INTERNATIONAL JOURNAL OF APPLIED BIOLOGY AND PHARMACEUTICAL TECHNOLOGY

www.ijabpt.com Volume-5, Issue-2, April-June-2014 Coden : IJABPT Copyrights@2014

ISSN : 0976-4550

Received: 15th March-2014 *Revised: 4th April-2014* *Accepted: 5th April-2014*

Research article

GENETIC STUDIES FOR QUALITY TRAITS OF F_2 POPULATION IN RICE (*Oryza sativa* L.)

V.Venkanna , N Lingaiah, Ch S Raju and V T Rao

Regional Agricultural Research Station, WARANGAL - 506 007 (A.P)

rksing_05@yahoo.co.in

ABSTRACT: In the present investigation F_2 population of 36 crosses were studied to estimate the variability, heritability, and genetic advance and genetic advance as percentage of mean for agronomic and grain quality traits. The Genotypic Coefficient of Variation (GCV) and Phenotypic Coefficient of Variation (PCV) were low to moderate with low heritability and genetic advance for harvest index indicating that the character is highly influenced by non-additive genetic effects and thus the selection would be ineffective. The moderate heritability and genetic advance were recorded for grain quality characters *viz.,* kernel length, kernel breadth and L/B ratio. Moreover phenotypic and genotypic coefficients of variances were low which indicated the presence of non-additive gene action.

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

INTRODUCTION

The F_2 generation is critical for success of breeding programme because there are remote chances of finding superior recombinants in advanced generations if there is lack of desirable segregates in F_2 populations. Therefore the estimates of heritability in narrow sense and genetic advance would help to formulate a sound breeding programme. These genetic parameters were worked out for yield and physical quality characters based on F_2 generation means of 36 crosses in the present study.

MATERIALS AND METHODS

The experiment was conducted during *rabi*, 2007-08 and *rabi* 2008-09 at Regional Agricultural research Station, Jagityal, Andhra Pradesh. The study material comprising of nine rice (*Oryza sativa* L.) genotypes viz., MTU 1010, IR-64, MTU 1001, BPT-5204, NLR-34449, JGL-1798, Erramallelu, JGL-3844 and JGL-11690 were sown in a crossing block with four rows of 20 hills each at a spacing of 20 x 15 cm. 36 crosses were made in a 9 X 9 diallel mating design. F_1's were raised in *Kharif* 2008. Parents, F_1's and F_2's were evaluated during rabi, 2008-09 to estimate the Genetic variability, heritability and genetic advance. The standard error, phenotypic and genotypic coefficient of variation, heritability, genetic advance and genetic advance as percentage of mean were calculated by using INDOSTAT Statistical software. The values were treated as high, moderate and low as per the categorization proposed by Siva Subramanian and Madhavamenon (1973) for variability and Johnson et al. (1955) for heritability as well as genetic advance as per cent of mean.

RESULTS AND DISSCUSSION

Genotypic coefficient of variation, phenotypic coefficient of variation, heritability in narrow sense, genetic advance and genetic advance as percentage of means were estimated for yield and quality in F_2 generation as presented in Table1. PCV and GCV for total plant biomass recorded was 12.27 and 6.70 per cent respectively. Low heritability (21.16 per cent) coupled with low genetic advance (9.65 per cent) was observed for total plant biomass. For harvest index the genotypic coefficient of variation was 5.71 per cent while phenotypic coefficient of variation was 10.25 per cent. Low heritability (22.32 per cent) along with low genetic advance as percentage mean (8.39) was reported for this trait. Heritability (22.46) GCV (4.75) and PCV (13.14) and genetic advance was 4.54 per cent even low for grain yield per plant (Table 1).

Table: 1 Genetic parameters for yield and quality characters of rice in F_2 progenies

Parameter	Total biomass (g)	Harvest Index (%)	Grain yield/ Plant (g)	Hulling per cent	Kernel length (mm)	Kernel breadth (mm)	Kernel L/B ratio
PCV (%)	12.27	10.25	13.14	1.00	5.80	6.33	6.35
GCV (%)	6.70	5.71	4.75	0.57	5.57	5.89	5.87
h^2 (narrow sense) %)	21.16	22.32	22.46	21.79	56.76	28.06	32.06
GA (%)	4.61	3.58	0.92	0.68	0.78	0.28	0.42
GAM (%)	9.65	8.39	4.54	0.86	14.13	14.48	14.35

Among all traits studied lowest GCV (0.57 per cent) and PCV (1.00 per cent) with low heritability of 21.79 per cent and genetic advance as per cent mean of 0.86 was observed for the character hulling per cent. The GCV was low (5.57 per cent) where as the heritability was moderate (56.76 per cent) with a moderate genetic advance as percentage mean (14.13) for Kernel length. A trend of low GCV (5.89 per cent), low heritability (28.06) and moderate genetic advance (14.48) was also observed for the trait Kernel breadth. For the trait Kernel L/B ratio GCV and PCV recorded was 5.87 and 6.35 per cent respectively. The moderate heritability of 32.06 per cent and genetic advance of 14.35 per cent was observed for this trait. Low variability was observed with grain quality characters (Table 1). The characters total biomass, harvest index and grain yield showed moderate variability. Biomass is essential for high yield and its production depends primarily on photosynthetic ability (Suman et al.2005). Moderate variability was observed for biological yield. Low heritability coupled with low genetic advance noticed for this trait indicates presence of non-additive genetic effects.

The yield improvement is possible by increasing either harvest index or total biological yield. In general, higher harvest index values were associated with dwarf varieties (Suman et al.,). The GCV and PCV were low to moderate for harvest index, with low heritability and genetic advance indicating that the character is highly influenced by non-additive genetic effects and thus the selection would be ineffective. Prasanthi (1993) and Surender Raju (2002) also reported low GCV and PCV, whereas heritability and genetic advance were moderate. The estimates of heritability were low for grain yield, whereas the variability and genetic advance were found to be moderate to low. Low heritability in narrow sense was also observed for yield in rice by Surender Raju (2002) and Vaithiyalingan and Nadarajan (2006). Such lower values of narrow sense heritability and genetic advance indicates that yield is largely controlled by non-additive gene action, thus direct selection for yield as it is would not be effective, instead selection for its component characters having high relation with grain yield with biological yield and harvest index might be highly advantageous. Lowest variability was observed in case of hulling percentage is in accordance to the earlier reports of Nagajyothi (2001) and Madhavilatha (2002). Low heritability and genetic advance limits the chances of improvement of this character through direct selection in view of non-additive gene action in its inheritance.

Estimates of heritability as well as genetic advance were moderate for the grain quality characters *viz.*, kernel length, kernel breadth and L/B ratio. In addition phenotypic and genotypic coefficients of variances were also low for the traits *viz.*, kernel length, kernel breadth and L/B ratio. This indicated the presence of non-additive gene action. Similar findings were reported by Reddy and De (1996) and Krishna et al. (2008) for kernel length and breadth, and Krishna et al. (2008) reported for kernel L/B ratio. However, Bharadwaj et al. (2005) reported high heritability coupled with moderate genetic advance for both kernel length and breadth.

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