Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2019; 7(2): 1287-1290

Received: 13-01-2019
Accepted: 17-02-2019

Manish Kumar
Department of Nematology, Narendra Deva University of Agriculture and Technology Kumarganj, Ayodhya, Uttar Pradesh, India

Ramesh Chand
Department of Nematology, Narendra Deva University of Agriculture and Technology Kumarganj, Ayodhya, Uttar Pradesh, India

Vipin Kumar Verma
Department of Nematology, Narendra Deva University of Agriculture and Technology Kumarganj, Ayodhya, Uttar Pradesh, India

Shyam Babu Gautam
Department of Nematology, Narendra Deva University of Agriculture and Technology Kumarganj, Ayodhya, Uttar Pradesh, India

Himanshu Verma
Department of Agronomy, Narendra Deva University of Agriculture and Technology Kumarganj, Ayodhya, Uttar Pradesh, India

Correspondence
Manish Kumar
Department of Nematology, Narendra Deva University of Agriculture and Technology Kumarganj, Ayodhya, Uttar Pradesh, India

Survey on alternate weed host of rice root-knot nematode, *Meloidogyne graminicola* in kharif Session

Manish Kumar, Ramesh Chand, Vipin Kumar Verma, Shyam Babu Gautam and Himanshu Verma

Abstract
The survey conducted to know the alternate weed host of rice root-knot nematode showed that out of 465 sample collected from both rice and wheat field of metrology farm, GPB field and the Jorium 50 samples collected from rice crop and 80 sample wheat field were found free from any nematode sample while 210 and 79 samples was observed to be infected with the larvae and galls were recorded ransing from 3-19 on the root of rice plant and 1-3 gallls per plant on wheat the decomposed plant leaves of wheat botanicals was used @5, 10 and 15g/kg soil in nematode infecting soil containing 3 larvae/ g soil.

Keywords: Rice, wheat, survey, *Meliodogyne graminicola*

Introduction
Rice (*Oryza sativa* L.) is the staple food of a vast majority of the population in the East and South East Asian, African and South American countries. In addition to its direct food value, rice grain is used in manufacturing of several industrial and commercial products. The paddy is most important cereal crop in India occupying 44.48 million hectares of area with an annual production of 112.91 million tones with the productivity of 19.56 quintals per hectare during 2017-18. Rice is grown in diverse environment either as a sole crop (rainfed, irrigated or deepwater) or as major component in various cropping systems. Cropping systems, involving different year specific crop sequences or fallow in a given area, create conditions of varying favorability for microbes and weeds and thus affect the flora and fauna. Since, rice cultivation cover large area in India, even a smallest pest problem would have great impact on yield and farmers' income. Soil borne diseases are becoming increasingly important in the rice-based cropping systems. One of the most important soil born pests is plant parasitic nematode in rice crop. About 300 nematode species belonging to 35 genera have been reported infesting rice. Among them, *Meloidogyne graminicola* (Golden and Birchfield) is considered as most important constraint in rice production. *Meloidogyne graminicola* reduce rice yield by more than 17% in a greenhouse experiment and the yield losses might go as high as 98% (Bridge & Plowright 1990) [1] in pot experiment under favorable conditions. To prevent further yield losses and improve productivity, it is necessary to find out the effective sustainable management strategy. Many species of *Meloidogyne* have been reported by various scientists throughout world. *M. graminicola* is reported as an important nematode pest of rice from countries like South East Asia, Burma, Bangladesh, Laos, Thailand, Vietnam, India, China, Philippines, Nepal and USA. *Meloidogyne oryzae* an another species of this genus is also reported on irrigated rice from Surinam and *M. incognita* is reported from Costa Rica, Cuba, Egypt, Ivory Coast, Nigeria, South Africa and Japan, *M. javanica* in Brazil, Egypt, Comoro Islands, Nigeria and Ivory Coast. Apart from this *M. arenaria is reported from* Nigeria, Egypt and South Africa and *M. salasi* in Costa Rica and Panama on upland rice.
Considering the fact that *M. graminicola* is serious nematode pest of rice of eastern Uttar Pradesh where it is predominantly used by the farmers, investigation was planned to generate information on its distribution and host range with host reaction on some rice and wheat varieties. Broad host range of nematode is beneficial to maintain population in absence of main host, many scientist have reported that rice root knot nematode *M graminicola* maintain the population on various weed host and maintain population on weeds for next season (Rich, *et al.*, 2009) [3]. Moreover rice root nematode complete life cycle is a very fast span, within 15 days at 27-37 °C (Jaiswal and singh, 2010) [2].

