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Studies on Character Association, Path Analysis and Genetic Variability in Rice (*Oryza sativa*) Genotypes

S.K. Singh, Prudhvi Raj Vennela*, Rajesh Singh, Varsha Gayatonde and D.K. Singh

Department of Genetics and Plant Breeding, Institute of Agricultural Sciences, BHU, Varanasi-221005 U.P., India

**Corresponding author*

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A B S T R A C T

In the present investigation 50 rice genotypes were used to study character association, path analysis and variability. The studies of variance among 50 genotypes for ten characters revealed that the genotypes differed significantly for all the characters under study. PCV was recorded highest for plant height (22.93) followed by effective tillers/plant (21.60) and biomass per plant (18.35). Low magnitude of PCV was exhibited by harvest index (9.28) followed by 1000 grain weight (9.99) and days to maturity (10.16). GCV was also high for plant height (22.90) followed by biomass (16.96) and grain yield per plant (16.77). Whereas, low magnitude of GCV was exhibited by harvest index (6.99) followed by 1000 grain weight (9.52) and days to maturity (10.10). The highest heritability was found in days to 50% flowering, days to maturity and plant height (99%) followed by spikelet fertility (95%) and panicle length (93%). Lowest heritability was observed in effective tillers/plant (55%) followed by harvest index (56%). Genetic advance as percent of mean (5%) was realized highest for plant height (47.12) followed by biomass (32.29) and grain yield per plant (32.10). Lowest value was observed in harvest index (10.85) followed by 1000 grain weight (18.69) and days to maturity (20.70).

Introduction

Rice (*Oryza sativa* L.) is an important crop which belongs to genus *Oryza* of Poaceae family. There is evidence suggesting that rice was the first crop domesticated by humans in the Yangtze river basin as early as 13000 years ago (Lu *et al.*, 2002). The genus *Oryza* has twenty two wild and two cultivated species namely; *Oryza sativa* and *Oryza glaberrima*, all the germplasm found in Asia, America and Europe belongs to *Oryza sativa*, and while in West Africa belong to *Oryza glaberrima*. *Oryza sativa* is a cultivated diploid species having 24 chromosomes. The *sativa* rice is commonly divided into three sub-species *i.e. Indica, Japonica* and *Javanica.*

Presently rice is grown in more than 114 countries over 165.4 million ha area with the total annual production of 758.1 million tonnes (Ezuka and Kaku, 2000; FAO, 2017). India is the world's second largest producer of rice after China with a production of 210.10 million tonnes of rice on an area of 43.97

million hectares (mha) and with average productivity of 24.04 quintal per hectare (Directorate of Economics and Statistics, 2017). However, rice yield is growing at a pace of around 1% now, which means that global rice production by 2050 will grow by only 42% to around 705 million tons, says the study (http://www.oryza.com). The best alternative strategy to supplement this is to increase the productivity of rice by minimizing the impact of biotic and abiotic stresses which come in the way of rice production. Plant breeding is the most important tool for alleviating both biotic and Abiotic stresses. The foremost goal of plant breeders is to bridge the gap between food requirements and growing population, which requires the development of appropriate technologies for sustainable agriculture productivity (Madhavilatha, 2007).

Genetic variability for agronomic traits is the key component of breeding programs for broadening the gene pool of rice and would require reliable estimates of heritability in order to plan an efficient breeding program (Akinwale *et al.,* 2011). Yield component breeding to increase grain yield would be most effective, if the components involved are highly heritable and genetically independent or positively correlated with grain yield. However, it is very difficult to judge whether observed variability is highly heritable or not. Moreover, knowledge of heritability is essential for selection based improvement as it indicates the extent of transmissibility of a character into future generations (Sabesan *et al.,* 2009). The advantage of path analysis is that it permits the partitioning of the correlation coefficient into its components, one component being the path coefficient that measures the direct effect of a predictor variable upon its response variable; the second component being the indirect effect(s) of a predictor variable on the response variable through another predictor variable.

