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Evaluation of rice landraces against rice root-knot nematode, *Meloidogyne graminicola*

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Of late, rice root-knot nematode *Meloidogyne graminicola* has become a serious menace in all type of rice situations in India. A field study was under taken during *kharif*-2013 to evaluate 135 landraces (local cultivars) collected and maintained at Organic Farming Research centre of ZAHRS, Navile, Shimoga against *Meloidogyne graminicola.* The result reveals that the varieties show varying degrees of responses. Out of 135 cultivars, 32 cultivars were found to be highly resistant, while, 45 varieties read were resistant. However, 40 varieties were evaluated to be moderately resistant and nine varieties susceptible. The remaining nine cultivars were learnt to be highly susceptible.

Key word: Rice, root-knot nematode.

INTRODUCTION

Rice is an important cereal crop of India and is the second most staple food crop of the world next to wheat and staple food for two thirds of world's population (Abodolereza and Racionzer, 2009). More than 90% of the world's rice area is in Asia, which is the home for more than half of the world's poor, and more than half of the world's rice cultivators (Rao et al., 2010). *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% might be incurred due to severe infestation of *M. graminicola* in upland, rainfed 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 Shimoga 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* is also observed in Shimoga, Karnataka

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Table 1. Root-Knot Index 0 to 5 scales for *Meloidogyne* spp.

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 landraces against *Meloidogyne graminicola.*

Reaction	Varieties	Root-knot Index
Highly resistant	Nazar bad, Bheemasaale, Nazarbaik, Kichadi samba, Kichadi samba, kattaru, B.P.T, Mouruda, Bagashaparimalaakki, Kempukaalu, Malgudisanna, Delhibogabhattha, Sannakki, Padma rekha, Chitiga, Sharavathikempu, Andrabasumati, Orrisabhattha, Kasubai, Bangarakaddi, KH-4, Meese bhattha, Kemputadi, Kavadhari, Jeerige samba, Tunuru, Dappavalya, Rasakadari, Nagabhatha, Baiganmanja, Bud bhattha, Siddasanna.	1
Resistant	Chinnaponni, Bangarasanna, Jasmine, H.M.T, Siggikaimai, Sannavallya, Kalalajeera, Aravatellu, Karijeddu, vijayanandeda, Raichursanna, Bangarugundu, Yelatakkigidda, hasudi, Marudi, Aanekombinabhattha, Sambhamasana, Sannamuttige, Karigajavilai, Bilidaddibudda, Kagga, kuduvekalaje, Hole saala, Chippiga, H.M.T, Dappabhattha, Kempudaddegidda, Gandhasaale, KA-1, Eppattu, Manja kai mai, Sasti, Kari basumati, kallunundigar, Malabar, bilijeddu, Neragulabhattha, Bangla rice, Madaikar, Togarsi, maranellu, Champakali, Red jasmine,Doddiga, Netibhattha, Baredabinasaale.	2
Moderately resistant	Yedikani, Kundapulan, Kempujeddu, Kiruvagi Jaya, Biriya black, Mukkanna, Bagyajyothi, Selamsanna, Valaiponni, Puttabhattha, Kagisale, Rajbhoga, Sughandhi, Kerekalumuttiga, guddapairunellu, Gangadalai, SampigeGilisaale, Ulkad rice, Honnasu, Akkalu, Madras sanna, Raja kai mai, Deepak rani, Bettadhayam, Navara, Karikandaga, Anadatumba, Ratnachudi, Mulabhattha, Marasumallige, Ambamohir, Kongalli, Navalasaale, Raja mani, Sondakar, Coimatorsanna, Mara bhatha, Allure sanna.	3
Susceptible	Aadribhattha, Gowrisanna, Sannamundaga, Pusasughandhi, Ujagunda, Karimundaga, Kempudoddi, Kushiaditam, Punkar,	4
Highly susceptible	Kaduvalli, Intan 81212, Narikela, Balaji, Solari, Dehlibasumati, Karangaravat, Jopuvadlu, Doddataikallu	5

(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. The present investigation was undertaken to know the performance of rice landraces against *M. graminicola* under *in-vivo* condition in the Organic Farming Research Centre of Zonal Agricultural Research Station (ZAHRS), Navile, Shimoga during *kharif*-2013.

