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Genetic Variability, Heritability and Genetic Advance for Grain Quality Characters in Rice (*Oryza Sativa* L.) Hybrids

Key words: *Heritability, Genetic advance, Rice, Variability*

Rice (*Oryza sativa* L.) is the world's most important staple food for about 2.5 billion people and which may escalate to 4.6 billion by the year 2050. More than 40 per cent of the world's population depends on rice as the major source of calories. In India, about 65 per cent of the population has rice as major constituent in the diet and it is grown in almost all parts of the country and has the largest area of 43.86 million hectares and ranks second with an average production of 104.32 million tonnes and productivity of 2404 kg ha^{-1} (Ministry of Agriculture, Directorate of Economics and Statistics, 2014-15). Among the innovative breeding options available for enhancing the rice production in short term, hybrid rice is one of the technology which is practically feasible and readily adoptable one. Despite having great potential to enhance production and productivity of rice in the country, hybrid rice has not been adopted on large scale as expected due to several constraints. Lack of acceptability of hybrids due to region specific grain quality requirement and low consumer preference due to poor taste are reported in hybrid rice. Hence, selection for improved milling, cooking, eating and processing qualities is crucial to meet consumers' preference and industry standards. Keeping in view of the above perspectives, the present investigation is carried out to estimate the genetic variability in rice hybrids for quality traits

MATERIAL AND METHODS

Fifty four hybrids were developed by crossing three lines with 18 testers. Out of fifty four hybrids studied, ten hybrids recorded significantly higher grain yields compared to standard check (KRH-2) over locations. These ten hybrids along with two checks (DRRH-2 and KRH-2) were subjected to quality analysis at Agricultural Research Station, Nellore during *kharif* 2016 in two replications. After harvesting, threshing and cleaning, the seeds from individual hybrids were dried under shade until moisture content reaches to 14%. The seed was dehusked in a Satake laboratory huller (Type THU 35 A) and polished in a Satake Rice Polisher (Type TM 05). The polished seed obtained was then utilized for the quality analysis for 11 traits namely L/B ratio, hulling (%), milling (%), head rice recovery (%) (physical quality traits); kernel elongation ratio (ER), water uptake, volume expansion ratio (VER) (cooking quality traits); alkali spreading value, protein content, gel consistency (mm), amylose content (%) (chemical quality traits). The genotypic and phenotypic coefficients of variance (Burton and Devane, E.W. 1953), heritability and genetic advance as percentage of mean (Johnson *et al.* 1955) were estimated.

RESULTS AND DISCUSSION

The analysis of variance revealed highly significant differences among the genotypes for all the 11 quality characters indicating the existence of significant amount of variability among the characters studied. In the present study, the phenotypic coefficient of variation (PCV) was higher than the genotypic coefficient of variation (GCV) for all the characters studied (Table 1). A wide range of phenotypic coefficient of variation (PCV) was observed which ranged from 3.94 per cent for milling % to 23.43 per cent for alkali spreading value among the quality traits studied. Similarly, Genotypic coefficient of variation (GCV) showed a range from 2.21 per cent for hulling % to 22.96 per cent for alkali spreading value. High PCV and GCV were recorded for alkali spreading value (ASV) (23.43 % and 22.96%) indicating the présence of high degree of variability and better scope for the improvement through simple sélection. Similar results of high GCV and PCV for ASV were also reported by Allam *et al.* (2015) and Satyarajkumar *et al.* (2015). Moderate PCV and GCV were recorded for head rice recovery (16.98, 16.65), volume expansion ratio (15.89, 14.77), water uptake (15.72, 14.86) and gel consistency (14.81, 14.59). This indicates the existence of comparatively moderate variability for these traits which could be exploited for improvement through selection in advanced generations. Similar results of moderate GCV and PCV were also reported by Umadevi *et al.* (2010) and Satyarajkumar *et al.* (2015).