It indicate that nematode complete many generations in one crop season. However rice root-knot nematode, *M graminicola is* most distractive pest of rice and wheat cropping system and reduce crop yield. Therefore need for a sophisticated management system is felt to reduced population of nematode. Various nematode management systems for nematode management is popular like, cultural practices, crop rotation, chemical nematode control, biological control and integrated nematode management. But integrated nematode management with chemical and non host botanicals (Neem, Turmeric, Zinger and Eucalyptus), Weeds (Congrass grass, Bhang, Madhar and Lantana) is best known method to reduced nematode population (Wasmi and Simon, 2014) [6]. Chemicals nematode management is essential for successful nematode management and botanicals may be beneficial to reduced nematode population, because these non host botanicals and weeds have nematicidal properties and contain some toxic chemicals which are harmful to rice root-knot nematode, *M graminicola* multiplication. These botanicals and weeds may be part of integrated nematode management. Accordingly investigations were planned to conduct experiments under the following objectives.

Materials and Methods

An experiment was conduct on Survey for alternate weed host of rice root-knot nematode, *Meloidogyne graminicola* in kharif session was conducted. at experimental field of department of nematode N.D. University of Agriculture and Technology, Kumarganj, Ayodhya during 15th August to 15th Sept., 2015 (rice). The temperature during experimentation prevailed between 25 to 32 ˚C (aug.- sept.). Twelve locations/village Panchayats of Milkipur were randomly selected for weed host identification of rice root-knot nematode, *Meloidogyne graminicola.* The weed host were identified on the basis of field symptoms like patchy growth and gall formation on plant roots.

Survey for the weed host of *M graminicola* in Milkipur sub-division of Faizabad was also carried out at NDUAT campus including Meteorology farm, GPB Fields and Jorium.

Field survey for the weed host identification of *M. graminicola*

Twelve locations/village Panchayats of Milkipur were randomly selected for weed host identification of rice root-knot nematode, *Meloidogyne graminicola.* The weed host were identified on the basis of field symptoms like patchy growth and gall formation on plant roots.

Survey for the weed host of *M graminicola* in Milkipur sub-division of Faizabad was also carried out at NDUAT campus including Meteorology farm, GPB Fields and Jorium.

Collection and storage of soil and root samples

The soil and root samples were collected randomly from root zone (15 cm depth) of rice crop infected with root -knot nematode with the help of auger and kept in polythene bags. The bags were sealed with rubber bands and brought carefully to the laboratory.

Extraction of nematode from soil samples

The soil samples were processed using Cobb's sieving and decanting technique (Southey, 1986) [4]. The soil sample was put in large bucket containing water and stirred until all of the clods were broken. When heavy soil particles setteled at the bottom, nematode suspension was poured through the coarse sieve of 16 mesh, leaving the heavy particles in the bucket. The whole aliquot was then passed through 60, 100, 200 and 350 mesh sieves. The suspension was collected in a beaker and poured over wire gauge fitted with double layer tissue paper. The wire gauge was kept on Baermann's funnel and the suspension was poured over it until it touched the tissue paper. The nematode suspension was collected next day by opening the clip. The nematodes thus collected in the suspension was taken in a counting dish to count the nematodes under stereoscopic microscope.

Morphometric measurement

The second stage juvenile (J_2) and eggs were obtained by blending galled root segments in 1% sodium hypochlorite solution for 1-3 min and rinsing them several times with tap water. The eggs were allowed to hatch in tap water for 48 hr., Juveniles were picked randomly, placed in a drop of water on a glass slide, killed by gentle heat and covered with a glass cover slip. Thirty to five J2 were selected from each sample and measured. Measurements included body length and width, stylet length, tail length and length from the anterior end to the end of the esophagus. The A value (body length/maximum body width), B value (body length/esophagus length) and C value (body length/tail length) were calculated for each individual.

