

Research Article

Effect of Different Organic Amendment against Rice Root-Knot Nematode, *Meloidogyne Graminicola* in Rice

Ram Sharan, Gurpreet Singh* and S N Nandal

Department of Nematology, CCS HAU, Hisar

Abstract

A pot experiment was conducted in screen house of Department of Nematology to study the effect of cakes (mustard and neem) and plant leaves (calotropis and neem) @ 1% and 2% w/w dose on rice infected with *Meloidogyne graminicola*. Cakes and plant leaves were incorporated in the naturally nematode infested soil 15 days before seed sowing. Untreated soil was maintained for comparison. After 45 days of seed sowing observations were recorded. The results showed that all treatments significantly improved plant height over untreated check, except neem cake @ 1% dose. Plant weight was significantly increased in all the treatments as compared to untreated check. Number of galls per plant reduced in all the treatments except neem cake @ 1% dose. Minimum reproduction factor was observed in mustard cake @ 2% dose that stands at par with neem leaves @ 2% dose.

Keywords: Cakes, leaves, *Meloidogyne graminicola*, organic amendment and rice

***Correspondence**

Author: Gurpreet Singh
Email: ppecef@gmail.com

Introduction

Rice is staple food for about half of the population of our planet [1]. It is used in ready to eat products, cattle feed, paper making and as fuel source. It is grown in almost all the states of India as a principal food crop. Total area under rice cultivation in 2015-16 was 43.49 million hectares with production of 104.4 m tons in India while in Haryana it was 1.3 m ha with production of 4.1 m tons.

Rice is quite susceptible to different nematodes and is attacked by *Meloidogyne* spp. *Hirschmanniella* spp. *Aphelenchoides besseyi*, and *Ditylenchus angustus* [2]. Amongst these species, *M. graminicola* is a primary pest of rice and poses a substantial threat to rice cultivation [3]. The nematode is characterized by root-knot diseases or hook shaped galls in rice roots. Occurrence of this particular disease has been reported globally including India [4]. In severe infestation of this obnoxious pest yield losses of up to 64 per cent has been recorded in rice crop [5]. Though chemicals provide easy, quick and effective methods of nematode control but in the recent years ongoing of serious health problems their use has been minimized. Considering the damaging potential and heavy economic losses caused by this nematode on rice, the present study was planned to assess efficacy of different plant parts i.e. cakes and leaves against rice root-knot nematode on variety PR106.

Material and Methods

The experiment was set up in green house to study the effect of plant part such as fresh neem leaves, fresh calotropis leaves and oil cakes i.e. neem cake, mustard cake on rice for plant growth and nematode population. Chopped leaves of neem and calotropis, each @ 1% and 2% (w/w) and powdered oil cakes of neem and mustard each @ 1% and 2% (w/w) were incorporated in 15 cm dia. earthen pots filled with *Meloidogyne graminicola* infested soil. A waiting period of 15 days was provided for proper decomposition of organic amendments. Initial nematode population was 1.5 larvae/g soil. Seeds of rice variety PR106 were sown in these pots. After germination one plant per pot was maintained. There were total nine treatments including untreated check. Each treatment was replicated four times. Pots were arranged in completely randomized design. Observations on plant growth parameters and nematode multiplication were recorded after 45 days of sowing.

Results and Discussion

The results showed that all treatments significantly improved plant height over untreated check, except neem cake @ 1% dose. Amongst various plant products, maximum height (9.75 cm) was recorded in mustard cake @ 2% which differed significantly from all other treatments with respect to 2% dose, 2% dose in all the treatments showed significantly higher plant height than the lower dose (1%). Similarly, all plant products significantly increased the

plant weight over untreated check. The maximum weight (1.82 g) was recorded in mustard cake @ 2% dose followed by mustard cake (1.0 g) @ 1% dose.

Both the doses of calotropis leaves did not differ significantly from each other in terms of plant weight. Similarly, both the doses of neem leaves did not differ significantly from each other. The present studies are in an agreement with the observation recorded by [6] who found that mustard cake @ 2% dose increased wheat plant growth. [7] also reported mustard and neem seed cakes significantly better the plant growth and decreased the population of *Hirschmanniella oryzae* at higher dosages of neem and mustard cakes.

Reduction in number of galls (**Table 1**) was observed in all the treatments except in neem cake @ 1%. Minimum number of galls (3.25/plant) was observed in mustard cake @ 2% followed by neem leaves @ 2% (4.25), which did not differ significantly from each other. Nematode population in root and soil decreased in all the treatment over untreated check. [8] found that population of plant-parasitic nematodes, *Meloidogyne incognita*, *Rotylenchulus reniformis*, *Tylenchorhynchus brassicae* etc. significantly reduced in mungbean and chickpea by addition of oil seed cakes of different plant origin. In our experiment growth of rice seedling improved in amended soil, due to the reduction in the populations of plant-parasitic nematodes.

The data in **Table 2** revealed that maximum population in root and soil was recorded in untreated check (1944.1) and it was minimum (528.8) in mustard cake @ 2% dose followed neem leaves @ 2% dose (575.0). Maximum multiplication (1.3) of nematode occurred in untreated check which was statistically at par with neem cake @ 1% dose. Minimum multiplication (0.4) was observed in mustard cake @ 2% dose which is statistically at par with neem leaves @ 2% dose followed by neem leaves (0.6) times @ 1% dose.

