

Screening of Rice and Wheat Cultivars for Resistance against Root-knot Nematode, *Meloidogyne graminicola* (Golden and Birchfield) in Rice-Wheat Cropping System

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Abstract

Field evaluation of eighty seven cultivars of rice and fifty nine cultures of wheat against root-knot nematode infection in the field during *kharif* 2007, 2008 & 2009 and *rabi* 2008 & 2009 revealed two rice cultivars Achhoo and Naggardhan and two wheat cultivars HS 295 and VL 829 as resistant with 2 score. Rice lines Ranbir Basmati, Hasan Sarai, and Purple cultures and wheat cultivar HS 240 were rated as susceptible.

Rice is the important cereal crop during *kharif* and wheat during *rabi* in Himachal Pradesh. Root-knot nematode, *Meloidogyne graminicola* (Golden and Birchfield) infests both rice and wheat in the region (Srivastava et al. (2008). Chandel et al. (2002) reported another species of root-knot nematode, *M. triticoryzae* affecting rice and other important crops including wheat. Infection by second stage juveniles in roots cause disruption and hypertrophy of cortical cells due to their secretions resulting in swelling of stele at the sites of nematode establishment. The swellings are visible to naked eyes as knots on the roots. In upland rice, the nematode infection leads to incomplete filling of kernels while in deepwater, infected seedling remains stunted, unable to grow above flood water and perish due to continuous submergence. Water availability for rice cultivation and cropping patterns are influencing population dynamics of the parasitic nematode (Rao et al., 1985; Prasad et al., 1990; Sharma and Prasad, 1995; Prasad et al., 2006a). We report here performance of selected cultivars of rice and wheat against the root knot nematode in field evaluation and identified resistant material against the pest.

Materials and Methods

Eighty seven rice genotypes (Table 1), and fifty nine elite wheat strains (Table 2) from the in-house germplasm collection were screened for resistance to root-knot

nematodes under natural condition for three *kharif* seasons (2007-2009) for rice genotypes and two *rabi* seasons (2008 & 2009) for wheat entries. Twenty five days old rice seedlings of test entries were transplanted in the field with a spacing 20 x15 cm in one row of 25 hills and paired rows of one metre length of various wheat genotypes were planted on experimental farm at Malan (32° 1' N Latitude and 76° 20' E Longitude, at 950 m above msl). Observations were taken in rice and wheat genotypes on thirty days after transplanting in rice and sixty days after sowing in wheat. The observation was repeated after 30 days in each cultivar. Ten plants were pulled out carefully from each cultivar from the field, roots were washed free of soil, clipped off and five sub-samples of 5 gm were observed for total number of galls present and rated for their resistance / susceptibility as per the following scale.

1. No galls per 5 g of root sample
Highly resistant (HR)
2. 1-10 gall per 5 g of root sample
Resistant (R)
3. 11-30 gall per 5 g of root sample
Moderately Resistant (MR)
4. 31-100 galls per 5 g of root sample
Susceptible (S)
5. 101 and above galls per 5 g of root sample
Highly susceptible (HS)

Results and Discussion

Three rice cultivars Achhoo, Naggardhan and HPR 2373 were rated as resistant against the root knot nematode in three consecutive years of testing while 14 cultures were rated as resistant in two years of testing (Table 1). Another 14 cultures were rated as moderately resistant and eight cultures as susceptible in two years of testing. Screening in pot tests revealed One accession of *O. longistaminata* represented by two individuals (WL02-2 and WL02-15) and three accessions of *O. glaberrima* (TOG7235, TOG5674 and TOG5675) were resistant to the rice root-knot nematode (Soriano et al. 1999). Greenhouse evaluations of 12 Nepalese rice varieties

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showed that Masuli and Chaite-6, were moderately resistant to the nematode (Sharma-Poudyal et al. 2004). Evaluation of advanced backcross populations developed for water stress environment revealed that Teqing and the donors cvs Type 3, Zihui 100, Shwe Thwe Yin Hyv were resistant to the nematode (Prasad et al. 2006b). 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 genotypes IR 81426-B-B-186-4 and IR81449-B-B-51-4 to be resistant to *M. graminicola*. Similar evaluation of wheat cultivars revealed seven cultivars viz., PW 911, PW 920, PW 921, PW 926, PW

927, HS 295 and VL 829 to be resistant in two years of testing (Table 2). In addition 42 cultivars scored resistance in one year of testing. Two entries DW 107, HS 240 were rated as susceptible in one year of testing.

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Table 1: Response of rice genotypes against root knot nematode under transplanted condition at Malan

Rating	Years of testing	
	Three	Two
R	Achhoo, Naggar Dhan, HPR 2373	China 988, Himalya 741, Himalya 2216, Palam Dhan-957, HPR 2143, HPR 1149, IRBB 21, IR-7193, IR-71703, HPR-2362, VL-Dhan-207, VL 3400, VL 30424, SKAU 05
MR	-	RJ- 100, Kalizhini (White), RP 2421, HPW 741, Norin18, HPW 894, Zenith, VL 932767, SKAU 382, ACC 19164, ACC 19178, ACC 19186, ACC 19197, ACC 19243
S	-	IR 64, Fukunishiki, HPR 2328, HPR 2355, Hassan Sarai, Ranbir Basmati, Purple (farmer field), ACC 19283

Table 2: Response of wheat cultivars against root knot nematode at Malan

Rating	Years of testing	
	Two	One
R	PW 911, PW 920, PW 921, PW 926, PW 927, HS 295, VL 829	BW 201, BW 202, BW 204, DW 93, DW 98, DW 99, DW 100, DW 102, DW 103, DW 106, KWS 29, PW 914, PW 917, PW 923, Sonalika, PW 909, PB 908, V 616, HPW 249, VL 892, PW 929, PW 918, PW 919, PW 916, PW 907, PW 910, PW 915, PW 924, PW 906, PW 927, HPW 155, HS 240, HPW 89, HPW 147, HPW 211, HPW 288, HPW 185, HPW 285, HPW 266, RajMR 1, HPW 236, HPW 184.
MR	HPW 42	BW 203, DW 92, DW 94, DW 95, DW 96, DW 97, DW 101, DW 104, DW 105, DW 108, DH 65, DH 36, DH 84, PW 906, PW 907, PW 908, PW 909, PW 910, PW 912, PW 913, PW 915, PW 916, PW 918, PW 919, PW 922, PW 924, PW 925, PW 928, HPW 147, HPW 184, HPW 89, HPW 155, VL 616, Raj MR 1 (C)HS 490, HPW 251,
S	-	DW 107, HS 240

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