

Research Article

Reaction of certain local rice varieties against *Orseolia oryzae* under rainfed ecosystem

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ABSTRACT

Field screening of eighty one rice varieties (including one susceptible check) was carried out against gall midge during *Kharif* 2009-2010 at the Agricultural Research Station, Sirsi, (Uttar Kannada) under rainfed ecosystem. Varieties were evaluated based on the standard evaluation scale of 0-9. Per cent silver shoot varied between 0.00 (highly resistant) to 19.3 (susceptible) per cent and 0.00 (highly resistant) to 25.32 per cent (susceptible) at 30 and 50 days after transplanting (DAT). Out of 81 varieties, eight proved to be highly resistant (0 % SS), forty eight varieties reacted as moderately resistant (1-5% SS), twenty three varieties reacted as moderately susceptible (6-10% SS) and none of the varieties was found to be resistant (<1% SS) and highly susceptible (>25% SS) at 30 DAT. Similarly eight proved highly resistant (0 % SS), eight rice varieties reacted moderately resistant (1-5% SS), forty two varieties showed moderately susceptible (6-10% SS), twenty three varieties reacted susceptible (11-25% SS) and none of the varieties was found to be resistant (<1% SS) and highly susceptible (>25% SS) at 50 DAT.

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INTRODUCTION

Rice (*Oryza sativa* L.) is grown in many regions across India. India is the second leading producer of rice in the entire world. Rice is grown in 117 countries, being a staple food of 2.7 billion people in Asia alone. The major insect pests including gall midge, leaf folder, white backed plant hopper (WBPH), ear head bug and yellow stem borer act as production constraint in rainfed rice ecosystem. Among these, rice gall midge, *Orseolia oryzae* (Wood-Mason) damages the crop during early stage and it is considered as second major pest of rice in India, based on its relative importance. It has become one of the most serious pests of high yielding varieties in recent years in few states of India. The symptom produced by gall midge is popularly known as 'silver shoot' or 'onion shoot' or 'anekombu'. The high degree of susceptibility to gall midge has become a limiting factor in further spread of Jaya variety in endemic areas. Heavy rains in the area during *Kharif* season also make the use of insecticides very difficult. The growers are also not able to afford the high cost of granular insecticides which are effective against this pest. The use of gall midge

resistant varieties therefore, appears to be the most effective way of reducing the gall midge damage and increasing rice production. Gall midge infestation starts building up at 30 days after transplanting (DAT) and rice varieties show differential degree of infestation. A number of workers have screened rice germplasms against gall midge populations through which several important sources of resistance have been identified. Hence, the present study was undertaken, to evaluate 81 rice varieties for their resistance against gall midge.

MATERIALS AND METHODS

The investigation was taken under field condition at the Agricultural Research Station, Sirsi, Uttar Kannada district of Karnataka, during *Kharif* season of 2009-2010. Eighty one rice genotypes were obtained from Directorate of Rice Research (DRR), Rajendranagar, Hyderabad. At ARS, these local varieties were screened against gall midge in comparison with susceptible check Jaya which is cultivated on large area in Karnataka. Test entries were transplanted in the main field at 21 days after sowing and each entry was planted with two

rows of five meter length at spacing of 20X20 cm with one seedling per hill. To increase the infestation of gall midge, constant water level of 5 inches was maintained in the field to increase the relative humidity.

The observations on number of infested and healthy plants on hill basis and number of healthy and infested tillers (silver shoot) or tiller basis or 5 randomly selected hills in each test entry was made on 30 and 50 days after transplanting. Total number of tillers and the total number of tillers with silver shoot were recorded and the per cent tiller infestation was calculated as follows:

$$\% \text{ silver shoots} = \frac{\text{No. of infested tillers}}{\text{Total no. of tillers}} \times 100$$

To check the levels of resistant/susceptibility to RGM, the percentage silver shoot in each entry was converted to 0-9 scale (Anonymous, 2002).

