Genetic studies and response of rice germplasm (*Oryza sativa* L.) to brown spot incidence in aerobic condition

Abstract

The present investigation was carried out with 150 rice genotypes and three check varieties namely Rajshree, Pankaj and Rajendra Neelam with the view of assessing the variability in traits related to productivity and studying the response of these varieties towards brown spot resistance under the aerobic condition. These genotypes were evaluated for brown spot incidence and yield potential by recording observation for 11 quantitative traits by using augmented randomized complete block design at Rice research farm of RPCAU, Pusa, Bihar, during *Kharif* season of 2019. Analysis of variance revealed significant differences amongst the genotypes for all the eleven traits studied. Based on the mean performance, 14 genotypes out of 150 genotypes were significantly superior to the best check, Rajendra Neelam, for three traits *viz.,* grain yield/ plant, Percent Disease Intensity (PDI) and area under disease progress curve (AUDPC), which are considered key traits for the assessment of brown spot incidence. The genotypes *viz*., VLD 16 entry no. -5, Udyagiri entry no.-9, and SKL 6 entry no.-94 significantly exhibited high mean for majority of the traits under study. Based on the AUDPC values, genotypes Satabdi, PS-4, Haryana Basmati and SKL6 were resistant for brown spot incidence. For most of the traits studied, moderate to low value of phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) was recorded. Higher magnitude of broad sense heritability and genetic advance as per cent of mean (GAM) were perceived for days to 50% flowering, plant height, no. of tillers per plant, no. of panicles per plant, filled grains per panicle, grain yield per plant, PDI, AUDPC signifying that direct selection by these traits can be rewarding for achieving yield improvisation and resistance to brown spot disease

Keywords: - GCV, PCV, GAM genetic parameter estimates, AUDPC, brown leaf spot, PDI, rice, Heritability, Selection

Introduction

Rice (*Oryza sativa* L.) is an annual monocotyledonous cereal grass encompassed within the genus *oryza* and the family *Gramineae*. Globally, rice is a staple food of more than 2.5 billion individuals and it also provides daily calorie intake of about 50 to 80%(1). The demand for rice is projected to grow by 2.5% per year in the upcoming decades (1).

For over centuries, rice production has been largely dependent on the irrigated lowland rice system, but in present , the sustainability of rice production in the lowland areas is under threat due to water shortage, water contamination and competition for water use (2). This impeding water crisis and water exhaustive nature of the rice farming drives the need to search for alternative approach(es) that increase the water productivity of rice. One of the potential approaches that contributes to increased rice productivity is the aerobic rice cultivation. This technique reduces the water demand in rice production and increases the water use efficiency (2). Experiments on aerobic rice has shown that water requirement in aerobic rice were 50% lower (470-650mm) and water productivity were 64-88% higher than lowland rice (3). In aerobic rice system, crop is established by direct seeding under non-puddled, non-flooded soil and field remain unsaturated throughout the season.

The significant production constraints among different yield constraining variables are pest and diseases. Rice is infected by many diseases among them, a couple of them appear in epiphytotic form in various parts of India and results in substantial yield losses. In general, aerobic rice cultivation is affected by similar pest and diseases as transplanted rice; however, certain diseases like blast, brown spot, seedling blight and foot rot show higher levels of outbreak under aerobic condition (4.).

Among them, brown spot of rice whose causal organism is *Bipolaris oryzae* (telemorph = *Cochliobolus miyabeanus*) is considered as the deadliest disease of rice which is known to have worldwide occurrence (5). This disease is very frequent in various rice growing nations. The disease assumes epiphytotic form under the direct seeded rice cultivation which is commonly practiced within the states of Chhattisgarh, Jharkhand., Orissa, Assam, Madhya Pradesh, West Bengal and Bihar. This epiphytotic form of the disease is known to cause mammoth losses of approximately 90% as reported in the great Bengal famine incidence during the year of 1942 (5). The pathogen infects the crop from seedling to milk stage but the infection is most critical from the tillering to the maturation stages of crop

Although several fungicide treatments are available for brown spot management, the host-plant resistance treatment is cheapest and most feasible means of practice for the management of the disease. The utilization of fungicides is considered as the less promising option for controlling the disease in future due to the restrictions on its use to tackle its harmfulness to nature. Hence, the exploitation of the resistant cultivar can serve us with the simple, harmless efficient and economical mode of controlling various crop diseases which can lead to stabilization of the crop yield. However, the variation and diversity in pathogen population often make host plant resistance short lived and unstable. The short life and instability are due to the advent of novel or more contagious races of the pathogens. Thus, breeders often engage on routine screening for identifcation and selection of effective and broad -spectrum brown spot resistance genes in diverse germplasm for deployment in high yielding varieties to achieve the sustainable production of rice.

Material and method

The present investigation was executed at the research farm, of Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar,India during the Kharif season of 2019. This state is situated between the longitudinal boundary of $85.6488°$ E longitudes and the latitudinal boundary $25.9780°$N, with an average elevation of 173 feet above mean sea level. This region experiences yearly precipitation over 1100 mm with the subtropical climatic condition. The texture of the soil varies from light to heavy. The experimental material used in this study included 150 rice genotypes along with the 3 check varieties (Rajshree, Pankaj and R. Neelam) which are collected from the department of plant breeding and genetics, of Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar. Out of these three checks Rajshree was used as moderately resistant check and Neelam was used as resistant check while Pankaj was used as susceptible check. Eleven parameters viz., panicle length days to 50% flowering, plant height, disease intensity % (PDI), area under disease progress curve (AUDPC), days to maturity, number of panicles per plant, test weight, filled grains per panicle, number of tillers per plant, grain yield per plant. For the estimation of PDI and AUDPC, an epiphytotic condition for the brown spot was created by artificial inoculation by using the inoculum collected from Department of Plant Pathology, RPCAU, Pusa, Bihar after 65 days after sowing by using an aerosol sprayer. The PDI was estimated by carrying out the field scoring for three times during the entire cropping period, *i.e.* 20th October, 5th November, 20th November. Screening for brown spot resistance consists of

visual scoring of affected plants following disease rating scale of Standard Evaluation System of Rice published by IRRI 2013 presented in table1. During scoring the tagged plants inside each plot was visually assessed for percent foliar affected area at fifteen days span. Disease intensity % (PDI) was calculated using the following formula:

$$\text{Disease intensity } \% = \frac{\text{Sum of all numerical ratings} \times 100}{\text{Number of plants observed } \times \text{Maximum rating}}$$

The percent disease intensity (PDI) was estimated by carrying out the field scoring for three times during the entire cropping period, *i.e.* 20th October 2019, 5th November 2019, 20th November 2019. Then the integration of PDI readings (disease severity) recorded from the rice variety estimated the values of AUDPC. AUDPC also summarizes the level of disease intensity along a period which is computed using the following formula as given by "Campbell and Madden 1990".

$$\text{AUDPC} = \sum_{i=1}^{n-1} (Y_{i+1} + Y_i)\, 0.5\, (T_{i+1} - T_i)$$

Where,

Yi = PDI on i[th] date
Ti = date of scoring of the disease
n = numbers of dates on which disease was scored.

