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 screening these varieties for 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 ~~under~~ studied. Based on the mean performance, 14 genotypes out of 150 genotypes were ~~found~~ significantly superior~~ity over~~ to the best check, Rajendra Neelam, for ~~the~~ three traits *viz*., grain yield/ plant, PDI and AUDPC, which ~~is~~ are considered ~~as utmost importance~~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 ~~were found displaying the~~ significantly exhibited high mean for majority of the traits under study. ~~-~~Based on the AUDPC values, ~~four~~ genotypes ~~*viz*.,~~ Satabdi, PS-4, Haryana Basmati~~,~~ and SKL6 were ~~found~~ resistant for brown spot incidence. For most of the traits studied, moderate to low value of PCV and GCV was recorded. Higher magnitude of broad sense heritability ~~(broad sense)~~ and 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. All the 153 genotypes (including checks) were grouped into 17 clusters using D^2 statistics. The maximum inter cluster distance was chronicled ~~among~~ between clusters VII and ~~cluster~~ XVI. Cluster XVI holds the desirable mean value for the traits like the highest mean value for the number of tillers per plant (18.66) and grain yield per plant (??) and the lowest mean value for the PDI (??) and AUDPC (??)~~which are~~ necessary ~~to develop the varieties required~~for the genetic improvement of the crop for ~~the~~ resistance ~~from the~~to brown spot disease.

Keywords: ~~-~~ AUDPC, PDI, GCV, PCV, Heritability, Selection

Introduction

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

For ~~O~~over centuries, rice production has been largely dependent on the irrigated lowland rice system, but in present ~~day scenario~~ties, the sustainability of rice production in the lowland areas is under ~~menace by~~threat due to water shortage, water contamination and competition for water use (Ref??). ~~Hence due to~~This impeding water crisis and water exhaustive nature of the rice farming drives the need to search ~~an~~ for alternative approach(es) that increase~~s~~ the water productivity of rice. ~~Thus, one such forthcoming~~One of the potential approaches ~~of~~ that contributes to increased rice ~~cultivation~~ productivity is the aerobic rice cultivation. ~~which~~ This technique reduces the water demand in rice production and increases the water use efficiency (Ref??). Experiments on aerobic rice has shown that

Comment [p1]: Needs to be well written to reflect the objective of the study, methods, key findings and conclusions. Abbreviations need to be written in full e.g. Phenotypic coefficient of variation (PCV)

Comment [p2]: Inconsistent font sizes used.

Comment [p3]: I suggest the following keywords: genetic parameter estimates, AUDPC, brown leaf spot, PDI, rice

Comment [p4]: Materials need to be well organised for smooth flow of related ideas in paragraphs. Large portion of information in the introduction are not referenced. The introduction lacks the objective of the study.

water requirement in aerobic rice were 50% lower (470-650 mm) and water productivity were 64-88% higher than lowland rice (1). 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 pests and diseases. Rice experiences a few infections among them, a couple of them happen in epiphytotic form in various parts of India and cause 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 (Ref??).

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 (Ref??). 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 approx.imately 90% ~~when it adopts the epiphytotic form~~ as ~~it was seen~~reported in the great Bengal famine incidence during the year of 1942 (Ref??). The pathogen infects the crop from seedling to milk stage but the infection is most critical ~~during~~ from the tillering ~~stage up~~to the maturation stages of crop.

Although ~~there are~~ several fungicide treatments are available for brown spot management, ~~but~~ the ~~use of the~~ host-plant resistance treatment is ~~most~~ cheapest and most feasible means of practice for the management of ~~brown spot~~the disease. ~~Likewise, t~~The utilization of fungicides is considered as the less promising option for controlling the disease in future ~~because of~~due to the restrictions on its use ~~due~~ to tackle ~~the~~ its harmfulness ~~of its~~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. Th~~erefore, there is endless need for~~us, breeders often engage on routine screening ~~and~~ for identifi~~c~~ation and selection of~~eation 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. The experimental material used in this study included 150 rice genotypes along with the 3 check varieties ~~named~~ (Rajshree, Pankaj and R. Neelam). 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

Comment [p5]: Please rewrite for clarity and brevity.

Comment [p6]: Needs major revision.

Comment [p7]: The source, status, collection sites, pedigree, etc. (Are there any passport information on these varieties?)
The varieties were evaluated under natural condition with no disease infector rows.
This section lacks information on the climate parameters such as temperature, rainfall, relative humidity, etc that can guide the disease spread, germination, development and infectivity.

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 table 1. 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 ithdate
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

Comment [p8]: Check referencing style...