RESULTS AND DISCUSSION

Results of 80 rice varieties compared with a susceptible check Jaya under field condition against gall midge population revealed that per cent silver shoots at 30 DAT varied between

0.00 (highly resistant) to 19.3 (susceptible). Out of 81 rice varieties, eight proved highly resistant (0% SS) viz., SRS-GO22, SRS-GO67, SRS-GO69, SRS-GO70, SRS-GO71, SRS-GO73, SRS-GO74, SRS-GO77, forty eight varieties reacted as moderate resistant (1-5% SS) and twenty three varieties reacted as moderately susceptible (6-10% SS). None of the varieties was found resistant (<1% SS) and highly susceptible (>25% SS). The details of per cent damage score and category of each entry under trail are indicated in Table 1.

At 50 DAT, per cent silver shoot varied between 0.00 (highly resistant) to 25.32 (susceptible) (Table 2). Out of 81 rice varieties, eight proved highly resistant (0% SS) viz., SRS-GO22, SRS-GO67, SRS-GO69, SRS-GO70, SRS-GO71, SRS-GO73, SRS-GO74, SRS-GO77; eight varieties reacted moderate resistant (1-5% SS) viz., SRS-GO02, SRS-GO03, SRS-GO27, SRS-GO33, SRS-GO35, SRS-GO37, SRS-GO53 and SRS-GO66; forty two varieties showed moderately susceptible reaction (6-10% SS); twenty four varieties showed susceptible reaction (11-25% SS). None of the varieties was found resistant (<1% SS) and highly susceptible (>25% SS). The details of per cent damage score and category of each entry under trail are indicated in Table 2.

The mean percentage of silver shoots (30 and 50 DAT) varied between 0.00 (highly resistant) to 21.29 (susceptible).

Table 1: Reaction of rice varieties to rice gall midge at 30 DAT

Scale (0-9)	Score (Silver shoot)	Category	Varieties
0	No damage	Highly resistant	SRS-GO22 (0.00), SRS-GO67(0.00), SRS-GO69(0.00), SRS -GO70(0.00), SRS- GO71(0.00), SRS-GO73(0.00), SRS -GO74(0.00) and SRS- GO77(0.00)
1	Less than 1%	Resistant	-Nil-
3	1-5%	Moderately resistant	SRS -GO035(1.96), SRS -GO037(1.96), SRS -GO003(2.0), SRS -GO027(2.04), SRS -GO053(2.08), SRS -GO044(2.12), SRS -GO02(2.17), SRS -GO058(2.17), SRS -GO33(2.22), SRS -GO66(2.22), SRS -GO40(2.32), SRS -GO01(2.43), SRS -GO05(2.43), SRS -GO34(2.94), SRS -GO06(3.57), SRS -GO38(3.57), SRS -GO17(3.63), SRS -GO42(3.63), SRS -GO68(3.63), SRS -GO72(3.63), SRS -GO61(3.63), SRS -GO65(3.63), SRS -GO10(3.70), SRS -GO60(3.70), SRS -GO64(3.77), SRS -GO20(3.84), SRS -GO24(3.84), SRS -GO28(3.84), SRS -GO04(3.92), SRS -GO09(3.92), SRS -GO46(3.92), SRS -GO76(3.92), SRS -GO80(3.92), SRS -GO14(4.00), SRS -GO45(4.00), SRS -GO41(4.08), SRS -GO78(4.08), SRS -GO13(4.25), SRS -GO07(4.34), SRS -GO36(4.34), SRS -GO30(4.34), SRS -GO52(4.39), SRS -GO16(4.54), SRS -GO63(4.54), SRS -GO79(4.60), SRS -GO55(4.76), SRS -GO18(5.30) and SRS -GO29(5.50)
5	6-10%	Moderately susceptible	SRS -GO32(5.55), SRS -GO56(5.66), SRS -GO26(5.69), SRS -GO25(5.76), SRS -GO62(5.76), SRS -GO51(5.76), SRS -GO59(5.88), SRS -GO31(5.88), SRS -GO23(8.33), SRS -GO75(6.12), SRS -GO15(6.25), SRS -GO43(6.52), SRS -GO19(6.77), SRS -GO21(6.89), SRS -GO08(7.14), SRS -GO11(7.14), SRS -GO49(7.14), SRS -GO50(7.69), SRS -GO23(8.33), SRS -GO57(8.33), SRS -GO47(9.61), SRS -GO54(10.41), SRS -GO39(10.34)
7	11-25%	Susceptible	Jaya (19.30)
9	More than 25%	Highly susceptible	-Nil-

