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Resistance of traditional rice (*Oryza sativa* L.) genotypes against Asian gall midge (*Orseolia oryzae* wood-mason) in TBP command area

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Abstract
The rice gall midge (*Orseolia oryzae* Wood-Mason) is recognized as the third most destructive pest, after stem borer and planthoppers. The increased incidence of gall midge may be attributed to the late onset of monsoon and late transplanting during the *Kharif* season. The current study of screening traditional rice varieties to identify potential traditional rice varieties against rice gall midge was conducted at ARS, Gangavathi in late *Kharif* 2020. The gall midge incidence *i.e*. silver shoot was recorded on 30 and 50 days after transplanting. Among 59 traditional rice varieties, Sindhura Madhusaale, Aasanaleeya, and Ralugalli were promising varieties to gall midge incidence with less than 1 percent silver shoot damage. These resistant varieties are further employed in breeding programs and as a one of the component integrated pest management.

Keywords: Traditional rice, Asian gall midge, silver shoot, resistance

Introduction
Rice (*Oryza sativa* L.) is the crucial foremost cereal crop belonging to the family Poaceae and it is the most prominent crop of India. This crop is the backbone of livelihood for millions of rural households and plays vital role in the country's food security, hence the term "rice is life" is most appropriate in Indian context.

The Tungabhadra River is the "lifeline" of Koppal, Bellary and Raichur districts of Karnataka, India. Thousands of farmers throughout the command vicinity, after getting ready their paddy fields and growing paddy saplings within the nursery beds, are desperately awaiting for water to take up transplantation. But now a days due to late onset of monsoon, insufficient storage in the TBP reservoir and the unsatisfactory release of water results in transplanting rice during late *kharif* season. Late transplanting causes terminal cold stress in rice plant and effect plant growth and yield (Bashir *et al*., 2010) [1]. Late transplanting in *kharif* season also leads to attack of many pests and diseases on rice crop.

Among different rice pests, Asian rice gall midge (ARGM), *Orseolia oryzae* (Wood-Mason) is one of the important stem-feeding pest, has caused serious production losses. The external symptom of damage caused by gall midge is the production of a silvery-white, tubular leaf sheath gall called a silver shoot or onion shoot. This is due to the feeding and salivary secretion by the larvae which turn the growing shoot meristem into a gall [Bentur *et al*., 1992] [2]. This renders the tiller sterile and do not bear panicle

India is home to traditional rice varieties and their use has been common among practitioners of traditional medicine and communities as part of their cultural heritage. Traditional rice varieties are landraces which are genetically dynamic and display equilibrium with both the environment and pathogens (Harlan, 1975) [3]. Landraces have become important as sources of genetic variability in the search for genes for tolerance or resistance to biotic and abiotic factors of interest in agriculture, hence they are called as "treasure of valuable genes". Many management strategies *viz*., chemical, cultural, biological and planting of resistant cultivars that have resistance to insects are employed to reduce the damage caused by this insect pest. Among them, the use of resistant rice varieties appears to offer the most effective component for incorporation into an integrated pest management strategy (Seni and Naik, 2017) [6].

Breeding resistant varieties and their cultivation has been the main approach to manage the pest. Hence, traditional rice varieties are screened for resistance against Asian gall midge.

Materials and Methods

The experiment was conducted for resistance of traditional rice varieties against rice gall midge infestation at Agricultural Research Station, Gangavathi during late *kharif* season 2020. Sowing was delayed by one month to allow for natural buildup gall midge population in the experimental field. The seed material used for screening consists of 59 varieties along with resistant check PTB 33 and susceptible check TN 1. the nursery of the test entries along with standard checks seed were grown on raised beds and all the practices are followed as the package of practices, UAS Raichur. After 30 days sowing the healthy seedlings were transplanted in the experimental field. These screening rice varieties were planted at a spacing of 20 cm between the rows and 15 cm between the plants within the row. Each test entry had 20 plants transplanted in a single row. All the recommended agronomical practices were adopted during crop cultivation. Ten rows of susceptible types (TN 1) were planted around the test entries and a resistance check (PTB 33) was planted after every 9 rows of conventional varieties. Gall midge incidence *i.e.* silver shoot was recorded at 30 and 50 days after transplanting and percentage of silver shoot (SS) was worked out by using the following formula:

$$\text{Silver shoot (\%)} = \frac{\text{Number of silver shoots per hill}}{\text{Total number of tillers observed per hill}} \text{X } 100$$

