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CORRELATION AND PATH ANALYSIS IN SOME RICE VARIETIES UNDER ALKALINE STRESS*

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ABSTRACT

Field experiment was conducted with forty genotypes of rice (Oryza sativa L) under alkaline stress conditions during rabi season. The results revealed the following. Grain yield exhibitied positive phenotypic and genotypic correlation with plant height, number of productive tillers and grain number. The results of path analysis revealed that the highest positive direct effect on yield was exerted through number of productive tillers followed by grain number per panicle.

A large proportion of cultivable land has become unfit for successful crop production due to the accumulation of large amounts of sodium and bicarbonates. It is estimated that about 7 million hectares in our country have either gone out of cultivation or this area produces low yields of crops. Hence, the development of crop species and varieties suitable for growing in alkaline soils is one of the major tasks, in any program for increasing production in such soils. The effort would obviously necessitate an understanding of the relationship of yield with other components traits of rice varieties grown under alkaline stress conditions.

MATERIAL AND METHODS

The experiment was carried out with forty distinct genotyes or rice (Oryza sativa. L) at Alaathur village near Oomatchikulam in Madurai district during 1982 rabi season. The soil type of the field was sandy loam having 9.6 pH. A randomised block design with three replications was adopted. From a nursery under proper management, 27 day old seedlings were transplanted adopting 15 x 10 cm spacing. Mean values of 5 plants from each plot were utilised for statistical analysis. The methods suggested by Johnson et.al.(1955) and Deway and Lu (1959) were adopted for calculating the genotypic, phenotypic and environmental correlation coefficients and path coefficient analysis respectively.

RESULTS AND DISCUSSION

Simaltaneous selection of more than one character is essential for any crop improvement programme, especially for enhancing the complex character like yield. The genotypic correlation coefficient chiefly accounted for linkage, pleiotropic action of genes and effect of selection. The phenotypic correlation may be genotypic and/or environmental in origin and provides information about

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association between two observable characters. The results of the phenotypic, genotypic and environmental correlation coefficients are given in Table - 1. It was seen that grain yield exhibited highly significant positive phenotypic and genotypic correlations with number of productive tillers and grain number per panicle. Under saline stress conditions, Bhattacharyya (1981) reported significant positive correlation of yield with grain number. Highly significant environmental correlation was found between grain yield and number of productive tillers.

The intercorrelations among the yield components reveaaled that the genotypic correlation coefficients of plant height with panicle length, grain number and hundred grain weight were positive and significant. Similar associations were reported for plant height with panicle length (Chaudury et.al. 1980) grain number (Mohanty and Singh, 1969; Gangadharan and Ghosh, 1975) and hundred grain weight (Brar and Saini, 1976) by several workers under normal wet land conditions. The negative and significant genotypic correlation of days to half bloom with number of productive tillers and hundred grain weight indicated that long duration varieties were less productive in tiller number and reduced the hundred grain weight under alkaline stres. Spikelet sterility was negatively correlated with plant height, No. of productive tillers, grain number and hundred grain weight. Spikelet sterility which recorded high heritability estimates (99.81 per cent) in this study might be reckoned as an important trait while exercising selection for other traits.

Significant negative environmental correlations were observed for days to half bloom with hundred grain weight and for plant height with number of productive tillers. According to Adams (1967), such negative inter-correlations between developing traits may be due to the development of one character on the suppression of the other, as a consequence of competition for common nutrient.

PATH ANALYSIS

Path Analysis provided an aid for sorting out the total correlations into direct and indirect effects of different characters on yield. The results of Path Analysis furnished in Table - 2. revealed that the maximum positive direct effect was exerted through number of productive tillers followed by grain number. Panicle length was found to have very low negative direct effect on yield in the present study. This was in agreement with the findings of Singh et.al.(1980)

Days to half bloom exhibited considerable magnitude of negative indirect effect through number of productive tillers on yield. Similarly, spikelet sterility though grain number exhibited negative indirect effect on yield. Though spikelet sterility and days to half bloom had positive direct effect on yield they had negative genotypic correlation with yield because of the negative indirect effects through other traits.