DAT: Days after transplanting, SRS:Sirsi

Table 2 : Reaction of rice varieties to rice gall midge at 50 DAT

Scale (0-9)	Score (Silver shoot)	Category	Varieties
0	No damage	Highly resistant	SRS-GO22(0.00) SRS-GO67(0.00), SRS-GO69(0.00), SRS -GO70(0.00), SRS- GO71(0.00), SRS-GO73(0.00), SRS -GO74(0.00) and SRS- GO77(0.00)
1	Less than 1%	Resistant	-Nil-
3	1-5%	Moderately resistant	SRS-GO35(3.48), SRS-GO37(3.64), SRS-GO03(4.67), SRS -GO53(5.05), SRS -GO33(5.05), SRS-GO27(5.09), SRS-GO66(5.21) and SRS-GO02(5.34)
5	6-10%	Moderately susceptible	SRS-GO58(5.65), SRS-GO44(5.73), SRS-GO01(6.23), SRS -GO05(6.43), SRS-GO40(6.62), SRS-GO34(6.82), SRS-GO28(6.87), SRS-GO65(6.89), SRS-GO17(7.1), SRS-GO42 (7.16), SRS-GO72(7.25), SRS-GO80(7.26), SRS-GO10(7.36), SRS-GO68(7.42), SRS-GO38(7.48), SRS-GO76(7.56), SRS-GO04(7.62), SRS-GO64(7.76), SRS-GO60(7.87), SRS-GO24(7.94), SRS-GO45(8.04), SRS-GO78(8.09), GO61(8.34), SRS-GO30(8.48), SRS-GO36(8.37), SRS-GO46(8.48), SRS-GO79(8.56), SRS-GO14(8.83), SRS-GO06(8.95), SRS-GO16(9.03), SRS-GO52(9.32), SRS-GO07(9.35), SRS-GO20(9.47), SRS-GO13(9.48), SRS-GO09(9.57), SRS-GO55(9.65), SRS-GO41(9.82), SRS-GO63(9.87), SRS-GO26(10.12), SRS-GO32(10.22), SRS-GO18(10.27) and SRS -GO25(10.47)
7	11-25%	Susceptible	SRS-GO31(11.22), SRS-GO51(11.24), SRS-GO56(11.32), SRS-GO62(11.35), SRS-GO59(11.53), SRS-GO29(11.84), SRS-GO75(13.24), SRS-GO43(13.27), SRS-GO12(13.46), SRS-GO19(13.68), SRS-GO15(13.72), SRS -GO21(13.85), SRS-GO49(15.42), SRS-GO08(15.47), SRS-GO11(15.5), SRS-GO47(16.25), SRS-GO50(16.34), SRS-GO57(16.65), SRS-GO23 (16.83), SRS-GO39 (20.83), SRS-GO20(21.22), SRS -GO54(21.22), Jaya(23.29) and SRS-GO48(25.32).
9	More than 25%	Highly susceptible	-Nil-

DAT: Days after transplanting, SRS:Sirsi

Table 3 : Reaction of rice varieties to rice gall midge at 30 & 50 DAT (Based on the mean value)

