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Performance of Elite Rice genotypes against Rice Gall Midge, *Orseolia oryzae* (Wood- Mason) in Field Screening in Warangal, Telangana

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ABSTRACT: 83 elite rice genotypes were tested for resistance to rice gall midge [*Orseolia oryzae* (Wood-Mason)] in the field at Regional Agricultural Research Station, Warangal, Professor Jayashankar Telangana State Agricultural University (PJTSAU), Telangana during *Kharif*, 2021. Among 83 rice genotypes screened, WGL-1789, WGL-1790, WGL-1798 and WGL-1800 were found highly resistant and WGL-1767, WGL-1778, WGL-1782 and WGL- 1792 were found to be resistant to gall midge. These promising resistant entries could be utilized as donors in breeding programmes aimed at development of gall midge resistant varieties or can be utilized as varieties if yields are good and among different management strategies that are employed to reduce the damage caused by this insect-pest, use of resistant rice varieties appears to offer the most effective component for incorporation into an integrated pest management strategy.

Keywords: Rice, screening, field, resistance, gall midge, Warangal.

INTRODUCTION

Rice is the very important cereal crop of India, which is the most important staple food crop to the Indian population. Paddy is a widely produced crop in tropical and subtropical locations around the world. Crop improvement programme and selection of efficient genotype is highly reliant on the efficient manipulation of genetic variability in germplasm and viable breeding strategies to improve yield with enhanced disease & pest resistance. Rice with high carbohydrate content provides instant energy to majority of Indian people. As per Pasalu and Katti, (2006), nearly 300 species of insect pests were identified as pests that attack rice crop at different stages and among them only 23 species cause notable damage. Of the insect pests, Asian rice gall midge, *Orseolia oryzae* (Wood-Mason) is very important pest and prevalent in almost all the rice growing states (Bentur, 1992). As per the intensity and regularity of occurrence, few areas have been identified as hot spots. These are coastal and northern Telangana regions of Andhra Pradesh, Ranchi areas of Jharkhand, entire Chattisgarh, coastal and Sambalpur areas of Orissa and Tamil Nadu (Mathur and Krishnaiah, 2004).

Management practices like cultural, biological, use of resistant varieties, chemical methods may be used to reduce the incidence of gall midge. Farmers habituated

to spray chemical insecticides to control insect pests. Since gall midge is an internal feeder, use of insecticides may not be effective. The superior strategy to manage the damage by gall midge in rice is to develop new varieties with high resistance to rice gall midge (Thippeswamy *et al*., 2014). In this context, the present study was taken up in *kharif* 2021 to screen rice entries against gall midge in Warangal.

MATERIALS AND METHODS

An experiment was undertaken in Regional Agricultural Research Station, Warangal, of Professor Jayashankar Telangana State Agricultural University (PJTSAU), Telangana during rainy season (*Kharif*) of 2021. 83 genotypes of rice of Regional Agricultural Research Station, Warangal along with TN-1 (susceptible check) were tested for resistance to gall midge under field conditions. Sowing was delayed by about 4 weeks for enhancing the population of target pest i.e., gall midge in the field.

The rice genotypes along with susceptible check TN-1 were sown in the raised beds in the last week of July 2021 and seedlings were transplanted in the last week of August 2021. A spacing of 20 cm between rows and 15 cm between the plants with in the row was followed in the transplanted field. All the suggested agronomical measures were adopted to conduct the experiment. No plant protection measures were followed against insect pests. Twenty plants were transplanted in a single row for each test entry. Susceptible check TN-1 was maintained for every 9 test entries. For maintaining the sufficient gall midge population, susceptible check TN-1 was also cultivated on the border covering the experimental field. Data were recorded on infestation of rice gall midge two times, one at 39-40 and second at 62-63 days after planting.

Observations on total number of plants and number of plants with silver shoots were recorded and per cent plant damage was arrived at using the following formula:

Per cent Plant Damage (PD%)

$$= \frac{\text{Number of plants with silver shoots}}{\text{Total number of plants}} \times 100$$

Like this, observations were also recorded on total no. of tillers and total no. of silver shoots in all the twenty plants. Mean number of silver shoots per plant and mean number of tillers per plant were calculated and per cent silver shoots was known by using the following formula:

Per cent Silver Shoots (SS %)

$$= \frac{\text{Mean number of silver shoots per plant}}{\text{Mean number of tillers per plant}} \times 100$$

Then, the test entries were assessed for gall midge damage as per Standard Evaluation System (Table 1), International Rice Research Institute (IRRI) for gall midge (IRRI, 2013).

Table 1: Standard Evaluation System scale for scoring the reaction against gall midge.