Table 1: Disease rating scale of standard evaluation system of Rice published by IRRI (2013) for assessment of brown spot incidence

Scale	% Foliar infected	Host response
0	No incidence	Immune
1	Less than 1%	Highly Resistant
2	1-3%	Resistant
3	4-5%	Resistant
4	6-10%	Moderately Resistant
5	11-15%	Moderately Resistant
6	16-25%	Moderately Susceptible
7	26-50%	Susceptible
8	51-75%	Susceptible
9	76-100%	Highly susceptible

Result and discussion

Genetic variability parameters and mean performance

The ANOVA for eleven quantitative attributes including grain yield for rice genotypes taken into consideration has been performed and displayed in Table 2. ANOVA revealed that for all eleven traits the mean sum of squares for the total treatments, varieties, and Checks vs. Varieties were found significant showing significant differences between the genotypes used in the present investigation. Comparable findings were likewise reported by Padmaja *et al.* (6), Sameera *et al.* (7), Dariush *et al.* (8) where ANOVA showed a significant difference for all the traits they had taken into consideration.

Study of mean performance pre-requisite for the initiation of any research program as it provides first-hand information about the material used in any research study which can be exploited further to accelerate the breeding process as well as to understand the underlying biological mechanisms. The mean performance of individual rice test entries beside the three check entries which were studied under the aerobic condition for all the traits is tabularized in Table 3. The mean, range and coefficient of variation of all the traits are tabularised in the Table 4.

Among the 150 test genotypes evaluated 56 genotypes were significantly early in days to 50% flowering over best check Rajendra Neelam, 31 genotypes were significantly early in days to maturity over best check Rajendra Neelam, only 39 genotypes were significantly shorter for plant height than the best check Rajendra Neelam, 43 genotypes have significantly longer panicle length than the best check Rajshree, only 6 genotypes have significantly higher number of tillers per plant than the best check Rajshree, only 3 genotypes have significantly higher number of panicles per plant than the best check Rajshree, 21 genotypes have significantly higher number of filled grains per panicle than the best check Rajendra Neelam, 30 genotypes have significantly higher test weight than the best check Rajshree, 81 genotypes were significantly higher yielding than the best check Rajendra Neelam, 14 germplasm and 22 germplasm showed significant superior mean performance over the best check Rajendra Neelam for AUDPC and PDI respectively. Proposing that the selection for desired genotype premised on the characters evaluated for material can be efficacious.

The genotypes that displayed a wide range of variation under aerobic condition provide an enormous scope for the selection of desirable cultivar by the plant breeders for imminent crop improvement program in rice. An evaluation of heritable proportion of the total variability is imperative in adopting suitable breeding programme. Genetic variability parameters for all the attributes investigated are presented in table 5. Findings indicated that the PCV estimates were slightly higher than the corresponding GCV for all the traits, signifying that these characters were under a lesser environmental influence. Both PCV and GCV exhibited moderate values for percent disease intensity, number of panicles per plant, grain yield per plant, AUDPC, plant height, number of tillers per plant, filled grains per panicle, and days to 50% flowering. Comparable findings were also found by Dhanwani et al. (9), Singh et al. (10), Behera et al. (11). The Low PCV and GCV values observed for days to maturity, panicle length, and test weight in the present study are consistent with those obtained by Lahari et al. (12) for days to maturity, panicle length, and test weight. However, Karim et al. (13), Thomas et al. (14) and Dhurai et al. (15) only had low PCV and GCV values for days to maturity, whereas Singh et al. (16), and Prajapati et al. (17) found low PCV and GCV values for panicle length. The moderate estimates of the coefficient of variability specify that there is a reasonable opportunity for the selection and refinement of these attributes. The low values of coefficient of variability indicate that there is the necessity for engendering of variability either through hybridization or by mutagenesis and transformation prior to the selection. From the perusal of the data (Table 5), it can be stated that all the eleven characters exhibited high heritability, which ranged from 80.25% to 94.85 %. However, high broad sense heritability and high genetic advance as percent of mean was obtained for days to 50% flowering, plant height, number of tillers per plant, number of panicles per plant, filled grains per panicle, grain yield per plant, PDI, and AUDPC. Comparable findings were likewise chronicled by Durrishahwar et al. (18) and Zewdu et al. (19) for PDI and AUDPC; Dhurai et al.(15) and Sameera et al.(7) for days to 50% flowering, plant height, number of tillers per plant, number of panicles per plant, filled grains per panicle, grain yield per plant.

Findings implied that days to 50% flowering, plant height, number of tillers per plant, number of panicles per plant, filled grains per panicle, grain yield per plant, PDI, and AUDPC emerged as key traits with reasonable genetic variability in the studied genotypes and higher response to selection for the breeding varieties for brown spot resistance

Response of test germplasm to brown spot incidence

The screening was done using the brown spot incidence scale of the standard evaluation system of IRRI,2013. The assessment of the response of the rice genotypes to this disease was done by estimation of a parameter known as AUDPC. AUDPC revealed the quantitative summary of the disease intensity over the period. Hence, the genotypes used in the current research investigation were allotted into different responses using the mean AUDPC values which are tabularized in table 6

Conclusion

Analysis of variance revealed that significant differences among the germplasm was obtained for all the traits indicating sufficient variability is present in the germplasm used in the present investigation. The variability studies indicated that the PCV estimates was marginally higher than the corresponding estimates of GCV for all the traits contemplated, signifying that these traits were under a lesser environmental influence. High heritability coupled with high genetic advance as per cent of mean was observed for days to 50% flowering , plant height, no. of tillers per plant , no. of panicles per plant, filled grains per panicle , grain yield per plant , PDI , AUDPC indicate that direct selection for these traits will be rewarding Out of 150 of which only 14 genotypes exhibited significant superiority over the best check i.e. R. Neelam for grain yield per plant, PDI, and AUDPC specifying that the selection of desirable genotype with good yield as well as tolerance to brown spot can be effective. Through the categorization of one fifty three genotypes based on the AUDPC values, it was found that four genotypes Satabdi, PS-4, Haryana Basmati, SKL6 were exhibiting resistance response toward brown spot incidence.

