* amendment on squash infected with (*Meloidogyne incognita*, *Journal of Nematology*. 2004. Vol. 36, No. 3. pp. 290-296.