Biological Forum – An International Journal **16(4): 16-19(2024)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Effect of *Trichoderma viride* and Organic Manures Against Root-knot Nematode *Meloidogyne incognita* Infecting Jute under Seed Production

Pranjal Pratim Neog[1]*, Pal Deka[2] and R.K. Goswami[3]
[1]Department of Nematology, B.N. College of Agriculture,
AAU, Biswanath Chariali (Assam), India.
[2]Department of Agricultural Statistics, B.N. College of Agriculture,
AAU, Biswanath Chariali (Assam), India.
[2]Department of Crop Physiology, B.N. College of Agriculture,
AAU, Biswanath Chariali (Assam), India.

(Corresponding author: Pranjal Pratim Neog)*
(Received: 01 February 2024; Revised: 18 February 2024; Accepted: 09 March 2024; Published: 15 April 2024)
(Published by Research Trend)

ABSTRACT: The effect of different organic manures *viz.* Goat dung, Poultry manure, Cow dung and bioagent *Trichoderma viride* alone and in combination as soil application were evaluated against root-knot nematode, *Meloidogyne incognita* infecting jute. The results indicated that all these organic manures both alone or in combination with bioagent, *T. viride* significantly reduced the number of galls and egg masses per plant, final nematode population in soil and increased the seed yield of jute in comparison to untreated control. Maximum reduction of number of galls, eggmasses and final nematode population in soil was recorded in the treatment with soil application of poultry manure in combination with *T. viride* followed by the treatment with soil application of goat dung in combination with *T. viride.* Likewise highest seed yield of jute was recorded in the treatment with soil application of poultry manure in combination with *T. viride.*

Keywords: Jute, organic manure, root-knot nematode, *Trichoderma viride.*

INTRODUCTION

Jute (*Corchorus* spp.) is one of the most important fibre yielding crops. Jute fibre is one of the cheapest and the strongest of all natural fibres and considered as fibre of the future. Jute is mainly cultivated in Bangladesh, China, India, Nepal, Thailand, Myanmar, Pakistan and Bhutan (Maiti and Singh 2019). In India jute cultivation mainly confined to the states like West Bengal, Bihar, Assam, Tripura, Meghalaya, Orissa and Uttar Pradesh. Jute fibre is used extensively in the manufacture of gunny bags, gunny cloths and other packaging materials for storing and transporting of various agricultural and industrial products. They are also used in making ropes, rugs and carpet etc. Their leaves can also be used as vegetables in India. Jute crop is attack by several diseases and insect pests *viz.* stem rot, anthracnose, tip blight, bacterial leaf spot, stem weevil, yellow mite, semi looper, hairy caterpillar. Pests and diseases damage the crop starting from germination to maturity (De, 2013). Apart from insect pest several plant parasitic nematodes are also attacking jute and responsible for considerable yield reduction both fibre as well as seed production. Among the plant parasitic nematodes attacking jute crop, root-knot nematode *Meloidogyne incognita* being the most serious and destructive one (Luang and Bora 2005; Neog, 2021).

Root-knot nematode infected plants show above ground symptoms like yellowing of foliage, stunted growth of plants, wilting during hotter part of the day, premature shedding of leaves, reduction in yield both seed as well as fibre and quality of fibre. Below ground symptoms includes production of galls on roots (Fig. 1). Root-knot nematodes can effectively be managed by application by several nematicides, but indiscriminate use of pesticides has caused immense damages to the entire ecosystems. Therefore, in recent times, emphasis has been made on ecofriendly methods of management of pests and diseases. Management of root-knot nematode through the use of biocontrol agents as well as incorporation of different cultural practices is gaining importance and recognized as efficient methods of management of plant parasitic nematodes (Gogoi and Boruah 2019; Jayakumar, 2019; Neog, 2020). Thus, the present study was undertaken to explore the effectiveness of different organic manures and bio-control agent *Trichoderma viride* alone and organic manures in combination with *T. viride* against root-knot nematode, *M. incognita* infecting jute under seed production trial.

Fig. 1. Galls on roots of jute.

MATERIALS AND METHODS

The experiment was conducted during the *kharif* season 2023 in a naturally infested field with root-knot nematode, *M. incognita* at Biswanath College of Agriculture [26.7° (26°42′) N latitude, 93.5° (93°30′) E longitude and altitude of 105m AMSL], AAU, Biswanath Chariali to evaluate the effectiveness of *T. viride* and three different organic manure alone and in combination against root-knot nematode in seed production trial of jute. The different treatments were: T_1: Goat dung @ 10t/ha, T_2: Poultry manure @10t/ha, T_3: Cow dung @10t/ha, T_4: *T. viride* @ 10kg/ha, T_5: Goat dung @ 10t/ha + *T. viride* @10kg/ha, T_6: Poultry manure @10t/ha + *T. viride* T_7: Cow dung @10t/ha+ *T. viride*, T_8: Control. The experiment was laid out in 2m x 1.5m plots following RBD and treatment was replicated thrice. Initial nematode population on the field was recorded before experimentation ($260J_2$/250cc of soil). Land was thoroughly prepared by harrowing and laddering; plots were laid out as per the design of experiment. Each plot was separated from each other by 0.5m wide space. Seeds of olitorius jute (var. Tarun) were sown in each plot at a spacing of 30 cm from row to row and 10cm from plant to plant. All the organic manures and *T. viride* were applied treatment wise and mixed before sowing of seeds. All other recommended practices were followed as per package of the crop.

