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# Assessment of Genetic Parameters for Yield and its Attributing Characters in Rice Breeding Lines

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**ABSTRACT**

The present experiment was carried in 119 $F_6$ rice breeding lines along with two high yielding local checks to estimate genetic parameters for 9 quantitative characters. The analysis of variance revealed significant differences among the lines for all the characters studied. Higher estimates of Phenotypic Coefficient of Variation (PCV) and Genotypic Coefficient of Variation (GCV) were observed for number of grains per panicle and grain yield per plant and the difference between PCV and GCV was very low indicating little environmental influence on these characters. High heritability coupled with high Genetic Advance as Percent of Mean (GAM) was recorded for test weight, number of grains per panicle and grain yield per plant indicating the operation of additive gene action in the inheritance of these traits and improvement of these characters is possible through direct phenotypic simple selection.

**Key words**: *Genetic Advance as percent of Mean (GAM) and Rice,Genotypic Coefficient of Variation (GCV), Heritability, Phenotypic Coefficient of Variation (PCV).*

Rice (*Oryza sativa* L.) is the most important staple food for over half of world population. It contributes 43 per cent to the total food grains and 53 per cent to the cereal production. There will be more demand in future for rice and there is need to produce 350 million more tons of rice by 2020 in the world (Vijaya and Shailaja. 2016). So, in order to meet the demand for rice, development of high yielding varieties is essential. Assessment of variability for yield and its component characters becomes absolutely essential before planning for an appropriate breeding strategy for genetic improvement. Yield is a quantitative character which is polygenic in nature and is highly influenced by environment (Allard, 1960). Hence, partitioning of variability into heritable (due to genotype, GCV) and non-heritable (due to environment) components is very much needed to get a true indication of the genetic coefficient of variability which represents the true breeding behaviour of the phenotype. Heritability ($h^2$) measures the relative amount of the heritable portion of variability, while the genetic advance helps to measure the amount of progress that could be expected with selection in a character. So, only heritability will not give a true picture of inherited variance and high heritability is not always an indication of true genetic gain. Hence, there is need to estimate genetic advance, which is a relative measure and reliable indication of true genetic gain. Keeping in view of above perspectives, the present study is carried out with the objective of estimation of genetic parameters in rice breeding lines for yield and its attributing characters.

## MATERIAL AND METHODS

The experiment was carried out with 119 $F_6$ rice breeding lines and two checks in simple lattice design with two replications during *kharif* 2016 at Andhra Pradesh Rice Research Institute, Maruteru, Andhra Pradesh. The material was raised at a spacing of 20 and 15 cm between row to row and

plant to plant respectively. Each entry was sown in a plot of 1.6 $m^2$ area. All the recommended package of practices were carried out to ensure healthy crop growth. Observations were recorded on 9 quantitative traits *viz*., days to 50% percent flowering, days to maturity, plant height (cm), number of ear bearing tillers per plant, panicle length (cm), number of grains per panicle, spikelet fertility (%), grain yield per plant (g) and test weight (g). The mean values of all traits were subjected to analysis of variance on the basis of model proposed by Raghava Rao (1983) and PCV and GCV were calculated by the formulae given by Burton and De Vane (1953). Heritability in broad sense [$h^2$(bs)] was calculated by the formula given by Lush (1940) as suggested by Johnson *et al.* (1955). From the heritability estimates, the genetic advance as percent of mean was estimated by the formula given by Johnson *et al.* (1955).

## RESULTS AND DISCUSSION

The results of analysis of variance indicated that the traits under study are highly significant at 1% level except ear bearing tillers per plant (EBT) which is significant at 5% level indicating the presence of considerable amount of genetic variability in the material under study (Table 1).

The variability estimates *i.e*., PCV (%), GCV (%), Heritability (%) (broad sense) and genetic advance as percent of mean were presented in the Table 2. The estimates of variability revealed that the GCV for all the characters studied was lesser than the PCV but the difference is very less indicating low environmental influence except for EBT. High PCV and GCV were observed for number of grains per panicle (31.33 % and 30.61 %) and grain yield per plant (22.92 % and 22.45 %). Moderate levels of both GCV (11.31 %) and PCV (11.39 %) estimates were recorded for test weight. Similar results were earlier obtained by Shrivastava *et al*. (2015). Among the characters studied, number of ear bearing tillers per plant exhibited moderate GCV (15.79 %) and low PCV (6.65 %) which was earlier reported by Vijaya and Shailaja (2016). Lower estimates for both PCV and GCV were manifested by five characters *viz.*, days to 50% flowering, plant height, panicle length, spikelet fertility and days to maturity indicating less variability for these traits. These results were in concordance with the reports of Pandey *et al*. (2012) and Tejaswini *et al*. (2016).

