J. Indian bot. Soc. ISSN - 0019 - 4468, e-ISSN: 2455-7218 Vol. 95 (3 & 4) 2016: 293-296

EVALUATION OF RICE GERMPLASM AGAINST RICE ROOT-KNOT NEMATODE (*MELOIDOGYNE GRAMINICOLA*)

H. B. NARASIMHAMURTHY* **AND H. RAVINDRA

**Department of Plant Pathology, College of Agriculture, University of Agricultural and Horticultural Science, Shivamogga-577204, Karnataka, India*
***Zonal Agricultural and Horticultural Research Station, University of Agricultural and Horticultural Science, Shivamogga-577204, Karnataka, India*
**Email: namunema24@gmail.com*

Date of online publication- 31th December, 2016

Rice (*Oryza sativa L.*) is the important staple food for more than half of the world population and provides 60-70 per cent body calorie intake to the consumers. Rice is a supreme commodity to mankind, because rice is truly life, culture, tradition and a means of livelihood to millions. Of late, rice root-knot nematode *Meloidogyne graminicola* has become a serious menace in all type of rice growing situations in India. It causes yield loss varying between 17-30 per cent, in severe cases, up to 50 per cent. A glass house experiment was conducted during *kharif*-2013 at College of Agriculture, Navile, Shivamogga to evaluate 20 genotypes. The result reveal that the genotypes showed varying degrees of responses. Out of 20 genotypes, only one genotype KMP-179 was found to be highly resistant with least root-knot index (1.6), while, 4 genotypes *viz.,* MAS-26, BR-2665, MTU-1001 and KMP-194 were moderately resistant with root-knot indices between 2 and 3. However, 11 genotypes viz., KMP-175, MAS-946, KMP-149, IR-64, MTU1010, JGL-1798, KCP-1, KMP-153, Kadamba, KMP-169 and Rasi were found to be susceptible with root-knot indices varying between 3 and 4. The remaining 4 genotypes, KMP-148, KMP-128, KMP-105 and Thanu were highly susceptible.

Keywords: Rice, Root-knot nematode, *Meloidogyne graminicola,* Germplasm

Rice is an important staple food for more than half of the world population and provides 60-70 percent body calorie intake to the consumers. It contributes 43 per cent of total food grain production and 46 per cent of total cereal production. It continues to play vital role in the national food grain supply. The crop rice suffers heavy losses due to number of micro flora that includes bacteria, fungi, nematode, virus and mycoplasma. Many of these diseases are seed associated, vector borne and transmitted through various agencies (Sharma 2006). *Meloidogyne graminicola* is known to infect and cause serious damage to cereals, especially rice, in many countries (Port and Matias 1995; Padgham *et al.* 2004) In India, *M. graminicola* has been found in Assam, Andhra Pradesh, Karnataka, West Bengal, Orissa, Kerala, Tripura and Madhya Pradesh (Prasad *et al.* 1987). It is not only a serious problem in nurseries and upland rice but also found to be widespread in the deepwater and irrigated rice in many states of India (Prasad *et al.* 1985; MacGowan, 1989; Jairajpuri and Baqri, 1991). Yield loss up to 50% has been recorded under severe infestation of *M. graminicola* in upland, rain fed and direct seeded rice (Lorenzana *et al.* 1998). The use of resistant cultivars is a low cost and sustainable option for the control of nematodes in the long term which does not impose unwanted changes in traditional agronomic practices (Amoussou *et al.* 2004). Rice root-knot nematode appeared in devastating form in parts of major rice growing areas of Shivamogga during 2001, which was a first report from Karnataka and subsequently, reported from Mandya district of the state (Krishnappa *et al.* 2001). Severe outbreak of *M. graminicola* was also observed in Shimoga, Karnataka. (Sehgal *et al.* 2012). Initially, it was noticed only in aerobic condition. Since 2011, it has been observed in anaerobic condition also and appearing in all types of rice cultivating situations. Ravindra *et al.* (2014) observed incidence of *M. graminicola* in major rice growing districts of Karnataka. The present investigation was undertaken to know the performance of rice germplasms against *M. graminicola* under *in-vitro* conditions.

MATERIAL AND METHODS

A glass house experiment was conducted at College of Agriculture University of Agricultural and Horticultural Sciences, Shivamogga. A total of 20 promising breeding lines were collected from Breeder AICRP on rice V.C Farm Mandya *viz.,*KMP-179, KMP-194, MTU-1001, MAS-

Received on August 12, 2016 www.indianbotsoc.org Accepted on October 03, 2016

26, BR-2665, KMP-149, JGL-1798, KCP-1, KMP-148, KMP-153, KMP-175, Rasi, MAS-946, IR-64, KADAMBA, KMP-169, MTU-1010, KMP-128, KMP-105and Thanu were sown in pots to assess the level of resistance or susceptibility to the root-knot nematode. according to the number of galls per root system in which 0 = No galls(Immune) 1 =1-2 galls / root system(Resistant), 2=3-10 galls/root system(Moderately resistant)3 = 11- 30 galls / root system(Moderately susceptible) 4=31-100 galls/root system (Susceptible) and 5 = >100 galls / root system (Highly susceptible) (Taylor and Sasser 1978). (Table.1)