The high estimates of heritability coupled with high estimates of genetic advance was observed for gel consistency (97.14, 29.63), head rice recovery (96.23, 33.65), alkali spreading value (95.96, 46.32), water uptake (89.43, 28.96) and volume expansion ratio (86.44, 28.29). Similar results for these characters

Table 1. Genetic parameters for quality characters in rice (*Oryza sativa* L.) during *kharif* 2016

S.No.	Characters	General Mean	Range		Coefficient of variation		Heritability	Genetic Advance as % of Mean	Genetic Advance
			Min.	Max.	PCV (%)	GCV (%)	(Broad Sense)		
1	L/B Ratio	3.04	2.63	3.47	8.71	7.87	81.53	14.63	0.45
2	Hulling %	78.86	73.21	79.99	2.51	2.21	77.19	4.00	3.15
3	Milling %	72.75	67.58	76.04	3.94	3.06	60.32	4.90	3.57
4	Head rice recovery	54.09	35.65	64.31	16.98	16.65	96.23	33.65	18.20
5	Kernel elongation ratio	1.62	1.51	1.95	8.00	7.11	78.90	13.00	0.21
6	Water uptake	155.54	112.50	187.00	15.72	14.86	89.43	28.96	45.04
7	Volume expansion ratio	4.63	3.62	5.99	15.89	14.77	86.44	28.29	1.31
8	Alkali spreading value (GT)	3.79	2.50	5.26	23.43	22.96	95.96	46.32	1.76
9	Protein %	8.29	6.85	8.89	8.81	8.07	83.90	15.23	1.26
10	Gel consistency	70.04	55.00	88.50	14.81	14.59	97.14	29.63	20.75
11	Amylose content	25.15	21.35	28.55	10.59	9.83	86.19	18.79	4.73

were reported by Tushara *et al.* (2013), Arpita *et al.* (2014) and Allam *et al.* (2015). The high estimates of heritability coupled with medium estimates of genetic advance was observed for amylose content (86.19, 18.79), protein per cent (83.90, 15.23), L/B Ratio (81.53, 14.63) and kernel elongation ratio (78.90, 13.00) as earlier observed by Kumar *et al.* (2013), Allam *et al.* (2015) and Satyarajkumar *et al.* (2015). The high estimates of heritability and lower estimates of genetic advance as percent of mean was recorded for hulling and milling percent (77.19, 4.00 and 60.32, 4.90) and this is an indication of more environmental influence on these characters. Chandra *et al.* (2009), Venkata Subbaiah *et al.* (2011) and Kumar *et al.* (2013) were also reported high heritability and low genetic adavcnce for hulling and milling percent.

High PCV, GCV and heritability coupled with genetic advance were recorded for alkali spreading value. Charactères like head rice recovery, water uptake, volume expansion ratio and gel consistency showed moderate GCV and PCV and high heritability coupled with high genetic advance. This indicated the présence of high degree of variability and predominance of additive gene action and the improvement of these traits through simple sélection may be rewarding.

LITERATURE CITED

Allam C R, Jaiswal H K, Qamar A, Challa Venkateshwarlu and Reddy Y S 2015 Variability, heritability and genetic advance studies in some indegenous genotypes of basmati rice (*Oryza sativa* L.). *Electronic Journal of Plant Breeding.* 6 (2): 506-511.

Arpita Shrivastava, Mishra D K, Koutu G K and Singh S K 2014 Heritability and genetic advance estimation from parental lines of hybrid rice. *International Journal of Scientific Research*. 3 (7): 11-13.

Burton G W and Devane E W 1953 Estimating heritability in tall fescue (*Festuca arundiraceae*) from replicated clonal material. *Agronomy Journal*. 45: 478-481.

Johnson H W, Robinson H F and Comstock, R E 1955 Estimates of genetic and environmental variability of soybeans. *Agronomy Journal.* 47: 314-318.

Kumar V, Singh P K and Verma O P 2013 Correlation and path analysis of yield and its component characters in scented rice. *Oryza.* 4: 317-323.

Satyarajkumar A, Adilakshmi D, Ramakumar P V and Mukundarao Ch 2015 Genetic variability for yield, yield components and quality traits in rice hybrids. *The Andhra Agricultural Journal*. 62(4): 836-840.

Tushara M, Satyanarayanarao V, Ahamed L M, Krishnaveni B and Narasimharao K L 2013 Correlation of quantitative and qualitative characters with yield in medium and long duration genotypes of rice *(Oryza sativa* l.). 2013. *The Andhra Agricultural Journal.* 60(1): 29-35.

Umadevi M, Veerabadhiran P, Manonmani S and Shanmugasundaram P 2010. Physico-chemical and cooking characteristics of rice genotypes. *Electronic Journal of Plant Breeding.* 1 (2):114-123.

Venkata Subbaiah P, Reddi Sekhar M, Reddy K H P and Eswara Reddy N P 2011. Variability and genetic parameters for grain yield and its components and kernel quality attributes in CMS based rice hybrids (*Oryza sativa* L.). *International Journal of Applied Biology and Pharmaceutical Technology*. 2 (3): 603-609.

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