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Variability, heritability and genetic advance for yield and yield attributing characters in different local rice (*Oryza Sativa* L.) cultivars

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A field experiment was conducted to study the extent of genetic variability in yield and yield attributing traits under irrigated conditions. Genetic parameters of variability and heritability of 13 characters were studied in 100 genotypes of local rice. Co-efficients of variation were high for number of productive tillers per plant, grain yield per plant, number of tiller per plant, panicle number, plant height, panicle length, test weight, number of spikelet per panicle. The maximum genotypic co-efficient of variability and phenotypic co-efficient of variability were observed for test weight, number of productive tillers per plant, number of spikelet per panicle, amylase per cent and grain yield/plant (g). High heritability coupled with high genetic advance as per cent of mean were observed for days to 50 per cent flowering, test weight, number of spikelet per panicle, per cent of spikelet fertility, protein per cent and grain yield/plant (g) will be useful for further breeding programme. Indicated the possibility of yield and quality improvement through adoption of selection procedures.

Key words : Rice, Variability, Quality, Yield

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INTRODUCTION

Variation is the basis of plant breeding. As success of any crop improvement programme largely depends on the magnitude and range of variability on the available genetic stock. A Land race plays an important role in the local food security and sustainable development in agriculture (Tang *et al.*, 2002). A critical estimate of genetic variability is a prerequisite for initiating appropriate breeding procedures in crop improvement programmes. Hence, it becomes necessary to spilt over-all variability into its heritable and non-heritable components with the help of certain genetic parameters, which may enable the breeders to plan a proper breeding programme. Therefore, the progress of a population mainly depends upon the amount and magnitude to genotypic variability present in the population. Information of genetic variability among growth as well as yield components in rice has been reported by many workers (Vaithiyalingan and Nadarajan, 2007).

One important constraint is less adoptability of newly introduced varieties. In the light if this, existence of sufficient variability especially in local cultivars is considered as prime requirement in the breeding programmes. Estimation of genetic variability present in the germplasm of a crop is pre-requisite for making any effective breeding program (Allard, 1960).The development of high yielding long duration rice varieties using javanica shows great potential still remaining unutilized in germplasm (Siddiq,1989). Keeping in view, the importance of variability in breeding programmes, the present study was undertaken to determine the extent of variability in yield and yield attributing traits of local rice cultivars under irrigated condition.

RESEARCH METHODOLOGY

The experimental material consisted of 100 local rice genotypes. The experiment was carried out at Agricultural college farm, Navile, Shimoga. The experiment was laid out in a 10 x 10 Simple Lattice Design with two replications which consisted of 100 local genotypes during *Kharif* 2010. Thirty days old seedlings were transplanted at the rate of one seedling per hill with a spacing of 30 x 20 cm. Recommended

package of practices were followed to raise the crop. Observations were recorded on 13 different characters *viz.*, days to 50 per cent flowering, days to maturity, plant height, panicle length, panicle number, test weight, total number of tillers per plant, number of productive tiller per plant, number of spikelet per panicle, per cent of spikelet fertility, protein per cent, amylase percent, grain yield/ plant(g). Finally, genotypic and phenotypic co-efficients of variation (Burton, 1952), heritability and genetic advance as per cent of mean (Johnson *et al.*, 1955) were estimated.

RESEARCH FINDINGS AND ANALYSIS

Analysis of variance revealed significant genotypic difference for all the characters except panicle number studied (Table 1). Earlier workers have also made similar observation in panicle number (Hasib, 2005*)*. In general, phenotypic co-efficient of variation (PCV) values were higher than genotypic co-efficient of variation (GCV) values (Table 2); similar results were also reported by (Das *et al.*, 2001 and Rita Binse *et al.*, 2007). High variability was observed for test weight, number of productive tillers per plant, number of spikelet per panicle, amylase per cent and grain yield/plant (g). Whereas variability was low for days to maturity, panicle length. The remaining characters possessed moderate variability.