Then, the gall midge pest intensity was scored as per standard evaluation system developed by International Rice Research Institute (IRRI). The scale is presented in table 1.

Table 1: Standard evaluation system for rice gall midge

Scale	Damage (%)	Reaction
0	No damage	HR(Highly Resistant)
1	<1%	R(Resistant)
3	1-5%	MR(Medium Resistant)
5	6-10%	MS(Medium Susceptible)
7	11-25%	S(Susceptible)
9	>25%	HS(Highly Susceptible)

Results and Discussion

The study was conducted on the reaction of traditional rice varieties against gall midge populations at the Agricultural Research Station (ARS) Gangavathi. The incidence of Asian gall midge on traditional rice varieties was recorded 30 and 50 days after transplanting (Table 2). The 59 traditional entries indicate a silver shot incidence ranging from zero to 14.93 percent and a susceptibility check of 5.96 and resistant check (PTB 33) recorded 0.76 Percent silver shoot (Damage score 1) at 30 DAT. The gall midge incidence (silver-shoot %) increased with the development of vegetative growth and literally up to the maximum tillering stage. The data recorded at 50 DAT indicated that incidence of traditional rice varieties ranged from 0.74 – 25.00 percent tiller damage (silver shoots) and Suscpible check (TN-1) was recorded 28.6 percent silver shoots showing susceptible reaction with Score 9 and resistant check (PTB 33) recorded 0.23 Percent (Damage score 1). It is evident that among 59 traditional rice varieties screened against gall midge few varieties were found to be resistant are *viz*., Sindhura Madhusale, Aasanaleeya and Ralugalli showed resistance reaction with score of 1.

Jeerige samba, Karijivili, Gouri Sanna, Mukannaratnachudi, Kempubattha, Jugal Battha, NMS-2, Siddhi Sanna, Masoori, Hosa. S. H. Sona, Gidda Gouri, Madras Sanna, Aalursanna, Navara, Rajamudi, Pundaravanaki, Dasamathi, Kaamadhari, Asanachudi and Ambe Mohar exhibited moderately resistance with disease score of 3. Ratana Sagar, Jeerigesanna, Anandi, Malgudisanna, Navalisaali, Andanoorsanna, HMT, Gandha Saale, Barma black, Kaagisaale, Narikela, Jasmine black, Gangabaali, Gangavati Sanna, Protein rice, Suvasane rice, Sanna Battha, Athi Kariya, Kari Jodya, Gouri Sanna, Jolige, Kagga Saale, Selam Sanna, Hasaada and Karekallu exhibited moderately susceptible reaction with disease score of 5.

Bangarasanna, Chinna Ponni, Raichur Sanna, Chitti Muthyalu, Kaala Jeera, Mugadhasugandha, Doddiga, Kayaam, Saandarasaali, Anthara Saali and Barma black-1 showed high virulence and susceptible reaction with disease score of 7.

Sindhura Madhusaale, Aasanaleeya and Ralugalli are the promosing entries against gall midge. These above mentioned resistant rice varieties can be used in integrated pest management, which is economical and eco-friendly.

The rice genotypes belonging to different type shows reaction towards Asian gall midge is presented percentage in Fig 1. Around 6 percent of traditional rice varieties under screening were showing resistant reaction, 26 percent of rice varieties were moderately resistant, 65 percent of traditional rice genotypes were scrutinized to be moderately resistant and susceptible reaction to Asian gall midge was shown by 3 percent of traditional rice varieties.

