RESEARCH ARTICLE

SCREENING OF DIFFERENT RICE ENTRIES AGAINST SHEATH BLIGHT DISEASE RESISTANCE

Toorray N.K.* and Tiwari P.K.[1]

College of Agriculture and Research Station, Marra, IGKV, Durg (C.G.)
[1]Department of Plant Pathology, IGKV, Raipur (C.G.)

Received-26.08.2021, Revised-10.09.2021, Accepted-20.09.2021

Abstract: The twenty-four rice entries were screened against sheath blight resistant in rice in the kharif 2016 and 2017. Among the tested rice entries, the entry IET No. R-2302-387-1-277-1, IET No. R-2302-390-2-288-1, IET No. R-2302-396-3 -301- 1 and IET No. - SUVT-324, recorded as a resistant reaction to sheath blight of rice, while IET No. VL-31289, IET No. Nidhi, IET No. RP-Patho-4, IET No. -RP-Patho-6 , IET No. UPL R1-7, IET No. R-1675-1844-2-1257-1, IET No. R-2302-386-1-275-1, IET No..-R-1909-112-1-86-1, IET No.R-2034-147-1-186-1, IET No.Jaldoobi, IET No.R-RGY-SI-13, IET No.- R-1670-3975-1-485- 1, IET No. - SUVT-122, IET No. - SUVT-230, IET No. - SUVT-353, IET No. - SUVT-362, IET No. - SUVT-412, IET No. Badshah Bhog-2 and IET No. Sarai Phool showed the moderately resistant response as compared to the susceptible check variety swarna.

Keywords: Screening, Rice entries, Sheath blight

INTRODUCTION

Rice (*Oryzae sativa* L.) is cultivated across the world, making it possibly the most valuable plant on earth (Shimamoto, 1995; Goff, 1999). It provides 20 percent of the world's supply of dietary energy followed by maize and wheat. Of the several factors known to destabilize rice yields, pests and diseases account for 30-40 percent crop losses. Most parts of the country regularly encounter complete crop failure due to epidemics of pests and diseases. In Chhattisgarh, rice production is comparatively smaller than the national average production. A lot of fungal, bacterial, nematode, and viral diseases are attacked on rice. Serious incidences of diseases such as blast, sheath blight and bacterial blight have been reported from rice growing areas in Chhattisgarh regions.

Sheath blight disease is one of India's harmful and widespread rice disease which is causing significant losses, particularly in areas where high yielding varieties are cultivated. *Rhizoctonia solani* (Perfect stage-*Thanatephorus cucumeris*) which causes rice sheath blight in both soil and water borne. Kumar *et al*. (2015) screened six parental genotypes of rice *viz*, FL 478, IW Ponni, BPT 5204, IR 64, RNR 57979 and TETEP along with the susceptible check, T (N) 1 against sheath blight resistance. TETEP exhibited resistant reaction to sheath blight with 5.75% mean RLH as against the highest mean RLH of 66.70% in T (N) 1 (susceptible check). The RNR 57979 and IR 64 parental lines showed moderately resistant and moderately susceptible reactions with a mean RLH of 21.35% and 31.80% respectively. The other parental lines *viz*, FL 478, IW Ponni and BPT 5204 showed susceptible reaction recording 47.60%, 49.55% and 46.70% mean RLH respectively.

Chandra *et al*. (2016) Tested 108 germplasms, screened in both natural and artificial inoculated conditions, none of the entries were observed as immune or resistant. Two entries Baigani black and Prasada registered moderately resistant reactions, 17 moderately susceptible and 27noted resistant reactions. Tejaswani (2016) reported that the F5 rice varieties obtained from the two crosses MTU 7029/PAU 3116-25-5-1 and MTU 7029/PAU 3140-126-1 has been screened against sheath blight using artificial inoculation typha leaf bit method followed by field screening using 0-9 scale of SES, 2014. Specific varieties of bacterial leaf blight were also screened using artificial leaf clipping method, and no varieties were detected resistant. 21 varieties displayed moderately resistance to sheath blight while only six varieties displayed moderately resistance to bacterial leaf blight.