References

1. Hegde, S., & Hegde, V. (2013). Assessment of global rice production and export opportunity for economic development in Ethiopia. Int. J. Sci. Res, 2, 257-260.
2. Tuong, T. P., & Bouman, B. A. M. (2003). Rice production in water-scarce environments. Water productivity in agriculture: Limits and opportunities for improvement, 1, 13-42.
3. Suryavanshi, P., Singh, Y. V., Prasanna, R., Bhatia, A., & Shivay, Y. S. (2013). Pattern of methane emission and water productivity under different methods of rice crop establishment. *Paddy and Water Environment*, *11*(1-4), 321-329.
4. Yaqoob, M., Mann, R. A., Iqbal, S. M., & Anwar, M. (2011). Reaction of rice genotypes to brown spot disease pathogen Cochliobolus miyabeanus under drought conditions. Mycopath journal, 9, 9-11.
5. Sunder, S., Singh, R., & Agarwal, R. (2014). Brown spot of rice: an overview. Indian Phytopathology, 67(3), 201-215.
6. Padmaja, D., Radhika, K., Rao, L. V., & Padma, V. (2008). Studies on variability, heritability and genetic advance for quantitative characters in rice (*Oryza sativa* L.). *Indian Journal of Plant Genetic Resources*, 21(3), 196-198.
7. Sameera, S. K., Rajesh, A. P., Jayalakshmi, V., Nirmala, P. J., & Srinivas, T. (2015). Genetic variability studies for yield and yield components in rice (*Oryza sativa* L.). *Electronic Journal of Plant Breeding*, *6*(1), 269-273.

8. Dariush, S., Darvishnia, M., Ebadi, A. A., Padasht-Dehkaei, F., & Bazgir, E. (2020). Screening rice genotypes for brown spot resistance along with yield attributing characters and its association with morphological traits. *Journal of Crop Protection*, *9*(3), 381-393.

9. Dhanwani, R. K., Sarawgi, A. K., Solanki, A., & Tiwari, J. K. (2013). Genetic variability analysis for various yield attributing and quality traits in rice (O. sativa L.). *The Bioscan*, *8*(4), 1403-1407.

10. Singh, C. M., Babu, G. S., Kumar, B., & Mehandi, S. (2013). Analysis of quantitative variation and selection criteria for yield improvement in exotic germplasm of upland rice (Oryza sativa L.). *The Bioscan*, *8*(2), 485-492.

11. Behera, B., Sahu, S., Kar, R. K., & Pandey, R. K. (2018). Studies on genetic variability for some metric traits in slender grain rice genotypes. *Journal of Applied and Natural Science*, *10*(1), 375-378.

12. Lahari, G. (2017). Assessment of Genetic Diversity of Rice Genotypes for Submergence Tolerance in Rainfed Lowlands (Doctoral dissertation, University of Agricultural & Horticultural Sciences, Shivamogga).

13. Karim, D., Sarkar, U., Siddique, M. N. A., Miah, M. K., & Hasnat, M. Z. (2007). Variability and genetic parameter analysis in aromatic rice. *International Journal of Sustainable Crop Production*, *2*(5), 15-18.

14. Thomas, N., & Lal, G. M. (2012). Genetic divergence in rice genotypes under irrigated conditions. *Annals of Plant and Soil Research*, *14*(2), 109-112.

15. Dhurai, S. Y., Bhati, P. K., & Saroj, S. K. (2014). Studies on genetic variability for yield and quality characters in rice (*Oryza sativa* L.) under integrated fertilizer management. *The Bioscan*, *9*(2), 745-748.

16. Singh, S. K., Singh, C. M., & Lal, G. M. (2011). Assessment of genetic variability for yield and its component characters in rice (*Oryza sativa* L.). *Research in Plant Biology*, *1*(4).

17. Prajapati, M. K., Singh, C. M., Babu, G. S., Lavanya, G. R., & Jadhav, P. (2011). Genetic parameters for grain yield and its component characters in rice. *Electronic Journal of Plant Breeding*, *2*(2), 235-238.

18. Durrishahwar, H., Shah, S. M. A., Khalil, I. A., & Ali, F. (2008). Recurrent selection for yield and yield associated traits under leaf blight (*Helminthosporium maydis*) stress in maize. *Sarhad Journal of Agriculture*, *24*(4), 599-605.

19. Zewdu, Z., Gibson, P., Lamo, J., & Edema, R. (2017). Reaction of introduced Korean rice genotypes for resistance to rice blast in Uganda. *Journal of Plant Breeding and Crop Science*, *9*(7), 98-105.

Table 2: Analysis of variance for various traits under study for rice genotypes

Source of variation	d.f	DFF	DM	PH (cm)	P L (cm)	NTP	NPP	FGP	TW (g)	GYP (g)	PDI	AUDPC
Blocks (ignoring treatments)	5	1.52	3.95	25.78	0.79	6.42	243.74	179.54	1.73	19.85	21.08	17.45
Treatments (eliminating blocks)	152	130.30**	140.70**	355.97**	3.92**	6.62**	235.57**	205.95**	31.30**	59.80**	68157.82**	188062.71**
checks	2	953.55**	1358.38**	113.54**	3.66**	2.67	480.64**	54.99**	107.44**	40.84**	424475.59**	1339229.37**
Varieties	149	95.46 **	102.20**	359.71**	3.84**	6.70**	233.04**	210.57**	29.90**	45.05**	58859.48**	158987.15**
Check vs.Varieties	1	3676.32**	3442.49**	284.10**	15.12**	2.48	122.88	8.38	88.36**	2295.59	740975.75**	2217988.75**
ERROR	10	1.15	1.85	15.80	0.58	1.44	35.77	9.48	1.97	2.60	38.91	13.84

** Significance at 1% level

* Significance at 5% level

Degree of freedom(d.f) Days to 50% flowering (DFF), Days to maturity (DM), Plant height (PH), Panicle length (PL), Number of tillers per plant (NTP), Number of panicles per plant (NPP), Filled grains per panicle (FGP), Test weight (g.) (TW), Grain yield per plant (g.) (GYP), Percent disease intensity (PDI) and Area under disease progress curve (AUDPC)

Table 3: Mean performance of 153 rice genotypes for eleven characters under aerobic condition

