

Original Research Article

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Performance of Paddy Varieties against Brown Leaf Spot Disease under Flooded Conditions in Mandya District, Karnataka, India

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ABSTRACT

Rice is an important food crop in India. One of the major constraints of rice production is that it is prone to several diseases. Among them brown leaf spot disease has been reported to occur in all rice growing regions. A study was conducted to determine the performance of fifty paddy varieties against the disease at college of agriculture, V.C. Farm, Mandya, during *kharif* 2015. The per cent disease severity was recorded at 30, 60 and 90 days after transplanting (DAT). It was observed that, the disease severity increased with increase in age of the crop from 30-90 DAT. However, there was no disease at 30 DAT in any of the genotypes. At 60 DAT the average disease severity ranged from 0.0 to 13.55%, whereas at 90 DAT it ranged from 0.0 to 21.20%. A moderately resistant reaction to the disease was noticed in 31 genotypes. Further, 11 genotypes *viz.*, Rasi, JGL-1798, BR-2655, Raksha, KMP-201, BI-33, Sagbatta, Honnekattu, Klame, Kavekantak and Togarshi were identified as the resistant sources against the disease as they were free from the disease throughout the cropping period, which could be used by the breeders to improve the yield of the rice crops.

Keywords

Paddy, Brown leaf spot,
Disease severity,
Screening and MTU 1001

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Introduction

Rice (*Oryza sativa* L.) fulfills the need of food product in the most of the developing countries of the world. It provides energy in the form of starch and about half of the world population depended upon the rice in per day meal. More than 3.5 billion people depended on rice for more than 20% of their daily calories (IRRI Rice facts, 2012).

According to (FAO, 2010) rice is cultivated in 114 countries and has got third rank in the world after maize and wheat. India produce 2240 kg/ha rice annually. India rank second in

terms of production in world being next to the China (FAO, 2010).

In India, rice grown on above one-fourth of the total crop area and provides food to about half of the country's population. Rice is playing a vital role in our national food security. It's growing in the different part of country due to their wide adaptability. Due to infection of several types of pathogens, resulting causes extensive damage to the crop. Fungi alone account for nearly 30 diseases of rice in the country (Rangaswami and Mahadevan, 1992). Among these, a few occur in epiphytotic form in many parts of India and

one of the important disease is brown leaf spot of paddy caused by *Bipolaris oryzae* Shoemaker (*Helminthosporium oryzae* Breda de Hann) which caused havoc loss in Bengal during 1942-43.

Brown leaf spot disease is the most serious disease of rice Arshad *et al.*, (2008). It caused Bengal Famine in 1942, with yield loss of 50-90%, which resulted in death of 2 million people due to starvation. The pathogen can infects both seedlings and mature plants with the coleoptile, leaves, leaf sheath, panicle branches, glumes, and spike lets (Webster and Gunnell, 1992). The disease is also known as poor rice farmer's disease because it occurs mostly in deficient and poor soils (Agarwal, 1989; Khan *et al.*, 2001 and Zadoks, 2002). The disease has been noted to reduce yields from 6 to 90% in Asia (Padmanabhan, 1973; Estrada, 1984).

The severity of brown spot disease can be managed through development of resistant lines (Mew *et al.*, 1991; Bonman *et al.*, 1991). Reaction of 31 rice genotypes was evaluated in field against brown leaf spot disease under low water application condition by Yaqoob *et al.*, 2011. The disease was scored using 1-9 rating scale. The late maturing lines HHZB, IR80416-B-32-3, IR84677-34-1-B and HHZ11-Y6-Y1-Y1 were found to be highly resistant against brown leaf spot by scoring 1. Medium and early maturing lines showed susceptible reaction by scoring 5. Pannu *et al.*, (2006) observed the reaction of paddy varieties PR-116, PR-114, PR-106, PR-103, PR-108, PR-113, PR-111 and PR-115 against brown leaf spot and reported PR-116, PR-114 and PR-106 to be more susceptible with per cent disease severity of 28.41, 23.13 and 19.57 respectively. Alam *et al.*, (2016) screened 25 rice varieties against brown leaf spot caused by *Helminthosporium oryzae* during session *Kharif*2014 and 2015. The results were four varieties recorded *viz.* NDR-359, CR-1, CR-2

and N-18 in highly resistant. Seven varieties were recorded *viz.* PR-103, IR-36, Prasd, Narendra-2, IR-597, OC-1339 and Cross-116 in resistant.