Preparation of Perineal pattern of *M. graminicola*

Identification of rice root-knot nematode was carried out following Taylor and Sasser's (1978) [5] technique. The mature females were picked up from galled roots of rice and placed on a glass slide in a drop of water. The posterior end was cut with a sharp razor blade and cleaned. The glass slide with the female end (cut side down) was covered with a cover slip and sealed. Ten female perineal patterns were analyzed per isolate. Each was examined under a compound microscope.

Staining of root

After 2 minutes the roots were removed from warm acid fuchsine solution and rinsed into water to wash out the excess of stain if any. The stained roots were transferred in lacto-phenol solution for further studies. Adult female nematodes from roots were obtained by teasing them with the help of dissecting needles under stereoscopic microscope. Adult females were transferred in a drop of lacto-phenol taken on glass slide and the posterior end of the nematodes (perineal pattern) was cut with the help of sharp razor blade. These perineal patterns were transferred over other slide in a drop of lacto- phenol, covered with glass cover and the perineal pattern was examined under compound research microscope.

Counting of galls

For determining the number of galls, the root system of plant was carefully removed after expiry of the experimental period and washed free of soil. The total numbers of galls present on the roots were counted under a stereoscopic binocular microscope.

Varietal screening

Two-week-old seedlings of different varieties /germplasm of rice were sown separately in 1 kg autoclaved soil in 10 cm diameter earthen pots. Freshly hatched 2000 juveniles of *M. graminicola* were transferred around the seedling in each pot by removing top soil which was replaced after inoculation. There were 3 replicates for each treatment. Pots were

arranged in complete randomized block design. After 45 days of inoculation, the experiment was terminated and the No. of galls and egg masses/plant, gall and egg mass was indexed on 0-5 scale (Taylor and Sasser 1978) [5].

3.14 Rating of varietal susceptibility/resistant host responses

The susceptibility/resistant response of germplasm was recorded in terms of galls/egg masses that developed on each root system as follows"

0. 0 galls/egg masses = Immune
1. 1-2 galls/egg masses = H.R. (Highly resistant)
2. 3-10 galls/egg masses = R (Resistant)
3. 11-30 galls/egg masses = MR(Moderately resistant)
4. 31-100 galls/egg masses = S (Susceptible)
5. >100 galls/egg masses = HS (Highly susceptible)

Statistical analysis of data

The experiments were carried out in completed randomized block design with four replications of each treatment. The variance of each mean value was analyzed at five percent confidence limit.

Result and Discussion

Survey for alternate weed host of rice root-knot nematode, *Meloidogyne graminicola* in kharif session was conducted. A total of 230 samples of common weeds from rice field with ten samples of each weed from meteriology, GPB fields and Jorium was collected. The collected samples were analyzed for number of infected samples, number of galls and nematode population. The results revealed that out of 10 samples of each weed plants 7.0,5.0,0.0,2.0,0.0,5.0,4.0, 5.0, 0.0, 3.0, and 2.0 samples of *Echinochloa crusgalli, Pennisetum polysachion, Parthenium hysterophorus, Cynodon dactylon, Fimbristylis miliacea, Eclipta alba, Cyprus rotundus, Corchorus olitorius, Eleusine indica, Dactyloctenium aegyptium and Digitaria sanguinalis from meterology farm, 6.0, 3.0, 2.0, 6.0, 5.0, 4.0, 0.0, 0.0, 3.0 and 4.0 samples of Echinochloa crusgalli, Pennisetum polysachion, Brachiaria spp., Fimbristylis iniliacea, Eclipta alba, Cyprus rotundus, Corchorus olitorius, Leucas india, Dactyloctenium aegyptium and Digitaria sanguinalis from GPB fields and 7.0,5.0,4.0,0.0,3.0,3.0,6.0 samples of Echinochloa crusgalli, Pennisetum polysachion, Brachiaria spp., Fimbristylis miliacea, Eclipta alba, Cyprus rotundus, Corchorus olitorius from Jorium respectively was found infected with Meloidogyne graminicola. In all cases the number of galls and nematode population was also recorded to know the nematode population level. The results indicated that Echinochloa crusgalli was recorded with maximum number of galls (24-26) and the nematode population (114.00) in Jorium followed by Dactyloctenium aegyptium, Fimbristylis miliacea, Eclipta alba, Pennisetum polysachion, Eleusine indica and Cyprus rotundus and minimum (Zero) infection was observed in Parthenium hysterophorus, Fimbristylis dichotoma and Corchorus olitorius weed of rice respectively.*

