

Genetic variability, heritability and genetic advance in rice (*Oryza sativa* L.)

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ABSTRACT : An experiment was conducted to estimate the genetic variability parameters for the quantitative characters in mid early group genotypes of rice cultivars. The analysis of variance revealed significant difference among the genotypes for the traits studied indicating that a large amount of variability was present in the material. The magnitude of phenotypic co-efficient of variation was higher to genotypic co-efficient of variation for all the traits. The highest value of phenotypic and genotypic co-efficient of variation was observed for yield followed by number of grains per panicle and test weight. High heritability associated with high genetic advance as per cent of mean was found for the characters number of grains per panicle, yield, test weight and plant height indicating the role of additive gene action in controlling these characters.

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Rice is an important staple food crop in the world. There is an ample scope for improving the productivity of this crop through varietal improvement and development of hybrids. The primary consideration to bring about genetic improvement of a crop is the study of genetic variability. Assessment of variability for any trait is pre-requisite for a plant breeder to planning effective breeding programmes. Heritability is an index of the transmission of characters from parents to their offspring and it plays an important role in the selection process in plant breeding. Genetic advance provides information on expected gain resulting from selection of superior individuals. Heritability and genetic advance are important selection parameters which help in predicting the gain under selection. The present study was undertaken to determine the extent of variability and heritability for yield

contributing characters with involvement of mid early group (duration 120-130 days) genotypes.

The experiment was carried out during *Kharif*, 2012 at Regional Agricultural Research Station, Warangal. The material comprised of 31 elite mid early group genotypes of rice (having duration of 120-130 days) sown in a Randomized Block Design with two replications with spacing of 20×15 cm. Data were recorded on five randomly selected plants in each entry in each replications for the traits days to 50 per cent flowering, plant height (cm), productive tillers/plant, panicle length (cm), test weight (g) and yield in kg per plot which converted into kg/ha. The data was subjected to INDOSTAT software to estimate genetic co-efficient of variation (%) (GCV), phenotypic co-efficient of variation (%) (PCV), heritability (%) (broad sense),

Table 1 : Variability, heritability and genetic advance for quantitative traits in rice

Character	Mean	Genetic co-efficient of variation (%)	Phenotypic co-efficient of variation (%)	Heritability (%)	Genetic advance	Genetic advance as per cent of mean
Days to 50% flowering	99.39	0.299	18.49	0.00	0.013	0.013
Productive tillers/plant	9.17	1.56	10.37	-2.30	-0.057	-0.618
Plant height	101.26	9.66	10.39	86.40	23.99	23.69
Panicle length (cm)	23.55	5.93	6.96	72.70	3.144	13.34
Number of grains/panicle	188.21	21.63	25.94	69.60	89.67	47.64
Test weight (g)	21.81	17.15	18.41	86.80	9.19	42.16
Yield (kg/ha)	4008.14	20.19	23.93	71.20	1803.46	44.99

genetic advance and genetic advance as per cent of mean. The estimates for variability treated as per the categorization proposed by Siva Subramanian and Madhavamenon (1973) *i.e.*, low: less than 10 per cent, moderate: 10-20 per cent and high: more than 20 per cent. Heritability (Low: less than 30%, moderate: 30-60% and high: more than 60%) and genetic advance as per cent of mean estimates (Low: less than 10%, moderate: 10-20% and high: more than 20%) according to criteria proposed by Johnson *et al.* (1955).

The analysis of variance revealed significant genotypic difference for all the traits studied indicating that a large amount of variability was present in the material. The general mean, variability estimates *i.e.*, Genetic co-efficient of variation (%), phenotypic co-efficient of variation (%), heritability (%) (broad sense), genetic advance as per cent of mean are presented in Table 1. Phenotypic co-efficients of variation (PCV) values were higher than genotypic co-efficient of variation (GCV) for all the traits. High genotypic co-efficients of variation were obtained for the traits number of grains per panicle and yield (Pal *et al.*, 2011) indicating that these characters are amenable for improvement while going for selections. The magnitude of phenotypic co-efficient of variation and genotypic co-efficient of variation was moderate for the trait test weight (Kiran *et al.*, 2012; Basavaraja *et al.*, 2013 and Singh *et al.*, 2014). The high PCV observed for yield and number of grains per panicle (Venkanna *et al.*, 2014). Heritability estimates were high for the characters test weight, panicle length, yield and number of grains per panicle. In general, heritability along with genetic advance can be useful in selection programmes. The characters number of grains per panicle (Dhurai *et al.*, 2013; Anjaneyulu *et al.*, 2010) yield, test weight (Vaithiyalingam and Nadarajan, 2006) and plant height (Dhurai *et al.*, 2013 and Anjaneyulu *et al.*, 2010) have high genetic advance as per cent of mean

along with high heritability. High heritability with high genetic advance as per cent of mean indicates that these characters are largely controlled by additive gene action, which indicating that improvement in these characters is possible through hybridization followed by selection with pedigree breeding. The characters days to 50 per cent flowering and productive tillers per plant with low heritability with low genetic advance indicating the character is influenced by environmental effects and selection may not be useful.

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