Observations on seed yield and nematode multiplication parameters like number of galls and egg masses per root system and final nematode population in soil were recorded at the time of harvest. For recording number of galls and eggmasses, from each plot ten plants were uprooted randomly and numbers were calculated then average was taken. For estimation of population of *M. incognita*, soil samples consisting 10 cores were collected 1 day after harvest at a depth of 15-20 cm from each plot using khurpi. Cores were composited and 250cc soil was used for nematode extraction by modified Cobb's sieving and decanting technique. After extraction nematodes were counted in a counting dish using stereoscopic binocular microscope Data were analyzed statistically using analysis of variance and Fisher's least significant difference (FLSD) were calculated for separation of mean.

RESULTS AND DISCUSSION

All the treatments were found to be statistically significant in increasing the seed yield of jute and reducing the number of galls, eggmasses and final nematode population in soil as compared to that of untreated control. Maximum reduction of number of galls, eggmasses and final nematode population in soil was recorded in the treatment with combine application of *T. viride* and poultry manure which is followed by the treatment with combine application of *T. viride* and goat dung (Table1). This finding is in conformity with the findings made by Kumar and Chand (2015). They reported that *T. viride* in combination with cow dung, goat dung, vermicomost and poultry manure was found to be effective in increasing the plant growth parameters of brinjal and reducing the numbers of galls and root-knot nematode population. Similar results were also recorded by Pant and Pandey (2002) in chick pea due to application of neem cake in combination with *Trichoderma harzianum*. They also reported that application of organic substance released addition plant nutrients responsible for better plant growth parameters and release some toxic chemicals to kill the plant parasitic nematodes. Neog and Gogoi (2003) also reported that soil application of poultry manure in combination with mycorrhizal fungus *Glomus fasciculatum* was found to be very effective in reducing the number of gall and eggmass production in the roots of greengram and also reducing the root-knot nematode population in soil. Similarly Abhi *et al*. (2022) reported that seed treatment with *T. viride* (10g/kg seed) followed by soil application with *T. viride* was found to very effective in reducing the number of galls, eggmasses and nematode population in soil and increasing the plant growth parameters of black gram. The antagonistic effect of *T. viride* might be due to several actions, such as mycoparasitism, spatial and nutrient competition, induced systemic resistance, antibiosis by enzymes and secondary metabolites (Spiegel and Chet 1998; Verma *et al*., 2007).

In the present investigation maximum seed yield of jute was recorded in the treatment with soil application of poultry manure in combination with *T. viride* followed by soil application of goat dung in combination with *T. viride* and both were at par with each other (Table 2). This finding was in agreement with the findings of Devi and Das (2017), who reported that combined application of neem cake, *T. harzianum* and rice husk was most effective in increasing the yield of cucumber and reducing the nematode population in soil.

Table 1: Effect of organic manures and antagonistic fungus *Trichoderma viride* alone and in combination on nematode multiplication (Mean of 3 replications).

Treatments	Number of galls	% decrease over control	Number of eggmasses	% decrease over control	Final nematode population in soil (250c.c)	% decrease over control
T_1: Goat dung @ 10t/ha	46.53	29.29	33.93	28.51	214.66	29.69
T_2: Poultry manure @10t/ha	43.33	34.15	26.33	44.52	207.00	32.20
T_3: Cow dung @10t/ha,	49.03	25.49	30.53	35.67	225.66	26.09
T_4: *Trichoderma viride* @ 10kg/ha	41.76	36.53	30.10	36.58	194.33	36.35
T_5: Goat dung @ 10t/ha + *T. viride* @10kg/ha	34.36	47.78	20.23	57.38	165.33	45.85
T_6: Poultry manure @10t/ha + *T. viride*@10kg/ha	21.16	67.84	15.26	67.85	128.33	57.97
T_7: Cow dung @10t/ha+ *T. viride*@10kg/ha	37.80	42.55	22.06	53.52	172.33	43.56
T_8: Un treated control	65.80	-	47.46	-	305.33	-
S.Ed±	4.13		2.38		9.03	
CD(P=0.05)	8.95		5.16		19.55	

Table 2: Effect of organic manures and antagonistic fungus *Trichoderma viride* alone and in combination on seed yield of jute (Mean of 3 replications).