Survey of alternate weed host of rice root-knot nematode, *Meloidogyne graminicola* in ravi season was conducted. A total of 185 samples of common weeds from wheat field with ten samples of each weed from meteorology, GPB fields and Jorium was collected. The collected samples were analyzed for number of infected samples, number of galls and nematode population. The results revealed that out of 10 samples of each weed plants 0.0, 5.0, 0.0, 5.0, 3.0 and 0.0 samples of *Convolvolus arvensis, Anagallis arvensis, Amaranthus viridis, Panicum repens, Orobanche cernua and Oxallis carniculata from meterology farm, 0.0, 0.0, 4.0, 0.0, 4.0, 1.0 and 0.0 samples of Convolvolus arvensis, Argemone maxicana, Anagallis arvensis, Amaranthus viridis, Panicum repens, orobanche cernua and Oxallis carniculata from GPB fields and 4.0, 0.0, 5.0 and 3.0 samples of Anagallis arvensis, Amaranthus viridis,*

Panicum repens and orobanche cernua from Jorium respectively was found infected with Meloidogyne graminicola. In all cases the number of galls and nematode population was also recorded to know the nematode population level. The results indicated that Panicum repens was recorded with maximum number of galls (4-5) and the nematode population (18.0) in Jorium followed by Anagallis arvensis and minimum (Zero) infection was observed in Amaranthus viridis, Oxallis carniculata, Convolvolus arvensis and Argemone maxicana weeds of wheat respectively. Alternate host of rice root-knot nematode, *M graminicola* was identified on the basis of field symptoms like short plant height, yellowing and galls on plant roots.

Table 1a: Survey of weed alternate host for rice root-knot nematode, *Meloidogyne graminicola*.

Name of Village	Weed plant			Root sample collected	No. Of sample found infected	No. Of galls/plant	Nematode population/plant
	S. NO.	Common Name	Botanical Name				
Meterology farm	1	Sawank/Kauada	*Echinochloa crus galli*	10	7	19-20	94
	2	West Indian Pennisetum	*Pennisetum polystachion*	10	5	4-5	16
	3	Congress grass	*Parthenium Hysterophorus*	10	0	0-0	0.0
	4	Doob/Durba	*Cynodon dactylon*	10	2	2-3	10
	5	Two leaf fimbristylis	*Fimbristylis dichotoma* L.	10	0	0-0	0.0
	6	Moaban	*Fimbristylis miliacea*	10	5	6-8	24
	7	Kala bhangra	*Eclipta alba*	10	4	5-7	22
	8	Jews mallow	*Corchorus olitorius* L.	10	5	3-5	10
	9	Goose grass	*Eleusine indica*	10	0	0-0	0.0
	10	Motha	*Cyperus rotundus*	10	3	3-4	17
	11	Tachri ghash	*Digitaria sanguinalis*	10	4	4-6	18
	12	Crow foot grass	*Dactyloctenium aegyptium*	10	2	2-4	12
GPB Fields	1	Sawank/Kauada	*Chinochloa crusgalli*	10	6	16-18	73
	2	West Indian pennisetum	*Pennisetum polysachion*	10	3	4-5	17
	3	Para ghash	*Brachiaria* sp.	10	2	5-6	18
	4	Moaban	*Fimbristylis miliacea*	10	6	6-9	24
	5	Kala bhangra	*Eclipta alba*	10	5	5-7	22