Materials and Methods

The present investigation was carried out at the Agricultural Research Farm, Banaras Hindu University, Varanasi, (India) during the kharif 2015 cropping season. Experimental material consisting of 50 rice genotypes (Table 1) was grown in three rows of 3.0 m with three replications in RBD with spacing of 20 x 15 cm^2. Recommended agronomic practices were followed to raise a good crop. Observations were recorded on five randomly selected plants for estimation of mean with respect to ten quantitative traits *viz.,* days to flowering (DF), days to maturity (DTM), plant height (PH) (cm), effective tillers/plant (ETP), panicle length (PL) (cm), spikelet fertility (SF) (%), 1000- grain weight (g), grain yield plant/ plant (GYP) (g), biomass and harvest index (HI).

The analysis of variance was done as suggested by Panse and Sukhatme (1967). Genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV) and heritability were estimated by formula suggested by Burton (1952). Genetic advance (GA) was calculated by the method suggested by Johnson *et al.,* (1955). The genotypic and phenotypic correlation coefficients were worked out by adopting method described by Singh and Chaudhary (1977). Path coefficient analysis was done according to the procedure suggested by Dewey and Lu (1959). The data was analyzed by Windostat *version 9.2* with indostat services.

Results and Discussion

The analysis of 10 traits was carried out to partition the total variation into genotypic variation and variation due to other sources. Analysis of variance was based on the mean values of ten quantitative traits in 50 rice genotypes. The ANOVA of ten traits is presented in Table 2.

Analysis of mean performance and range

Mean of replication is calculated by taking the average of five randomly selected plants of each genotype. Similarly mean of the other two replications were also considered and a final mean was calculated from these three data. The mean performance and range of all the characters under study among 50 genotypes are presented in Table 3.

Days to 50% flowering

Days to 50% flowering ranged from 78 to 120 days. The average mean for this trait was 94 days. The early flowering was seen in genotype NDR-97 (78 days) while genotypes GR-32 & ADAMCHINI (120 days) exhibited late days to 50% flowering followed by MTU-7029 (116 days).

Days to maturity

Days to maturity varied from 106 to 150 days with a mean value of 121 days. The highest days to maturity was observed in genotype ADAMCHINI (150 days) followed by MTU-7029 (147 days). While, lowest in genotypes NDR 97 and URG-8 (106 days) followed by URG 5(107 days).

Plant height

Plant height ranged from 79.87 cm to 199.39 cm with a mean value of 110.59 cm. Among all genotypes URG-1 (79.87) was the shortest followed by URG-8 (85.26) whereas, KHUTADHAN (199.39) was having highest plant height followed by GR 32 (169.41).

Number of effective tillers per plant

The mean values of genotypes ranged from 4 to 8 with a general mean of 6. The highest number of effective tillers per plant was observed in genotypes MTU-1010, MTU 7029, RAJENDRA KASTHURI, HUR 917 and IET-22202 (8 No.) whereas lowest value was registered in three genotypes i.e. URG-41 and URG-1(4 No.).

Spikelet fertility%

Spikelet fertility % ranged from 61.0% to 89.0%. The average spikelet fertility was observed 77.10%. The highest spikelet fertility % was recorded in DANTESHWARI and HUR 2-1 (89.0%) and lowest value was found in URG 30 (61.0%) followed by ANJALI (62.0%).

Panicle length (cm)

Panicle length ranged from 19.40 cm to 35.10 cm with a mean value of 26.00 cm.

The longest panicle length was observed in GR 32 (35.10 cm) followed by AKSHYADHAN (31.58 cm), while the shortest panicle was found in genotype R-RHZ-7 (19.40 cm) followed by BD-105 (21.28 cm).

1000-grain weight (g)

This value ranged from 16.05 to 26.90 (g). The highest mean value for 1000 grain weight was registered in genotype BARANIDEEP (26.90 g) followed by IET-22202 (25.75 g), whereas lowest grain weight was observed in genotype ADAMCHINI (16.05 g). The mean of 1000-grain weight was 23.43 g.

