

Genetic Variability and Correlation Studies in Yield Traits of Elite Rice (*Oryza sativa* L.) Genotypes

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ABSTRACT

Genetic variability and correlation were studied in elite rice genotypes grown during kharif season, 2015 at Regional Agricultural Research Station, Warangal. The values of genotypic and phenotypic coefficients of variation (GCV and PCV) were moderate for no. of grain per panicle, test weight and yield and low for days to 50% flowering, no. of effective tillers per plant and plant height. High heritability coupled with high genetic advance as percent of mean was found for no. of grains/panicle, test weight and yield indicating the preponderance of additive type of gene action for the expression of these characters and selection may be effective for improving these characters. Test weight exhibited positive and significant correlation with grain yield indicating the importance of this character for yield improvement. Selection for the characters no. of grains/panicle and test weight would be effective in improvement of yield in rice crop.

Keywords: Rice, Variability, GCV, PCV, Heritability, Genetic advance.

INTRODUCTION

Knowledge on nature and magnitude of genotypic and phenotypic variability present in any crop species plays an important role in formulating successful breeding programme. The genotypic coefficient of variation indicates the range of variability present in different characters, while the phenotypic coefficient of variation measures the role of environment on the genotypes. Selection for yield *per se* is not reliable and indirect selection for yield component traits play an

important role. Hence studies on character association not only help to understand the nature of physical linkage but also provide information on the nature and direction of association existing between the traits. Keeping in view the above perspectives, the present investigation was carried out to estimate the variability in elite rice genotypes. The primary consideration to bring about of genetic improvement of a crop is the study of genetic variability.

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An understanding of the character association with yield is a desirable for effective selection of traits for high yield (Benerjee & Kole, 2006).

MATERIALS AND METHODS

The present investigation, the experiment material comprised a total of seven elite rice genotypes which were evaluated through preliminary yield trials for yield, yield attributing traits. The present investigation was carried out at the Regional Agricultural Research Station, Warangal, which is located at an altitude of 304 M above MSL, 17.97° N latitude and 79.60° E longitude during *kharif*, 2015. The main crop seasons in Telangana State can be called as *kharif* (June-Dec) and *rabi* (Nov-April) seasons. The experiments were laid in randomized complete block design with three replications. Standard package of practices were followed to maintain a good crop in the field.

Five randomly competitive plants were selected from each replication and used to record observations on yield traits viz. number of effective tillers per plant, panicle length, number of grains per panicle and plant height and days to 50% flowering was recorded when 50% plants of the plot with flowering and grain yield were recorded on plot basis. Estimates of phenotypic and genotypic coefficients of variation (Burton & De Vane 1952), heritability estimates in broad sense (Lush, 1940) and genetic advance (Johanson et al., 1955) and correlation coefficient (Robinson et al., 1951) were calculated following standard statistical procedures.

RESULTS AND DISCUSSION

The analysis of variance exhibited the significant differences due to genotype for all the characters studies except no. of effective tillers/plant (Table 1). The range, mean, variability estimates such as genotypic coefficient of variation, phenotypic coefficient of variation, heritability, genetic advance and genetic advance as percent of mean are presented in Table 1. Variability of a character is measured by its coefficient of variation. The

genotypic and phenotypic coefficients of variation are classified (low: less than 10%, moderate: 10-20% and high: more than 20%) as suggested by Sivasubramanian and Madhava Menon (1973). The values of genotypic and phenotypic coefficients of variation (GCV and PCV) were moderate for no. of grain per panicle, test weight and yield (Krishna et al., 2008) and low for days to 50% flowering (Manjunath et al., 2017), no. of effective tillers per plant and plant height. The moderate genotypic variability exhibited by no. of grain per panicle, test weight and yield can be exploited by selection. This fact was supported by estimates of mean, range, GCV and PCV. The findings were in agreement with Bharadwaj et al. (2007), Basita et al. (2008). All the characters except no. of effective tillers per plant, the difference between GCV and PCV was less, indicating little influence of environment on the expression of these characters.

