The differences in seed cotton yield due to genotypes were significant under stress condition in the first season only (Table - 4). The first season yield was higher than the second season. The differences in yield between genotypes in stress and non-stress condition is more in the first season than in the second season because of severe drought. Genotypes LRA.5166, TKH.680, TKH.679 and TKH.4-4-3 in the descending order had recorded more than 320 grams of seed cotton per plot under stress condition. Of these, TKH.680 and TKH.679 had registered higher yield under stress than under non-stress condition, with drought index of 1.37 and 1.05 respectively. It indicated that the yield potential of TKH.679 under stress was as good as under non-stress condition. In the second season TKH.679had recorded the highest yield of 75 gram per plot under stress condition with drought index of 0.93. Here also the first season performance of TKH.679 was repeated though TKH.679 was associated with fewer number of fruiting forms per plant than TKH.680and TKH.640. Seetharama *at al* (1983) observed that high yield potential culture always takes advantages of physiological mechanisms (mostly limited by water supply.) This may be responsible for TKH,679 giving higher yield under stress condition in both the seasons.

It can be concluded from the present study that TKH.679 was the most drought tolerant genotype as it recorded the maximum seed cotton yield under drought (1988) with yield potential under stress as good as under non-stress condition (1987). The average drought index was 0.99.

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GENETIC VARIABILITY, CORRELATION AND PATH ANALYSIS OF YIELD COMPONENTS IN RICE

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ABSTRACT

The present study revealed a wide range of genotypic and phenotypic variation in the traits studied. High estimates of genetic coefficient of variation, heritability and genetic advance were exhibited by total number of spikelets and grain yield per plant. Grain yield per plant was found positively and significantly associated with panicle weight, number of ear bearing tillers and plant height. The number of ear bearing tillers exerted maximum direct effect followed by plant height and 100-grain weight.

Grain yield in rice (*Oryza sativa* L.) is a complex trait and is the ultimate expression of its components. In any breeding programme, it is essential to know the variability, relationship of the yield components among themselves and with grain yield.

The direct and indirect effects towards grain yield can not be measured by correlations, which measure only mutual association. Path coefficient, which is a standardized partial regression coefficient permits the separation of correlation coefficients into measures of direct and indirect effects. The present study was carried out with the objectives (i) to study the variability, (ii) to study the association of yield traits among themselves and with grain yield, and (iii) to study the direct

Table 1. Estimates of mean, PCV and genetic parameters for grain yield and yield traits in rice.

Characters	Mean	PCV	GCV	Herit-ability	Genetic advance as per cent of mean
Ear bearing tillers	9.34	29.01	28.95	98.23	53.64
Plant height (cm)	104.96	7.28	7.23	98.81	11.01
Primary branches	9.28	14.59	14.48	99.20	37.72
Panicle length(cm)	19.99	9.73	9.21	90.19	22.21
Total number of spikelets	104.18	19.91	19.89	99.82	61.89
100-grain weight (g)	2.59	10.05	10.04	99.15	20.85
Grain yield per plant (g)	12.37	26.02	25.98	99.50	84.88
Panicle weight (g)	2.31	37.21	36.95	94.20	64.94

and indirect effects of the component characters on yield.

MATERIALS AND METHODS

The experiment was conducted with a set of 20 rice varieties during the *kharif*, 1982 at the Agricultural Farm of S.D.J.P.G. College, Chandeshwar, Azamgarh. A randomized block design was adopted with three replications. Each treatment consisted of eight rows of the variety. The transplanting was done by adopting a spacing of 30 cm between rows and 25 cm between plants. Each row was 6 meters long with 25 plants. Observations were recorded from 10 randomly selected plants in each replication on grain yield and yield traits namely, ear bearing tillers (EBT), plant height, primary branches, panicle length, total number of spikelets, 100-grain weight and panicle weight. The statistical analyses were done at the Computor Centre of Indian Agricultural Statistical Research Institute, New Delhi.