MATERIALS AND METHODS

The experiment of screening of different entries/varieties against sheath blight resistance was conducted under filed condition in bunded rice field and under irrigated conditions during Kharif 2016 and kharif 2017. Twenty four rice varieties/ entries *i.e*., IET No.R-2302-396-3-301-1, IET No.VL-31289, IET No. Nidhi, IET No.RP-Patho-4, IET No.RP-Patho-6, IET No.UPL R1-7, IET No.R-1675-1844-2-1257-1, IET No.R-2302-386-1275-1, IET No.R-2302-387-1-277-1, IET No.R-2302-390-2-288-1, IET No.R-1909-112-186-1, IET No.R-2034-147-1-186-1, IET No. Jaldoobi, IET No. R-RGY-SI-13, IET No. R-1670-3975-1-485-1, IET No. SUVT-122, IET No. SUVT-230, IET No. SUVT-353, IET No. SUVT362, IET No. SUVT-412, IET No. Badshah bhog-2, IET No. Sarai phool and swarna were transplanted in two rows and in one row ten plants were maintained for the resistance screening in Indira Gandhi Krishi Vishwavidyalaya, Raipur Research field.

*Corresponding Author

To conduct this experiment twenty one day old seedlings of each entries were transplanted in 2 rows of 2 meter length. 10 plants were transplanted in each row. Row to row and plant to plant spacing was 20 × 15 cm. Fertilizer was applied @ N120: P50: K0 ha-1. Fifty percent of N and total P were given as basal dose and remaining N applied in two split doses as top dressing at tillering and panicle initiation stage. Artificial inoculation was done at the maximum rice tillering stage by using mycelial block of 5-day-old culture of *R. solani*. Five plants were inoculated in each row. The disease development was recorded in each variety and percent disease severity was calculated as Standard Evaluation System (SES), IRRI (2014). Observations were recorded 30 days after inoculation and graded as per 0-9 SES scale. The sheath blight scale was as follows:

Table 1. Standard Evaluation System (SES), IRRI (2014)

Disease rating scale	Response	Description
0	Immune	No Infection
1	Highly Resistant	Vertical spread of the lesions up to 20% of plant height
3	Resistant	Vertical spread of the lesions up to 21-30% of plant height
5	Moderately Resistant	Vertical spread of the lesions up to 31-45% of plant height
7	Susceptible	Vertical spread of the lesions up to 46-65% of plant height
9	Highly Susceptible	Vertical spread of the lesions up to 66-100% of plant height

The disease development was recorded in each variety and Percent Disease severity and Percent Disease Index was calculated as:

$$\text{Disease severity \%} = \frac{\text{Total lession length}}{\text{Total length of sheath}} \times 100$$

RESULTS AND DISCUSSION

The twenty three rice entries were screened for their reaction against *R. solani* under artificial inoculation.

Fig. 1: Screening of different varieties of rice against *R. solani*

During the year 2016 the data presented in table no. 1.0 showed that no entry was recorded for highly resistance reaction. Among the twenty four rice varieties/entries designated *i.e.*, IET No.- R-2302-396-3-301-1, IET No.-VL-31289, Nidhi, IET No.- RP-Patho-4, IET No.-RP-Patho-6, IET No.-UPL R1-7, IET No.-R-1675-1844-2-1257-1, IET No.- R-2302-386-1-275-1, IET No.-R-2302-387-1-277-1, IET No.- R-2302-390-2-288-1, IET No.- R-1909-112-1-86-1, IET No.- R-2034-147-1-186-1, IET No.- Jaldoobi, IET No.- R-RGY-SI-13, IET No.- R-1670-3975-1-485-1, IET No.- SUVT-122, IET No.- SUVT-230, IET No.- SUVT-324, IET No.- SUVT-353, IET No.- SUVT-362, IET No.- SUVT-412, IET No.-Badshah bhog-2 and IET No.-Sarai phool and Swarna in check. Three entries IET No.- R-2302-396-3-301-1, IET No.-R-2302-387-1-277-1 and IET No.- SUVT-324 showed resistant reaction (Score-3). While, the twenty entries designated IET No.-VL-31289, IET No.-Nidhi, IET No.- RP-Patho-4, IET No.-RP-Patho-6, IET No.-UPL R1-7, IET No.-R-1675-1844-2-1257-1, IET No.- R-2302-386-1-275-1, IET No.- R-2302-390-2-288-1, IET No.- R-1909-112-1-86-1, IET No.- R-2034-147-1-186-1,IET No.- Jaldoobi, IET No.- R-RGY-SI-13, IET No.- R-1670-3975-1-485-1, IET No.- SUVT-122, IET No.- SUVT-230, IET No.- SUVT-353, IET No.- SUVT-362, IET No.- SUVT-412, IET No.-Badshah bhog-2 and IET No.-Sarai phool showed moderately resistant reaction (Score-5). Rest of the one entry **s**warna was recorded as susceptible (Score-7) in their reactions against the disease. The twenty four entries were screened against sheath blight of rice under artificial inoculation with one isolate collected from Raipur.