A particular character can be improved through simple selections if the heritability estimates for that character is high. Heritability estimates are categorized (low: less than 30%, moderate: 30-60% and high: more than 60%) as recommended by Johnson et al. (1955). Heritability and genetic advance are important selection parameters. As the heritability estimates alone do not provide sufficient information for the genetic improvement that would result from the selection of best individuals, genetic advance was calculated to predict net effect of selection. According to Johanson et al. (1955) and Panse (1957), heritability estimate and genetic advance should be considered jointly. The range of genetic advance as percent of mean is classified (low: less than 10%, moderate: 10-20% and high: more than 20%) as suggested by Johnson et al. (1955). High heritability was observed for days to 50% flowering, panicle length (cm) (Rukmini devi et al., 2016), no. of grains/panicle (Lingaiah et al., 2018), no. of grains/panicle, plant height (Lingaiah et al., 2018), test weight (g) and grain yield (kg/ha). High heritability coupled with high genetic advance as percent of mean was found for no.

of grains/panicle (Lingaiah et al., 2014; Islam et al., 2016 & Setu Rani Saha, 2019), test weight (Vaithiyalingan & Ndarajan, 2006; Lingaiah et al., 2014 & Shivani et al., 2018) and yield (Yadav et al., 2010; Gangashetty et al., 2013; Gokulakrishnan, 2014; Lingaiah et al., 2014; Lingaiah, 2015 & Rukmini devi et al., 2017) indicating the preponderance of additive type of gene action for the expression of these characters and selection may be effective for improving these characters. Low heritability and low genetic advance as percent of mean for no. of effective tillers per plant indicating that this character is highly influenced by environmental effects and selection would be ineffective. High heritability accompanied with low genetic advance as percent of mean for the trait days to 50% flowering reflected preponderance of non-additive gene action and selection for this trait may not be rewarding. For panicle length

high heritability coupled with moderate genetic advance (Akinola et al., 2019).

The character test weight exhibited positive and significant correlation with grain yield (Venkanna et al., 2014) indicating the importance of this character for yield improvement. Except the character days to 50% flowering, all other characters no. of effective tillers/plant, Panicle length (cm), No. of grains/panicle and Plant height (cm) showed the non-significant correlation with grain yield. The character days to 50% flowering exhibited positive and significant correlation with panicle length. The character plant height negatively correlated with the test weight (Dev Nidhi Tiwari et al., 2019). Present study revealed that there was good amount of genetic variability in the traits grains/panicle and test weight, selection would be more effective for developing high yielding genotypes.

Table 1: Estimates of variability and genetic parameters of seven yield traits in elite rice genotypes

Character	Range	Mean \pm SE	Mean sum of squares	GCV (%)	PCV (%)	H (bs) (%)	GA	GA as % of mean
Days to 50% flowering	92 to 105	100 \pm 0.93	79.69**	5.08	5.34	90.76	9.94798	9.98
No. of effective tillers/plant	10 to 13	11 \pm 0.68	2.15	0.043	11.25	14.78	0.39238	3.42
Panicle length (cm)	23.80 to 30.31	26.66 \pm 0.58	14.83**	8.05	8.89	81.96	4.00354	15.01
No. of grains/panicle	162 to 247	190 \pm 9.97	1919.22**	12.22	15.22	64.38	38.4174	20.19
Plant height (cm)	86.27 to 121.80	104.14 \pm 1.20	267.12**	8.99	9.21	95.26	18.8173	18.06
Test weight (g)	17.38 to 27.09	22.18 \pm 0.81	27.34**	13.12	14.56	80.96	5.38841	24.29
Yield (kg/ha)	3737 to 6391	5162 \pm 219.91	1810733.0**	14.43	16.21	79.28	1366.75	26.47

**Significant at $p < 0.01$

Table 2: Estimates of simple correlation coefficients for yield characters in elite rice genotypes

Character	Days to 50% flowering	No. of effective tillers/plant	Panicle length (cm)	No. of grains/panicle	Plant height (cm)	Test weight (g)	Yield (kg/ha)
Days to 50% flowering	1.00	0.015	0.670*	-0.333	0.139	-0.375	-0.033
No. of effective tillers/plant		1.00	-0.387	-0.133	-0.531	-0.241	0.053
Panicle length (cm)			1.00	-0.380	0.421	0.100	0.097
No. of grains/panicle				1.00	0.151	0.172	0.306
Plant height (cm)					1.00	-0.150	0.101
Test weight (g)						1.00	0.727*
Yield (kg/ha)							1.00

* Significant at $p < 0.05$

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