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Genetic Variability Estimates for Yield and Its Component Characters in Rice (*Oryza sativa* L.)

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ABSTRACT

Thirty three rice genotypes (ten parents, twenty one hybrids and two checks) were evaluated during *kharif,* 2015 for eight quantitative traits to examine the nature and magnitude of variability, heritability and genetic advance as percent of mean. Analysis of variance showed significant differences among the genotypes for all the characters studied. The highest estimates of genotypic coefficient of variation and phenotypic coefficient of variation were recorded by grain yield per plant. High heritability coupled with high genetic advance as percent of mean was observed for characters *viz.,* number of productive tillers per plant, number of filled grains per panicle, test weight and grain yield per plant indicating these traits are governed by additive gene action.

Key words: *Genetic advance, Heritability, Rice, Variability.*

Rice is an important staple food of almost half of the world population and referred to as "Global Grain". 'Rice is Life' was the theme of International year of rice 2004 denoting it's overwhelming importance as an item of food and commerce. Among rice growing countries, India has largest area under rice in the world *i.e.* 43.86 million hectares and ranks second in production with 105.80 million tonnes and productivity of 2.7 t ha^{-1}. (Ministry of Agriculture, 2014-2015). Rice production was increased four times, productivity three times while the area increase was only one and half times during post independence era. In order to keep pace with the growing population, the estimated rice requirement by 2025 is about 130 million tonnes. Therefore it is necessary to escalate the production of rice proportionate to growing population. The pre-requisite in yield improvement is to identify genotypes with high variability. Assessment of variability for any trait is esssential for planning effective plant breeding programme. Genetic parameters such as genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) are useful in detecting the amount of variability present in the germplasm. The genetic coefficient of variation together with heritability estimate would give the best picture of the amount of advance to be expected from selection. Heritability and genetic advance are important selection parameters helps in predicting genetic gain under selection than heritability estimates alone. Keeping this in view, an attempt has been made to assess the genetic variability and heritability of yield and yield components among the thirty three rice genotypes.

MATERIAL AND METHODS

Evaluation of 21 hybrids generated from crossing seven lines and three testers in line x tester fashion along with ten parents and two checks (DRRH 2 and MTU 1010) following Randomized Block Design with two replications was carried out at Agricultural College Farm, Bapatla during *kharif* 2015. Standard agronomic practices were followed to raise good crop. Observations were recorded on 10 randomly selected plants from each cross for eight metric traits *viz.,* plant height (cm), number of productive tillers per plant, panicle length (cm), number of filled grains per panicle, test weight (g), grain yield per plant (g) in each replication. Days to 50% flowering and days to maturity were recorded on plot basis.

The data collected for all the characters studied were subjected to analysis of variance technique proposed by Panse and Sukhatme (1978). The genotypic and phenotypic coefficients of variability were computed as per the formula proposed by Burton and Devane (1953).

Categorization of the range of variation was followed as per Subramanian and Menon (1973). Heritability in broad sense was estimated as per Allard (1960) and characterized as suggested by Johnson *et al.* (1955). Genetic advance was estimated as per the formula proposed by Lush (1940). The range of GA as percent of mean was classified as suggested by Johnson *et al.* (1955).

RESULTS AND DISCUSSION

Analysis of variance revealed highly significant differences among the genotypes for yield and yield components (Table 1) indicated the high degree of variability in the material. In this study the observation of slight differences between GCV and PCV values indicated least environmental influence and consequently greater role of genetic factors on the expression of the traits (Table 2).

High PCV and GCV was recorded by grain yield plant^{-1} therefore simple selection can be practiced for further improvement of this character. Similar result was reported earlier by Sindhumole *et al.* (2015). Moderate GCV and PCV was recorded for number of productive tillers plant^{-1} and test weight. Low PCV and GCV was recorded for days to 50% flowering, days to maturity, plant height and panicle length.

Heritability estimates were high for all the traits indicating the least influence of environment. Heritability along with genetic advance are more helpful in predicting the gain under selection than heritability estimates alone. High heritability coupled

Table 1. Analysis of variance for yield and yield component characters in rice (*Oryza sativa* L.).

Source of variations	df	Days to 50% Flowering	Days to Maturity	Plant Height (cm)	Number of productive tillers per plant	Panicle Length (cm)	Number of filled grains per panicle	Test Weight (g)	Grain Yield per plant (g)
Replication	1	0.06	0.00	9.56	0.06	0.24	25.71	0.056	0.55
Entries	32	87.21**	49.60**	153.06**	6.80**	3.85**	1322.6**	13.11**	74.77**
Error	32	0.96	1.21	6.64	0.88	0.43	18.26	0.245	1.20

**Significant at 1 % level

Table 2. Estimates of variability and genetic parameters for grain yield and yield components in rice (*Oryza sativa* L.).

S.No.	Character	Mean	Range		PCV (%)	GCV (%)	Heritability (broad sense) (%)	Genetic advance as per cent of mean (%)
			Min	Max				
1.	Days to 50% Flowering	89.96	80.50	103.50	7.38	7.29	97	14.87
2.	Days to Maturity	120.54	112.50	134.50	4.18	4.08	95	8.20
3.	Plant Height (cm)	89.78	76.75	114.00	9.95	9.52	91	18.79
4.	Number of Productive tillers per plant	13.72	10.35	17.10	14.29	12.54	77	22.68
5.	Panicle Length (cm)	22.40	18.67	26.10	6.54	5.84	79	10.74
6.	Number of filled grains per panicle	118.46	79.60	186.00	20.17	19.89	97	40.42
7.	Test Weight(g)	19.93	13.47	24.50	12.79	12.55	96	25.39
8.	Grain Yield per plant (g)	13.82	2.15	22.80	49.27	48.48	78	60.21

PCV = Phenotypic Coefficient of Variation GCV = Genotypic Coefficient of Variation

with high genetic advance as percent of mean were observed for the characters *viz.,* number of productive tillers per plant, number of filled grains per panicle, test weight and grain yield per plant indicating most likely the heritability is due to additive gene action and selection may be effective.

High heritability coupled with moderate genetic advance as percent of mean was observed for days to 50% flowering, plant height and panicle length. While high heritability coupled with low genetic advance as percent of mean was observed for days to maturity. Similar results of high heritability coupled with high genetic advance was reported by Gangashetty *et al.* (2013) for number of productive tillers per plant and test weight, Allam *et al.* (2015) for number of filled grains per panicle and Neha *et al.* (2014) for grain yield per plant.

The perusal of results revealed that there is adequate genetic variability in the material studied. The characters *viz,* number of productive tillers per plant, number of filled grains per panicle, test weight and grain yield per plant showing high heritability coupled with high genetic advance indicated the presence of additive gene action, therefore simple selection of these characters based on phenotypic values can be advocated for yield improvement. The character showing high heritability coupled with low genetic advance indicated the presence of non - additive gene action.

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