Treatments	Seed Yield/plot (g)	Seed Yield/ha (q)	% increase over control
T_1: Goat dung @ 10t/ha	133.66	4.46	22.86
T_2: Poultry manure @10t/ha	153.66	5.12	41.04
T_3: Cow dung @10t/ha,	132.33	4.41	21.48
T_4: *Trichoderma viride* @ 10kg/ha	171.33	5.71	57.30
T_5: Goat dung @ 10t/ha + *T. viride* @10kg/ha	184.33	6.14	69.14
T_6: Poultry manure @10t/ha + *T. viride*@10kg/ha	192.00	6.40	76.30
T_7: Cow dung @10t/ha+ *T.* viride@10kg/ha	172.33	5.75	58.40
T_8: Un treated control	109.00	3.63	-
S.Ed±	7.67	0.25	
C.D.(P=0.05)	16.60	0.55	-

Fig. 2. Field view of the Experiment at vegetative stage.

Fig. 3. Field view of the Experiment at the time harvesting.

CONCLUSIONS

From the present investigation it is clearly indicates that root-knot nematode can effectively be managed by application of organic manures and antagonistic fungus, *T. viride*. Applications of antagonistic fungus, *T. viride* in combination with different organic manures were found to very effective as compared with application of organic manures alone. Thus it can be concluded that as an alternative method of application of chemical nematicides combinations of bioagents and soil application of organic amendments plays an important role in effective management of plant parasitic nematodes.

FUTURE SCOPE

Further studies will be required to test the effect of different organic manures with other fungal and bacterial antagonist for management of plant parasitic nematodes infecting various economically important crops.

Acknowledgement. The author is grateful to all the field staff under farm section of Biswanath College of Agriculture, AAU, Biswanath Chariali for their support during the entire period of trials.
Conflict of Interest. None.

REFERENCES

Abhi, R., Snehalatha, P. and Dash, B. K. (2022). Exploitation of bioagents for managing root-knot nematode, *Meloidogyne incognita (*Kofoid & White, 1919) Chitwood, 1949 inciting black gram (*Vigna mungo* L.). *Biological Forum – An International Journal, 14*(1), 848-856.

De, R. K. (2013). Effect of date of sowing on the incidence of stem rot of jute (*Corchorus olitorious* L.) caused by *Macrophomina phaseolina. J. Mycopathol. Res*., *51***,** 251-257.

Devi, T. S. and Das, D. (2017). Managing *Meloidogyne incognita* on cucumber through bio-agents and organic amendments in field. *Annals of Plant Protection Sciences*, *25*(2), 380-383.

Gogoi, B. B. and Boruah, S. (2019). Bio-management of root-knot nematode in long pipper. *Annals of Plant Protection Sciences*, *27*(1), 156-160.

Jayakumar, J. (2019). An evaluation of biocontrol agents for management of sugarcane nematodes under field conditions. *Annals of Plant Protection Sciences*, *27*(2), 261-263.

Kumar, P. and Chand, R. (2015).Impact of *Trichoderma viride* culture filtrate and organic substrate against root-knot nematode, *Meloidogyne incognita* on brinjal. *Annals of Plant Protection Sciences*, *23*(2), 369-372.

Luang, B. and Bora, B. C. (2005). Comparative biology of *Meloidogyne incognita* on *capsularis* and *olitorius* jute. *Indian Journal of Nematology*, *35*(1), 88-89.

Maiti, R. and Singh, V. P. (2019). A review of research on jute production and quality. *Farm. Manage*., *4,* 97-133.

Neog, P. P. (2020). Cultural management of plant parasitic nematodes and yield of greengram, blackgram and jute under seed production programme. *International Journal of Current Microbiology and Applied Sci*ences, *9*, 654-66.

Neog, P. P. (2021). Effect of crop sequences in combination with other ecofriendly practices for management of plant parasitic nematodes infecting jute(*Corchorus olitorius* L.). *Crop Research*, *56*(6), 363-368.

Neog, P. P. and Gogoi, B. B. (2003). Effect of organic amendments in the interaction of VAM fungus (*Glomus fasciculatum*) and root-knot nematode (*Meloidogyne incognita*) on greengram. *Crop Research*, *26*(1), 159-162.

Pant, H. and Pandey, G. (2002). Use of *Trichoderma harzianum* and neem cake alone and in combination on *Meloidogyne incognita* galls in chick pea. *Annals of Plant Protection Sciences*, *10*, 175.

Spiegel, Y and Chet, I. (1998). Evaluation of *Trichoderma* spp. as a biocontrol agent against soil-borne fungi and plant-parasitic nematodes in Israel. *Int. Pest Manage. Rev*. *3*,169–175.

Verma, M., Brar, K. S., Tyagi, R. D., Surampalli, R. Y. and Val Ero, J. R. (2007). Antagonistic fungi, *Trichoderma* spp.; Panoply of biological control. *Biol. Engg. J*., *37*, 1-20.

How to cite this article: Pranjal Pratim Neog, Pal Deka and R.K. Goswami (2024). Effect of *Trichoderma viride* and Organic Manures Against Root-knot Nematode *Meloidogyne incognita* Infecting Jute under Seed Production. *Biological Forum – An International Journal, 16*(4): 16-19.