GENETIC VARIABILITY, CHARACTER ASSOCIATION AND PATH CO-EFFICIENT ANALYSIS IN RAINFED RICE, UNDER ALKALINE CONDITION

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ABSTRACT

Estimates of variability, heritability, genetic advance, correlation and path analysis were carried out for five characters (*Oryza sativa* L.) in rice with 15 salt tolerant genotypes under rainfed conditions. The highest genotypic coefficient of variation was observed for grain yield followed by harvest index, while it was the lowest for days to maturity. Days to 50 per cent flowering and days to maturity recorded high heritability and lowest for straw yield. Grain yield recorded high GCV, genetic advance and moderate heritability. Harvest index and straw yield were positively and significantly correlated with seed yield. Days to 50 per cent flowering recorded the highest positive direct effect on seed yield followed by harvest index. Harvest index recorded high positive and significant genotypic correlation co-efficient and direct positive effect on seed yield. The studies suggested that harvest index is important in the selection of superior genotypes of rice in rainfed condition.

KEY WORDS : Variability, Correlation, Path analysis, Harvest Index

Rice cultivation in problem soils under rainfed conditions in indispensable. It is important to understand the presence of variation, the association of characters with grain yield and the direct effect of characters on grain yield in some salt tolerant genotypes of rice under rainfed condition.

MATERIALS AND METHODS

Fifteen salt tolerant rice genotypes were obtained from Central Soil Salinity Research Institute, Karnal and Soil Salinity Research Centre, Trichy. Dry seeds were sown on 24th September 1993 before the onset of North East monsoon. The experiment was laid out in a randomised block design with three replications. The plot size was 3 m x 2 m and spacing followed was 20 cm between rows and 10 cm between plants. The pH of soil was 9.6. A fertilizer dose of 50:25:25 kg of NPK ha^{-1} was adopted. Entire P was applied as basal, entire N as top dress and the half of K as basal and another half of K as top dress and other recommended agronomic practices were followed. Biometric observations were recorded for five characters on five randomly selected plants. Standard statistical procedures were followed for calculating the genetic constants, correlation and path analysis (Burton, 1952, Lush 1940, Johnson *et al.*, 1955 and Dewey and Lu 1959).

RESULTS AND DISCUSSSION

The analysis of variance showed highly significant differences among the genotypes for all the characters studied. Higher GCV was observed for grain yield followed by harvest index and straw yield (Table 1). The high GCV could be exploited in selection programme. High GCV was repored for grian yield by Kaul and Kumar (1982) and Reddy and De (1996). The PCV was higher than their corresponding GCV. The difference between PCV and GCV was minimum for days to maturity followed by days to 50 per cent flowering suggesting that these characters were the least affected by the environment. This was also supported by very high value of heritability for these characters. The harvest index and straw yield exhibited wider gap between PCV and GCV indicating high environmental influence. It was confirmed by the lowest heritability of the characters. Very high heritability was observed for days to 50 per cent flowering and days to maturity and grain yield recorded moderate heritability.

Genetic advance as per cent of mean was high for grain yield as repored by Sawant and Patil (1995) followed by harvest index and straw yield and low for days to 50 per cent flowering and days to maturity. Heritability in conjunction with genotypic co-efficient of variation would give a

Table 1. Co-efficient of variation, heritability and genetic advance for five characters in upland rice

Characters	Range	GV	PV	GCV	PCV	PCV-GCV	Heri-tability	Genetic advance % of mean.
Days to 50% flowering	73.7 - 94.7	34.4	35.0	7.29	7.35	0.06	98.0	14.88
Days to maturity	108.7 - 126.0	34.4	34.9	5.08	5.11	0.03	98.0	10.40
Harvest index.	0.046 - 0.509	0.008	0.025	33.48	59.39	25.91	31.0	38.87
Straw yield (kg/plot 6 m^2)	1.25 - 5.37	0.718	2.536	29.35	55.16	25.81	28.0	32.17
Grain yield (kg/plot 6 m^2)	0.133 - 1.107	0.999	0.152	45.22	56.06	10.84	65.0	75.16

GV - Genotypic Variance

P.V - Phenotypic Variance

GCV - Genotypic Co-efficient of Variation

PCV - Phenotypic Co-efficient of Variation

more reliable index of selection value (Burton 1952). High heritability of days to 50 per cent flowering and days to maturity but low GCV implying the non-additive gene action resulted in low genetic advance and hence their response to selection would be poor. Grain yield with high genetic advance and high GCV and with moderate heritability indicates ample scope for the improvement of this character through selection.

The genotypic correlations were generally higher than the phenotypic correlations, indicating the inherent association between the traits (Table 2).

Grain yield was positively and significantly correlated with harvest index, followed by straw yield. Days to 50 per cent flowering revealed positive and significant correlation with days to maturity. Harvest index recorded positive and significant association with straw yield in genotypic level.

Days to 50 per cent flowering recorded high positive direct effect with grain yield followed by harvest index and straw yield (Table 3). Days to maturity recorded negative direct effect with the grain yield. The high positive direct effect of days to 50 per cent flowering has been nullified by its high

Table 2. Correlation co-efficient between different pairs of characters

Characters		Days to maturity	Harvest index	Straw yield (kg/plot)	Grain yield
Days to 50%	P	0.997**	0.042	-0.090	-0.044
flowering	G	1.001**	0.105	-0.147	-0.033
Days to maturity	P	-	0.044	-0.084	-0.049
	G	-	0.097	-0.152	-0.036
Harvest index	P	-	-	-0.0339	0.511**
	G	-	-	0.484**	0.957**
Straw yield	P	-	-	-	0.535**
(kg/plot)	G	-	-	-	0.797**

G - Genotypic, P- Phenotypic

Table 3. Path co-efficient, direct effects and indirect effects of the yield-components

characters	Days to 50% flowering	Days to maturity	Harvest index	Straw yield (kg/plot)	Genotypic correlation with grain yield
Days to 50% flowering	2.74	-2.79	0.077	-0.061	-0.033
Days to maturity	2.74	-2.78	0.072	-0.064	-0.036
Harvest index	0.287	-0.271	0.739	0.202	0.957**
Straw yield (kg/plot)	-0.403	0.425	0.358	0.418	0.797**

Residual effect = 0.226

negative indirect effect throught days to maturity. Due to this, days to 50 per cent flowering could not exert positive significant association with seed yield. Due to the positive indirect and direct effects of harvest index, it could exert positive significant genotypic correlation with grain yield. The indirect effects of straw yield through days to maturity, harvest index along with direct positive effect could associate with grain yield positively and significantly. Due importance might be given in the selection programme for harvest index and straw yield as these two characters recorded positive and significant association with grain yield and they exerted high indirect effects on grain yield.

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INTERRELATIONSHIP BETWEEN EARLINESS AND YIELD COMPONENTS IN RICE

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ABSTRACT

Relationship between earliness and other yield components were analyzed in 20 crosses involving four early and five very early lines in indica rice. Earliness (days to flowering) had significant and positive correlation with most of the characters studied. Positive significant association was observed among the yield components. Correlation studies revealed that selection for very early types obviously resulted in reductin in panicle length, number of grains and 100 grain weight which in turn reduced the yield.