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Studies on Genetic Variability and Character Association in Rice (*Oryza Sativa L.*)

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Abstract

Thirty one rice genotypes, provided by Rice Breeding programme, Directorate of Research (SHIATS) Allahabad, during *kharif* 2011 at Sam Higginbottom Institute of Agricultural Technology and Sciences, Allahabad, U.P. The experiment was conducted in RBD having three replications. The data were recorded on thirteen characters to study the genetic variability, heritability, genetic advance and correlation coefficient of analysis. Based on the mean performance genotypes NDR-1133, UPR-3281-25-1-1 and UPR-3281 were found best for grain yield per hill. High to moderate estimates of GCV and PCV were exhibited by number of panicles per hill, number of tillers per hill, flag leaf length, plant height, biological yield per hill, test weight and grain yield per hill indicating that these traits could be useful in selection for crop improvement. High estimate of heritability were observed for number of spikelet per panicles, plant height, flag leaf length, day to 50% flowering, day to maturity, number of panicles per hill and test weight. High estimate heritability coupled with high genetic advance as exhibited characters with number of spikelet per panicle and plant height. Correlation studies revealed that grain per hill at genotypic and phenotypic level was positively significant correlated with harvest index, biological yield, spikelet per panicle.

Keywords: Quality Rice, Genetic variability, Heritability, Genetic advance and correlation coefficient.

Introduction:

Rice *(Oryza* sativa L.*)* a plant of Asian origin is among principal cereal crops of the world. 'Rice is life' was the theme of International year of rice 2004 denoting its overwhelming importance as an item of food and commerce Pandey **(1).** It is a most important stable food among the cereals, consumed by more than half of the world's population. It provides 27 percent of dietary energy supply and 20 percent of dietary protein intake in the developing world. Grown in at least 114 developing countries, rice is dominant crop in Asia, where it covers half of the arable land used for Agriculture in many countries. During 2012- 2013 rice production in India 104.40 million tons pocket book **(2)**. Estimation of genetic variability, heritability and genetic advance is necessary. Yield is a complex character being governed by a large number of cumulative, duplicative and dominant genes and highly influenced by environment. Selection is effective when there is significant amount of genetic variability among the individuals in a population Johan K (**3).** The use of correlation coefficient is to establish the extent of association between yield and yield component and other character, which are having decisive role in influencing the yield. However, it is only genetic variation which is heritable and hence important in any selection programme.

Materials and methods

A field experiment was conducted with thirty one rice genotypes during *kharif* 2011 at the field experimentation Center, Department of Genetics and Plant Breeding, Allahabad School of Agriculture, SHIATS, Allahabad. In randomized Block Design (RBD) with three replications. Twenty one days old seedling were transplanted with a spacing of 20 cm and 10 cm between rows and hills, respectively .Five representative hills for each genotypes in each replication were randomly selected to record the observation for thirteen quantitative traits *viz*., plant height,

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number of tillers per hills ,number of panicles per hill, flag leaf length, flag leaf width ,number of spikelet per panicles ,panicles length, biological yield per hill, harvest index and test weight and grain yield per hill days to fifty percent flowering, days to maturity were computed on plot basis. The mean data after computing for each character was subjected to standard method of analysis of variance following genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV). Heritability in board sense (h2), genetic advance as percent of mean and correlation coefficient analysis were estimated by the formula as suggested.

Results and discussion:

Analysis of variance revealed highly significant differences among the genotypes for all the characters, indicating presence of high variability among the rice genotypes. Thus, there is ample scope for selection of different quantitative characters for improvement of rice. The maximum genotypic and phenotypic variation were obtained for number of spikelet per panicle, plant height, flag leaf length ,days to fifty percent flowering, days to maturity, number of panicles per hill, number of tillers per hill, biological yield per hill, whereas, the moderate variation was observed for harvest index, test weight, panicle length. This indicated that low influence of environment. Low level of genotypic variance for grain yield per hill and flag leaf width is indicative of stable nature of these characters. Similar findings were reported by Navin Kumar **(4).** The Genotypic Coefficient of Variation provides a measure to compare genetic variability present in various quantitative characters. The highest value of Genotypic Coefficient of Variation was recorded for number of panicle per hill, number of tiller per hill and low estimate for flag leaf width. The higher value clearly indicated high degree of genotypic variability in these quantitative characters in rice genotype. Similar findings were reported by Vivek **(5).**