S.no	Genotype name	DFF	DM	PH	PL	NTP	NPP	FGP	TW	GYP	PDI	AUDPC
1	Srabani	90.00	121.00	94.00	19.40	12.00	8.66	68.33	25.36	36.36	20.25	487.03
2	Golaka	101.00	132.00	122.20	19.60	8.00	7.66	65.00	27.00	20.52	85.19	1403.63
3	IR-64	78.00	101.00	94.80	21.60	11.60	10.00	68.33	26.76	35.12	23.23	540.96
4	Daya	75.00	106.00	96.60	22.00	8.33	7.00	62.66	31.00	24.12	70.37	1237.49
5	VLD-16	78.00	101.00	121.40	23.40	10.00	7.66	94.33	31.16	32.16	30.61	712.65
6	Sebati	92.00	116.00	70.40	15.60	8.66	6.30	51.66	29.36	36.51	18.52	410.79
7	Govinda	82.00	109.00	90.60	18.80	8.00	6.66	46.66	28.00	24.32	56.38	1052.36
8	PR113	93.00	125.00	84.80	17.80	10.33	7.66	56.00	34.40	23.58	63.12	1155.86
9	Udyagiri	79.00	101.00	100.00	21.00	8.66	7.00	67.66	26.00	36.52	19.48	451.26
10	IR-72	82.00	104.00	105.00	21.60	14.66	10.66	52.00	30.60	32.96	30.26	625.50
11	Narendra-1	83.00	111.00	93.40	20.40	11.66	9.66	50.33	27.00	31.31	31.42	670.06
12	VLD221	82.00	111.00	121.00	22.00	13.33	12.66	70.00	31.80	29.56	33.45	702.52
13	Khira	93.00	116.00	100.20	16.20	18.66	8.00	68.00	37.52	35.42	20.31	455.42
14	SARSA	84.00	113.00	101.40	21.40	13.00	8.33	61.66	27.56	31.29	34.56	746.63
15	MILYANG46	87.00	113.00	157.20	23.40	9.33	5.66	75.00	29.92	24.56	68.25	1287.64
16	Annada	76.00	104.00	90.00	20.80	8.66	6.00	57.66	25.84	28.54	62.48	908.87
17	Luna sankhi	88.00	115.00	128.40	23.60	16.00	10.00	52.66	28.20	20.56	77.19	1322.14
18	Radhi	78.00	105.00	120.00	22.40	7.66	7.33	84.66	24.48	25.30	65.12	1141.23
19	Sahabhagi dhan	76.00	113.00	114.40	23.40	9.66	6.33	55.33	28.00	36.12	25.38	468.51
20	Kalinga-3	75.00	108.00	138.60	24.20	10.66	8.00	57.66	21.04	24.52	62.96	1279.61
21	Satabdi	93.00	116.00	84.80	17.60	7.00	6.00	58.66	24.52	38.34	16.54	360.81
22	Tara	80.00	106.00	125.40	20.40	10.33	8.33	77.33	25.12	32.56	42.38	635.63
23	ASD18	105.00	132.00	125.80	22.40	8.00	6.33	143.00	18.36	20.29	78.23	1410.39
24	Purnandu	80.00	106.00	129.20	23.60	14.33	7.00	63.66	29.60	28.56	44.56	876.62
25	BUD110	88.00	114.00	103.40	20.80	14.66	8.33	64.33	24.00	36.21	18.56	437.41
	RAJSHREE	105.00	135.00	117.60	21.60	15.00	10.33	64.00	28.48	15.96	30.20	604.82
	PANKAJ	113.00	142.00	118.20	19.20	9.66	8.33	51.33	20.28	13.01	72.64	1305.12
	R. NEELAM	88.00	114.00	111.00	21.60	12.66	7.66	81.00	21.80	21.26	23.60	401.90
	Ci - Cj	1.38	1.75	5.11	0.98	1.55	7.69	23.13	1.81	2.08	8.03	4.79
	BiVi - BiVj	3.38	4.29	12.53	2.40	3.79	18.85	56.67	4.42	5.09	19.66	11.73
	BiVi - BjVj	3.91	4.95	14.47	2.77	4.38	21.76	65.43	5.11	5.88	22.70	13.54
	Ci - Vi	3.04	3.85	11.24	2.16	3.40	16.92	50.86	3.97	4.57	17.64	10.52
	overall mean	**86.79**	**115.87**	**117.23**	**22.22**	**10.03**	**7.25**	**69.94**	**25.71**	**24.68**	**63.41**	**1137.48**
	CD 5%	5.56	7.66	7.97	1.42	0.72	0.50	4.95	1.75	1.75	4.26	80.43
	S Em	1.99	2.74	2.86	0.51	0.26	0.18	1.77	0.63	0.63	1.52	28.81

S.no	Genotype name	DFF	DM	PH	PL	NTP	NPP	FGP	TW	GYP	PDI	AUDPC
26	ASD14	96.00	126.00	90.00	22.00	12.00	8.33	55.66	21.36	33.26	36.42	747.17
27	Sasyashree	107.00	131.00	109.20	23.80	9.00	6.66	50.33	29.60	32.48	34.39	697.79
28	PS3	80.00	101.00	99.60	22.00	7.66	7.00	68.66	25.84	31.56	35.46	744.53
29	Varsa	88.00	117.00	89.80	21.60	9.33	7.00	103.00	36.94	22.26	74.12	1236.91
30	Sarathi	83.00	113.00	103.60	20.80	14.00	11.00	60.66	25.44	23.24	76.12	1190.84
31	GR103	64.00	96.00	106.80	21.40	8.33	5.33	72.33	23.08	19.56	81.48	1457.15
32	Abhaya	65.00	96.00	103.20	20.40	6.33	6.00	49.66	24.24	20.19	89.35	1570.14
33	Dandi	98.00	124.00	104.60	21.20	9.66	7.33	72.00	22.28	20.52	92.59	1584.54
34	PS-4	80.00	109.00	102.80	22.20	8.33	6.00	52.33	25.16	38.56	18.53	391.56
35	Khandagiri	84.00	113.00	115.00	23.00	11.66	7.00	65.33	24.00	20.14	92.59	1562.93
36	NDR-97	104.00	129.00	96.00	21.40	7.00	5.66	81.00	26.76	32.46	36.26	648.98
37	Santhi	86.00	119.00	133.60	24.20	12.33	8.33	91.00	24.64	24.62	77.78	1277.70
38	Vaisak	80.00	109.00	130.80	24.60	7.33	6.00	59.66	32.84	18.23	85.19	1611.87
39	Pyari	82.00	116.00	121.40	20.60	16.00	7.00	69.33	28.52	24.51	59.26	1297.40
40	Jyati	96.00	128.00	98.20	19.80	9.00	6.33	81.33	34.16	32.42	33.64	701.22
41	Bhagyabati	86.00	111.00	114.80	22.00	9.66	5.33	80.66	23.04	20.45	80.37	1419.62
42	BVS1	86.00	116.00	123.40	21.20	9.00	8.66	127.00	25.04	32.56	32.38	644.84
43	CO-49	78.00	101.00	89.40	18.80	11.00	6.00	58.66	23.60	36.15	27.46	454.85
44	Bardhan	80.00	109.00	111.00	23.00	10.66	9.00	73.66	27.20	20.36	81.48	1489.95
45	Bhoi	80.00	109.00	104.40	23.00	10.66	5.33	53.00	25.36	28.56	56.23	949.13
46	Sarjo 52	82.00	115.00	100.60	22.40	8.33	7.00	84.33	27.60	32.42	34.65	645.05
47	BR -72	85.00	116.00	106.40	24.60	8.33	7.66	70.66	28.48	35.12	27.54	562.00
48	CSR35	92.00	126.00	101.60	23.80	9.00	7.33	67.00	29.24	36.52	16.39	401.04
49	BD-202	94.00	126.00	134.60	23.60	9.66	8.00	98.33	26.12	28.42	62.59	985.21
50	CSR27	78.00	110.00	110.00	23.40	8.33	6.33	70.66	33.56	35.26	24.59	516.37
	RAJSHREE	105.00	135.00	117.60	21.60	15.00	10.33	64.00	28.48	15.96	30.20	604.82
	PANKAJ	113.00	142.00	118.20	19.20	9.66	8.33	51.33	20.28	13.01	72.64	1305.12
	R. NEELAM	88.00	114.00	111.00	21.60	12.66	7.66	81.00	21.80	21.26	23.60	401.90
	Ci - Cj	1.38	1.75	5.11	0.98	1.55	7.69	23.13	1.81	2.08	8.03	4.79
	BiVi - BiVj	3.38	4.29	12.53	2.40	3.79	18.85	56.67	4.42	5.09	19.66	11.73
	BiVi - BjVj	3.91	4.95	14.47	2.77	4.38	21.76	65.43	5.11	5.88	22.70	13.54
	Ci - Vi	3.04	3.85	11.24	2.16	3.40	16.92	50.86	3.97	4.57	17.64	10.52
	overall mean	**86.79**	**115.87**	**117.23**	**22.22**	**10.03**	**7.25**	**69.94**	**25.71**	**24.68**	**63.41**	**1137.48**
	CD 5%	5.56	7.66	7.97	1.42	0.72	0.50	4.95	1.75	1.75	4.26	80.43
	S Em	1.99	2.74	2.86	0.51	0.26	0.18	1.77	0.63	0.63	1.52	28.81

