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Estimation of genetic parameters in some exotic genotypes of rice (*Oryza sativa* L.) in *rabi* season

B.L. Thaware*, S.S. Karande, B.D. Wghmode and J.S. Dhekale

Department of Agricultural Botany,
College of Agriculture, Dapoli-415 712, Ratnagiri, Maharashtra, India.

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ABSTRACT

Fifty three genotypes collected from IRRI, Philipines and one variety from research station were grown in randomized block design with three replications under three environments during *rabi* (dry) season 2013-14. Significant mean squares for genotypes indicated the presence of variability for all the characters under study. The phenotypic coefficient of variation (PCV) was higher than the genetic coefficient of variation (GCV) for all the characters studied. Small differences between GCV and PCV were recorded for most of the characters studied which indicated less influence of environment. The high heritability coupled with high genetic advance as percent of mean was observed for the characters *viz.*, grains per panicle, straw yield per plant, grain yield per plant and 1000 grain weight indicate that most likely the heritability is due to additive gene effects and selection may be effective.

Key words: Genetic advance, Genetic variability, GCV, Heritability, PCV, Rice.

Germplasm is an important source for the present and future crop improvement. A critical analysis of genetic variability is a prerequisite for initiating any crop improvement programme and for adopting appropriate selection techniques. Genetic parameters such as phenotypic coefficient of variation (PCV), genetic coefficient of variation (GCV) are helpful tools in detecting the amount of variability available in the germplasm. Heritability and genetic advance are important selection parameters in estimating the resultant effect in selection of the best genotype for yield and its attributing traits. Hence, the experiment was conducted with a view to study the genetic variability in some exotic rice germplasm in *rabi* (dry) season.

The experimental material consisted 53 genotypes received from IRRI, Philippines and one variety from this university were grown in randomized block design with three replications at three locations during *rabi* 2013-14. The plot size was 3 rows of 1.5 m length with 20x 15 cm. spacing. Thirty days old seedling per hill was transplanted in the field. Fertilizer dose of 100 Kg N + 50 Kg P_2O_5 + 50 Kg K_2O per hectare and other cultural practices were carried out as per the recommendations to grow a healthy rice crop. The data on the characters days to initiation of flowering, days to 50 per cent flowering and days to maturity was recorded on the plot basis and on randomly selected five effective plants for the characters *viz.*, plant height (cm), total tillers per plant, productive tillers per plant, panicle length (cm), grains per panicle, spikelet fertility (%), 1000 grain weight (g),straw yield per plant(g) and grain yield per plant(g). The mean performance of individual genotype over three environments was pooled and used for statistical analysis. Analysis of variance to test the significance for each character was carried out as per method by Panse and Sukhatme(1985). PCV and GCV were calculated by the formula given by Burton (1952), heritability in broad sense (h^2) by Burton and De Vane (1953) and genetic advance by Johnson *et. al* (1955).

The analysis of variance for different characters on pooled mean basis over different environments revealed that the mean sum of squares were significant for all characters studied. This indicated that genotypes were genetically variable and considerable amount of variability existed among them. The genetic parameters on pooled data are presented in Table 1. A wide range of variability was observed for all the characters studied. Greater variability in the initial breeding material ensures better chances of producing desired plant type. The characters studied in present investigation exhibited low, moderate and high PCV and GCV values. The PCV values were slightly higher than those of GCV for all characters studied except total tillers and productive tillers per plant indicating that there was a uniform G x E interaction. Similar findings were also reported by Bhadru *et al.* (2012). The highest magnitude of GCV was noticed for the character grains per panicle (22.60%) followed by straw yield per plant (17.16 %) and grain yield per plant (16.99%), while it was low for days to maturity (5.21%). The results are in agreement with Singh *et al*. (2006) for days to maturity and grain yield per plant. The moderate GCV values were noticed for plant height (9.56%), total tillers per plant (13.29 %), productive tillers per plant (12.14%) and 1000 grain weight (10.38 %). Similar

*Corresponding author's e-mail: blthaware@rediffmail.com

Table 1. Estimates of genetic parameters for various characters in rice on pooled mean basis over environments.

Characters	Range		General mean	GCV(%)	PCV(%)	h^2b(%)	Genetic advance	Genetic advance % mean
	Min	Max						
Days to initiation of flowering	88	119	105	7.01	7.32	92	14.70	13.84
Days to 50 % flowering	92	122	109	6.76	7.05	93	14.72	13.36
Days to maturity	123	151	138	5.21	5.53	89	14.00	10.12
Plant height (cm)	65	89	74	9.56	10.57	82	13.30	17.84
Total tillers / plant	8.5	15.4	12.0	13.29	18.75	45	2.32	19.96
Productive tillers / plant	6.9	12.4	9.8	12.14	19.26	40	1.70	16.05
Panicle length (cm)	19.4	24.8	22.0	6.98	9.49	55	2.35	10.64
Grains /panicle	67	170	106	22.60	23.13	96	48.64	45.50
Spikelet fertility (%)	72.2	93.1	82.9	6.83	7.34	86	10.80	13.09
1000 grain weight (g)	20.1	28.5	24.7	10.38	10.62	95	4.91	19.94
Straw yield / plant (g)	11.9	21.8	17.6	17.16	19.23	79	5.57	31.71
Grain yield /plant (g)	12.2	23.1	17.4	16.99	21.50	65	5.02	28.67

results were also reported by Yadav *et al.* (2010), RavindraBabu *et al.* (2012), and Sravan *et al.* (2012).

All the characters showed high estimate of heritability (more than 65%) except total tillers per plant, productive tillers per plant and panicle length. The results were in conformity with those of Ravindra Babu *et al.* (2012), Sravan*et al.* (2012) and Oladosu *et al.* (2014).The highest genetic advance as per cent of mean was observed for grains per panicle (45.50%) followed by straw yield per plant (31.71%), grain yield per plant (28.67%), total tillers per plant (19.69%), plant height (17.84%) and productive tillers per plant (16.05%). Similar results were also obtained by Sravan *et al.* (2012) for plant height, spikelet fertility and productive tillers per plant

High heritability coupled with high genetic advance as per cent of mean observed for grains per panicle, straw yield per plant, 1000 grain weight and grain yield per plant indicate that most likely the traits are under control of additive genes and hence selection may be effective. Low heritability accompanied with nearly high genetic advance as per cent of mean for total tillers per plant reveals that this character is governed by additive gene effects. The low heritability is being exhibited due to high environmental effects. Selection may not be effective in such cases.

It can be concluded that selection of the characters *viz.*, grains per panicle, straw yield per plant, 1000 grain weight and grain yield per plant were controlled by additive genes which could be improved through simple selection strategy.

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