High heritability coupled with high genetic advance as per cent of mean was observed for observed for days to 50 per cent flowering, test weight, number of spikelet per panicle, per cent of spikelet fertility, protein per cent and grain yield /plant (g) indicates that these traits are largely influenced by additive gene action, which is in conformity with the findings of Sharma and Sharma (2007) for plant height, number of ear bearing tillers per plant, number of filled grains per panicle, test weight, grain yield per plot; hence, yield and quality improvement to certain extent is simple and strait forward through directing selection towards higher ear bearing tillers per plant, filled grains per panicle and optimizing these quality characters through selection. Thus, the genetic parameters are useful to know the nature of inheritance (additive and non additive gene action) and expected quantum of genetic improvement in a particular trait. Present study revealed that there was good amount of variability in the traits days to 50 per cent flowering, test weight, number of spikelet per panicle, per cent of spikelet fertility, protein per cent and grain yield /plant (g) and selection towards these traits would be effective to develop high yielding genotypes, as these traits exhibited high heritability and high genetic advance as per cent of mean.

Table 1: Analysis of variance for 13 characters in local rice cultivars

Source of variation	d.f.	Days to 50 % flowering	Days to maturity	Plant height (cm)	Panicle length (cm)	Panicle no.	Test weight	No. of tiller /plant	No. of productive tiller/plant	No. of spikelet per panicle	Per cent of spikelet fertility	Protein %	Amylose %	Grain yield (g)/plant
Replication	1	4.501	4.509	2258	820.61	8.00	0.804	2.913	4.15	910.43	99.51	1.479	0.685	1098.68
Treatment Unadjusted)	99	67.01**	67.097**	461.25**	8.362**	0.305	0.887**	13.841**	10.654*	3334.1**	215.56**	7.882**	63.59**	880.3**
Blocks within adjusted	18	1.672	1.69	45.69	7.23	0.124	0.084	3.128	10.063	65.49	3.806	0.046	0.081	36.29
Error intra block	81	23.656	23.72	232.96	3.919	0.331	0.053	3.646	4.245	89.24	8.756	0.106	0.183	102.63
C.D. (5%)		8.79	8.7	26.9	4.23	1.07	0.48	3.73	4.58	18.28	5.56	0.613	0.80	18.8
CV (%)		3.53	2.6	14.4	9.5	10.36	7.71	11.92	16.43	8.29	3.92	2.83	2.20	14.5

** and * indicate significance of values at P=0.01 and P=0.05, respectively.

Table 2: Estimates of range, mean, variability, heritability and genetic advance for 13 characters in local rice cultivars

Sr. No.	Characters	Mean ± SE	Range	PCV (%)	GCV (%)	h^2 broad sense (%)	GAM (%)
1.	Days to 50% flowering	102.39± 0.46	109- 137	15.25	13.24	75.4	23.69
2.	Days to maturity	135.39 ± 0.41	125- 160	18.33	10.30	31.6	12.24
3.	Plant height (cm)	97.98± 1.28	59.3- 144.2	18.58	11.71	39.7	15.21
4.	Panicle length (cm)	22.37± 0.23	15.46-30.16	13.69	8.96	42.8	12.06
5.	Panicle number	5.29 ± 0.04	4-7	15.50	10.65	47.3	15.46
6.	Test weight (g)	31.3 ± 0.042	17.26-52.6	21.94	20.56	87.6	39.66
7.	No. of tiller per plant	15.79± 0.20	9.4-24.2	18.66	14.35	59.1	22.74
8.	No. of productive tiller per plant	14.03 ± 0.13	6.3-18.8	20.16	11.68	33.5	13.94
9.	No. of spikelet per panicle	111.2 ± 0.01	45.2-220.6	37.22	35.22	95.3	72.82
10.	Per cent of spikelet fertility	71.63 ± 0.74	29.3-92.35	14.45	11.29	75.1	20.11
11.	Protein %	10.91± 0.14	5.66-18.69	17.33	14.81	73.0	26.12
12.	Amylose %	18.40 ± 0.39	0.868-30.21	41.03	29.92	53.2	44.92
13.	Grain yield (g)/plant	21± 0.42	10.1-39.2	33.58	30.28	81.34	56.27

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