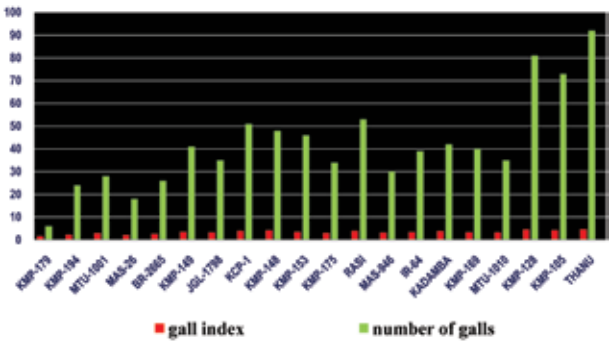
Table.1. Root-Knot Index 0 to 5 scales for *Meloidogyne* spp. (Taylor and Sasser, 1978).

Grade	Description	Reaction
0	No galls	Immune
1	1-2 galls / root system	Resistant
2	3-10 galls / root system	Moderately resistant
3	11- 30 galls / root system	Moderately susceptible
4	31-100 galls / root system	Susceptible
5	>100 galls / root system	Highly susceptible

Table-2: Reaction of rice germplasm to *M. graminicola*

Sl. No	Germplasm	Root-knot index	No. of galls / root system
	KMP-179	1.6	6
	KMP-194	2.3	24
	MTU-1001	3.0	28
	MAS-26	2.2	18
	BR-2665	2.6	26
	KMP-149	3.6	41
	JGL-1798	3.3	35
	KCP-1	4.0	51
	KMP-153	3.6	46
	KMP-175	3.1	34
	RASI	4	53
	MAS-946	3.2	30
	IR-64	3.5	39
	KADAMBA	3.9	42
	KMP-169	3.4	40
	MTU-1010	3.3	35
	KMP-128	4.5	81
	KMP-105	4.3	73
	THANU	4.6	92
	KMP-148	4.2	48

Figure-1: Screening of rice cultivars to *Meloidogyne graminicola*



RESULT AND DISCUSSION

This experiment was laid out in order to screen the promising landraces having desired phenotype characters for tolerance/resistance against rice root-knot nematode (Table 2. Figure.1) Out of 20 genotypes, only one genotype KMP-179 was found to be highly resistant which recorded least root-knot index (1.6), while, 4 genotypes *viz.,* MAS-26, BR-2665, MTU-1001 and KMP-194 were moderately resistant with root-knot indices between 2 and 3. However, 11 genotypes viz., KMP-175, MAS-946, KMP-149, IR-64, MTU1010, JGL-1798, KCP-1, KMP-153, Kadamba, KMP-169 and Rasi which were found to be susceptible with root-knot indices varying between 3 and 4. The remaining 4 genotypes, KMP-148, KMP-128, KMP-105 and Thanu were learnt to be highly susceptible. The present investigation is in conformity with those of Gitanjali and Thakur (2007) who evaluated the different germplasm /cultivars *viz.,*Lampnah 1, RCPL 1-87-8, RCM 9, IR 36, TOX 3093-10-2-3, JTA 222, Manipuri local

and Shahsarang for their reaction to root-knot nematode (*Meloidogyne graminicola*). Manipuri local, TOX-3093-10-2-3 and Lampnah-1 were recorded as moderately resistant. RCM-9, IR-36, JT A-222 were recorded as susceptible whereas Shahsarang and RCPL-1-87-8 were highly susceptible. Yik and Birchfield (1979) observed that out of 26 cultivars, 21 cultivars showed resistance to the rice root-knot nematode. Simon (2009) evaluated the susceptibility of 53 rice genotypes to *M. graminicola* in field and pot experiments and observed that 13 cultivars were highly resistant to this nematode. Poudyal *et al.* (2004) reported that all the cultivars tested were susceptible *to M. graminicola* except Masuli and Chaite-6, which were moderately resistant. Out of 135 local cultivars, 32 and 45 local cultivars were found to be highly resistant and resistant respectively against rice root knot nematodes (Ravindra *et al.* 2015). Berliner (2014) screened 414 rice cultivars including, 262 breeding lines, 68 lines from national bureau of plant genetic resources, New Delhi, 81 aerobic varieties and 3 hybrids against rice root-knot nematode, out of 414 cultivars only two entries from breeding lines, 127-28-1-1-1 and 183-6-1-1-3 were found resistant with score 2. Two lines from NBPGR collection and 4 aerobic cultivars were tolerant to root-knot nematode. Shrestha *et al*. (2007) identified six significant or putative Quantitative trait loci (QTLs) for partial resistance to *M. graminicola* in a mapping population derived from the cross Bala x Azucena. The rice line KMP-179 exhibiting highly resistant reaction and 4 other genotypes *viz.,* MAS-26, BR-2665, MTU-1001 and KMP-194 showing moderate resistance to root-knot nematode can be exploited in rice breeding programmes and to identify the novel QTL/gene(s) controlling root knot nematode resistance.