Karnataka has made rapid progress in rice cultivation during the last few years. Mandya, Uttar Kannada, Mysuru, Raichur and Kodagu are the main producers. It is grown in all the three seasons *viz.*, *kharif*, *rabi* and summer under rainfed and irrigated conditions. In view of the above facts the present study was conducted to investigate the severity of brown spot of paddy in mostly cultivated varieties in Mandya district and to know the most susceptible growth stage of rice due this diseases. To achieve these goals, different varieties were selected which are mostly cultivated in *Kharif* and *Rabi* season in Mandya district.

Materials and Methods

In the present investigation fifty paddy genotypes were collected at AICRP on rice at Zonal Agricultural Research Station (ZARS), V.C. Farm, Mandya, to screen against brown leaf spot disease. The collected seed samples were stored at room temperature in polythene bags. The seeds were sown in the nursery beds and normal agronomic practices were followed to ensure proper plant growth. Twenty six days old seedlings were transplanted in the main field under wet land condition, during *kharif*2015 at College of Agriculture, V.C. Farm, Mandya.

Infector row technique was followed to evaluate the genotypes wherein, each genotype was sown in two lines of 4.5m length with a spacing of 30 cm x 15 cm (Cardwell *et al.*, 1997). MTU 1001 was used as a susceptible check. 2 lines of MTU 1001 were sown at every 10 rows interval. Regular package of practices were carried out until harvest of the crop. Observations were

recorded at thirty days interval. Disease scoring was done by employing SES scale developed by IRRI in 1996 as mentioned in Table 1.

Percent disease index (PDI) will be calculated by using formula given by Wheeler (1969).

$$PDI = \frac{\text{Sum of total numericals}}{\text{Total No. of plants observed}} \times \frac{1}{\text{maximum scale}} \times 100$$

Results and Discussion

The results of the genotypes screened against the disease from the present study are presented in Table 2. The per cent disease severity of the disease was recorded at 30, 60 and 90 days after transplanting (DAT). Disease severity increased with increase in age of the crop from 30-90 DAT. However, there was no disease at 30 DAT in any of the genotypes. At 60 DAT the disease severity ranged from 0.0 to 13.55 per cent. Highest disease severity of 13.55 per cent was recorded on the variety Rajmudi followed by 13.40 per cent in MTU-1010. 13 varieties *viz.*, Rasi, JGL-1798, BR-2655, Raksha, KMP-201, KMP-128, BI-33, Sag batta, Honnekatte, Klame, Akkalu, Kavekantak and Togarshi did not produce any kind of disease symptoms. However on the susceptible variety MTU 1001, 18.90 per cent disease severity was recorded. Whereas, at 90 DAT the disease severity varied from 0.0 to 21.20 per cent.

Highest disease severity was recorded on variety Rathnhoodi (21.20%) followed by variety CTH-3 which recorded 18.80 per cent disease severity. 0.0% disease severity was recorded on 11 varieties *viz.*, Rasi, JGL-1798, BR-2655, Raksha, KMP-201, BI-33, Sag batta, Honnekattu, Klame, Kavekantak and Togarshi. However on susceptible variety MTU-1001, 19.50 per cent disease severity was recorded. Screening varieties against

brown leaf spot disease has been under taken by several workers like Pannu *et al.*, (2006), Yaqoob *et al.*, (2011), Arshad *et al.*, (2013) and Magar, (2015). Pannu *et al.*, (2006) reported that disease severity varied from 0.15 to 28.41 per cent during 2000, 2001, 2002, and 2003 at Ludhiana and during 2000 and 2001 at Gurdaspur under artificial inoculation conditions. They further reported that from among 9 varieties screened, Jaya and PR 111 showed lower severity of 4.20 and 4.30 per cent, respectively. Similarly, Magar (2015) reported 21.73 to 58.07 per cent disease severity in 14 varieties screened during August-November, 2013. Since the *B. oryzae* is low sugar pathogen, as the nutrient status deplete in soil against age of the crop, pathogen invade and causes more damage, this might be the possible reason for increased disease severity at 60 and 90 days after transplanting.

Further, all the 50 paddy genotypes were further categorized into different groups based on the type of disease reaction and is as shown in Table 3. The symptoms expressed on these genotypes are shown in Plate 2. Eleven genotypes *viz.*, Rasi, JGL-1798, BR-2655, Raksha, KMP-201, BI-33, Sagbatta, Honnekattu, Klame, Kavekantak and Togarshi showed immune reaction with 0.00% disease severity. Eight genotypes *viz.*, Rajbhog, KMP-153, Akkalu, MTU-1010, Sagvad, Bilidodibudda, Sannamullu and CTH-1 showed resistant reaction with 1-5 per cent disease severity. 31 genotypes *viz.*, KMP-175, Tellahamsa, KMP 149-1, Thanu, Basumathi, Jeerigebatta, Puttabatta, Sannaki, Alurusanna, DRK Basumathi, Bilirajmudi, Mandyavijaya, IR-30864, MAS-26, KMP-128, Rajamudi, KMP 149-2, BPT-5204, Jyothi, IR-64, MAS-946, Jaya, CTH-3, Ratbat, Theerthahalli selection, Manila, Doddaalur, MTU 1001, Tiruveni, KMP-200 and Rathnhoodi recorded moderately resistant reaction with disease severity of 6-15 per cent.