Per cent damage	Score	Reaction
Based on Per cent silver shoots		
0	0	Highly Resistant
<1	1	Resistant
1-5	3	Moderately Resistant
6-10	5	Moderately Susceptible
11-25	7	Susceptible
>25	9	Highly Susceptible
Based on Per cent plant damage		
0-10		Resistant
>10		Susceptible

RESULTS AND DISCUSSION

At second observation (62-63 DAT) (Table 2), tiller damage of 3.58-9.68% silver shoots and plant damage of 31.2-80 % damaged plants was recorded in the susceptible check TN-1**.** The mean damage was 6.13% silver shoots and 54.92% plants damage in susceptible check TN-1 with damage score of 5. The test entries were screened and assessed their resistance against gall midge by using standard evaluation system of IRRI for gall midge as per the damage score found during second observation i.e., at 62-63 DAT. Incidence of gall midge was ranged from 0 to 14.63 percent silver shoots and 0 to 85 percent plant damage in test entries. Of the 83 screened test entries, "Nil" gall midge incidence was noticed in four entries viz., WGL-1789, WGL-1790, WGL-1798 and WGL-1800 and they had shown highly resistant reaction to gall midge. Four entries viz., WGL-1767, WGL-1778, WGL-1782 and WGL- 1792 were found resistant against gall midge (<1% silver shoots). Twenty nine entries viz., WGL-1720, WGL-1726, WGL-1727, WGL-1728, WGL-1748, WGL-1754, WGL-1757, WGL-1759, WGL-1764, WGL-1766, WGL-1768, WGL-1769, WGL-1770, WGL-1771, WGL-1776, WGL-1777, WGL-1779, WGL-1780, WGL-1781, WGL-1783, WGL-1785, WGL-1786, WGL-1787, WGL-1788, WGL-1791, WGL-1793, WGL-1796, WGL-1799 and WGL-1801 were found moderately resistant with gall midge incidence of 1-5% silver shoots. But, all the moderately resistant rice genotypes had shown plant damage of

more than 10%. All the remaining genotypes had shown 5-7 damage score and were found moderately susceptible to susceptible to gall midge. Kumar *et al.* (2020) found "Nil" damage by gall midge in IBT MRR 18, IBT MRR 23 and IBT MRR 24 and had shown highly resistant reaction and 6 rice entries namely, IBT MRR 17, IBT MRR 19, IBT MRR 20, IBT MRR 21, IBT MRR 22 and IBT MRR 28 were found resistant to gall midge.

Table 2: Screening of rice entries against Gall midge during *Kharif*, 2021 at RARS, Warangal.

Sr. No.	Entry	I Observation (39-40 DAT)		II Observation (62-63 DAT)		Damage Score#	Reaction#
		% Plant Damage	% Silver shoots	% Plant Damage	% Silver shoots		
1.	WGL 1719	40.00	6.56	60.00	9.62	5	MS
2.	WGL 1720	10.00	1.06	20.00	2.00	3	MR
3.	WGL 1721	45.00	6.15	50.00	9.38	5	MS
4.	WGL 1722	45.00	7.32	65.00	8.96	5	MS
5.	WGL 1723	45.00	5.98	55.00	7.98	5	MS
6.	WGL 1724	45.00	4.72	55.00	7.41	5	MS
7.	WGL 1725	45.00	5.24	50.00	5.63	5	MS
8.	WGL 1726	25.00	2.94	25.00	3.16	3	MR
9.	WGL 1727	0.00	0.00	25.00	4.26	3	MR
10.	WGL 1728	35.00	3.57	45.00	4.66	3	MR
11.	WGL 1729	50.00	8.74	50.00	9.64	5	MS
12.	WGL 1730	40.00	5.47	47.30	5.64	5	MS
13.	WGL 1731	40.00	5.95	40.00	6.36	5	MS
14.	WGL 1732	60.00	8.41	60.00	8.30	5	MS
15.	WGL 1733	45.00	5.34	60.00	9.41	5	MS
16.	WGL 1734	50.00	4.98	65.00	10.08	5	MS
17.	WGL 1735	40.00	5.29	60.00	7.66	5	MS
18.	WGL 1736	45.00	7.69	65.00	10.94	7	S
19.	WGL 1737	18.75	2.38	53.30	6.21	5	MS
20.	WGL 1738	65.00	5.79	85.00	6.84	5	MS
21.	WGL 1739	26.31	5.53	31.50	6.58	5	MS
22.	WGL 1740	20.00	5.17	30.00	6.06	5	MS
23.	WGL 1741	11.11	1.90	38.80	5.85	5	MS
24.	WGL 1742	60.00	9.73	75.00	13.28	7	S
25.	WGL 1743	40.00	5.04	63.10	9.02	5	MS
26.	WGL 1744	60.00	8.28	80.00	14.63	7	S
27.	WGL 1745	47.36	5.25	72.20	11.97	7	S
28.	WGL 1746	22.22	2.44	41.20	6.24	5	MS
29.	WGL 1747	42.10	5.38	68.40	9.46	5	MS
30.	WGL 1748	26.31	3.34	35.30	5.24	3	MR
31.	WGL 1749	30.00	3.45	55.00	6.78	5	MS
32.	WGL 1750	35.00	4.72	63.15	8.87	5	MS
33.	WGL 1751	45.00	5.24	65.00	7.56	5	MS
34.	WGL 1752	40.00	9.01	40.00	9.58	5	MS
35.	WGL 1753	36.84	3.98	63.10	9.55	5	MS
36.	WGL 1754	30.00	2.65	60.00	4.73	3	MR
37.	WGL 1755	36.84	4.88	57.80	7.67	5	MS
38.	WGL 1756	55.00	1.98	70.00	10.08	5	MS
39.	WGL 1757	50.00	4.41	63.10	5.30	3	MR
40.	WGL 1758	25.00	2.12	55.00	9.23	5	MS
41.	WGL 1759	35.29	4.07	40.00	5.27	3	MR
42.	WGL 1760	50.00	4.78	70.00	9.18	5	MS
43.	WGL 1761	35.00	4.46	65.00	9.42	5	MS
44.	WGL 1762	25.00	3.28	50.00	7.33	5	MS
45.	WGL 1763	40.00	4.27	70.00	8.37	5	MS
46.	WGL 1764	25.00	2.93	25.00	3.17	3	MR
47.	WGL 1765	10.00	2.99	25.00	6.34	5	MS
48.	WGL 1766	20.00	4.03	25.00	3.40	3	MR
49.	WGL 1767	36.84	4.08	10.00	0.85	1	R
50.	WGL 1768	15.78	3.84	20.00	4.83	3	MR
51.	WGL 1769	15.78	1.65	27.70	2.72	3	MR
52.	WGL 1770	5.00	0.54	10.50	1.11	3	MR
53.	WGL 1771	11.76	2.04	17.60	2.41	3	MR
54.	WGL 1772	45.00	6.41	55.00	8.22	5	MS
55.	WGL 1773	45.00	4.11	60.00	5.67	5	MS
56.	WGL 1774	41.60	3.59	66.60	10.71	7	S