S.no	Genotype name	DFF	DM	PH	PL	NTP	NPP	FGP	TW	GYP	PDI	AUDPC
51	DRR Dhan 39	89.00	121.00	88.80	19.60	10.66	8.00	70.00	30.52	31.59	34.21	705.26
52	GR 64	94.00	124.00	101.40	20.00	6.66	4.33	84.00	18.00	31.12	37.92	779.32
53	Indrabans	74.00	106.00	120.60	23.60	11.66	9.66	109.66	23.56	23.56	66.67	1222.78
54	Danteshwari	88.00	116.00	139.20	23.80	8.33	7.33	83.00	23.80	23.80	77.78	1231.51
55	Red triveni	78.00	108.00	136.20	22.40	7.66	7.00	71.66	25.04	20.04	74.07	1313.01
56	RR-8588	86.00	116.00	111.20	22.40	8.00	5.33	89.00	29.96	18.23	81.48	1628.70
57	Pantdhan-12	78.00	101.00	107.00	23.40	12.33	7.00	52.33	25.92	32.23	31.48	664.38
58	VL dhan61	85.00	113.00	129.00	25.40	11.33	7.66	57.33	32.76	23.56	66.67	1146.01
59	VL Dhan209	80.00	101.00	84.60	19.80	10.66	7.66	62.33	21.44	20.19	70.37	1349.32
60	Samyakhala	78.00	109.00	139.00	22.20	8.00	7.66	70.33	29.20	19.56	72.39	1382.40
61	Rajendra Dhan 102	105.00	128.00	136.80	22.20	9.00	8.00	66.33	31.92	23.56	62.96	1231.58
62	GNR 3	92.00	121.00	110.40	19.40	12.66	7.33	77.00	28.36	19.56	85.19	1480.06
63	Varun dhan	70.00	103.00	128.80	22.20	15.66	7.66	76.66	26.16	19.21	85.12	1493.77
64	Sukhardhan	72.00	103.00	116.00	22.00	9.66	7.66	65.33	34.84	27.56	39.31	824.40
65	HPR2143	75.00	104.00	109.60	25.00	13.00	8.66	59.00	29.52	18.56	83.26	1443.93
66	Himalaya2216	78.00	109.00	124.80	23.00	12.66	6.00	67.33	22.56	19.23	76.39	1330.58
67	Himalaya1	70.00	94.00	105.40	22.00	16.00	7.33	62.66	18.28	18.89	85.19	1395.57
68	CO48	80.00	108.00	131.40	23.20	10.00	7.66	46.66	23.72	18.23	92.59	1381.35
69	Pantdhan4	91.00	119.00	95.60	20.00	7.33	5.33	68.00	25.00	17.56	85.19	1654.16
70	Pant sughandh dhan21	93.00	123.00	123.60	24.40	7.00	5.66	65.33	16.00	36.35	18.26	401.50
71	Bhalum-3	76.00	103.00	116.20	19.80	11.66	8.00	75.00	24.00	19.56	77.78	1329.16
72	Sanwal basmati	104.00	135.00	105.80	20.60	11.33	6.33	44.33	20.00	18.35	92.59	1542.97
73	Pusa sughandh-2	99.00	133.00	104.80	21.40	8.00	7.00	75.33	23.56	18.69	91.35	1502.43
74	Pusa 834	74.00	101.00	100.80	20.60	7.33	5.66	58.00	24.00	20.13	88.89	1405.49
75	Pusa sugandh-5	92.00	125.00	113.00	24.80	9.33	7.66	83.66	31.20	32.42	26.58	601.27
	RAJSHREE	105.00	135.00	117.60	21.60	15.00	10.33	64.00	28.48	15.96	30.20	604.82
	PANKAJ	113.00	142.00	118.20	19.20	9.66	8.33	51.33	20.28	13.01	72.64	1305.12
	R. NEELAM	88.00	114.00	111.00	21.60	12.66	7.66	81.00	21.80	21.26	23.60	401.90
	Ci - Cj	1.38	1.75	5.11	0.98	1.55	7.69	23.13	1.81	2.08	8.03	4.79
	BiVi - BiVj	3.38	4.29	12.53	2.40	3.79	18.85	56.67	4.42	5.09	19.66	11.73
	BiVi - BjVj	3.91	4.95	14.47	2.77	4.38	21.76	65.43	5.11	5.88	22.70	13.54
	Ci - Vi	3.04	3.85	11.24	2.16	3.40	16.92	50.86	3.97	4.57	17.64	10.52
	overall mean	**86.79**	**115.87**	**117.23**	**22.22**	**10.03**	**7.25**	**69.94**	**25.71**	**24.68**	**63.41**	**1137.48**
	CD 5%	5.56	7.66	7.97	1.42	0.72	0.50	4.95	1.75	1.75	4.26	80.43
	S Em	1.99	2.74	2.86	0.51	0.26	0.18	1.77	0.63	0.63	1.52	28.81

