Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

**E-ISSN:** 2278-4136
**P-ISSN:** 2349-8234
JPP 2017; 6(3): 829-831
Received: 07-03-2017
Accepted: 08-04-2017

**Mane Vinod**
Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh, India

**Suresh BG**
Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh, India

**GR Lavanya**
Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh, India

**B Jalandhar Ram**
Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh, India

**Correspondence**
**Mane Vinod**
Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh, India

# Studies on variability, heritability and genetic advance for quantitative characters in exotic rice (*Oryza sativa* L.) Germplasm

**Mane Vinod, Suresh BG, GR Lavanya and B Jalandhar Ram**

**Abstract**
The present experiment was conducted at Field Experimentation Centre, Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture Technology and Sciences, Allahabad during *kharif* 2016. The present investigation was conducted to evaluate thirteen quantitative characters among 37 rice genotypes to obtain estimates of genetic variability, heritability, genetic advance under randomized block design with three replications. The analysis of variance revealed that there were highly significant differences for all the characters except leaf width and 1000- seed weight among the genotypes. The estimates of GCV and PCV were high for all the characters except days to 50% flowering and panicle length. Heritability and genetic advance were high for all the characters except days to 50% flowering and panicle length, which had moderate genetic advance coupled with high heritability indicating the involvement of additive type of gene action in controlling these characters.

**Keywords:** Rice, Genetic variability, Heritability, Genetic advance

## 1. Introduction
Rice (*Oryza sativa* L. 2n = 24) is the most important staple food crop in the World. It is grown in almost all the continents of the World except Antarctica. More than 90 per cent of the world's rice is grown and consumed in Asia, known as "Rice Bowl of the World", where 60 percent of the earth's population and two thirds of world's poor live (Khush and Virk, 2000) [4]. India stands first in area and second in production. India is a major rice growing country in world with an area of 43.97 million hectares, having production of 106.2 million tones and productivity of 2.37 t/ha. It is estimated that the demand for rice will be 129.6 million tons by 2040 and 137.3 million tons by 2050 for internal consumption. (IIRR, Annual Report: 2014-15).

The studies on GCV and PCV indicated that the presence of high amount of variation and role of the environment on the expression of these traits. The magnitude of PCV was higher than GCV for all the characters which may due to higher degree of interaction of genotypes with the environment, Vivek *et al*., (2005) [8]. 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. Hence knowledge about genetic advance coupled with heritability is most useful. High heritability should be accompanied with high genetic advance to arrive more reliable conclusion. Expected genetic advance as per cent of mean indicates the mode of gene action in the expression of a trait, which helps in choosing an appropriate breeding method (Kumar *et al.*, 2007) [5].

Hence, the present investigation was done to evaluate the yield & yield attribute traits for early maturing elite rice germplasm and to assess the magnitude of genetic variability among 37 elite rice genotypes.

## 2. Materials and Methods
The experiment was conducted at Field Experimentation Centre, Department of Genetics and Plant Breeding, SHUATS, Allahabad. Thirty seven exotic rice genotypes including one local check procured from IRRI, Philippines, were grown during *kharif* 2016 in a Randomized Block Design with three replications. Each genotype was grown in a plot of size 2 x 5 square meters with a spacing of 20 x 15 cm row to row and plant to plant. Data were recorded on five randomly tagged plants for thirteen agro-morphological traits *viz*., days to 50% flowering, plant height (cm), flag leaf length (cm), flag leaf width (cm), tillers per hill, panicles per hill, panicle length (cm), spikelets per panicle, days to maturity, biological yield(g), harvest index (%), test weight (g), grain yield per hill (g).

The formulae used to calculate PCV and GCV as per method given by Burton (1952) [1] and heritability in broad sense by Lush (1949), Burton and Devane (1953) [2].

**Results and Discussions**

Phenotypic variance was higher than the genotypic variances for all the characters thus indicated the influence of environmental factor on these traits. Similar results were also reported by Bidhan *et al*. (2001) [3] for grain yield per hill, flag leaf length, test weight. Coefficient of variation study indicated that estimates of phenotypic coefficient of variation (PCV) were slightly higher than the corresponding genotypic coefficient of variation (GCV) for all the characters (Table 2.) as per Singh *et al.* (2012) [7] and Kumar *et al.* (2013) [6]. All traits under the present study had higher phenotypic coefficient of variation than genotypic coefficient of variation. The magnitude of phenotypic coefficient of variation and genotypic coefficient of variation was moderate to high for the traits Number of spikelets/panicle, test weight and yield. The high PCV observed for No. of spikelets/panicle, tillers/hill. The high GCV was obtained for No. of grains/panicle indicating the improvement is possible through selection. Genotypic coefficient of variation measures the extent of genetic variability percent for a trait but does not assess the amount of genetic variation which is heritable. Heritability estimates were high for all the characters except for Number of productive tillers per plant. The heritability estimates along with genetic advance can be useful to predict effect of selection in selection programmes. The traits, number of grains per panicle, test weight, yield and plant height exhibited higher magnitude of genetic advance as percent of mean. The traits, number of grains per panicle, test weight, plant height and yield have high heritability along with genetic advance as percent of mean indicate that these characters attributable to additive gene effects which are fixable revealing that improvement in these characters would be possible through direct selection.