It can be inferred from the results of genotypic correlation coefficients and path analysis that plant height, number of productive tillers and grain number

Table.1 : Phenotypic, Genotypic and environmental correlation coefficients (r) between different pairs of eight characters of rice genotypes under alkaline stress.

Sl.No	Characters		Height of the plant	No.of productive tillers	Length of the main panicle	No.of grain per panicle	Spikelet Sterility	100 grain weight	Grain yield per plant
1.	Days to 50% flowering	P	-0.1754	-0.2698*	0.1207	0.1811	0.1417	-0.3117**	-0.1230
		G	-0.1774	-0.2727*	0.1254	0.1829	0.1425	-0.3133**	-0.1240
		E	0.1309	0.0902	-0.0794	0.0066	0.0475	-0.2232*	0.0092
2.	Height of the plant	P		0.2042	0.4627**	0.3767**	-0.1509	0.3383**	0.2725*
		G		0.2069	0.4720**	0.3784**	-0.1513	0.3428**	0.2736*
		E		-0.5024**	0.0333	0.1218	0.0319	-0.0458	0.0095
3.	No.of productive tillers	P			0.0058	0.1583	-0.1973	0.1130	0.7465**
		G			0.0075	0.1594	-0.1980	0.1138	0.7462**
		E			-0.1146	0.0046	0.0101	0.0661	0.8009**
4.	Length of mean panicle	P				0.1727	0.1090	0.1942	0.0462
		G				0.1748	0.1103	0.2059	0.0486
		E				0.0980	0.1093	-0.2021	-0.1086
5.	No.of grains per panicle	P					-0.4664**	0.0086	0.3258**
		G					-0.4705**	0.0093	0.3289**
		E					0.3299**	-0.0404	-0.1164
6.	Spikelet sterility	P						-0.0268	-0.0423
		G						-0.0268	-0.0427
		E						-0.0451	0.0593
7.	100 grain weight	P							0.1577
		G							0.1594
		E							0.0310

*Significant at 5% level **Significant at 1% level P-Phenotypic Correlation Coefficients G-Genotypic Correlation Coefficients E-Environmental Correlation Coefficients.

Table-2 : Path coefficient analysis showing the direct and indirect effects under alkaline stress.

S.No	Characters	Days to 50% flowering	Plant height	No.of productive tillers	Length of the main panicle	No.of grains per panicle	Spikelet sterility	100 grain weight	Genotypic correlation coefficient on grain yield.
1.	Days to 50% flowering	**0.0256**	-0.0101	-0.2002	-0.0117	0.0606	0.0393	-0.0276	-01240
2.	Plant height	-0.0045	**0.0566**	0.1519	-0.0440	0.1253	-0.0418	0.0302	0.2736
3.	No. of productive tillers	-0.0070	0.0117	**0.7340**	-0.0007	0.0528	-0.0547	0.0100	0.7462
4.	Length of the mean panicle	0.0032	0.0267	0.0055	**-0.0933**	0.0579	0.0304	0.0181	0.0486
5.	No. of grains per panicle	0.0047	0.0214	0.1170	-0.0163	**0.3312**	-0.1299	0.0008	0.3289
6.	Spikelet sterility	0.0037	-0.0086	-0.1453	-0.0103	-0.1558	**0.2760**	-0.0024	-0.0427
7.	100 grain weight	-0.0080	0.0194	0.0835	-0.0192	0.0031	-0.0074	**0.0880**	0.1594

Residual effect = 0.5903. The Bold figures denote direct effects.

showed not only positive crrelation coefficients but also positive direct effects on yield.

This study among forty genotypes of rice under alkaline stress indicated that the varieties AU.1, CUL 25333, SR 26-B, IET 6700, IET-6999, CSR 4 and IET 6238 were alkaline tolerant in the order of merit. Among the above seven genotypes, Au.1, CSR 4 and IET 6700 were stable in respect of productive tillers and grain number per panicle but were sensitive in respect of plant height, number of productive tillers and grain number per panicle. These characters might be recombined by hybridization for developing high yielding varieties of rice tolerant to alkaline stress.

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