s.no	Genotype name	DFF	DM	PH	PL	NTP	NPP	FGP	TW	GYP	PDI	AUDPC
76	JR 353	90.00	121.00	93.40	22.00	7.00	5.00	48.66	21.56	23.56	74.07	1208.38
77	Karanti	87.00	116.00	93.20	20.60	8.00	7.33	65.33	35.12	36.98	25.39	468.88
78	JR503	89.00	119.00	90.60	19.40	8.00	6.00	37.33	33.92	34.52	27.12	519.93
79	Kalanamak101	108.00	131.00	118.20	21.80	7.00	6.00	58.00	12.12	36.51	26.41	493.40
80	Saraswati	96.00	128.00	121.80	22.00	9.33	8.00	77.33	32.72	16.52	85.19	1592.59
81	GAR -13	96.00	130.00	116.80	23.20	17.66	12.66	92.33	24.00	21.20	75.23	1327.75
82	GR 12	94.00	123.00	118.80	22.40	10.00	6.66	129.66	21.16	20.10	80.52	1370.46
83	GR 11	103.00	130.00	132.20	22.00	9.66	6.33	75.33	23.14	19.54	92.59	1471.79
84	GR 7	89.00	120.00	126.40	22.00	9.00	7.00	70.00	23.16	18.34	92.59	1567.49
85	GR4	84.00	117.00	123.40	22.60	9.00	8.66	51.33	25.28	21.24	92.56	1346.56
86	GAR 2	92.00	125.00	134.40	21.60	9.00	6.00	62.00	15.35	15.35	89.25	1567.24
87	Palghar2	84.00	108.00	120.60	18.60	9.00	8.00	73.66	18.92	22.90	66.67	1282.06
88	Ratnagiri 1	83.00	113.00	100.80	22.60	10.00	6.33	72.33	18.60	23.60	85.19	1257.44
89	Ratnagiri4	84.00	116.00	94.60	21.80	10.66	7.33	70.33	23.88	19.56	88.89	1468.79
90	Ratnagiri711	79.00	109.00	93.80	20.20	10.66	8.33	57.33	16.68	16.68	88.89	1623.81
91	Karjat-7	91.00	123.00	101.80	23.40	12.66	10.33	63.00	29.59	32.56	29.52	603.66
92	Haryana Basmati	96.00	126.00	104.20	22.20	9.66	5.66	94.00	14.68	38.71	20.89	383.04
93	SYE1	78.00	108.00	106.60	23.40	8.00	5.00	41.66	16.16	24.69	55.56	1069.50
94	SKL6	70.00	103.00	85.40	20.00	8.00	5.33	57.33	20.52	38.56	18.23	340.42
95	Badami	74.00	96.00	114.00	24.40	11.00	6.66	59.33	19.80	19.56	77.78	1400.18
96	Mandakini	77.00	106.00	91.00	21.20	13.66	9.33	35.33	22.04	35.26	27.42	597.25
97	Jyotimayee	88.00	113.00	108.60	22.40	7.00	5.00	55.33	26.08	14.62	92.59	1935.19
98	Pantdhan19	76.00	104.00	131.00	21.80	7.33	6.00	54.33	19.24	15.29	96.54	1790.63
99	Kasalath	116.00	144.00	120.20	21.00	8.00	5.66	37.66	14.80	16.23	92.19	1723.14
100	Rhyllo white	80.00	109.00	129.00	22.00	8.00	6.33	55.66	26.92	24.12	66.67	1200.54
	RAJSHREE	105.00	135.00	117.60	21.60	15.00	10.33	64.00	28.48	15.96	30.20	604.82
	PANKAJ	113.00	142.00	118.20	19.20	9.66	8.33	51.33	20.28	13.01	72.64	1305.12
	R. NEELAM	88.00	114.00	111.00	21.60	12.66	7.66	81.00	21.80	21.26	23.60	401.90
	Ci - Cj	1.38	1.75	5.11	0.98	1.55	7.69	23.13	1.81	2.08	8.03	4.79
	BiVi - BiVj	3.38	4.29	12.53	2.40	3.79	18.85	56.67	4.42	5.09	19.66	11.73
	BiVi - BjVj	3.91	4.95	14.47	2.77	4.38	21.76	65.43	5.11	5.88	22.70	13.54
	Ci - Vi	3.04	3.85	11.24	2.16	3.40	16.92	50.86	3.97	4.57	17.64	10.52
	overall mean	**86.79**	**115.87**	**117.23**	**22.22**	**10.03**	**7.25**	**69.94**	**25.71**	**24.68**	**63.41**	**1137.48**
	CD 5%	5.56	7.66	7.97	1.42	0.72	0.50	4.95	1.75	1.75	4.26	80.43
	S Em	1.99	2.74	2.86	0.51	0.26	0.18	1.77	0.63	0.63	1.52	28.81