Table 2. Screening of different entries / varieties against sheath blight resistance (Year2016).

S. No.	Grade	Varietal Reaction	Frequency Distribution	Varieties/entries (IET No.)
1	0	Immune	0	NIL
2	1	Highly Resistant	0	NIL
3	3	Resistant	03	IET No.- R-2302-396-3-301-1 and IET No.- R-2302-387-1-277-1, IET No.- SUVT-324
4	5	Moderately Resistance	20	IET No.-VL-31289, IET No.-Nidhi, IET No.- RP-Patho-4, IET No.- RP-Patho-6, IET No.-UPL R1-7, IET No.-R-1675-1844-2-1257-1, IET No.- R-2302-386-1-275-1, IET No.- R-2302-390-2-288-1, IET No.- R-1909-112-1-86-1, IET No.- R-2034-147-1-186-1, IET No.- Jaldoobi, IET No.- R-RGY-SI-13, IET No.- R-1670-3975-1-485-1, IET No.- SUVT-122, IET No.- SUVT-230, IET No.- SUVT-353, IET No.- SUVT-362, IET No.- SUVT-412, IET No.-Badshah bhog-2 and IET No.-Sarai phool.
5	7	Susceptible	01	Swarna
6	9	Highly Susceptible	0	NIL
Total entries = 24				**LSI= 4.83**

During the year 2017 the data presented in table no. 2.0 shows that no entry was recorded for highly resistance reaction. Among the twenty four rice varieties/entries, four entries IET No.-R-2302-387-1-277-1, IET No.- R-2302-390-2-288-1, IET No.- R-2302-396-3-301-1 and IET No.- SUVT-324 showed resistant reaction (Score-3). While, the nineteen entries designated IET No.-VL-31289, IET No.-Nidhi, IET No.-RP-Patho-4, IET No.-RP-Patho-6, IET No.-UPL R1-7, IET No.-R-1675-1844-2-1257-1, IET No.- R-2302-386-1-275-1, IET No.- R-1909-112-1-86-1, IET No.- R-2034-147-1-186-1,IET No.- Jaldoobi, IET No.- R-RGY-SI-13, IET No.- R-1670-3975-1-485-1, IET No.- SUVT-122, IET No.- SUVT-230, IET No.- SUVT-324, IET No.- SUVT-353, IET No.- SUVT-362, IET No.- SUVT-412, IET No.- Badshah bhog-2 and IET No.-Sarai phool showed moderately resistant reaction (Score-5). Rest of the one entry, swarna was showed as susceptible (Score-7) in their reactions against the disease.

Table 3. Screening of different entries / varieties against sheath blight resistance (Year2017):

S. No.	Grade	Varietal Reaction	Frequency Distribution	Varieties/entries (IET No.)
1	0	Immune	0	NIL
2	1	Highly Resistant	0	NIL
3	3	Resistant	04	IET No.- R-2302-387-1-277-1, IET No.- R-2302-390-2-288-1, IET No.- R-2302-396-3-301-1 and IET No.- SUVT-324.
4	5	Moderately Resistance	19	IET No.-VL-31289, IET No.-Nidhi, IET No.-RP-Patho-4, IET No.- RP-Patho-6, IET No.-UPL R1-7, IET No.-R-1675-1844-2-1257-1, IET No.- R-2302-386-1-275-1, IET No.- R-1909-112-1-86-1, IET No.- R-2034-147-1-186-1, IET No.-Jaldoobi, IET No.- R-RGY-SI-13, IET No.- R-1670-3975-1-485-1, IET No.- SUVT-122, IET No.- SUVT-230, IET No.- SUVT-353, IET No.- SUVT-362, IET No.- SUVT-412, IET No.-Badshah bhog-2 and IET No.-Sarai phool.
5	7	Susceptible	01	Swarna
6	9	Highly Susceptible	0	NIL
Total entries= 24				**LSI= 4.75**

Pooled data of kharif 2016 and kharif 2017 presented in the table 3.0 and fig. 1.0 indicated that among twenty four rice varieties/entries**,** no entry was recorded for highly resistance reaction. Four entries IET No.-R-2302-387-1-277-1, IET No.- R-2302-390-2-288-1, IET No.- R-2302-396-3-301-1 and IET No.-

