

EFFECT OF ROOT KNOT NEMATODE INFESTATION ON NODULATION BY *RHIZOBIUM* IN COWPEA*

The root-knot disease caused by *Meloidogynespp.* is of common occurrence in many crops grown in the tropical and subtropical regions. AM *et al.* (1981) and Sharma and Sethi (1977) have reported that cowpea (*Vigna unguiculata* (L) Walp) is susceptible to infection by this nematode. The present study was carried out to study the effect of inoculation with *M. incognita* on nodulation, gall formation and other plant characters in this crop.

The susceptible cowpea variety New Era, was used in this pot culture experiment under aseptic conditions. The potting mixture consisted of steam sterilized garden soil, sand and cowdung in the ratio 2:1:1. Seven kg of this mixture was used to fill medium size pots of 17 cm diameter. Pure cultures of *M. incognita* were maintained in the roots of coleus (*Coleus blumei*). This specific *Rhizobium* culture was used for seed treatment of surface sterilized seeds of cowpea prior to sowing following standard procedures. After germination, one seedling each of uniform growth was maintained in every pot. The seedling was inoculated with the nematode on the 15th day of plant growth. Five inoculum levels such as 0 (control), 10, 100, 1000 and 10,000 second stage larvae per plant were used. The nematodes were added to the soil in 10 ml suspension of sterilized tap water near the root zone. Six replications were maintained for each treatment. The observations on nodule number, nodule fresh weight, gall number, gall fresh weight, plant height, leaf number, fresh and dry weight of shoot, root length and percentage nitrogen content of the shoot were taken on the 50th day of plant growth. The nitrogen content was estimated by microkjeldahl method of Jackson (1958).

A progressive reduction in various plant characters studied was observed due to inoculation with different levels of *M. incognita*. The number of nodules formed was reduced significantly after inoculation with 100, 1000 and 10,000 nematodes per plant (Table 1). The fresh weight of nodules was also correspondingly low. However, the number of galls formed per plant increased significantly with an increase in the inoculum level of the nematode. The galls formed were 41.33, 135.67, 222.00 and 290.67 with 10, 100, 1000 and 10000 nematodes per plant (Table 1). The increase in fresh weight of galls was in direct proportion to their number. There was no gall formation in the uninoculated control treatment. The percentage nitrogen content of the shoot was reduced significantly, by inoculation with 1000 and 10000 nematodes. The nitrogen content was 2.60 and 2.37 per cent respectively as against 3.34, 3.30 and 3.15 per cent for plants treated with 0, 10 and 100 nematodes (Table 1). A significant reduction in plant height, leaf number, fresh and dry weight of shoot and root length was also observed due to inoculation with the above levels of the nematode (Table 1).

* Part of M. Sc. (Ag) thesis submitted by the first author to the Kerala Agricultural University, 1986.

Table 1

Effect of inoculation with *Meloidogyne incognita* on nodulation and other plant characters in cowpea

Nematode Number	Nodule Number	Nodule fresh weight (g)	Gall number	Gall fresh weight (g)	Plant height (cm)	Leaf Number	Fresh weight of shoot (g)	Dry weight of shoot (g)	Root length (cm)	Percentage nitrogen content of shoot
Control	209.33 (14.47)	54.3	0.00 (1.00)	0.00	118.15	14.17 (3.76)	81.17	7.57	62.30	3.34
10	183.50 (13.55)	4.83	41.33 (6.42)	0.55	119.12	13.67 (3.69)	77.55	6.86	61.13	3.30
100	161.00 (12.69)	4.03	135.67 (11.64)	1.53	113.90	12.67 (3.55)	75.57	6.05	55.58	3.15
1000	115.33 (10.74)	2.87	222.00 (14.90)	2.15	78.55	8.33 (2.88)	63.05	3.97	46.03	2.60
10000	63.33 (7.96)	2.46	290.67 (17.04)	3.37	49.63	5.50 (2.34)	46.72	2.26	35.47	2.37
CD (0.05)	1.12	0.96	1.53	0.50	1343	0.27	7.99	1.69	9.63	0.31

Mean of 6 replications

Figures in parenthesis are \sqrt{x} transformation values for nodule number and leaf number and $\sqrt{x \pm 1}$ transformation values for gall number.