Comment [p9]: Check referencing style...
Formatted: Highlight
Formatted: Highlight

Comment [p10]: How do we distinguish these sets of host response to the disease infection? For instance, 1-5% is resistant.
Disaggregating this range into 1-3% and 4-5% speaks of the same resistance, etc.
Formatted: Highlight
Formatted: Font: (Default) Times New Roman, 12 pt, Not Bold, Font color: Auto, English (United States), Highlight
Formatted: Highlight
Formatted: Font: (Default) Times New Roman, 12 pt, English (United States),
Formatted: Highlight
Formatted: Font: (Default) Times New Roman, 12 pt, English (United States),
Formatted: Highlight
Formatted: Font: (Default) Times New Roman, 12 pt, English (United States),
Formatted: Highlight
Formatted: Font: (Default) Times New Roman, 12 pt, English (United States),
Formatted: Highlight
Formatted: Font: (Default) Times New Roman, 12 pt, English (United States), Highlight

The ANOVA for eleven quantitative attributes including grain yield for rice genotypes taken into consideration has been performed and displayed in ~~the~~ 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.* (2), Sameera *et al.* (3), Dariush *et al*. (4) 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 purview for the selection of desirable cultivar by the plant breeders for imminent crop improvisation program in rice. An evaluation of heritable segments of the total variability is imperative in espousing any appropriate breeding ?. Genetic variability parameters for all the attributes investigated are ~~tabularized under the~~presented in table 5. ~~The variability studies~~Findings indicated that the PCV estimates ~~was~~ were slightly higher than the corresponding GCV for all the ~~characters studied~~traits, signifying that these characters were under a lesser environmental influence. ~~The~~ Both PCV and GCV exhibited ~~values was perceived a moderate value for most of the traits under study viz.,~~ 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 ~~likewise chronicled~~also found by Dhanwani *et al*. (5), Singh *et al.* (6), Behera *et al.* (7). The Low ~~estimates of~~ PCV and GCV values ~~were~~ observed for ~~the traits like~~ days to maturity, panicle length, and test weight in the present study are consistent with ~~. Comparable findings were likewise chronicled~~those obtained by Lahari *et al.* (13) for days to maturity, panicle length, and test weight. However, Karim *et al.* (8), Thomas *et al.* (9) and Dhurai *et al.* (10) only had low PCV and GCV values for days to maturity~~;~~, whereas Singh *et al.* (11), ~~Padmaja *et al.*,~~and Prajapati *et al.* (12) ~~for~~ found low PCV and GCV values for panicle length~~; .Lahari *et al.* (13) for days to maturity, panicle length, and test weight.~~ 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

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

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 ~~(broad sense)~~ 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.* ~~–~~(14) and Zewdu *et al*. (15) for PDI and AUDPC; Dhurai *et al.* and Sameera *et al*. 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.

~~Hence, it can be interpret~~Findings implied that ~~the traits like~~ 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 ~~the best~~key traits w~~hich possess~~ith reasonable genetic variability ~~amidst~~ in the studied genotypes and higher response to selection for the breeding varieties for brown spot resistance.

Genetic divergence

The distribution pattern of the rice cultivars, cluster mean of the traits, intra-cluster, and inter-cluster divergence (D^2) and contribution percentage of traits towards genetic divergence ~~were structured within the~~are presented in Tables 6, 7, 8, and 9. Accordingly, the D^2 analysis ~~conducted in the present investigation has~~ grouped the 153 rice genotypes into seventeen clusters~~., reflecting~~ indicating the presence of the greater amount of heterogeneity among the genotypes used in the present investigation. Comparable clustering pattern premised on the D^2 Mahalanobis was chronicled by Chauhan and Singh (16), Sankar *et al*. (17), Banumathy *et al*. (18). The maximum inter cluster distance was chronicled among cluster VII and cluster XVI, subsequently followed by cluster III and XVI, cluster XIV and cluster XVI inferring that the crossing of the genotypes grouped within these clusters would be useful in procuring the heterotic combination and transgressive segregants. Cluster XVI holds the desirable mean value for the traits like the highest mean value for the number of tillers per plant (18.66) and grain yield per plant and the lowest mean value for the PDI and AUDPC which are necessary to develop the varieties required for the resistance from the brown spot. Towards the genetic divergence, the maximum percentage contribution was ~~attributed~~ by PDI ~~subsequently~~ followed by filled grains per panicle, number of tillers per plant, and AUDPC, suggesting that the selection of desirable genotypes may be beneficial for the further use in the breeding programme.

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 10.

The genetic implications of findings to the breeders have not been well discussed. Moreover, the manuscript lacks logical conclusions. What is the take home message?

It lacks acknowledgement, funding information and declaration of interest.

Comment [p11]: Incomplete reference

Formatted: Highlight

Formatted: Highlight

Comment [p12]: This word is being overused.

Formatted: Highlight

References

Comment [p13]: Please check both your in-text and list of references. All should be done strictly in accordance to the journal style.