**Table 1:** Analysis of variance for thirteen quantitative characters in 37 rice genotypes.

| S. No | Parameter | Mean sum of squares | | |
|---|---|---|---|---|
| | | Replications (df=2) | Treatments (df=37) | Error (df=72) |
| 1. | Days to 50% Flowering | 1.19 | 60.44** | 0.89 |
| 2. | Plant Height | 32.73 | 449.74** | 11.13 |
| 3. | Flag Leaf Length | 8.70 | 50.72** | 22.38 |
| 4. | Flag Leaf Width | 0.00 | 0.04** | 0.00 |
| 5. | Tillers per hill | 1.77 | 24.13** | 1.48 |
| 6. | Panicles per hill | 0.76 | 20.60** | 1.54 |
| 7. | Panicle Length | 3.10 | 17.10** | 1.84 |
| 8. | Spikelets per Panicle | 0.57 | 8537.04** | 5.10 |
| 9. | Days to Maturity | 6.33 | 64.48** | 3.54 |
| 10. | Biological Yield | 12.39 | 428.01** | 8.05 |
| 11. | Harvest index | 1.34 | 74.53** | 1.76 |
| 12. | Test Weight | 0.36 | 29.07** | 0.16 |
| 13. | Grain Yield per hill | 0.08 | 71.38** | 0.91 |

** Significant at 1% level of significance

**Table 2:** Genetic parameters for 13 quantitative characters in 37 rice genotypes.

| S. No | Characters | MEAN | GCV (%) | PCV (%) | $h^2$ (%) | GA (%) |
|---|---|---|---|---|---|---|
| 1. | Days to 50% Flowering | 87.28 | 5.104 | 5.21 | 95 | 10.28 |
| 2. | Plant Height | 107.38 | 11.26 | 11.68 | 92 | 22.36 |
| 3. | Flag Leaf Length | 15.45 | 9.17 | 16.83 | 29 | 10.29 |
| 4. | Flag Leaf Width | 33.50 | 9.02 | 9.36 | 92 | 17.92 |
| 5. | Tillers per hill | 1.36 | 20.59 | 22.86 | 83 | 33.49 |
| 6. | Panicles per hill | 26.92 | 17.78 | 19.45 | 80 | 37.89 |
| 7. | Panicle Length | 12.28 | 8.37 | 9.77 | 73 | 14.77 |
| 8. | Spikelets per Panicle | 159.23 | 33.49 | 33.52 | 99 | 23.98 |
| 9. | Days to Maturity | 118.55 | 3.80 | 4.12 | 85 | 7.22 |
| 10 | Biological Yield | 32.59 | 13.17 | 13.55 | 94 | 26.39 |
| 11. | Harvest index | 89.78 | 15.10 | 15.64 | 95 | 30.04 |
| 12 | Test Weight | 23.68 | 13.10 | 13.21 | 98 | 26.70 |
| 13. | Grain Yield per hill | 29.11 | 16.64 | 16.97 | 96 | 33.64 |

**References**


1. Burton GW. Quantitative inheritance of grasses. Proc. *6th* International Grassland congress. 1952; 1:277-283.
2. Burton GW, Devane. Estimation of heritability in tall fescue *Festuca arundinacea* from replicated clonal material, Agronomy Journal. 1953; 45:478-481.
3. Bidhan R, Hossain M, Hossain F, Roy B. Genetic variability in yield components of rice (*Oryza sativa* L.), Environment and Ecology. 2001, 19(1):186-189.
4. Khush GS, Virk PS. Crop improvement. 2000; 27(2):115-144.
5. Kumar ST, Narasimman R, Eswaran R, Kumar CPS, Anandan A. Studies on genetic variability, heritability and genetic advance in segregating generations of rice (*Oryza sativa* L.), International Journal of Plant Science, Muzaffarnagar. 2007; 2(1):48-51.
6. Kumar A, Rangare NR, Vidyakar V. Study of Genetic Variability of Indian and Exotic Rice Germplasm in

Allahabad Agroclimate, the Bio Scan. 2013, 8(4):1445-1451.
7. Singh AK, Sharma, Parveen, Singh PK. Studies on genetic characteristic of upland rice ('*Oryza sativa* L.). International Journal of Agriculture, Environment & Biotechnology. 2012, 6(4).
8. Vivek S, Singh S, Singh SK, Singh H. Estimation of genetic variability, heritability and genetic advance in rice (*Oryza sativa* L.), Agricultural Science and Defeasance. 2005; 25(3):207-209.