Table 1 Effect of oil cakes, leaves on plant growth and number of galls on rice infected with *Meloidogyne graminicola*

Treatments	Dose (%)	Plant height (cm)	Plant weight (g)	Number of Galls/plant
Neem cake	1	5.25 (16.7)	0.45 (40.6)	17.50 (16.7)
Neem cake	2	6.50 (44.4)	0.83 (159.4)	13.25 (-11.7)
Mustard cake	1	8.00 (77.8)	1.00 (212.2)	9.00 (-40.0)
Mustard cake	2	9.75 (116.7)	1.82 (468.8)	3.25 (-78.3)
Calotropis leaves	1	5.50 (22.2)	0.52 (62.5)	8.00 (-46.7)
Calotropis leaves	2	5.75 (27.8)	0.57 (78.2)	7.00 (-53.3)
Neem leaves	1	5.75 (27.8)	0.74 (131.3)	6.00 (-60.0)
Neem leaves	2	6.25 (38.9)	0.76 (137.5)	4.25 (-71.7)
Untreated check		4.50	0.32	15.00
CD at 5%		1.23	0.11	2.23

Figures within parentheses denote increase (+)/decrease (-) over untreated check.

Table 2 Effect of oil cakes and leaves on multiplication of *Meloidogyne graminicola* in rice

Treatments	Doses (%)	Nematode population in			R.F.
		Root	Soil (Kg ⁻¹)	Root+Soil	
Neem cake	1	1201.3	500.0	1701.3	1.1
Neem cake	2	1063.8	493.8	1557.6	1.0
Mustard cake	1	806.3	450.0	1256.3	0.8
Mustard cake	2	297.5	231.3	528.8	0.4
Calotropis leaves	1	801.3	462.5	1263.8	0.8
Calotropis leaves	2	713.8	425.0	1138.8	0.8
Neem leaves	1	501.3	325.0	826.3	0.6
Neem leaves	2	337.5	237.5	575.0	0.4
Untreated check	-	1050.3	893.8	1944.1	1.3
CD at 5%		234.5	60.5	232.9	0.2

The results confirm the findings of [9] who found the 20g neem cake was more effective in reducing the nematode population (*Aphelenchoides composticola*) on button mushroom (*Agaricus bisporus*). Similar results were found by [10] who observed that neem cake at 5 g/kg soil had fewest egg masses of *M. graminicola* in rice.

References

- [1] Food and Agricultural Organization of the United States (FAO). 2004. Food and Population: FAO Looks ahead
- [2] Prasad, J. S., Panwar, M. S. and Rao, Y. S. (1987). Nematode problems of rice in India. *Tropical Pest Management*, 33: 127-136
- [3] Gaur, H. S. and Pankaj (2010). Root-knot nematode infestation in rice, In: Khan, M. R., Jairajpuri, M. S. (Eds.), *Nematode Infestations, Part 1: Food Crop*. NASI, pp. 72-90 (2010).
- [4] Pankaj, Sharma, H.K. & Prasad, J.S. (2010). The rice root-knot nematode, *Meloidogyne graminicola*: an emerging problem in rice-wheat cropping system. *Indian Journal of Nematology*, 40: 1-11.
- [5] Phukan, P.N. (1995). Nematode problems of rice crops in India. IV. Stem nematode and rice root knot nematode. In: *Nematode pest management -an appraisal of eco-friendly approaches* (G. Swarup, D.R. Dasgupta and Gill, J.S. eds.), *Nematological Society of India, New Delhi, India*, pp. 156-160.
- [6] Patel, A.D., Patel, B.A. and Patel, D.J. (2000). Effect of different organic amendments in management of stunt nematode, *Tylenchorhynchus vulgaris* affecting wheat in pots. *Indian Journal of Nematology*, 30: 236-237.
- [7] Mathur, V.K. and Prasad, S.K. (1973). Control of *Hirschmanniella oryzae* associated with paddy. *Indian Journal of Nematology*, 3: 54-60.
- [8] Tiyyagi, S.A. and Alam, M. M. (1995). Efficacy of oil-seed cakes against plant-parasitic nematodes and soil-inhabiting fungi on mungbean and chickpea. *Bioresource Technology*, 51: 233- 239.
- [9] Gitanjali and Nandal, S.N. (2001). Effect of neem products and Dazomet for the management of *Aphelenchoides composticola* on white Button Mushroom (*Agaricus bisporus*) under semi-commercial condition. *Indian Journal of Nematology*, 31: 52-57.
- [10] Prasad, J.S., Varaprasad, K.S., Rao, Y.R., Srinivasa Rao, E. and Sankar, M. (2005). Comparative efficacy of some oil seed cakes and extracts against root-knot nematode (*Meloidogyne graminicola*) infection in rice. *Nematologia Mediterranea*, 33: 191-194.

Publication History

Received	17 th Apr 2018
Revised	05 th May 2018
Accepted	10 th May 2018
Online	30 th May 2018

© 2018, by the Authors. The articles published from this journal are distributed to the public under “**Creative Commons Attribution License**” (<http://creativecommons.org/licenses/by/3.0/>). Therefore, upon proper citation of the original work, all the articles can be used without any restriction or can be distributed in any medium in any form.