Cont…

S.No	Genotype name	DFF	DM	PH	PL	NTP	NPP	FGP	TW	GYP	PDI	AUDPC
101	Dullo	91.00	121.00	128.20	21.80	11.00	9.00	78.00	24.88	19.53	81.48	1450.43
102	Kuki	70.00	100.00	131.20	25.20	8.66	7.33	38.33	22.40	24.35	66.67	1134.07
103	IRCTN-91-5	83.00	113.00	107.00	22.80	8.33	7.66	81.00	24.32	19.52	92.59	1489.21
104	IRCTN-11-94	76.00	103.00	131.20	22.40	10.33	9.33	68.33	24.00	22.56	78.26	1362.41
105	Nami	67.00	99.00	129.80	22.60	8.66	6.33	80.66	27.32	15.26	92.59	1658.64
106	HR5829-73-3-23	78.00	109.00	119.80	21.60	8.66	5.33	77.00	22.92	23.56	74.07	1187.43
107	Zielum	87.00	116.00	113.40	24.40	9.00	8.66	76.33	36.48	24.21	71.49	1123.72
108	RCPL-1-9C	88.00	121.00	113.00	22.40	11.33	8.00	98.33	32.52	18.32	85.43	1509.18
109	Channapaddy	96.00	123.00	108.80	21.20	9.00	7.00	61.00	23.16	14.56	85.19	1764.82
110	RCPL-1-5C	95.00	123.00	108.00	20.20	9.00	7.33	66.66	31.92	24.23	65.23	1065.92
111	NCW11	94.00	121.00	116.20	23.40	11.00	7.33	86.33	27.36	28.56	62.15	920.19
112	IR-1386	86.00	117.00	147.20	23.80	7.66	6.00	75.66	21.64	20.52	80.52	1330.77
113	RCPL-1-13C	89.00	119.00	134.80	23.20	7.66	5.66	63.00	20.88	19.53	81.48	1414.47
114	Nonglwai	82.00	116.00	95.40	20.40	10.33	6.66	64.66	23.68	24.61	77.78	1231.51
115	K-393-29-1	84.00	116.00	113.80	24.00	8.66	7.00	72.66	22.20	24.69	72.14	1236.19
116	IRCTN-91-78	88.00	113v	114.80	23.20	8.00	6.66	97.33	17.36	14.56	92.59	1666.93
117	Khamong	87.00	116.00	140.80	24.80	7.66	5.66	64.66	28.40	18.23	92.59	1593.70
118	Kala jira jaha	123.00	151.00	136.60	21.00	8.00	6.66	109.00	12.52	17.23	81.48	1504.08
119	Raga- binni (sticky	91.00	121.00	129.00	21.60	11.33	10.33	103.00	21.40	20.14	81.48	1413.38
120	Gopalbhok	89.00	123.00	122.60	19.80	8.00	7.00	71.66	30.44	24.56	72.18	1220.53
121	Hatibandha	88.00	121.00	135.20	22.60	10.66	8.00	110.66	23.36	24.89	72.19	1227.79
122	Mima	82.00	116.00	140.60	27.20	9.33	8.00	77.66	19.44	20.56	74.32	1319.66
123	Jahagipok	90.00	121.00	136.20	22.80	18.00	10.00	48.66	20.30	19.21	85.19	1460.23
124	Taramon	119.00	151.00	134.00	23.60	8.33	6.66	84.66	21.04	21.04	71.56	1319.58
125	Kutchigisim	98.00	122.00	150.20	26.40	12.33	6.66	58.33	31.36	36.51	25.42	481.20
	RAJSHREE	105.00	135.00	117.60	21.60	15.00	10.33	64.00	28.48	15.96	30.20	604.82
	PANKAJ	113.00	142.00	118.20	19.20	9.66	8.33	51.33	20.28	13.01	72.64	1305.12
	R. NEELAM	88.00	114.00	111.00	21.60	12.66	7.66	81.00	21.80	21.26	23.60	401.90
	Ci - Cj	1.38	1.75	5.11	0.98	1.55	7.69	23.13	1.81	2.08	8.03	4.79
	BiVi - BiVj	3.38	4.29	12.53	2.40	3.79	18.85	56.67	4.42	5.09	19.66	11.73
	BiVi - BjVj	3.91	4.95	14.47	2.77	4.38	21.76	65.43	5.11	5.88	22.70	13.54
	Ci - Vi	3.04	3.85	11.24	2.16	3.40	16.92	50.86	3.97	4.57	17.64	10.52
	overall mean	**86.79**	**115.87**	**117.23**	**22.22**	**10.03**	**7.25**	**69.94**	**25.71**	**24.68**	**63.41**	**1137.48**
	CD 5%	5.56	7.66	7.97	1.42	0.72	0.50	4.95	1.75	1.75	4.26	80.43
	S Em	1.99	2.74	2.86	0.51	0.26	0.18	1.77	0.63	0.63	1.52	28.81

S.No	Genotype name	DFF	DM	PH	PL	NTP	NPP	FGP	TW	GYP	PDI	AUDPC
126	Maigothi	98.00	123.00	131.80	22.40	13.33	6.66	54.00	31.60	21.60	79.23	1364.57
127	Minil Gisim	91.00	125.00	139.40	24.00	14.00	6.33	67.33	34.28	34.28	56.23	982.92
128	Jahagisim	82.00	116.00	141.80	25.20	6.66	4.66	59.66	29.34	29.34	56.23	1146.50
129	Kuhusoi-ri-sareku	89.00	119.00	152.40	23.40	9.66	6.00	75.33	31.65	20.21	79.26	1472.39
130	Vinhatsa	89.00	121.00	138.00	22.20	6.00	8.00	63.66	18.48	18.51	88.89	1501.93
131	Ngobanyo Red Clover	91.00	121.00	104.00	21.00	15.66	8.33	62.66	24.32	19.36	81.48	1554.80
132	Teviirii	76.00	105.00	145.00	24.60	9.00	6.00	76.33	21.40	19.56	74.07	1550.60
133	Dzuluore	78.00	109.00	154.40	26.00	11.00	6.33	109.66	25.68	24.69	74.07	1254.11
134	Kelhrie Cha	80.00	104.00	140.00	22.40	14.66	8.00	97.66	21.48	17.51	89.23	1686.20
135	Nedu	96.00	121.00	140.00	23.00	10.00	7.33	112.00	28.80	20.16	81.48	1552.42
136	Pora Meunya	86.00	116.00	103.00	20.80	7.33	6.00	79.00	21.76	24.51	65.23	1110.65
137	Hazor Kecho	91.00	119.00	124.20	22.40	15.33	10.00	85.33	20.04	25.90	73.56	1282.03
138	Saponyo	80.00	109.00	156.40	22.60	7.00	5.33	54.33	25.14	25.20	69.23	1222.00
139	Rosho	88.00	118.00	135.60	25.80	8.66	5.33	76.00	22.16	20.12	61.23	1338.68
140	Sirarakhong Meryon Maa	91.00	121.00	159.00	24.80	6.66	6.00	59.00	25.00	25.32	62.96	1125.38
141	Sirarakhong Ashangn	93.00	123.00	161.00	27.00	5.66	4.00	37.00	30.00	24.65	70.37	1246.70
142	Ringui Maa	92.00	121.00	128.60	22.20	7.66	4.66	58.33	26.00	14.50	84.62	1400.12
143	Teinem Ruisheng Maa	93.00	122.00	142.00	25.20	8.00	7.00	60.00	25.00	15.39	92.12	1521.42
144	Sirarakhong Manui	89.00	123.00	157.40	26.00	7.66	5.66	76.33	31.40	14.39	85.19	1660.98
145	Kongkoi	90.00	121.00	129.20	22.60	12.66	10.00	58.00	23.60	25.32	62.34	1079.07
146	Arunachal Pradesh-1	89.00	119.00	118.60	20.80	10.33	8.33	86.33	36.00	24.56	69.12	1197.58
147	Taker AM	93.00	123.00	110.80	22.80	11.66	9.00	49.66	33.40	20.56	77.78	1358.79
148	Amker	84.00	116.00	98.60	21.40	10.66	9.33	67.00	29.60	32.39	35.45	728.96
149	Sakha	86.00	116.00	110.20	23.20	9.33	8.00	72.33	25.56	22.56	71.26	1238.10
150	Ayaar	80.00	108.00	165.20	27.00	9.00	7.33	71.00	48.44	20.44	80.65	1438.91
	RAJSHREE	105.00	135.00	117.60	21.60	15.00	10.33	64.00	28.48	15.96	30.20	604.82
	PANKAJ	113.00	142.00	118.20	19.20	9.66	8.33	51.33	20.28	13.01	72.64	1305.12
	R. NEELAM	88.00	114.00	111.00	21.60	12.66	7.66	81.00	21.80	21.26	23.60	401.90
	Ci - Cj	1.38	1.75	5.11	0.98	1.55	7.69	23.13	1.81	2.08	8.03	4.79
	BiVi - BiVj	3.38	4.29	12.53	2.40	3.79	18.85	56.67	4.42	5.09	19.66	11.73
	BiVi - BjVj	3.91	4.95	14.47	2.77	4.38	21.76	65.43	5.11	5.88	22.70	13.54
	Ci - Vi	3.04	3.85	11.24	2.16	3.40	16.92	50.86	3.97	4.57	17.64	10.52
	overall mean	**86.79**	**115.87**	**117.23**	**22.22**	**10.03**	**7.25**	**69.94**	**25.71**	**24.68**	**63.41**	**1137.48**
	CD 5%	5.56	7.66	7.97	1.42	0.72	0.50	4.95	1.75	1.75	4.26	80.43
	S Em	1.99	2.74	2.86	0.51	0.26	0.18	1.77	0.63	0.63	1.52	28.81