Scale (0-9)	Score (Silver shoot)	Category	Varieties
0	No damage	Highly resistant	SRS-GO22(0.00) , SRS-GO67(0.00), SRS-GO69(0.00), SRS-GO70(0.00), SRS- GO71(0.00), SRS-GO73(0.00), SRS-GO74(0.00) and SRS-GO77(0.00).
1	Less than 1%	Resistant	-Nil-
3	1-5%	Moderately resistant	SRS-GO35(2.72), SRS-GO37(2.80), SRS-GO03(3.34), SRS-GO27(3.57), SRS-GO53(3.57), SRS-GO33(3.64), SRS -GO66(3.72), SRS-GO02(3.76), SRS-GO58(3.91), SRS-GO44(3.93), SRS-GO01(4.33), SRS-GO05(4.43), SRS-GO40(4.47), SRS-GO34(4.88), SRS-GO05(5.26), SRS-GO28(5.36), SRS-GO17(5.37), SRS-GO42(5.40) and SRS-GO72(5.44)
5	6-10%	Moderately susceptible	SRS-GO10(5.53), SRS-GO68(5.53), SRS-GO38(5.53), SRS-GO80(5.59), SRS-GO76(5.74), SRS-GO64(5.77), SRS-GO4(5.77), SRS-GO60(5.79), SRS-GO24(5.89), SRS-GO81(5.99), SRS-GO45(6.02), SRS-GO78(6.09), SRS-GO46(6.20), SRS-GO6(6.26), SRS-GO36(6.36), SRS-GO30(6.41), SRS-GO14(6.42), SRS-GO79(6.58) and SRS-GO20(6.66), SRS-GO09(6.75), SRS-GO16(6.79), SRS-GO07(6.85),SRS-GO52(6.86), SRS-GO13(6.87), SRS-GO41(6.95), SRS-GO55(7.21), SRS-GO63(7.21), SRS-GO18(7.79), SRS-GO32(7.89), SRS-GO26(7.91), SRS-GO25(8.12), SRS-GO56(8.49), SRS-GO51(8.50), SRS-GO31(8.55), SRS-GO29(8.67), SRS-GO59(8.71), SRS-GO75(9.68), SRS-GO12(9.73), SRS-GO43(9.90), SRS-GO15(9.99), SRS-GO19(10.23), SRS -GO21(10.37)
7	11-25%	Susceptible	SRS-GO08(7.00), SRS-GO11(7.00), SRS-GO23(7.00), SRS-GO39(7.00), SRS-GO47(7.00), SRS-GO48(7.00), SRS-GO49(7.00), SRS-GO50(7.00), SRS-GO54(7.00), SRS-GO57(7.00) and Jaya(7.00).
9	More than 25%	Highly susceptible	-Nil-

DAT: Days after transplanting, SRS:Sirsi

Among the rice cultivars screened, forty two varieties reacted moderately susceptible (6-10% SS); nineteen varieties reacted moderately resistant (1-5% SS); eleven varieties proved susceptible (11-25% SS) and remaining eight proved highly resistant (0% SS) viz., SRS-GO22, SRS-GO67, SRS-GO69, SRS-GO70, SRS-GO71, SRS-GO73, SRS-GO74, SRS-GO77 as compared to 21.29 per cent silver shoots recorded in susceptible check Jaya. None of the varieties was found resistant (< 1%) and highly susceptible (25% SS) (Table 3).

In coastal Karnataka, 12 promising rice cultures were evaluated by Shetty *et al.* (1994, 1994a) for gall midge resistance along with susceptible cultivar Jaya during *Kharif* 1989-1992. The mean gall midge incidence ranged from 0.4 per cent in IET 10765 to 21.2 per cent in Jaya. IET 10247 and IET 10867 recorded low incidence (1.4 and 0.5% SS, respectively). Misra and Kulshreshtha (1971) screened that the seventy two rice cultivars against gall midge. The per cent incidence of silver shoot varied from nil incidences to 70 per cent. The cultivars IR-8 and Jaya showed 49 and 70 per cent incidence,

respectively. In present investigation silver shoot incidence ranged from 19.3 to 23.29 per cent with a mean of 21.29 per cent compared to other local varieties.

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