



Emerging Nematode Pest of Rice, Wheat and Onion: Rice Root-Knot Nematode

Matiyar Rahaman Khan*, Vishal Singh Somvanshi and Uma Rao

Division of Nematology, ICAR-Indian Agricultural Research Institute, New Delhi-110 012

*Email of corresponding author: mrkhan@iari.res.in, drmrkhanbckv@gmail.com

Rice root knot nematode (*Meloidogyne graminicola*) is an emerging and devastating nematode pest of rice in India. Infestation of this nematode predominantly occurs in rice nursery, upland rice, and rarely in lowland rice. Rice nurseries during *boro* and *kharif* are severely affected; the nematode-infested fields display patchy, yellowish and stunted rice plants. Individual plant's root system shows typical hook/spindle shaped terminal root galls. Management approaches involves selection of nematode resistant rice cultivars, if available, adoption of suitable crop rotation with non-host or poor host crops, selection of nematode free fields for raising nursery, disinfestations of nursery areas by soil solarization, seed and soil treatment with bioagents and nematicides.

Introduction

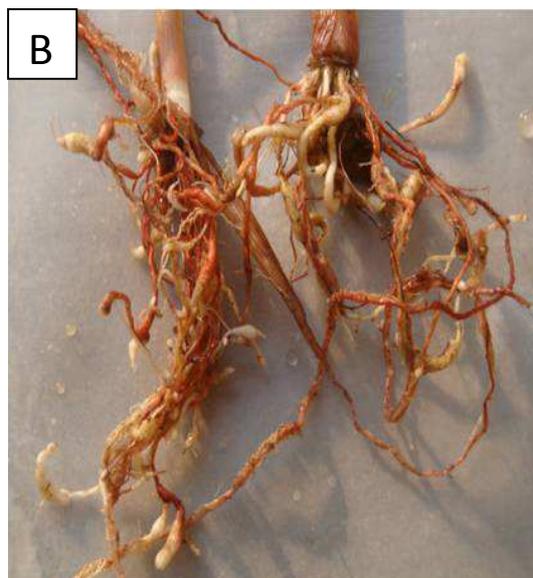
Crops in field conditions are exposed to several biotic stresses including phytonematodes. Among the soil inhabiting phytonematodes posing serious problems for the cultivation of crops, rice root-knot nematode (*Meloidogyne graminicola*) is an emergent nematode pest of rice in many parts of India. Although the nematode problem was first time recorded and described as *M. graminicola* from the roots of barnyard (local name *Shyma* grass) grass, *Echinochloa colonum* in Louisiana, USA (Golden and Birchfield, 1965), this has now become an economically important pest of rice in south-east Asian countries including India (Dutta et al. 2012; Jain et al. 2012). It has been recorded from many states of India like Assam, Orissa, West Bengal, Kerala, Karnataka, Punjab, Haryana, Gujarat, Andhra Pradesh, Himachal Pradesh, UP, MP, Chattisgarh etc (Khan et al. 2010). In some areas of Assam, West Bengal and Karnataka, an outbreak of this nematode has been experienced and it has now become a major concern for rice nurseries. Besides rice (figure 1A) and several weed hosts including motha grass (figure 1B), severe attack of *M. graminicola* on *rabi* wheat (figure 1D) in West Bengal, and onion (figure 1C) in West Bengal (in *kharif* onion), Odisha (in *rabi* onion) and Karnataka (in a 'sweet onion' variety) have been noticed.

Detection and Diagnosis

Infestation of rice root-knot nematode produces a characteristic 'spindle-shaped', often hook like, root gall at the terminal part of the root in most of the host plants (rice, wheat, onion, weeds etc.). It can easily be identified with the typical symptoms on the crops. The field infested with the nematode species; during fallow period, several weeds and volunteer rice seedlings and sprouted seedling from rice stubble are good indicators for easy detection and confirmation for the presence of rice root-knot nematode in the field.



Riceinfected by *Meloidogyne graminicola* in West Bengal



Motha (*Cyperus rotundus*) infected by *Meloidogyne graminicola*



Onion infected by *Meloidogyne graminicola* in Odisha
(photo Courtesy: Mr. Sudhansu Shekhar Sahu)



Wheat infected by *Meloidogyne graminicola*
in West Bengal (Photo courtesy: Mr. Pranay)

Management Approaches

Several management approaches have been tried; anational collection of rice genotypes have been tested for identifying sources of resistance, Carbofuran is routinely recommended for control of the nematode in rice nursery and mainfield conditions, andcrop rotation practice like rice-mustard-rice, rice-fallow-rice etc. have been proved effective (Jain *et al.* 2010; 2012). However, these practices need to be integrated depending upon farmers' access to resources and feasibility.

Therefore, following management options could be adopted by the rice growers for the control of rice root-knot nematode:

- Select rice root-knot nematode free-nursery area for growing nursery or solarize nursery beds of rice during summer months for at least 3-4 weeks using polythene sheet (preferably LLDPE 100 gauze) followed by nursery bed treatment with Carbofuran at 0.3 g a.i./m². The nursery bed may also be treated with a bacterial bioagent, *Pseudomonas fluorescens* at 20g/m².
- Treat rice seed in 0.1% solution of Carbosulfan 25EC (Marshal) for 12 hours; this may adversely affect the egg mass production of *M. graminicola* and reduce root galling severity and enhance rice yield.
- Grow non-host crop (groundnut, mustard, blackgram and potato) in the rotation or adopt fallowing at least for two seasons to bring down the populations of rice root-knot nematode.
- Use of resistant rice genotypes such as ARC-12620, INRC-2002, CR-94-CCRP-51, if available in the nematode-affected areas.
- Treat main-field with Carbofuran (Furadan) 3G at 1 kg a.i./ha 40 days after transplanting for reducing nematode populations and this may also control of rice insect pest like rice stem borer.

References

- Dutta TK, Ganguly AK, and Gaur HS. 2012. Global status of rice root-knot nematode, *Meloidogyne graminicola*. *African J. Microbiol. Res.* **6**(31): 6016-6021.
- Golden AM, and Birchfield W. 1965. *Meloidogyne graminicola* (Heteroderidae) a new species of root-knot nematode from grass. *Proc. Helminth. Soc. Wash.* **32**: 228-231.
- Jain RK, Khan MR and Kumar V. 2012. Rice root knot nematode (*Meloidogyne graminicola*) infestation in rice. *Archv. Phytopathol. Pl. Prot.* **45**(6): 635-645.
- Jain RK, Singh RV and Kumar V. 2010. Technical Bulletin on management of economically important nematodes, All India Coordinated Research Project on Plant Parasitic nematodes with Integrated approach for their Control, Project Coordinating Cell, Division of Nematology, ICAR, New Delhi, India, 35p.
- Khan MR, Jain RK, Ghule TM, Pal S. 2014. Root knot Nematodes in India-A Comprehensive Monograph. All India Coordinated Research Project on Plant Parasitic nematodes with Integrated approach for their Control, Indian Agricultural Research Institute, New Delhi. pp 78 + 29 plates.
- Khan MR, Jain RK, Singh RV, Pramanik A. 2010. Economically Important Plant parasitic nematodes Distribution – Atlas. New Delhi, India: Directorate of Information and Publications of Agriculture, Indian Council of Agricultural Research, Krishi Anusandhan Bhavan, India, 145p.