Days to 50% flowering (DFF), Days to maturity (DM), Plant height (PH), Panicle length (PL), Number of tillers per plant (NTP), Number of panicles per plant (NPP), Filled grains per panicle (FGP), Test weight (g.) (TW), Grain yield per plant (g.) (GYP), Percent disease intensity (PDI) and Area under disease progress curve (AUDPC), Critical difference (CD5%), mean standard error(SEm)

Table 4: Mean, Range and coefficient of variation for traits of rice genotypes under aerobic condition

Serial number.	TRAITS	MEAN	RANGE	CV%
1	DFF	86.79	64-123	11.53
2	DM	115.87	94-151	8.93
3	PH	117.22	70.4-165.2	16.02
4	PL	22.21	15.6-27.2	8.77
5	NTP	10.03	5-18	15.92
6	NPP	7.25	4-12	18.23
7	FGP	69.94	35-143	12.38
8	TW	25.70	12.12-48.44	9.56
9	GYP	24.67	13.01-38.71	17.36
10	PDI	63.40	16.39-96.54	18.48
11	AUDPC	1137.48	340.40 -1935.18	16.41

Days to 50% flowering (DFF), Days to maturity (DM), Plant height (PH), Panicle length (PL), Number of tillers per plant (NTP), Number of panicles per plant (NPP), Filled grains per panicle (FGP), Test weight (g.) (TW), Grain yield per plant (g.) (GYP), Percent disease intensity (PDI) and Area under disease progress curve (AUDPC), Coefficient of variation(CV%)

Table 5: Genetic parameters for various traits of rice under aerobic condition

S. No.	TRAITS	σ^2g	σ^2p	GCV	PCV	h^2(Broad sense)	GAM%
1	DFF	96.38	108.36	11.31	11.99	88.90	21.97
2	DM	99.61	122.34	8.61	9.54	81.40	16.01
3	PH (cm)	344.67	369.29	15.83	16.39	93.30	31.51
4	PL	3.58	4.35	8.51	9.39	82.10	15.89
5	NTP	2.35	2.55	15.27	15.92	92.04	30.18
6	NPP	1.65	1.75	17.72	18.23	94.50	35.49
7	FGP	65.49	74.97	11.57	12.38	87.36	22.28
8	TW	4.84	6.04	8.56	9.56	80.25	15.80
9	GYP	17.15	18.34	16.79	17.36	93.52	33.44
10	PDI	130.25	137.27	18.00	18.48	94.89	36.12
11	AUDPC	32336.17	34842.13	15.81	16.41	92.81	31.37

Days to 50% flowering (DFF), Days to maturity (DM), Plant height (PH), Panicle length (PL), Number of tillers per plant (NTP), Number of panicles per plant (NPP), Filled grains per panicle (FGP), Test weight (g.) (TW), Grain yield per plant (g.) (GYP), Percent disease intensity (PDI) and Area under disease progress curve (AUDPC), Genotypic coefficient of Variation (GCV), Phenotypic coefficient of Variation (PCV), Genotypic variance (σ^2g), Phenotypic variance(σ^2p),Broad sense heritablity h^2(Broad sense), Genetic advance as per cent of mean (GAM%)

Table 6: Response of rice genotype towards brown spots incidence based on mean AUDPC.

Mean AUDPC	RESPONSE	GENOTYPE NAME
0-200	Highly resistant	
201-400	Resistant	Satabdi , PS-4 ,Haryana Basmati, SKL6
401-600	Moderately resistant	Srabani, IR64, Sebati, Udyagiri , Khira, Sahabhagi Dhan, Bud110 ,CO-49,BR-72,CSR35, CSR27, Sughandh Dhan21 , JR353, Karanti, Kalanamak101 , Mandakini, Kutchigisim, R. NEELAM
601-800	Moderately susceptible	VLD16,IR72, Narendra-1, VLD221, SARSA, Tara, ASD14, Sasyashree, PS3 ,NDR-97, Jyati, Bvs1, Sarjo 52, DRR Dhan 39, GR 64 , Pantdhan-12, Pusa Sugandh-5, Karjat-7, Amker RAJSHREE
>801	Susceptible	Annada,Purnandu,Bhoi,BD-202, Sukhardhan,NCW11, Minil gisim, Golaka, Daya , Govinda, PR113, MILYANG46, Luna Sankhi, Radhi, Kalinga-3, ASD18, Varsa, Sarathi, GR103, Abhaya, Dandi, Khandagiri, Santhi, Vaisak, Pyari, Bhagyabati, Bardhan, Indrabans, Danteshwari, Red Triveni, RR-8588, VL Dhan61, VL Dhan209, Samyakhala, Rajendra Dhan 102, GNR 3, Varun Dhan, HPR2143, Himalaya2216, Himalaya1, CO48, Pantdhan4, Bhalum-3, Sanwal , Basmati, Pusa Sughandh-2, Pusa 834, JR 353, Saraswati, GAR -13, GR 12, GR 11, GR 7, GR4, GAR 2, Palghar2, Ratnagiri 1, Ratnagiri4, Ratnagiri711, SYE1, Badami, Jyotimayee, Pantdhan19, Kasalath, Rhyllo White, Dullo, Kuki, IRCTN-91-5, IRCTN-11-94, Nami, HR5829-73-3-23, Zielum, RCPL-1-9C, Channapaddy, RCPL-1-5C, IRI386, RCPL-1-13C, Nonglwai, K-393-29-1, IRCTN-91-78, Khamong, Kala Jira Jaha, Raga- Binni ,Gopalbhok, Hatibandha, Mima, Jahagipok, Taramon, Maigothi, Jahagisim, Kuhusoi-ri-sareku, Vinhatsa, Ngobanyo Red Clover, Teviirii, Dzuluore, Kelhrie Cha, Nedu, Pora Meunya, Hazor Kecho, Saponyo, Rosho, Sirarakhong Meryon M, Sirarakhong Ashangn, Ringui Maa, Teinem Ruisheng Maa, Sirarakhong Manui, Kongkoi, Arunachal Pradesh-1, Taker AM, Sakha, Ayaar, PANKAJ