RESULTS AND DISCUSSION

Variability, Heritability and Genetic Advance

The wide range of variations observed for all the traits would offer scope of selection for development of desirable types. The higher estimates of PCV in comparison to GCV for all the traits suggest the influence of environmental factors on the traits, also reported by Lal *et al.* (1983).

All the traits showed high heritability, being highest for total number of spikelets followed by grain yield per plant and 100-grain weight and lowest for panicle length (Table 1). The estimate of

Table 2. Estimates of genotypic and phenotypic correlation coefficients among grain yield and yield traits in rice.

Characters		Plant height	Primary branches	Panicle length	Total number of spikelets	100-grain weight	Grain yield per plant	Panicle weight
Ear bearing tillers	G	NS(+)	NS(-)	NS(+)	NS(+)	NS(+)	NS(+)	NS(-)
	P	NS (+)	-0.28**	NS(+)	NS(+)	NS(+)	0.47**	NS(-)
Plant height	G		NS(+)	NS(+)	NS(+)	NS(-)	NS(+)	NS(+)
	P		NS(+)	0.31**	0.24**	NS(-)	0.36**	NS(+)
Primary branches	G			NS(+)	NS(+)	NS(-)	NS(+)	NS(+)
	P			NS(+)	NS(+)	NS(-)	NS(+)	0.81**
Panicle length	G				NS(+)	NS(-)	NS(+)	NS(+)
	P				0.53**	NS(-)	NS(+)	NS(+)
Total number of spikelets	G					NS(-)	NS(+)	NS(+)
	P					NS(-)	NS(+)	0.76**
100-grain weight	G						NS(+)	NS(+)
	P						NS(+)	0.63**
Grain yield per plant	G							NS(+)
	P							0.59**

** Significant at P = 0.01; G = Genetypic correlation coefficient, P = Phenotypic correlation coefficient

Table 3. Path coefficient analysis of the total correlations observed between yield and yield traits in rice.

Characters	Ear bearing tillers	Plant height	Total number of spikelets	100-grain weight	Genotypic correlation with grain yield
Ear bearing tillers	0.44	0.01	0.01	0.02	0.48
Plant height	0.02	0.34	0.02	-0.01	0.37
Total umber of spikelets	0.05	0.08	0.09	0.02	0.20
100-grain weight	0.07	-0.02	-0.02	0.13	0.16

Residual effect = -0.593; Underlined values are direct effects.

genetic advance as per cent of mean was highest for grain yield per plant followed by panicle weight and total number of spikelets and lowest for plant height. In the present study, higher estimates of heritability along with genetic advance were observed for total number of spikelets, grain yield per plant and panicle weight as also reported by Shamsuddin (1982).

Correlation

The correlations between grain yield and other yield traits and among the traits themselves are given in Table 2. The genotypic correlations were found to be considerably more than the phenotypic correlations for all the traits. Grain yield per plant was positively and significantly correlated with ear bearing tillers, plant height and panicle weight. Other yield traits had non-significant correlations with grain yield. These observations find support from Kaul and Kumar (1982). The positive and significant correlation was observed between panicle length and plant height, panicle length and number of spikelets and plant height and number of spikelets. Panicle weight exhibited positive and significant correlations with primary branches, number of spikelets, 100-grain weight along with grain yield per plant.

Path analysis

The total genotypic correlation was partitioned into direct and indirect effects of the different traits on yield. The results obtained from character combinations of four characters, namely, ear bearing tillers, plant height, total number of spikelets and 100-grain weight towards grain yield per plant is presented in Table 3. All the direct effects towards grain yield were positive while the maximum was observed in the case of EBT followed by plant height, 100-grain weight and total number of spikelets. The present findings find support from the study of Amirthadevarathinam (1983). The indirect effects were either positive or negative but lower in magnitude except those shown by total number of spikelets with EBT (0.05) and plant height (0.08) and 100-grain weight with EBT. However, the present study indicates the importance of ear bearing tillers as a selection criteria in hybridization programmes.

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