

Eco-Friendly Approaches to Manage Root-Knot Nematode on Tomato

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Abstract

Studies on management of *Meloidogyne incognita* under field conditions in tomato with the individual application of *Glomus fasciculatum*, *Trichoderma viride*, neem cake, FYM and marigold revealed that *Glomus fasciculatum* significantly increased the plant growth characters like root length, shoot length, yield of tomato cv Pusaruby besides reduction of nematode population and root galls and root-knot index.

Key words : Eco-friendly, Root-knot nematode, Tomato.

Tomato is one of the most popular vegetable crops of tropical countries and it can be grown throughout the year. It is more susceptible to nematode invasion due to multiple cropping pattern and continued presence of host. Among the nematodes, root-knot nematode, *Meloidogyne incognita* is the most destructive nematode. Among the various management practices existing so far, the cultural methods are not generally appreciated due to time limit and economic pressure on land use. Though the use of chemical is found to be effective in managing nematodes, their utility is limited due to higher cost, non-availability, environmental pollution, residual problem. Hence, one of the attractive and promising alternatives is the use of biological components for nematode management as they are environmentally safe and cost effective. Efforts were made for management of root-knot nematode on tomato under field conditions by utilizing important biological agents like AMF—*Glomus fasciculatum*, *Trichoderma viride* and organic amendments like neem cake, FYM and marigold, a trap crop.

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Methods

The experiment was carried out in randomized block design in the root-knot infested field of nema-

tology section of Department of Plant Pathology, University of Agricultural Sciences, Bangalore. Three replications were maintained for each treatment plot size of 1 × 1 m for nursery and 1 × 1.5 m for the mainfield were laid out uniformly for all replications.

The treatments viz., T₁-Healthy check (treated with 4% formalin 15 days before sowing and transplanting in nursery and main field respectively), T₂-inoculated check, received no treatments, T₃-*Glomus fasciculatum* (50 g soil culture containing an average of 200 chlamydo spores per gram of soil/m²) T₄-*Trichoderma viride* (10 g/m²) T₅-Neem cake- (250 g/m²), T₆-Farm Yard manure (500 g/m²) and T₇-marigold as intercrop.

All the treatments were imposed in the nursery beds. Then known quantity of tomato seeds Pusa ruby were sown in these nursery beds. The cowpea was raised in the infested mainfield served as host for the nematodes, so as to achieve the nematode population above economic threshold level. The shoot was then cut and leaving the roots in the soil. At the time of transplanting of tomato seedling, the field had a population of 565 *M. incognita*/200 cc soil. Thirty days old seedlings were removed from the nursery beds and transplanted to the mainfield (1 × 1.5 m²).

The treatments were completely randomized in three replications with both inoculated and uninoculated checks. Observations on host growth parameters, nematode population at every 30-day in-

Table 1. Effect of different treatments on growth and development of tomato. Infested by root-knot nematode, *Meloidogyne incognita*.

Treatments	Shoot length (cm)	Fresh shoot weight (g)	Root length (cm)	Fresh root weight (g)	Yield/plot (kg)	Yield/ha (kg)	C : B ratio
T ₁ Healthy check	57.94	43.38	20.42	15.00	2.27	11,350	1:2.06
T ₂ Inoculated check	31.40	20.81	9.48	8.00	1.50	7,500	1:1.20
T ₃ <i>Glomus fasciculatum</i>	45.56	38.84	19.36	16.00	3.25	16,250	1:1.89
T ₄ <i>Trichoderma viride</i>	38.56	34.43	17.36	14.06	2.79	13,950	1:1.58
T ₅ Neem cake	36.60	37.86	16.69	12.47	2.26	11,300	1:1.41
T ₆ FYM	35.50	34.42	17.76	13.32	2.29	11,450	1:1.63
T ₇ Marigold	37.50	32.12	16.86	10.35	2.00	10,000	1:1.78
SE ±	4.36	5.46	3.47	3.10	0.40	10.50	–
CD at 5%	13.36	15.75	10.30	8.96	1.20	30.46	–

tervals and nematode reproduction at harvest and yield parameters recorded for calculating cost : benefit ratio.

Results and Discussion

The efficacy of various treatments on growth of tomato plants are presented in Table 1. The plants treated with various treatments recorded better growth and yield compared to untreated control. Maximum reduction in plant growth with respect to germination percentage (47.00%), shoot length (31.40 cm), shoot weight. (20.81 g), root length (9.48 cm), root weight (8.00 g) and yield (1.50 kg/plot) was noticed in inoculated control (T₂).

Among various treatments, *Glomus fasciculatum* performed well by recording higher shoot length (45.56 cm), fresh shoot weight (38.84 g), root length (19.36 cm), root weight (16.00 g), yield (16,250 kg/ha) and

Cost : benefit ratio (1:1.89).

The data on the nematode population in different treatment at various interval (Table 2) revealed that all the treatments individually had performed well in reducing the nematode population after transplanting. However, the maximum reduction in the nematode population was recorded in *Glomus fasciculatum* with least nematode population of (326.66/200 cc soil) compared to untreated control, which recorded highest nematode population (706.66 nematode/200 cc soil) at harvest.

Even minimum number of galls (47.33) with root-knot index (4.00) recorded with *Glomus fasciculatum* as against inoculated check recording 183.66 galls/ root system with RKI of 5.00 respectively.

The present results are in line with work of Rajeshwari et al. (1) on tomato and Rao et al. (2) who obtained better seedling establishment and plant growth parameters with application of *Glomus mossae*

Table 2. Effect of different treatments on development and multiplication of root-knot nematode, *Meloidogyne incognita* on tomato.

Treatments	At transplant	30 DAT	60 DAT	At harvest	No. galls/ root system	Root-knot index
T ₁ Healthy check	–	–	–	–	–	–
T ₂ Inoculated check	524.00	586.66	653.33	706.66	183.66	5.00
T ₃ <i>Glomus fasciculatum</i>	386.00	513.33	420.00	326.66	47.33	4.00
T ₄ <i>Trichoderma viride</i>	413.00	560.00	473.33	376.66	46.66	4.00
T ₅ Neem cake	395.66	520.00	453.33	353.33	51.25	4.00
T ₆ FYM	420.00	500.00	413.33	333.36	66.50	4.00
T ₇ Marigold	400.66	526.66	446.66	366.66	67.88	4.00
SE ±	11.20	21.01	18.73	15.24	3.56	0.06
CD at 5%	32.48	60.90	54.04	45.08	10.09	0.22

and neem leaf extract in brinjal.

Glomus fasciculatum suppressed nematode infection and nematode number this may be due to highest mycorrhizal colonization and spore production upon inoculation of mycorrhizal fungi, similar results with other endophytes were reported by Sikora and Schoenbeck (3) and Atilano et al. (4) who reported significant reduction in number of *M. incognita* due to well established endophytic mycorrhizal root system.

In AM-nematode interaction, nematode could not affect the mycorrhizal development. Similar observations were noticed by Sharma et al. (5) on tomato. The enhanced plant growth and higher vigor of mycorrhizal plants might led to higher growth of AM fungi in root cortex. These results support the use of eco-friendly components for the sustainable management of root-knot nematode on tomato.

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