In general, inoculation with *M. incognita* had an adverse effect on nodulation and other plant characters in cowpea. Such deleterious effects due to inoculation with specific nematodes in pulses have been reported earlier by Hussaini and Seshadri (1975), Nath *et al.* (1979) Raut(1980), Raut and Sethi (1980) and Singh *et al.*, (1977). The overall reduction in plant growth appears to be due to gall formation and its adverse effect on root growth and hindrance to the normal uptake of nutrients from the soil. This can also influence nodulation and nitrogen fixation by *Rhizobium*. During the present study also, it was observed that inoculation with different levels of nematode reduced the number of nodules formed and the percentage nitrogen content of the plant. Further, out of the various levels tried 1000 nematodes per plant was found to be the threshold level for causing adverse effect on plant growth.

Pathogenicity of *M. incognita* in cowpea, variety New Era, was studied by inoculating with 10, 100, 1000 and 10,000 second stage larvae per plant. This had a significant effect on the number of nodules and galls formed, percentage nitrogen content of the shoot and on other plant characters studied. Among the different levels used for artificial inoculation, 1000 nematodes per plant was found to be the damage threshold level.

സംഗ്രഹം

ന്യൂ ഇറാ എന്ന പയറിനത്തിൽ 10, 100, 1000, 10000 എന്ന തോതിൽ മെലോയ്ഡോഗയിൽ ഇൻകോഗ്നിറ്റാ എന്ന *rolffloajroeoj'ffls rosns* ഘട്ടത്തിലെ പുഴുക്കൾ വളരുന്നതിനുള്ള സാഹചര്യമുണ്ടാക്കിക്കൊടുത്ത് ചെടികൾക്ക് തന്മൂലമുണ്ടാകുന്ന നാശത്തിന്റെ കഠിനതും പഠിക്കുകയുണ്ടായി. നിമാവിരകൾ ചെടികളിലെ നോഡ്യൂളുകളെയും (മൂലാർബുങ്ങങ്ങൾ) പാകൃജനകത്തിന്റെ തോതിനെയും ബാധിക്കുന്നതായി കണ്ടു. വിവിധ തോതുകളിൽ നിമാവിരകൃത്തിവച്ചതിൽ ഒരു *ff>ruslsi^Q* നശിപ്പിക്കുന്നതിന് ആവശ്യമായ കുറഞ്ഞ നിമാവിരയുടെ എണ്ണം ആയിരം എന്ന് കണ്ടെത്തി.

College of Agriculture
Vellayani 695 522, Trivandrum, Kerala

D. Nirmala Moni
Sasi Kumar Nair

References

AM, M. A., Trabulsi, I. Y., Abd-elsamea, M. E. 1981. Antagonistic interaction between *Meloidogyne incognita* and *Rhizobium leguminosarum* on cowpea. *Plant Dis.* **65**: 432-435

Hussaini, S. S. and Seshadri, A. R. 1975. Inter-relationship between *Meloidogyne incognita* and *Rhizobium sp* on mung bean (*Phaselousaureus*). *Indian J. Nematol.* **5**: 189-199

- Jackson, M. L. 1958. *So/7 Chemical Analysis*. Prentice Hall of India Pvt, Ltd., New Delhi.
- Nath, R. P., Banerjee, A. K., Haidar, M. G. and Sinha, B. K. 1979. Studies on the nematodes of pulse crops in India I. Pathogenicity of *Meloidogyne incognita* on gram. *Indian Phytopath.* **32**: 28-32
- Raut, S. P. 1980. Effects of initial inoculum levels of *Meloidogyne incognita* on plant growth and rhizobial nodulation of mung bean. *Indian Phytopath.* **33** 351-353.
- Raut, S. P. and Sethi, C. L. 1980. Studies on the pathogenicity of *Meloidogyne incognita* on soybean. *Indian J. Nematol.* **10**: 166-174
- Sharma, N. K. and Sethi, C. L. 1977. Effects of initial inoculum levels of *Meloidogyne incognita* and *Heterodera cajani* on cowpea and on their population development. *Indian J. Nematol.* **5**: 148-154
- Singh, I., Chahal, V. P. S, Sakhuj, P. K. and Chohan, J. S. 1977. Effect of different levels of *Meloidogyne incognita* in the presence and absence of *Rhizobium phaseoli* on *Phaseolus aureus*. *Indian J. Nematol.* **7**: 172-174