The result obtained was in accordance with the outcomes of Seni and Naik, 2017 [6] suggested that use of resistant rice varieties appears to offer the most effective component for incorporation into an integrated pest management strategy and The adoption of resistant cultivars is highly appreciated by farming community as this involves less cost and no requirement of insecticides and other cultural practices (Krishnaiah *et al*., 1986) [5]. Similarly Joshi and Venugopal, 1984 [4] reported that Promising varieties resistant to the rice gall midge are utilized in paddy fields for practical control.

Table 1: Reaction of traditional rice varieties against rice gall midge infestation

Sl. No	Entry name	% Tiller damage		Scale	Reaction
		At 30 DAT	At 50 DAT		
1	Sindhura Madhusale	0.66	0.74	1	R
2	Jeerige Samba	4.47	3.76	3	MR
3	Bangarasanna	11.34	21.60	7	S
4	Karijivili	2.84	4.20	3	MR
5	Gouri Sanna	0.72	2.38	3	MR
6	Mukannaratnachudi	5.13	4.86	3	MR
7	Ratana Sagar	1.79	4.76	5	MS
8	Kempubattha	1.17	3.01	3	MR
9	Jeerigesanna	0.66	4.07	5	MS
10	Aasanaleeya	0.00	0.83	1	R
11	Jugal battha	1.79	4.76	3	MR
12	NMS-2	2.53	0.74	3	MR
13	Anandi	1.23	4.14	5	MS
14	Malgudisanna	1.29	5.76	5	MS
15	Navalisaali	0.67	7.50	5	MS
16	Chinna Ponni	1.32	5.66	7	S
17	Andanoorsanna	1.23	8.39	5	MS
18	HMT	3.92	4.39	5	MS
19	Siddhi Sanna	1.37	1.96	3	MR
20	Gandha Saale	0.68	4.92	5	MS
21	Barma black	1.44	0.83	5	MS
22	Kaagisaale	13.13	9.68	5	MS
23	Narikela	14.39	8.11	5	MS
24	Jasmine black	1.72	6.47	5	MS
25	Gangabaali	2.31	4.93	5	MS
26	Raichur Sanna	7.03	14.53	7	S
27	Masoori	0.00	1.21	3	MR
28	Hosa. S. H. Sona	1.84	2.36	3	MR
29	Gidda Gouri	2.21	0.71	3	MR
30	Madras Sanna	0.80	3.10	3	MR
31	Aalursanna	0.00	2.10	5	MS
32	Navara	3.92	7.04	5	MS
33	Rajamudi	2.50	5.71	5	MS
34	Pundaravanaki	6.63	2.90	5	MS
35	Dasamathi	6.99	14.38	7	S
36	Kaamadhari	0.00	3.10	5	MS
37	Aasanachudi	6.90	7.58	5	MS
38	Chitti Muthyalu	0.76	7.14	5	MS
39	Gangavathi Sanna	4.32	9.35	5	MS
40	Protein rice	1.76	7.63	5	MS
41	Suvasane rice	6.56	6.29	5	MS
42	Sanna Battha	2.72	5.92	5	MS
43	Kaala Jeera	10.81	17.69	7	S
44	Mugadasugandha	11.92	24.14	7	S
45	Athi Kariya	3.22	8.61	5	MS
46	Doddiga	11.59	25.00	7	S
47	Kayaam	5.38	24.38	7	S
48	Kari Jodya	0.67	7.50	5	MS
49	Gouri Sanna	0.00	3.55	5	MS
50	Jolige	0.00	3.83	5	MS
51	Kagga Saale	7.87	0.00	5	MS
52	Selam Sanna	4.32	8.39	5	MS
53	Saandarasaali	1.55	11.73	7	S
54	Hasaada	9.20	3.88	5	MS
55	Anthara Saali	14.93	18.71	7	S
56	Karekallu	3.88	9.20	5	MS
57	Barma black-1	6.11	18.08	7	S
58	Ambe Moer	7.84	2.36	3	MR
59	Ralugalli	0.00	0.72	1	R
Check 1	TN1 (S)	5.96	28.6	9	HS
Check 2	PTB 33 (R)	0.76	0.23	1	R