Table.1 Standard evaluation system scale for brown leaf spot disease of paddy

Score	Description
0	No disease observed
1	Less than 1%
2	1-3%
3	4-5%
4	6-10%
5	11-15%
6	16-25%
7	26-50%
8	51-75%
9	76-100%

Table.2 Screening of paddy varieties against brown leaf spot disease at Mandya during *kharif* 2015

Sl. No.	Varieties/Genotypes	Disease severity (%)		
		30 DAT	60 DAT	90 DAT
1.	Rajamudi	0.0	13.55	15.50
2.	KMP-149-2	0.0	12.20	12.20
3.	Rathnachoodi	0.0	10.00	21.10
4.	BPT-5204	0.0	07.70	14.40
5.	KMP-175	0.0	07.70	07.70
6.	MAS-26	0.0	06.60	06.60
7.	Jyothi	0.0	06.60	15.50
8.	IR-64	0.0	10.00	13.30
9.	Rasi	0.0	00.00	00.00
10.	Tellahamsa	0.0	06.00	06.60
11.	MAS-946	0.0	07.80	12.20
12.	KMP-200	0.0	08.90	17.70
13.	Jaya	0.0	07.80	11.10
14.	IR-30864	0.0	04.50	10.00
15.	CTH-3	0.0	11.10	18.80
16.	CTH-1	0.0	03.00	05.50
17.	Mandyavijaya	0.0	08.90	10.00
18.	JGL-1798	0.0	00.00	00.00
19.	MTU-1001 (check)	0.0	10.00	18.50
20.	BR-2655	0.0	00.00	00.00
21.	KMP-153	0.0	03.00	03.30
22.	Raksha	0.0	00.00	00.00
23.	KMP-201	0.0	00.00	00.00
24.	MTU-1010	0.0	13.40	15.50
25.	KMP-128	0.0	00.00	07.80
26.	KMP149-1	0.0	03.50	04.30

*DAT= Days after transplanting

Table.3 Disease reaction of paddy genotypes screened during *kharif* 2015 at Mandya

Sl. No.	Disease severity (%)	Disease reaction	No. of genotypes	Genotypes
1	0.0	(0) Immune	11	Rasi, JGL-1798, BR-2655, Raksha, KMP-201, BI-33, Sagbatta, Honnekattu, Klame, Kavekantik and Togarshi.
2	1-5%	(1-3) Resistant	8	Rajabhog, KMP-153, Akkalu MTU-1010, Sagvad, Bilidodibudda, Sannamullu. CTH-1
3	6-25%	(4-6) Moderately resistant	31	KMP-175, Tellahamsa, KMP 149-1, Thanu, Basumathi, Jeerigebatta, Puttabatta, Sannaki, Alurusanna, DRK Basumathi, Bilirajmudi, Mandyavijaya, IR-30864, MAS-26, KMP-128, Rajamudi, KMP 149-2, BPT-5204, Jyothi, IR-64, MAS-946, Jaya, CTH-3, Ratbat, Theerthahalli selection, Manila, Doddaalur, MTU 1001, Tiruveni, KMP-200 and RathnaChoodi
4	26-50%	(7) Susceptible	0	-
5	51-100%	(8-9) Highly susceptible	0	-

Similar results obtained by Alam *et al.*, (2016) they 25 screened varieties against brown leaf spot caused by *Helminthosporium oryzae* during session *Kharif*2014 and 2015. The results were four varieties recorded *viz.* NDR-359, CR-1, CR-2 and N-18 in highly resistant. Seven varieties were recorded *viz.* PR-103, IR-36, Prasd, Narendra-2, IR-597, OC-1339 and Cross-116 in resistant. Six varieties were recorded *viz.* IET-849, Pusa NR-381, Narendra-80, Narendra Dhan-97, Jalnidhi and Jallahari in moderately resistant. Three varieties were recorded *viz.* Rupali, MTU-7029 and Sweta in moderately susceptible. IET-2969 and Annapurna was recorded in susceptible. Three varieties were recorded *viz.* Nagina-22, CR-126 and Cauvery highly susceptible in all three screening conditions, *i.e.* laboratory, pot and field.