1. 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.
2. 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.
3. 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.
4. 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.
5. 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.
6. 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.
7. 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.
8. 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.
9. Thomas, N., & Lal, G. M. (2012). Genetic divergence in rice genotypes under irrigated conditions. *Annals of Plant and Soil Research*, *14*(2), 109-112.
10. 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.
11. 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).
12. 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.
13. Lahari, G. (2017). *Assessment of Genetic Diversity of Rice Genotypes for Submergence Tolerance in Rainfed Lowlands* (Doctoral dissertation, University of Agricultural & Horticultural Sciences, Shivamogga).
14. 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.
15. 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.
16. Chauhan, J.S. and Singh, K.H. (2003) Genetic divergence analysis using quality traits in upland rice. *Annals of Agricultural research*. 24(3),673-675.

17. Sankar, P.D., Ibrahim S.M. Vivekanandan, P., Anbumalarmathi, J. and Sheeba, A. (2005). Genetic divergence in rice. Crop Research Hisar. 30(3),428-431.
18. Banumathy, S., Manimaran, R., Sheeba, A., Manivannan, N., Ramya, B., Kumar, D., & Ramasubramanian, G. V. (2010). Genetic diversity analysis of rice germplasm lines for yield attributing traits. *Electronic Journal of Plant Breeding*, 1(4), 500-504.

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

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)

Comment [p14]: The tables should be explicit. All abbreviations should be written in full below the table

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

Cont….

Comment [p15]: The tables should be explicit. All abbreviations should be written in full below the table

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

Cont…

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

Cont….

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…

Comment [p16]: The tables should be explicit. All abbreviations should be written in full below the table

Formatted: Highlight

Formatted: English (United States), Highlight

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

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

Serial ~~.NO.~~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

Comment [p17]: The tables should be explicit. All abbreviations should be written in full below the table

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

Comment [p18]: The tables should be explicit. All abbreviations should be written in full below the table

Table 6: Assignment of 153 rice genotypes into seventeen clusters as per the D^2 statistics

Cluster No.	No. of genotype within the cluster	Name of genotype
I	62	Red Triveni, Samyakhala, Rhyllo White, Gopalbhok, Sakha, K-393-29-1, Danteshwari, Radhi, HR5829-73-3-23, Pora Meunya, IR-1386, Bhagyabati, RCPL-1-13C, Rosho,teviirii,mima, MILYANG46, Ratnagiri 1, Palghar2, Nonglwai, GR 7, Golaka, IRCTN-91-5, GR 11, Bhalum-3, Dullo, IRCTN-11-94, Bardhan, Ratnagiri4, Himalaya2216, Khandagiri, Badami, Dandi, Pusa Sughandh-2, GR103, Daya, GR4, Pusa 834, GNR 3, Kuhusoi-ri-sareku, CO48, Vinhatsa, Teinem Ruisheng Maa, VL Dhan209, Channapaddy, Saraswati, Pantdhan4, Ringui Maa, GAR 2, Khamong, RR-8588, Nami, JR 353, Vaisak, RCPL-1-5C, Kalinga-3, HPR2143, Santhi, Rajendra Dhan 102, VL Dhan61, Saponyo, Maigothi
II	34	DRR Dhan 39, Amker, SARSA, Narendra-1, Karjat-7, IR64, Srabani, ASD14, IR72, Pantdhan-12, BUD110, Tara, BR -72, Udyagiri, CO-49, Sahabhagi Dhan, CSR35, Pusa Sughandh -5, Sarju 52, PS3, Karanti, CSR27, PS-4, Sasyashree, Vld16, Jyati, Sukhardhan, JR503, Sebati, Satabdi, NDR-97, SKL6, Purnandu, Kutchigisim
III	1	Abhaya
IV	23	Zielum, Arunachal Pradesh-1,Varsa, RCPL-1-9C, Nedu, Hatibandha, BD-202, NCW11, Indrabans, Dzuluore, Raga- Binni (Sticky Rice), GR 12, Taramon, Hazor Kecho, Kelhrie Cha,varun Dhan, Pyari, Kongkoi, Taker AM, Ngobanyo Red Clover,sarathi, PR113, Luna Sankhi
V	1	Sirarakhong meryon maa
VI	6	Pant sughandh dhan21, Kalanamak101 ,Haryana Basmati, GR 64, R. NEELAM, BVS1
VII	1	Sirarakhong manui
VIII	16	Annada, Bhoi,Govinda, SYE1, Kuki, Jahagisim, Sirarakhong Ashangn Maa, MINIL GISIM, Sanwal Basmati, PANKAJ, Ratnagiri711, Himalaya1, Pantdhan19, Kasalath, Jyotimayee, IRCTN-91-78
IX	1	ASD18
X	1	Jahagipok
XI	1	Mandakini
XII	1	VLD221
XIII	1	GAR -13
XIV	1	Kala jira jaha
XV	1	RAJSHREE
XVI	1	Khira
XVII	1	Ayaar