Grain yield per plant (g)

Data for Grain yield per plant ranged from 10.74 g to 24.63 g. Highest grain yield was observed in genotype MTU-7029 (24.63 g) followed by IR 64 (23.51 g) whereas lowest grain yield was observed in genotype BG 102 (10.74 g). The average mean for this trait was 17.93g.

Table.1 List of genotypes selected for D^2 analysis

S. No.	Genotype	S. No.	Genotype
1	MTU-1010	26	GR-32
2	SAHBHAGIDHAN	27	HUR 917
3	NDR-97	28	IET-22202
4	NDR-359	29	URG-5
5	SARJU-52	30	URG-42
6	HUR-105	31	URG-1
7	HUR-3022	32	URG-30
8	BPT-5204	33	URG-8
9	MTU-7029	34	URG-19
10	VANDANA	35	URG-22
11	ANJALI	36	BG-102
12	TARORI BASMATI	37	ADAMCHINI
13	N-22	38	PANTDHAN-12
14	HUBR 10-9	39	IET-22225
15	DANTESHWARI	40	IET-20556
16	SUSKSAMARAT	41	IR-36
17	BARANIDEEP	42	IR-64
18	VARDHAN	43	URG-3
19	TYPE-3	44	URG-24
20	RAJENDRA KASTHURI	45	BD-105
21	KARHANI	46	HUR 5-2
22	KHUTADHAN	47	CGZR-1
23	PANTDHAN-4	48	R-RHZ-7
24	AKASHYADHAN	49	NDR-2104
25	HUR 2-1	50	NDR-2064

Table.2 ANOVA of all the traits - Genetic Parameters (Summary)

	DF	DTM	PH (cm)	ET/ P	SF (%)	PL (cm)	1000GW (g)	GY/ Plant (g)	Biomass (g)	HI (%)
Var. Environmental	0.913	1.664	1.734	0.742	3.302	0.71	0.461	1.44	6.77	8.559
ECV	1.021	1.066	1.191	14.373	2.357	3.24	3.026	6.692	7.017	6.103
Var. Genotypical	127.351	149.604	641.712	0.934	65.203	9.709	4.559	9.052	39.578	11.233
GCV	12.065	10.107	22.906	16.125	10.474	11.984	9.522	16.777	16.965	6.992
Var. Phenotypical	128.264	151.268	643.446	1.676	68.505	10.419	5.02	10.492	46.348	19.792
PCV	12.108	10.163	22.937	21.601	10.736	12.414	9.991	18.062	18.359	9.281
h^2 (Broad Sense)	0.993	0.989	0.997	0.557	0.952	0.932	0.908	0.863	0.854	0.568
Genetic Advancement 5%	23.164	25.057	52.114	1.486	16.228	6.196	4.192	5.757	11.976	5.201
Genetic Advancement 1%	29.686	32.112	66.786	1.905	20.798	7.941	5.372	7.378	15.348	6.666
Gen.Adv as % of Mean 5%	24.766	20.706	47.123	24.798	21.05	23.831	18.694	32.1	32.295	10.851
Gen.Adv as % of Mean 1%	31.739	26.536	60.391	31.779	26.977	30.541	23.957	41.138	41.388	13.907
General Mean	93.533	121.013	110.591	5.993	77.093	26.002	22.425	17.934	37.082	47.933
Exp Mean next Generation	116.698	146.071	162.704	7.48	93.322	32.198	26.617	23.691	49.058	53.135