In the present investigations, the varieties showing resistance against brown spot disease can be utilized as a source of resistance for breeding disease resistant lines of rice. Moreover, the late genotypes besides producing lower yields have also confusing behavior due to ambiguous response against diseases.

References

- Agarwal, V. K., 1989, A simpler technique for routine examination of rice seed lots for rice brown leaf spot disease. Seed Technology News. Bulletin of the Indian Society of Seed Technology. 11:1-2.
- Alam, S., Seth, R. K., Singh, H., Srivastava, J. N. and Shukla, D. N., 2016, Screening of Disease Resistant Varieties against Brown Leaf Spot of *Oryza sativa* in Allahabad, India. *AJEA*, 14(1): 1-11.

- Arshad, H. M. I., Hussain, N., Khan, J. A., Sallem, K. and Baber, M. M., 2013, Behavior of *Bipolaris oryzae* at different temperatures, culture media, fungicides and rice germplasm for resistance. *Pakistan J. Phytopath.*, 25(1): 84-90.
- Arshad, H. M. I., Khan, J. A. and Jamil, F. F., 2008, Screening of rice germplasm against blast and brown spot diseases. *Pakistan J. Phytopathol.*, 20(1):52-57.
- Bonman, J. M., Estrada, B. A., Kim, C. K., Ra, C. K. and Lee, E. J., 1991, Assessment of blast disease and yield losses in susceptible and partial resistant rice cultivars in two irrigated and low land environments. *Pl. Dis.*, 75: 462-466.
- Cardwell, K. F., Kling, J. G. and Bock, C., 1997, Methods for screening maize against downy mildew *Peronosclerospora sorghi*. *Pl. Breeding*, 116: 221-226.
- Estrada, A. B., 1984, Selection of differential varieties for race study of *Helminthosporium oryzae*. M.S. Thesis. College, Leguna, the Philippines: University of Philippines at Las Banos, Philippines.
- FAO Food Outlook Global Market Analysis, 2010, (Retrieved from November 2010) Available: <http://www.fao.org/docrep/013/al969e/al969e00.pdf>.
- IRRI, 1996, *Standard evaluation system for rice* (4th ed.). Manila, Philippine: IIRI.
- IRRI, 2012, Rice facts. International Rice Research Institute, Manila, Philippines.
- Khan, J. A., Jamil, F. F., Cheema, A. A. and Gill, M. A., 2001, Screening of rice germplasm against blast disease caused by *Pyricularia oryza* in: Proc. National Conf. of Plant Pathology, held at NARC. Islamabad. pp. 6-9.
- Magar, P. B., 2015, Screening of rice varieties against brown leaf spot disease at Jyotinagar, Chitwan, Nepal. *Int. J. Appl. Sci. Biotechnol.*, 3(1): 56-60.
- Mayee, C. D. and Datar, V. V., 1986, *Phytopathometry. Technical Bulletin-1 (special bulletin-3)*, Marathwada Agricultural University, Parbhani, Maharashtra, India, p. 29.
- Mew, T. W., 1991, Disease management in rice. CRC Handbook of Pest Management. 2nd Ed. Vol. III. D. Pimentel and A. A. Hanson, eds. CRC Press, Boca Raton. pp. 279-299.
- Padmanabhan, S.Y., 1973, The great Bengal famine. *Ann. Rev. Phytopathol.*, 11:11-26.
- Pannu, P. P. S., Chahal, S. S., Vineeth, K. S., MandeepKaur, and Bagga, P. S., 2006, Occurrence of brown leaf spot of rice in Punjab, its effect on grain yield and its control. *Indian Phytopath.*, 59(2): 190-193.
- Rangaswami, G. and Mahadevan, A., 1999, Diseases of crop plants in India. (4th Ed.). Prentice Hall of India Pvt. Ltd., New Delhi. pp.165-169.
- Webster, R. K. and Gunnell, P. S., 1992, Compendium of rice diseases. *American Phytopathological Society*, St. Paul, Minnesota. Pp. 62.
- Yaqoob, M., Mann, R. A., Iqbal, S. M. and Anwar, M., 2011, Reaction of rice genotypes to brown spot disease pathogen *Cochliobolus miyabeanu* under drought conditions. *Mycopath.*, 9(1): 9-11.
- Zadoks, J. C., 2002, Fifty years of crop protection, 1950-2000. *Netherland J. Agric. Sci.*, 181-193.

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