Heritability is a measure of extent of phenotypic variation caused by the action of genes. In the present study, high heritability was observed for traits *viz*., number of spikelet per panicles ,plant height ,flag leaf length, days to fifty percent flowering ,Whereas, flag leaf width was lowest heritability. High heritability of the above characters indicated that low influence of environment. High genetic advance only occurs due to additive gene action. High heritability coupled with genetic advance would be more useful than heritability alone. Estimate of genetic advance for different characters, it was observed for number of spikelet's per panicle, followed by plant height and flag leaf length. When both heritability and genetic advance are considered, as reported earlier by Kishor **(7)** for, number of spikelet's per panicle, plant height, flag leaf length, days to fifty percent flowering. The estimate of mean serve as a basis for eliminating the undesirable genotype, where as variability (GCV and PCV) helps to choose the potential. genotype. Heritability (h^2) along with genetic advance (GA) would be more useful tool in predicting the resultant effect from selection of best genotypes for yield of some of its component Suresh **(8).** Estimate of heritability and genetic advance will play an important role in exploiting further research projections of rice improvement. The Correlation coefficient was showed the positive significant of genotypic association with biological yield per hill, flag leaf width, flag leaf length, spikelet's per panicle and negative significant with plant height and panicle per hill. The positive significant was showed the phenotypic association with harvest index, biological yield, spikelet per panicles and negative association with test weight and panicle per hill.

Table.1 Estimation of Genetic parameters for thirteen quantitative characters in thirty one rice genotypes

Sr. No.	Characters	σ^2g	σ^2p	G CV	P CV	h^2 bs) %	GA	GA as % of mean
1	Days to 50% flowering	28.05	30.80	5.68	5.95	95.46	10.41	11.16
2	Plant height	140.32	149.37	9.93	10.24	96.97	23.65	19.82
3	Flag leaf length	35.90	38.74	14.99	15.57	96.27	11.88	29.72
4	Flag leaf width	0.00	0.01	3.46	7.65	45.22	0.05	3.23
5	No. of tillers per hill	14.84	16.34	17.86	18.74	95.30	7.56	35.06
6	No. of panicles per hill	15.77	17.74	20.67	21.92	94.29	7.71	40.14
7	Panicle length	2.58	3.18	6.02	6.68	90.11	2.98	11.17
8	No. of spikelet's per panicle	241.33	248.87	8.24	8.36	98.56	31.51	16.71
9	Days to maturity	23.60	26.49	4.02	4.26	94.36	9.44	7.82
10	Biological yield per plant	13.27	17.28	7.49	8.55	87.60	6.57	13.52
11	Harvest index	4.24	14.16	4.24	7.75	54.70	2.32	4.78
12	Test weight	2.84	3.33	7.41	8.03	92.27	3.20	14.08
13	Grain yield per plant	2.39	5.73	6.56	10.15	64.63	2.06	8.73

Conclusion

The phenotypic coefficient variation was higher than the genotypic coefficient of variation for all the characters under studied. The maximum genotypic coefficient of variation and phenotypic coefficient of variation was found in number of panicle per hill. The heritability estimated in narrow sense was high for almost all the traits. Maximum heritability was observed in number of spikelet per panicle followed by plant height. The maximum genetic advance was recorded number of spikelet per panicle followed by plant height. High heritability was coupled with genetic advance for the traits like number of spikelets per panicle and plant height.

The Correlation coefficient was showed the positive significant genotypic association with biological yield per hill, flag leaf width, flag leaf length and spikelet's per panicle and negative significant with plant height and panicle per hill. The positive significant showed the phenotypic association with harvest index, biological yield and spikelet per panicles and negative association with test weight and panicle per hill.

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