Table.3 Mean performance of different genotypes for different traits

S. No.	Genotypes	DF	DTM	PH (cm)	ET/ P	SF (%)	PL (cm)	1000 GW(g)	GY/ Plant (g)	Biomass (g)	HI (%)
1	MTU-1010	92	118	98.22	8	87.0	25.52	22.07	22.23	39.44	52.33
2	SAHBHAGIDHAN	86	111	98.48	6	76.0	27.35	24.70	17.37	36.88	47.00
3	NDR-97	78	106	83.16	5	72.0	24.58	22.00	16.39	35.52	46.33
4	NDR-359	98	125	98.56	6	70.0	28.70	24.30	19.30	43.13	45.00
5	SARJU-52	100	126	104.38	6	88.0	29.62	24.03	21.82	43.90	49.67
6	HUR-105	103	129	95.94	7	81.0	23.88	23.61	23.15	44.60	52.00
7	HUR-3022	90	127	104.28	7	83.0	29.61	21.77	19.33	36.76	52.67
8	BPT-5204	114	144	85.33	7	84.0	21.76	22.87	22.43	44.80	50.33
9	MTU-7029	116	147	90.77	8	83.3	22.77	24.27	24.63	48.58	51.00
10	VANDANA	86	111	106.48	6	67.0	23.02	23.17	15.61	28.16	52.67
11	ANJALI	80	106	111.38	6	62.0	26.90	24.27	16.00	28.43	53.33
12	TARAWARI BASMATI	109	137	167.30	5	73.0	27.83	22.20	16.85	40.59	41.33
13	N-22	83	110	107.40	5	71.0	22.64	19.87	15.27	28.71	53.33
14	HUBR 10-9	97	125	121.27	6	84.0	27.00	23.00	17.84	32.98	51.33
15	DANTESHWARI	85	111	85.26	5	89.0	27.65	24.83	16.79	29.40	50.00
16	SUSKSAMARAT	95	122	103.78	5	87.0	27.18	25.70	16.90	29.97	52.33
17	BARANIDEEP	102	128	103.54	6	72.0	28.74	26.90	20.07	40.41	49.67
18	VARDHAN	86	108	117.23	6	85.0	25.00	21.43	15.35	31.14	49.00
19	TYPE-3	94	117	143.40	6	73.0	28.41	23.93	20.76	49.36	41.67
20	RAJENDRA KASTHURI	107	135	107.30	8	84.7	22.07	21.43	19.55	40.37	48.33
21	KARHANI	83	121	112.93	5	79.0	21.43	22.81	14.67	31.09	47.00
22	KHUTADHAN	103	134	199.39	5	75.0	28.67	22.42	16.86	38.35	44.00
23	PANTDHAN-4	94	122	108.43	6	78.0	29.00	21.49	18.03	37.84	47.67
24	AKASHYADHAN	97	123	111.70	5	80.7	31.58	25.15	22.30	45.83	48.67
25	HUR 2-1	97	139	92.50	5	89.0	24.77	22.37	16.90	35.14	48.00
26	GR-32	120	145	169.41	7	84.0	35.10	17.79	17.89	37.69	45.00
27	HUR 917	114	139	93.77	8	88.0	22.00	20.67	19.41	37.72	51.67
28	IET-22202	79	108	113.95	8	79.0	30.73	25.75	20.70	42.92	48.33
29	URG-5	80	107	89.10	6	64.0	26.45	22.77	15.54	29.71	52.33
30	URG-42	96	122	100.96	5	61.0	25.84	20.80	16.80	37.19	45.00
31	URG-1	85	111	79.87	4	79.0	24.74	20.37	12.13	26.43	45.67
32	URG-30	82	110	101.70	4	64.0	21.56	20.33	11.93	25.95	46.00
33	URG-8	79	106	81.63	5	61.0	22.42	22.17	12.87	26.92	47.67
34	URG-19	82	109	134.35	6	79.0	28.32	24.10	18.25	38.97	47.00
35	URG-22	85	110	141.78	5	72.0	26.68	21.07	20.28	43.11	47.33
36	BG-102	85	109	124.35	5	67.0	25.63	24.50	10.74	23.38	46.00
37	ADAMCHINI	120	150	159.40	6	84.0	24.90	16.05	13.86	30.97	44.67
38	PANTDHAN-12	92	117	99.86	7	81.0	30.65	25.15	17.56	37.83	46.33
39	IET-22225	94	123	108.93	6	76.0	25.20	23.70	16.69	34.88	47.67
40	IET-20556	99	127	135.37	6	78.0	28.80	22.63	17.35	35.71	48.33
41	IR-36	92	119	92.61	6	71.0	25.42	25.65	21.37	44.97	47.67
42	IR-64	91	118	90.79	7	77.0	25.79	22.25	23.51	47.01	50.00
43	URG-3	80	108	87.34	5	64.0	24.82	20.10	16.03	35.39	45.33
44	URG-24	82	108	150.97	5	75.0	26.10	19.87	18.64	43.73	42.67
45	BD-105	85	111	93.72	8	85.0	21.28	21.93	17.71	30.99	48.33
46	HUR 5-2	95	122	94.17	7	74.0	28.17	22.30	20.14	38.32	52.33
47	CGZR-1	84	112	103.00	7	87.0	21.47	20.65	19.50	37.31	53.00
48	R-RHZ-7	107	139	88.00	5	86.0	19.40	18.28	14.63	42.31	34.67