DAT- Days after transplanting, HS- Highly susceptible, S- Susceptible, MS- Moderately susceptible, MR- Moderately resistant

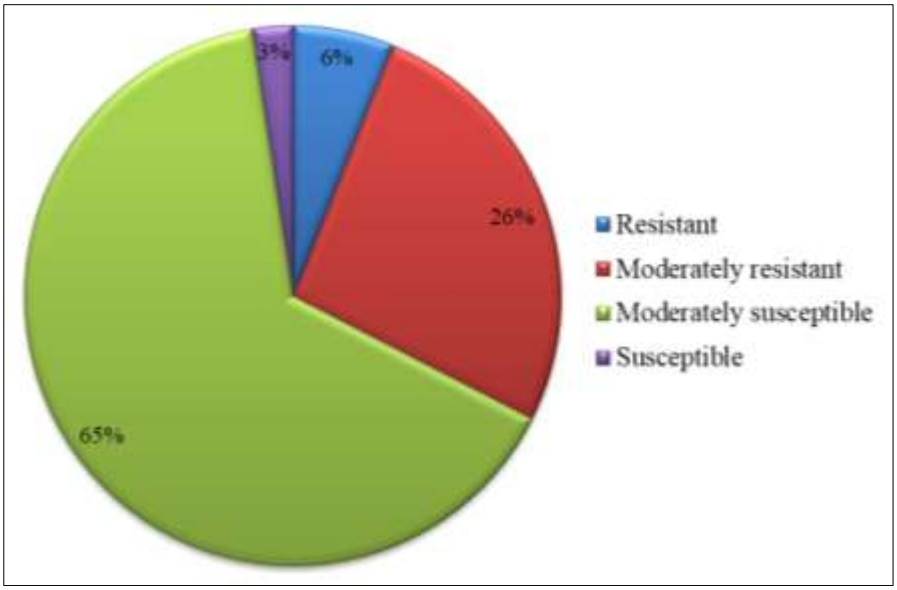

Fig 1: Percent of rice genotypes with different reaction towards Asian gall midge infestation

Conclusion

The use of resistant rice varieties appears to offer the most effective component for incorporation into an integrated pest management strategy which is economic and ecofriendly. In the present study, traditional rice varieties *viz*., Sindhura Madhusaale, Aasanaleeya and Ralugalli were resistant against Asian gall midge in the TBP command area so, they can be developed as varieties or can be used in breeding programme as a source of gall midge resistance.

References

1. Bashir MU, Akbar N, Iqbal A, Zaman H. Effect of different sowing dates on yield and yield components of direct seeded coarse rice (*Oryza sativa* L.). Pakistan Journal of Agricultural Sciences. 2010;47(4):361-365.
2. Bentur JS, Pasalu IC, Kalode MB. Inheritance of virulence in rice-gall midge (*Orseolia oryzae*). Indian Journal of Agricultural Sciences. 1992;62:492-493.
3. Harlan JR. Crops and Man, American. Social Agricultural Crop Science Society. 1975, 295.
4. Joshi RC, Venugopal MS. Varietal reaction to rice gall midge (GM) in Tamil Nadu. International Rice Research Newsletter. 1984;9:3.
5. Krishnaiah K, Reddy PC, Rao CS. Integrated pest control in rice in Krishna delta area of Andhra Pradesh. International Journal of Plant Protection. 1986;14:1-12.
6. Seni A, Naik BS. Screening of different rice entries against rice gall midge, *Orseolia oryzae* (Wood-Mason). International Journal of Environmental, Agricultural, and Biotechnology. 2017;2(5):2427-2432.