57.	WGL 1775	40.00	3.17	70.00	6.35	5	MS
58.	WGL 1776	10.00	0.76	15.00	1.32	3	MR
59.	WGL 1777	35.00	3.37	45.00	4.55	3	MR
60.	WGL 1778	5.00	0.43	5.00	0.50	1	R
61.	WGL 1779	15.00	1.89	30.00	3.68	3	MR
62.	WGL 1780	30.00	3.35	57.80	5.31	3	MR
63.	WGL 1781	0.00	0.00	30.00	3.33	3	MR
64.	WGL 1782	0.00	0.00	5.00	0.40	1	R
65.	WGL 1783	15.70	1.34	36.80	3.04	3	MR
66.	WGL 1784	36.80	3.67	63.10	6.62	5	MS
67.	WGL 1785	21.05	1.40	26.30	2.72	3	MR
68.	WGL 1786	25.00	2.26	35.20	2.66	3	MR
69.	WGL 1787	15.70	2.57	21.05	2.85	3	MR
70.	WGL 1788	30.00	2.27	55.00	3.87	3	MR
71.	WGL 1789	0.00	0.00	0.00	0.00	0	HR
72.	WGL 1790	0.00	0.00	0.00	0.00	0	HR
73.	WGL 1791	15.00	1.67	25.00	3.06	3	MR
74.	WGL 1792	5.00	0.35	5.00	0.36	1	R
75.	WGL 1793	16.60	2.77	27.70	4.25	3	MR
76.	WGL 1794	40.00	5.29	55.00	6.94	5	MS
77.	WGL 1795	40.00	4.81	55.00	6.30	5	MS
78.	WGL 1796	21.05	3.49	47.05	5.36	3	MR
79.	WGL 1797	33.30	2.36	83.30	7.12	5	MS
80.	WGL 1798	0.00	0.00	0.00	0.00	0	HR
81.	WGL 1799	5.20	0.59	10.52	1.18	3	MR
82.	WGL 1800	0.00	0.00	0.00	0.00	0	HR
83.	WGL 1801	10.00	1.23	20.00	1.33	3	MR
	TN-1 * (S.Check)	39.27	0.43	54.92	6.13	5	MS

***** Mean incidence in TN-1; [#] Based on percentage silver shoots at II observation; HR-Highly Resistant, R-Resistant, MR-Moderately Resistant, MS-Moderately Susceptible; S-Susceptible, HS-Highly Susceptible

Krishnaiah *et al*. (1983), found cultivation of gall midge-resistant varieties such as Surekha and Phalguna in 70% of the rice areas in gall midge-endemic districts in Telangana and north coastal districts in Andhra Pradesh, reduced pest incidence considerably, resulting almost 45% increase in yield. This denotes the impact and importance of gall midge resistant varieties in reducing the gall midge incidence.

CONCLUSION

The test rice genotypes WGL-1789, WGL-1790, WGL-1798 and WGL-1800 were highly resistant and WGL-1767, WGL-1778, WGL-1782 and WGL- 1792 were found resistant to rice gall midge. Hence, they could be utilized as donors in varietal development programmes aimed in development of gall midge resistant varieties or can directly be utilized as varieties if they are found good yielders.

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Conflict of Interest. None.

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