49	NDR-2104	96	119	104.43	6	79.0	25.47	20.39	16.50	40.60	41.33
50	NDR-2064	98	120	131.67	5	66.0	27.47	21.42	20.29	42.71	47.67
	Mean	**94**	**121**	**110.59**	**6**	**77.1**	**26.00**	**22.43**	**17.93**	**37.08**	**47.93**
	C.V. (%)	1.0213	1.066	1.1908	14.37	2.357	3.2399	3.0263	6.6916	7.0168	6.1034
	S.E.	0.5515	0.7448	0.7603	0.497	1.0491	0.4864	0.3918	0.6929	1.5023	1.6891
	C.D. 5%	1.5478	2.0903	2.1338	1.396	2.9443	1.365	1.0996	1.9445	4.216	4.7403
	C.D. 1%	2.0489	2.767	2.8246	1.848	3.8975	1.8069	1.4556	2.574	5.5809	6.2749
	Range Lowest	78	106	79.87	4	61.0	19.40	16.05	10.74	23.38	34.67
	Range Highest	120	150	199.39	8	89.0	35.10	26.90	24.63	49.36	53.33

Plant biomass (g)

The value for biomass varied from 23.38 g to 49.36 g. The highest biomass was registered in genotype TYPE 3 (49.36 g) and lowest was BG-102 (23.38 g). The mean for this trait was value with 37.08 (g).

Harvest index %

The value for HI was ranged from 34.67% to 53.33%. The highest harvest index was registered in genotype ANJALI (53.33%) and lowest was in R-RHZ 7 (34.67%). The mean for this trait was value with 47.93%.

Genetic variability and heritability and genetic advance parameters

The results pertaining to phenotypic coefficient of variation (PCV), genotypic coefficient of variation (GCV), heritability (broad sense) and genetic advance expressed as percent of mean for all the characters under study are presented in Table 3.

Phenotypic and genotypic coefficient of variation

The ANOVA presented in Table 2 revealed considerable variations over the traits under study exhibiting a wide range of phenotypic as well as genotypic coefficient of variation. In general, the values of phenotypic coefficient of variance were higher than those of genotypic coefficient of variance. The relative magnitudes of the phenotypic as well as genotypic variances between the traits were compared based on the phenotypic and genotypic coefficient of variation. PCV was recorded highest for plant height (22.93) followed by effective tillers/plant (21.60) and biomass per plant (18.35). Low magnitude of PCV was exhibited by harvest index (9.28) followed by 1000 grain weight (9.99) and days to maturity (10.16).

Rest other traits exhibited medium values of PCV. Similarly, GCV was also high for plant height (22.90) followed by biomass (16.96) and grain yield per plant (16.77). Whereas, low magnitude of GCV was exhibited by harvest index (6.99) followed by 1000 grain weight (9.52) and days to maturity (10.10).