MATERIALS AND METHODS

The study was conducted in nematode sick soil of Zonal Agricultural Research Station, Navile, Shimoga during *kharif* 2013. 135 rice landraces were screened for resistance to rice root-knot nematode under natural condition. Observations were recorded on 30 days old seedlings. Three seedlings were pulled out carefully from the field, roots were washed free of soil, clipped off and were observed for total number of galls present and rated for their resistant/ susceptibility as per the 0-5 rating scale (Taylor and Sasser, 1978) (Table 1).

RESULTS 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, Plates 1 and 2). Out of 135 landraces screened, 32 recorded least root-knot index of 1 and they were found to be highly resistant, while, 45 landraces showed root-knot indices of 2 and read to be resistant, 40 landraces evaluated to be moderately resistant and 9 landraces showed susceptible and highly susceptible reactions. The present investigation is in conformity with those of Gitanjali et al. (2007) who screened 8 rice varieties, screening rice varieties for resistance against root-knot nematode (*M. graminicola*). Yik and Birchfield (1979) observed that out of 26

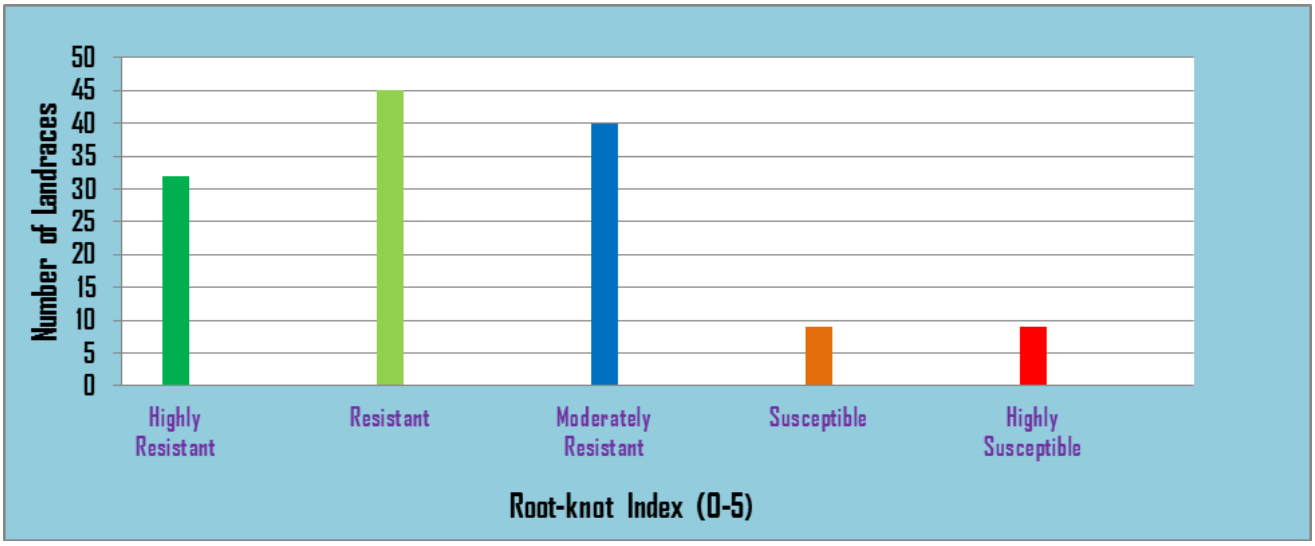

Figure 1. Response of 135 landraces of rice to *Meloidogyne graminicola* under *in-vivo* condition.

Plate 1. General view of the experimental plot.

Plate 2. Infected rice root with *M. graminicola.*

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. Evaluation of advanced backcross populations developed for water stress environment revealed that Teqing and the donarscvc Type 3, Zihui 100, ShweThwe Yin Hyv were resistant to the nematode (Prasad et al., 2006). Das et al. (2011) reported that *O. glaberrima* accessions CG 14 and TOG 5674, traditional cultivars WAB 638-1 and IRAT 216 and aerobic rice genotype IR 81426-B-B-186-4 and IR81449-B-B-51-4 were resistant to *M. graminicola.*

Conflict of interest

The authors did not declare any conflict of interest.

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