	6	Motha	*Cyperus rotundus*	10	4	3-5	7.0
	7	Jews mallow	*Corchorus olitirius* L.	10	0	0-0	0.0
	8	Red sprangletop	*Leucas india* L.	10	0	0-0	0.0
	9	Crow foot grass	Dactyloctenium Aegyptium	10	3	4-7	19
	10	Tachri ghash	*Digitaria sanguinalis*	10	4	3-5	14
Jorium	1	Sawank/Kauada	*Chinochloa crusgalli*	10	7	24-26	114
	2	West Indian pennisetum	*Pennisetum polysachion*	10	5	3-5	16
	3	Para ghash	*Brachiaria* sp	10	4	4-6	17
	4	Moaban	*Fimbristylis miliacea*	10	0	0-0	0.0
	5	Kala bhangra	*Eclipta alba*	10	3	2-4	10.0
	6	Motha	*Cyperus rotundus*	10	3	2-3	8.0
	7	Jews mallow	*Corchorus olitirius*.	10	6	5-7	20.0

Table 1b: Survey of weed alternate host for rice root-knot nematode, *Meloidogyne graminicola*

Name of Village	Weed plant			Root sample collected	No. Of sample found infected	No. Of galls/plant	Nematode population/plant
	S. NO.	Common Name	Botanical name				
Meterology farm	1	Filed bind weed	*Convolvus arvensis* L.	10	0	0-0	0.0
	2	Scarlet pimpernel	*Anagallis arvensis* L.	10	5	4-6	14
	3	Slender pigweed	*Amaranthus viridis* L.	10	0	0-0	0.0
	4	Torpedo grass	*Panicum repens*	10	5	4-5	18
	5	Broome rape	*Orobanche cernua*	10	3	1-3	10
	6	Indian sorrel	*Oxallis carniculata*	10	0	0-0	0.0
GPB Fields	1	Filed bind weed	*Convolvus arensis* L.	10	0	0-0	0.0
	2	Maxican prickly poppy	*Argemone maxicana* L.	10	0	0-0	0.0
	3	Scarlet pimpernel	*Anagallis arvensis* L.	10	4	4-7	16
	4	Slender pigweed	*Amaranthus viridis* L.	10	0	0-0	0.0
	5	Torpedo grass	*Panicum repens*	10	4	3-5	17
	6	Broome rape	*Orobanche cernua*	10	1	1-3	8
	7	Indian sorrel	*Oxallis carniculata*	10	0	0-0	0.00
Jorium	1	Scarlet pimpernel	*Anagallis arvensis* L.	10	4	3-5	15
	2	Slender pigweed	*Amaranthus viridis* L.	10	0	0-0	0.00
	3	Torpedo grass	*Panicum repens*	10	4	3-6	16
	4	Broome rape	*Orobanche cernuma*	10	3	1-3	0.00

Reference

1. Bridge J, Luc M, Plowright RA. Nematode parasites of rice, In Luc, M., Sikora, R. A. and Bridge, J. (Eds), Plant parasitic nematodes in subtropical and tropical agriculture, Wallingford, UK, CAB International, 1990, 69-108.
2. Jaiswal RK, Singh KP. A technique for studying the life cycle of Meloidogyne graminicolain rice roots; Int. Rice Res. Notes. 2010; 35:0117-4185.
3. Rich JR, Brito JA, Kaur R, Ferrell JA. Weed species hosts of *Meloidogyne* A Review. Nematropica*;* 2009; 39(2):157-185.
4. Southey JF. Laboratory method for work with plant and soil nematodes, London. Mini. Agri. Fish. and Food. 1986; (6):202.
5. Taylor AL, Sasser JN. Biology, identification and control of root-knot nematode, Meloidogyne spp. Int. Deve., Raleigh. NC. USA, 1978, 111.
6. Wasmi AAF, Simon S. Eco-friendly management of root-knot nematode *(Meloidogyne graminicola,* Golden & Brich field) on Wheat. Europ. Acad. Res. 2014; 2(4):5845-5856.