The differences between the values of PCV and GCV were small for almost all the traits indicating less influence of environment in expression of these traits. However, the differences was comparatively greater in case of harvest index (2.29) followed by biomass (1.39).

Heritability

In the present study, heritability (broad sense) ranged from 55% to 99%. The highest heritability was found in days to 50% flowering, days to maturity and plant height (99%) followed by spikelet fertility (95%) and panicle length (93%). Lowest heritability was observed in effective tillers/plant (55%) followed by harvest index (56%). Other traits showed intermediate heritability.

Genetic advance

Genetic advance as percent of mean (5%) was realized highest for plant height (47.12) followed by biomass (32.29) and grain yield per plant (32.10). Lowest value was observed in harvest index (10.85) followed by 1000 grain weight (18.69) and days to maturity (20.70).

The studies of variance among 50 genotypes for ten characters revealed that the genotypes differed significantly for all the characters which suggested that the materials selected for the studies might be of diverse origin. Several workers have reported the presence of variability in and amongst the genotypes of rice for different traits. These findings are in accordance with the findings of Shobha *et al.,* (2001), Yadav (2002) and Paikhomba *et al.,*(2014).The early flowering and maturity was seen in three genotypes namely NDR-97, IET-22202, URG-8 and N-22 while genotypes Adamchini and Swarna exhibited late flowering and maturity suggesting that short duration genotypes like NDR-97, IET-22202, URG-8 and N-22 can be used for evolving early maturity or short duration rice suitable for rainfed areas. Several workers Viraktamath (1987) also reported positive as well as negative value for earliness in rice genotypes. The negative significant value for plant height is desirable because dwarf plant stature is essential to develop semi-dwarf high yielding varieties which are believed to be lodging resistant. The highest mean performance for plant height was observed in genotype Khutadhan and lowest in URG-8. Similar observations for plant height were also reported by Mitra (1962), Srivastava and Seshu (1982), and Singh *et al.,* (2015) in rice. Higher number of tillers per plant contributes to higher grain yield. Genotype Swarna, MTU-1010, HUR 917 and Rajendra Kasthuri had highest mean performance for effective tillers and lowest mean performance for effective tillers in genotype URG-1 and URG-14. Genotypes GR-32 and Akshyadhan had highest mean performance for panicle length and lowest in genotype R-RHZ-7 and BD-105. Highest Spikelets fertility % was observed in genotype Dantheshwari and HUR-2-1. The highest 1000 grain weight was registered in genotype Baranideep. Grain yield per plant in positive direction is desirable as higher grain yield is the main objective for almost all the breeding programmes. Highest grain yield per plant was observed in genotype Swarna (MTU-7029) whereas lowest grain yield was observed in genotype BD-102. Many workers Roy *et al.,* (2009), Priyanka *et al.,* (2014) and Venkanna *et al.,* (2014) have reported significant positive as well as negative heterosis for grain yield per plant in rice. The highest biomass was registered in genotype Type-3 and lowest was BD 102, the highest harvest index was also registered in genotype Anjali and lowest was R-RHZ-7. Sharma *et al.,* (2013) and Singh *et al.,* (2015) have also reported the similar observations for biomass and harvest index in their genotypes.