SUVT-324 showed resistant reaction (Score-3). While, the nineteen entries designated IET No.-VL-31289, IET No.-Nidhi, IET No.-RP-Patho-4, IET No.-RP-Patho-6, IET No.-UPL R1-7, IET No.-R-1675-1844-2-1257-1, IET No.- R-2302-386-1-275-1, IET No.- R-1909-112-1-86-1, IET No.- R-2034-147-1-186-1, IET No.-Jaldoobi, IET No.- R-RGY-SI-13, IET No.- R-1670-3975-1-485-1, IET No.- SUVT-122, IET No.- SUVT-230, IET No.- SUVT-324, IET No.- SUVT-353, IET No.- SUVT-362, IET No.- SUVT-412, IET No.-Badshah bhog-2 and IET No.-Sarai phool showed moderately resistant reaction (Score-5). Rest of the one entry Swarna was showed as susceptible (Score-7) in their reactions against the disease.

The above results are accordance with the findings of Mosaddeque *et al*., (2008) screened that forty four test entries of parental lines of rice with one susceptible (BR11) and one resistance check (BRR1 dhan 29) were screened against sheath blight of rice. Ten lines were resistant, 31 were moderately resistant and 3 showed susceptible reaction at maximum tillering stage. Chandra *et al*. (2016) tested one hundred eight germplasms, screened under both natural and artificial inoculated conditions, were not found to be susceptible or immune to any of the entries. Out of eighty two entries, forty-five entries were found to be resistant to under artificial inoculated disease. Baigani black and Prasada reported moderately resistant reactions, with 70 moderately susceptible reactions, and 27 reactions noted.

Table 4. Screening of different entries / varieties against sheath blight resistance (Pooled data of kharif 2016 and 2017):

S. No.	Grade	Varietal Reaction	Frequency Distribution	Varieties/entries (IET No.)
1	0	Immune	0	NIL
2	1	Highly Resistant	0	NIL
3	3	Resistant	04	IET No.- R-2302-387-1-277-1, IET No.- R-2302-390-2-288-1, IET No.- R-2302-396-3-301-1 and IET No.- SUVT-324.
4	5	Moderately Resistance	19	IET No.-VL-31289, IET No.-Nidhi, IET No.-RP-Patho-4, IET No.-RP-Patho-6, IET No.-UPL R1-7, IET No.-R-1675-1844-2-1257-1, IET No.- R-2302-386-1-275-1, IET No.- R-1909-112-1-86-1, IET No.- R-2034-147-1-186-1, IET No.-Jaldoobi, IET No.- R-RGY-SI-13, IET No.- R-1670-3975-1-485-1, IET No.- SUVT-122, IET No.- SUVT-230, IET No.- SUVT-353, IET No.- SUVT-362, IET No.- SUVT-412, IET No.-Badshah bhog-2 and IET No.-Sarai phool.
5	7	Susceptible	01	Swarna
6	9	Highly Susceptible	0	NIL
Total entries= 24				**LSI= 4.79**

REFERENCES

Chandra, S. Singh, H. K., Kumar, P. and Yadav, Y. (2016). Screening of Rice (*Oryza* sativa L.)Genotypes for Sheath Blight (*Rhizoctonia solani*) in Changing Climate Scenario. *Jour.of Agri.Sear*. 3: 130-132.

Goff, S. A. (1999). Rice as a modle for ceral genomics. *Curr. Opin. Plant Biol*. 2:86-89.

IRRI (2014). The *Int*. Rice Testing program (The *Int*. Rice Research Institute) Los Banos, Laguna, Phillipinnes.

Kumar, S.M., Ganesh, S.K., Sakila, M., dinakaran, D. and Senguttuvan, T. (2015). Screening for sheath blight (*Rhizoctonia solani* Kühn) resistance in rice (*Oryzae sativa* L.). *Int. J. of Curr. Res.*, 7(12): 23901-23903.

Mosaddeque, H.Q.M., Talukder, M.I., Islam, M.M., Khusrul Amin, A.K.M. and Alam, M.A. (2008). Screening of Some Restorer and Maintainer Hybrid Rice Lines against Sheath Blight (*Rhizoctonia solani*). *J. Soil .Nature* . 1: 23-29.

Shimamoto, K. (1995. The molecular biology of rice. *Science* 270: 172-173.

Tejaswini, KLY. Krishnam R., S. Kumar R., Mohammad L.A., Ramakumar, P.V. Sayanarayana P.V. and M. Srinivas (2016). Screening of Rice F5 families for Sheath Blight and Bacterial Leaf Blight. *Jour. of Rice Res*.9:(1).