

## CORRELATION STUDIES IN RICE (*Oryza sativa* L.)

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A study was made to find out the phenotypic correlation, correlation based on *gca* of parents, correlation based on *sca* and heterosis of hybrids for yield and yield components using 7 X 7 diallel. The results showed positive and significant association of productive tillers per plant, number of grains per panicle and 100 grain weight with grain yield both based on mean and *gca* effects of parents. The correlation between heterosis for different traits indicated that heterosis for yield is not influenced by heterosis for other component characters except days to flowering and that heterosis for lateness apparently has a positive effect on yield. Choice of parents based on *per se* performance and *gca* effects can lead to rapid improvement in these characters and ultimately the yield.

In rice, grain yield is influenced by different characters. Hence a knowledge on correlation between grain yield and component characters and also the intercorrelation between the component characters will be helpful for simultaneous selection for characters influencing the yield. Besides, the correlation based on *gca* of parents, *sca* and heterosis of hybrids for the different traits will be useful in understanding the genetic mechanism governing the characters.

### MATERIALS AND METHODS

Seven rice varieties viz., Cult. 340, ADT. 3, ADT. 16, Co. 33, Co. 37, IR 8 and IR 20 were crossed in all possible combinations. All the 42 F<sub>1</sub>s with the parents were raised in Randomised Blocks Design with three replications during *Kharif* 1983. Each variant consisted of a single row of 21 plants placed 10 cm apart and spacing between rows was 20 cm. Observations on days to 50%

flowering, plant height, productive tillers per plant, number of grains per panicle, 100 grain weight and grain yield per plant were recorded on 10 randomly chosen plants from each replication and mean values were used for statistical analysis. Correlation between mean for all the six characters was worked out. For correlations based on *gca* and *sca*, the *gca* effects of parents and *sca* effects of hybrids derived as per combining ability analysis (Griffing, 1956) were used.

### RESULTS AND DISCUSSION

The phenotypic correlation between yield and yield components obtained are furnished in Table 1. Days to flowering had significant positive correlations with productive tillers per plant, number of grains per panicle and grain yield per plant and significant negative correlation with plant height. It had no correlation on 100 grain weight.

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Plant height had significant negative correlation with productive tillers per plant. Productive tillers had positive significant correlations on number of grains per panicle, 100 grain weight and grain yield. Number of grains per panicle had positive and significant correlations with 100 grain weight and grain yield. A positive correlation was observed between 100 weight and grain yield.

Correlations between general combining ability effects of different traits are furnished in Table 2. The *gca* effects for days to flowering were negatively correlated to *gca* effects for plant height. The *gca* effects for productive tillers were positively correlated with *gca* effects for number of grains per panicle and *gca* effects for grain yield. The *gca* effects for number of grains per panicle were positively correlated to *gca* effects for 100 grain weight and *gca* effects for grain yield. The *gca* effects for 100 grain weight had no correlation with *gca* effects for other traits except number of grains per panicle.

The *sca* effects for days to flowering had significant and positive correlation with *sca* effects for 100 grain weight. All other correlations were not significant (Table 3).

Correlations between heterosis based on mid parent values are furnished in Table 4. The heterosis for days to flowering alone had positive and significant correlation with heterosis for grain yield while

there was no significant correlation between other traits.

The positive and significant correlation between grain yield with other traits viz., days to flowering, productive tillers per plant, number of grains per panicle and 100 grain weight and presence of significant inter-correlations between these traits (except between 100 grains weight and days to flowering) offer great scope for selection based on these traits for best results. Positive association of grain yield with productive tillers (Singh and Nanda, 1975; Aly, 1979 and Singh, 1980), number of grains/panicle (Singh and Nanda, 1975; Satpathy and Nanda, 1978 and Yadav and Singh, 1979), 100 grain weight (Singh and Nanda, 1975; Brar and Saini, 1976 and Talwar and Goud, 1974) and days to flowering (Yadav and Singh, 1979) were reported, whereas a significant negative correlation between plant height and productive tillers per plant with yield. (Majumdar *et al.*, 1971) was observed.

In the present study, correlation between days to flowering and plant height both based on mean and *gca* effects was negative. This indicates that when plants are selected for lesser duration (days to flowering), the plant height is likely to be taller. Considering the importance of semi tall type with short duration in rice breeding, a compromise at optimum level of plant height and duration has to be struck. In the case of other important traits like productive tillers

Table 1. Correlation between means of different characters

	Plant height	Productive tillers per plant	Number of grains per panicle	100 grain weight	Grain yield per plant
Days to flowering	-0.392**	0.394**	0.405**	0.039	0.411**
Plant height		-0.354**	-0.044	0.248	0.228
Productive tillers per plant			0.760**	0.476**	0.670**
Number of grains per panicle				0.605**	0.804**
100 grain weight					0.564**

\*\* Significant at 1 per cent level

Table 2. Correlation between parental general combining ability effects for different traits

Days to flowering	-0.765*	0.670	0.611	0.014	0.659
Plant height		-0.517	-0.186	0.276	-0.356
Productive tillers per plant			0.945**	0.306	0.951**
Number of grains per panicle				0.767*	0.954**
100 grain weight					0.723

\*\* Significant at 1 per cent level

\* Significant at 5 per cent level

Table 3. Correlation between specific combining ability effects of hybrids for different traits

Days to flowering	0.017	-0.080	-0.092	0.651**	0.379
Plant height		0.098	0.392	-0.008	0.166
Productive tillers per plant			0.098	-0.015	0.040
Number of grains per panicle				-0.033	0.252
100 grain weight					0.039

\*\* Significant at 1 per cent level

Table 4. Correlation between heterosis (di) for different characters

Days to flowering	-0.052	0.119	-0.010	-0.132	0.335*
Plant height		-0.047	0.093	0.039	0.052
Productive tillers per plant			0.251	0.204	0.089
Number of grain per panicle				0.275	0.206
100 grain weight					0.013

\* Significant at 5 per cent level

and grain yield, number of grains per panicle and grain yield, productive tillers and number of grains per panicle, number of grains per panicle and 100 grain weight, the correlations are significant and positive based both on mean and *gca* effects of parents. Therefore choice of parents on mean perfor-

mance and *gca* effects of parents can lead to rapid improvement in these characters and ultimately yield. The absence of correlation based on *sca* effects indicates the differential interactions of the genes of different characters which is favourable in breeding.

The correlation between heterosis (di) for different traits indicates that heterosis for yield was not influenced by heterosis for other component characters except days to flowering which had positive significant correlation with grain yield. Therefore, it is apparent that yield heterosis is not due to heterosis for component characters but to some interaction effects between the different pathways of heterosis for yield. The positive correlation between heterosis for days to flowering and heterosis for yield indicates that it may not be possible to obtain heterosis for yield by reducing the duration. Heterosis for lateness apparently has got a positive effect on heterosis for yield. But Virmani *et al.* (1981) observed that heterosis in yield was found to be due to heterosis in spikelet per panicle and 1000 grain weight. It was also found that positive heterosis in spikelets per panicle was found to compensate heterosis for panicles per m<sup>2</sup>.

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