The magnitude of genetic variability decides the effectiveness of selection. It is an established fact that greater the variability among the genotypes better is the chance for further improvement in the crop. But this variability can be utilized better if it is heritable. The heritable portion of the overall observed variation can be ascertained by studying the components of variation such as GCV, PCV, heritability and predicted genetic advance. In this study, the estimates of PCV were higher than their corresponding GCV for all the traits studied. These findings were similar to the findings of Souroush *et al.,* (2004) and Singh *et al.,* (2015). The highest PCV and GCV were high recorded for sterile spikelets per panicle followed by grains yield per plot and grains yield per plant indicating that these traits were under the major influence of genetic control and less variable due to environmental factors. Therefore, such traits are important for further improvement. These findings are in close agreement with the researchers Anjaneyulu *et al.,* (2010) and Singh *et al.,* (2015). In the present study traits such as canopy temperature depression followed by chlorophyll content, days of maturity had low estimates of PCV and GCV indicating that selection for these traits will be less effective in comparison to remaining traits. The GCV provides a measure of comparison of variability and sometimes give some indication regarding validity of traits for selection. However, it does not provide clean picture of the extent of genetic gain to be expected from selection of phenotypic traits, unless heritable fraction of variation (heritability) is known (Burton, 1952). The difference between the values of PCV and GCV were small for almost all the traits indicating less influence of environment in expression of these traits suggesting phenotypic differences may be considered as genetic difference among genotypes for selection. However, the difference was comparatively greater in case of stomatal conductance followed by effective tillers and tiller per plant. This cautions that *per-se* performance of these traits should not be taken directly as the basis of selection other variability parameter for these traits such as heritability may also be taken into consideration.

The relative magnitude of genotypic and phenotypic variances for the traits is the broad sense heritability and it is used as analytical role in selection procedures. In the present investigation, high heritability was recorded for most of the characters except spikelet fertility per cent and number of effective tillers. Days to 50% flowering and days to maturity exhibited highest heritability followed by panicle length and total grains per panicle. Similar results were obtained by Verma *et al.,* (2000), Mahto *et al.,* (2003), Aktar *et al.,* (2004) and Lingaiah (2015) in rice genotype they studied. This indicated that selection of these traits would be more effective as compared to others.

High heritability does not always indicate high genetic gain. Heritability and genetic advance are important selection parameters. Heritability estimates along with genetic advance are normally more helpful in predicting the gain under selection than heritability estimates alone. It is not necessary that a character showing high heritability will also exhibit high genetic advance. The breeder should be cautious in making selection based on heritability as it indicates both additive and non-additive gene action.

Thus, heritability values coupled with genetic advance would be more reliable and useful in formulating selection procedure as it indicates that most likely the heritability is due to additive gene effects. In the present set of materials, high heritability coupled with high genetic advance as percent was recorded for panicle weight, total grains per panicle and filled grains per panicle indicating effectiveness of selection for the improvement of these traits while high heritability coupled with low genetic advance as percent of mean were observed for panicle length, days to maturity and days to 50% flowering which is indicative of non-additive gene action. High heritability coupled with high genetic advance may be attributed to additive gene action (Khan, 1990).The high heritability is being exhibited due to favorable influence of environment rather than genotype and selection for such traits may not be rewarding. These results are in conformity with the findings of Krishna *et al.,* (2010), Singh *et al.,* (2015) and Sawarkar and Senapati (2014).

The major findings and implications of the present study can be summarised as follows:

Analysis of variance for 50 rice genotypes with regards to yield and yield components revealed that the existence of significant differences among the genotypes studied for all the traits.

The PCV value was recorded highest for plant height (22.93) followed by effective tillers/ plant (21.60) and biomass per plant (18.35). Low magnitude of PCV was exhibited by harvest index (9.28) followed by 1000 grain weight (9.99) and days to maturity (10.16).

The GCV value was high for plant height (22.90) followed by biomass (16.96) and grain yield per plant (16.77). Whereas, low magnitude of GCV was exhibited by harvest index (6.99) followed by 1000 grain weight (9.52) and days to maturity (10.10). The differences between the values of PCV and GCV were small for almost all the traits indicating less influence of environment in expression of these traits.

Heritability (broad sense) ranged from 55% to 99%. The highest heritability was found in days to 50% flowering, days to maturity and plant height (99%) followed by spikelet fertility (95%) and panicle length (93%). Lowest heritability was observed in effective tillers/plant (55%) followed by harvest index (56%). Other traits showed intermediate heritability. Genetic advance as percent of mean (5%) was realized highest for plant height (47.12) followed by biomass (32.29) and grain yield per plant (32.10). Lowest value was observed in harvest index (10.85) followed by 1000 grain weight (18.69) and days to maturity (20.70).

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