The authors greatfully acknowledge the Department of Plant Pathology and AINRP (Tobacco) College of Agriculture, Zonal Agricultural and Horticultural Research Station, University of Agricultural and Horticultural Sciences, Shivamogga for providing research facilities.

REFERENCES

Amoussou P L, Ashurt J, Green J Jones M, Koyama M, Snape J T W and Atkinson H 2004 Broadly based resistance to nematodes in the rice and potato crops of subsistence farmers. DFID *Plant Sciences Research Programme Annual Report,* pp.9-14.

Berliner J, Pokhare S S, Mishra C , Jena M and Singh 2014 Screening of rice germplasm lines against rice root-knot nematode *Meloidogyne graminicola. Oryza,* **51**(2) 177-178

Gitanjali Devi N S and Azad T 2007 Screening of Rice Germplasm/Varieties for resistance against root-knot nematode (*Meloidogyne graminicola*). *Indian. Journal of Nematology,* **37** 1

Jairajpuri M S and Baqri Q H 1991 Nematode pest of rice, Oxford and IBH publisher, New Delhi. India, Pp. 66.

Krishnappa K, Reddy B M R, Ravichandra N G and Ravindra H 2001 Incidence of root-knot nematode on rice in Karnataka in: National congress on Centenary of Nematology in India appraisal and future plans. pp 85.

Lorenzana O J, Matamis P P, Mallinin C B, Jose O L and De-leon D S 1998 Cultural management practices to control rice root knot nematode. Philippine Council for Agriculture, Forestry and Natural Resources Research and Development, Los Banos, Laguna (Philippines). pp 120.

Macgowan J B 1989 Rice root-knot nematode *Meloidogyne graminicola* Golden and Birchfield 1965. Florida Department of Agriculture and Consumer Services. *Nematology Circular No. 166*, June, 1989.

Padgham J L, Duxbury J M, Mazid A M, Abawi G S and Hossain M 2004 Yield loss caused by *Meloidogyne graminicola* on low land rainfed rice in Bangladesh. *Journal of Nematology,* **36** 42-48.

Port J C and Matias D M 1995 Effect of water regime on the distribution of *Meloidogyne graminicola.* And other root-parasitic nematodes in a rice field top sequence and pathogenicity of *M. graminicola* on rice cultivar UPLR 15. *Nematology***41** 219-228.

Poudyal D S, Pokharel R R, Shrestha S M and Khatri-chetri G B 2004 Evaluation of common Nepalese rice cultivars against rice root-knot nematode. *Nepal Agriculture Research Journal,* **5** 33-36.

Prasad J S, Panwar M S and Rao Y S 1985 Occurrence of root-knot nematode, *Meloidogyne graminicola* in semi-deep water rice. *Current Science,* **54** 387-388.

Prasad J S, Panwar M S and Rao Y S 1987 Nematode problems of rice in India. *Tropical Pest Management,* **33** 127-136

Ravindra H, Sehgal M, Dinesh Kumar M, Manu T G, Murali R, Narasimhamurthy H B and Latha M 2014 Survey and digital mapping of rice root-knot nematode incidence in Karnataka, India.*Indian Journal of Nematology,* **44**(**1**) 27-31

Ravindra H, Mukesh Sehgal, Narasimhamurthy HB, Imran Khan H S and Shruthi 2015 Evaluation of rice landraces against rice root-knot nematode, *Meloidogyne graminicola. African Journal of Microbiology Research.,* **9**(**16**) 1128-1131.

Sehgal M, Somasekhara Y, Ravichandra N G, Ravindra H, Jain R K and Sardana HR 2012 An outbreak of rice-root knot nematode, *Meloidogyne graminicola* in Shivamogga, Karnataka, India. *Indian Journal of Nematology,* **42**:102.

Sharma P D 2006 *Plant pathology*. Narosa Publishing House, New Delhi.

Shrestha R, Uzzo F, Wilson M J and Price A H 2007 Physiological and genetic mapping study of tolerance to root-knot nematode in rice. *New Phytologist.***176** (**3**) 665-72.

Simon L S D 2009 Screening of rice germplasm against root knot nematode *Meloidogyne graminicola. Indian Phytopathology,* **62** 131-132.

Taylor A L and Sasser J N 1978 Biology, identification and control of root-knot nematodes (*Meloidogyne spp*.). Corporative publication, Department of Plant Pathology, NC5U and U5AID, Raleigh, North Carolina, p.111

Yik C P and Birchfield W 1979 Host studies and reaction of rice cultivars to *Meloidogyne graminicola*. *Phytopathology*., **49** 497-499.