Table 7: Cluster mean of seventeen clusters for different quantitative traits of rice

Cluster no	DFF	DM	PH (cm)	PL (cm)	NTP	NPP	FGP	TW (g)	GYP	PDI	AUDPC
I	85.16	114.53	122.3	22.44	9.21	6.88	68.93	24.98	20.67	79.46	1386.65
II	85.62	113.65	102.53	21.63	10.17	7.47	64.53	28.32	33.99	28.64	584.49
III	65	96	103.2	20.4	6.33	6	49.66	24.24	20.19	89.35	1570.14
IV	88.74	118.78	121.43	22.4	11.98	8.3	85.94	27.22	22.64	73.83	1293.66
V	91	121	159	24.8	6.66	6	59	25	25.32	62.96	1125.38
VI	94.17	122.33	113.63	21.87	8.66	6.33	84.89	17.94	32.75	26.58	517.33
VII	89	123	157.4	26	7.66	5.66	76.33	31.4	14.39	85.19	1660.98
VIII	86.63	115.5	116.43	22.36	9.27	6.18	53.85	22.76	21.65	74.59	1342.09
IX	105	132	125.8	22.4	8	6.33	143	18.36	20.29	78.23	1410.39
X	90	121	136.2	22.8	18	10	48.66	20.3	19.21	85.19	1460.23
XI	77	106	91	21.2	13.66	9.33	35.33	22.04	35.26	27.42	597.25
XII	82	111	121	22	13.33	12.66	70	31.8	29.56	33.45	702.52
XIII	96	130	116.8	23.2	17.66	12.66	92.33	24	21.2	75.23	1327.75
XIV	123	151	136.6	21	8	6.66	109	12.52	17.23	81.48	1504.08
XV	105	135	117.6	21.6	15	10.33	64	28.48	15.96	30.2	604.82
XVI	93	116	100.2	16.2	18.66	8	68	37.52	35.42	20.31	455.42
XVII	80	108	165.2	27	9	7.33	71	48.44	20.44	80.65	1438.91

Comment [p19]: The tables should be explicit. All abbreviations should be written in full below the table

Table 8: Average intra & inter-cluster distances among seventeen clusters of rice genotypes studied under aerobic condition

Cluster no	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII
I	70.90	351.94	104.65	133.17	106.30	419.43	116.21	134.33	268.63	232.87	454.12	401.60	311.17	195.72	375.20	635.54	235.32
II		80.10	502.66	316.13	254.40	154.26	575.04	376.75	556.49	490.62	125.66	163.58	439.74	539.63	218.45	207.36	560.74
III			0.00	251.22	173.71	604.18	146.65	152.03	428.90	357.21	589.52	611.08	534.53	334.16	615.04	900.00	294.81
IV				125.22	187.69	388.48	217.56	217.27	253.76	216.97	408.85	290.70	192.38	224.40	287.64	484.44	285.27
V					0.00	288.66	123.65	150.80	318.62	338.19	391.64	371.72	444.37	230.13	356.83	603.68	220.52
VI						134.33	641.10	448.59	451.56	619.01	250.27	304.15	539.17	443.52	317.55	369.41	749.12
VII							0.00	205.06	287.64	369.02	783.44	639.58	486.20	222.90	570.73	930.86	110.04
VIII								183.60	400.80	279.56	441.84	465.26	412.09	290.02	417.79	663.06	342.62
IX									0.00	575.52	834.63	637.56	417.79	67.40	610.58	882.09	511.66
X										0.00	383.77	341.88	121.00	399.60	262.12	536.39	468.29
XI											0.00	131.33	405.62	731.70	185.50	173.71	778.41
XII												0.00	205.06	612.56	102.01	182.52	541.96
XIII													0.00	362.14	206.78	431.39	526.70
XIV														0.00	509.40	882.68	509.86
XV															0.00	201.07	574.56
XVI																0.00	792.42
XVII																	0.00

Table 9: Contribution percentage of eleven traits towards divergence of rice genotypes

Source	Times ranked 1st	Contribution%
DFF	261	2.24%
DM	4	0.03%
PH(cm)	466	4.01%
PL (cm)	94	0.81%
NTP	1552	13.35%
NPP	1061	9.12%
FGP	1758	15.12%
TW	1100	9.46%
GYP(g)	296	2.55%
PDI	3931	33.81%
AUDPC	1105	9.50%

Comment [p20]: The tables should be explicit. All abbreviations should be written in full below the table

Table 10: 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