High heritability coupled with high genetic advance as percent of mean was recorded for test weight, number of grains per panicle (95.94 % and 45.30) and grain yield per plant (96.66 % and 61.99). These results indicated the operation of additive gene action in the inheritance of these traits and improvement of these characters is possible through direct phenotypic simple selection. The higher estimates of heritability coupled with moderate genetic advance as percent of mean was observed for days to 50% flowering, plant height and panicle length indicating the presence of both additive and non additive gene actions and hence, heterosis breeding is effective for improvement of these traits. These results were in co-linearity with the results of Sameera *et al*. (2016).

High heritability coupled with low genetic advance as percent of mean was observed for days to maturity and moderate heritability with low genetic advance as percent of mean for spikelet fertility indicating the presence of both additive and non additive gene action. These findings were similar to those obtained by Vanisree *et al*. (2013). Both heritability and genetic advance as percent of mean were low for EBT suggesting that the trait is highly influenced by environmental effects and simple selection for this trait may not be effective and similar results were observed previously by Chandramohan *et al*. (2016).

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**Table 1. Analysis of variance (mean sum of squares) for yield and yield contributing characters in rice breeding lines and checks during *kharif,* 2016**

| Source of variation | Degrees of freedom | Days to 50% flowering | Plant height (cm) | No. of ear bearing tillers | Panicle length (cm) | No. of grains panicle$^{-1}$ | Spikelet fertility (%) | Days to maturity | Grain yield per plant (g) | Test weight (g) |
|---|---|---|---|---|---|---|---|---|---|---|
| Replication | 1 | 0.004 | 39.686 | 0.500 | 0.022 | 0.203 | 0.698 | 0.004 | 0.087 | 0.121 |
| Treatment | 120 | 72.898** | 155.507** | 3.066* | 5.842** | 5118.746** | 63.697** | 71.707** | 123.501** | 10.238** |
| Error | 120 | 2.946 | 13.349 | 2.142 | 0.558 | 105.878 | 17.812 | 3.572 | 2.094 | 0.069 |

*Significant at 5% level, **Significant at 1% level

**Table 2. Estimates of genetic variability parameters for yield and yield contributing characters in rice breeding lines during *kharif,* 2016**

| Character | Mean | Range | | PCV | GCV | h² (bs) | GA | GA as % of mean |
|---|---|---|---|---|---|---|---|---|
| | | Minimum | Maximum | | | | | |
| Days to 50% flowering | 113.00 | 94.00 | 122.00 | 5.47 | 5.25 | 92.23 | 11.70 | 10.38 |
| Plant height (cm) | 123.00 | 102.00 | 156.00 | 7.44 | 6.83 | 84.18 | 15.94 | 12.91 |
| Number ear bearing tillers per plant | 10.00 | 8.00 | 15.00 | 15.79 | 6.65 | 17.74 | 0.59 | 5.77 |
| Panicle length (cm) | 25.07 | 20.85 | 31.70 | 7.13 | 6.48 | 82.57 | 3.04 | 12.14 |
| Number of grains per panicle | 223.00 | 115.00 | 370.00 | 22.92 | 22.45 | 95.94 | 101.02 | 45.30 |
| Spikelet fertility (%) | 89.33 | 63.35 | 97.85 | 7.15 | 5.36 | 56.29 | 7.40 | 8.29 |
| Days to maturity | 142.00 | 122.00 | 155.00 | 4.31 | 4.10 | 90.51 | 11.44 | 8.04 |
| Grain yield per plant (g) | 25.00 | 10.00 | 54.00 | 31.13 | 30.61 | 96.66 | 15.78 | 61.99 |
| Test weight (g) | 19.94 | 14.80 | 26.00 | 11.39 | 11.31 | 98.66 | 4.61 | 23.14 |

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