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GENETIC VARIABIITY AND CHARACTER ASSOCIATION FOR QUALITY TRAITS IN RECOMBINANT INBRED LINES DERIVED FROM INTER SUB-SPECIFIC CROSSES OF RICE (*ORYZA SATIVA* L.)

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Abstract

The investigation was carried out to study the genetic parameters for quality and nutritional characters in 60 recombinant inbred lines (RIL's) of rice. Analysis of variance revealed significant differences for all the traits. It was observed that grain yield per plant was positively significant associated with seed width, milling per cent, gelatinization temperature, amylose content and kernel breadth before cooking. Kernel length after cooking, seed width, milling per cent, amylose content and gelatinization temperature had positive direct effect on grain yield. Comprehensive examination of result revealed that the recombinant inbred lines tested for high yield in rice *viz*., RIL-77, 08, 99, 75, 10 and 13 were identified as superior.

Rice is the staple food crop of India, providing 43 per cent of caloric requirement for more than 70 per cent Indian population. Majority of the high yielding varieties developed hitherto suffer from poor consumer preference for variable quality. As a consequence, the process of selection for quality traits has become difficult. In situation of this kind, a precise knowledge of the genotypes and extent of correlated response to selection for yield attributes and quality traits would be of great help in planning a systematic breeding programme aiming at either selective or simultaneous improvement of cooking quality in the high yielding background for different consumer regions. Quality of rice may be considered from the view point of size, shape and appearance of grain, milling quality and cooking properties (Khush and Dela Cruz 2000). To achieve goals, the investigation will be conducted with objectives - to identity superior recombinant inbred lines (RIL) based on yield and quality traits. To estimate genetic parameter of variability for yield and quality traits in RILs. To study genotypic and phenotypic association among traits. To estimate path coefficient analysis of traits on seed yield.

The experimental material consists of 60 RILs, derived from inter sub-specific crosses JNPT40-01 × HMT. JNPT 40-01 a derivative of indica × japonica and indica rice variety, HMT, are used as parent to develop hybrid which was selected from the conventional Patel 3. All lines were planted in RCBD with three replications on Seed Breeding Farm, Department of Plant Breeding and Genetics, College of Agriculture, J.N.K.V.V., Jabalpur. Each plot comprised of 4 rows of 4 meter length spaced at 20 cm apart and plant within row at 20 cm. Recommended packages of practices follow to raise a good crop. Genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) were calculated by the method suggested by Burton (1952). The estimates of PCV and GCV were classified as low, moderate and high according to Sivasubramanian and Madhavamenon (1973).

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Correlation coefficients were calculated for all the character combinations at genotypic and phenotypic levels as per the formula given by Miller *et al.* (1958). Wright (1921) proposed the original technique but the analysis was carried out by modified method devised by Dewey and Lu (1959). Path coefficients were rated based on the scales given by Lenka and Mishra (1973). The mean range, phenotypic and genotypic coefficient of variation, heritability estimate genetic advance per cent of mean are presented in Table 1.

Table 1. Genetic parameter for yield and its component of RIL's in rice.

Characters	Range		Mean	GCV (%)	PCV (%)	h^2 (bs) (%)	GA as % of mean
	Min.	Max.					
Seed length (mm)	5.66	7.95	6.76	12.95	13.03	98.80	26.53
Seed width (mm)	2.00	3.00	2.49	21.00	22.87	84.34	39.74
Hulling per cent	74.51	84.90	79.59	4.48	4.49	99.87	9.22
Milling per cent	56.52	85.73	77.56	15.76	15.77	99.99	32.48
Kernel length before cooking (mm)	4.05	5.42	4.76	11.87	12.01	97.70	24.16
Kernel breadth before cooking (mm)	1.74	2.40	2.08	9.48	9.64	97.03	19.24
Kernel length after cooking (mm)	6.11	8.17	6.96	10.34	11.30	83.77	19.50
Kernel breadth after cooking (mm)	2.55	3.11	2.85	8.74	9.38	86.75	16.77
Length breadth ratio	1.79	2.87	2.32	18.22	19.37	88.43	35.29
Length breadth ratio of cooked rice	2.09	3.10	2.45	12.52	12.57	99.14	25.68
Elongation index	0.88	1.24	1.06	11.90	12.66	95.67	23.98
Elongation ratio	1.35	1.61	1.46	10.98	10.44	94.39	24.18
Amylose content (%)	13.38	22.51	18.73	69.82	69.84	99.93	8.61
Head rice recovery (%)	54.48	84.83	76.72	17.70	17.76	99.96	36.45
Gelatinization temperature (ºC)	56.00	79.00	72.03	19.72	19.72	100.00	40.63
Grain yield	17.57	42.87	30.69	32.18	32.23	99.72	66.21

Considering the magnitude of phenotypic and genotypic coefficient of variation it was revealed that amylose content, seed width, grain yield/plant and gelatinization temperature had relatively larger amount of genetic variability. In the present investigation, high heritability coupled with high genetic advance were exhibited for characters *viz.*, amylose content, grain yield/plant and gelatinization temperature. Such value indicated predominantly the presence of additive gene action in the expression of these traits and consequently greater chance of improving these traits through simple selection. High heritability coupled with low genetic advance was also observed for seed width, head rice recovery, seed length, elongation index, and length breadth ratio, such value indicate non-additive gene action and influenced by the favorable environment rather than genotypes. These results were in agreement with the finding of Bisne *et al.* (2009), Tyagi *et al.* (2004), Sinha *et al.* (2004), Elayaraja *et al.* (2004).

The grain yield per plant was positively significant associated with seed width, milling per cent, gelatinization temperature, amylose content, kernel breadth before and after cooking at both genotypic and phenotypic level. These results agree with the findings reported by Sarawgi *et al.* (1997), Elabd and Abd Allah (2004), Verma and Shrivastava (2004) and Singh *et al.* (1998).

The path coefficient analysis revealed that, kernel length after cooking, seed width, milling per cent, amylose content and gelatinization temperature had positive direct effect on grain yield per plant and therefore these traits will be given due importance while practicing

selection aimed to improve grain yield of RIL's in rice. The high positive indirect effect were observed for kernel length after cooking via seed length, length breadth ratio via amylose content was also important. These results agree with the findings reported by Sarawgi *et al*. (1997), Nandan *et al.* (2010) and Shanthala *et al*. (2004). On the basis of above finding the recombinant inbred lines tested for high yield in rice *viz.,* 77, 08, 99, 75, 10 and 13 were identified superior lines with respect to yield and its component characters.

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