

ASSOCIATION OF YIELD AND ITS COMPONENTS IN RICE (*ORYZA SATIVA L.*)*

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ABSTRACT

In rice, positive and significant correlation existed between yield and five of its components, plant height, production tillers, panicle length, grain number per panicle and grain weight in the F₂ progenies. Both positive and negative correlations between days to flowering and other yield component traits were observed. Significant and positive intercorrelations between plant height and tiller number and panicle length; tiller number and panicle length and panicle length and grain number were observed in the crosses.

KEY WORDS : Rice, Correlation, Yield Components.

Yield is a complex character being influenced by various component factors. A knowledge of the association of component traits with yield may greatly help in making selection precise and accurate. The greater the magnitude of correlation coefficient, the stronger is the association (Gomez and Gomez, 1976). The results on the association of yield and its components are presented.

MATERIALS AND METHODS

The material comprised of the F₂ progenies of six inter-varietal hybrids crossing ADT 16, Co 33 and Co 37 as parents in all possible combinations. The F₂ population was raised in a randomised block design with two replications at Tamil Nadu Rice Research Institute, Aduthurai. In a replication each treatment consisted of five rows of 20 plants with a spacing of 20x10 cm. Observations were recorded on days to flowering, plant height, number of productive tillers per plant, panicle length, grain number per panicle, 100 grain weight and single plant yield. The simple phenotypic correlation coefficients were estimated using

the formula suggested by Goulden (1952). The significance of correlation coefficients was tested (Snedecor, 1961).

RESULTS AND DISCUSSION

The correlation analysis indicated that the single plant yield was positively and significantly associated with plant height, number of productive tillers per plant, panicle length, grain number per panicle and grain weight (Table 1). Positive association of grain yield with the above traits was reported by Rajagopalan *et al.* (1973) in the F₂ of BAM 3/T(N)1 cross, Natarajamoorthy (1979) in the F₂ populations of inter-varietal crosses and Amirthalingam (1980) in IR 36 hybrid derivatives.

Days to flowering was negatively and significantly associated with grain yield (Table 2). Negative association of days to flowering with grain yield was reported by Sivasubramanian and Madhava Menon (1973a) in the F₂ populations of rice and Talwar and Goud (1974) in rice varieties. Days to flowering was also negatively correlated with other traits such as plant

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Table 1. Correlation coefficient between single plant yield and its component traits.

S.No.	Crosses	Days to flowering	Plant height	Number of productive tillers per plant	Panicle length	Grain number per panicle	100 grain weight
1.	ADT 16/CO 33	-0.5217**	0.2837**	0.7613**	0.2357**	0.3532**	0.2323**
2.	Co 33/ADT 16	0.0081 ^{NS}	0.4563**	0.8176**	0.3518**	0.4773**	0.0666 ^{NS}
3.	Co 33/Co 37	-0.0926 ^{NS}	0.3446**	0.8475**	0.3219**	0.4674**	0.0249 ^{NS}
4.	Co 37/Co 33	-0.0545 ^{NS}	0.2932**	0.8740**	0.3959**	0.1760*	-0.3324**
5.	Co 37/ADT 16	0.0905 ^{NS}	0.2938**	0.8803**	0.3429**	-0.0858 ^{NS}	0.3742**
6.	ADT 16/Co 37	-0.5625**	0.4559**	0.7359**	0.3681**	0.1171 ^{NS}	0.2306**

height, tiller number, grain number and grain weight in four crosses; in the other crosses, there was positive and significant relationship between days to flowering and the traits tiller number, grain number per panicle and grain weight in the present study. Negative association of days to flowering with yield component traits in rice was reported by Govindasamy *et al.* (1973) and Sukanya Subramanian and Madhava Menon (1973 a). Positive relationship between days to flowering and the traits tiller number, panicle length and grain number was reported by Nagesha (1976) and Amirthalingam (1980). Chang and Tagumpay (1974) and Yadav and Singh (1979) reported positive association between days to flowering and plant height. Saini and Gagneja (1975) demonstrated that 100 grain weight was positively correlated with days to flowering in rice.

Plant height was positively and significantly associated with tiller number

and panicle length in six crosses (Table 3). Positive and negative correlations in respect of plant height with grain number and grain weight were observed in the crosses. Gopal Reddy and Goud (1970), Rajagopalan *et al.* (1973) and Nagesha (1976) reported positive correlation between plant height and the traits tiller number, panicle length and grain number. Positive association between plant height and grain weight was reported by Amirthalingam (1980) and Gopinath *et al.* (1984). Negative correlation between plant height and tiller number was reported by Chang and Tagumpay (1970) and Suyambulingam and Jebarani (1979). Govindasamy (1973) reported negative association between plant height and grain number and grain weight. In this study, the positive relationship of plant height with other characters indicated that the tall types can be selected for improving panicle length and grain number compared to dwarf types. However, the negative relationship of

Table 2. Correlation coefficient between days to flowering with other traits.

S.No.	Crosses	Plant height	Number of productive tillers per plant	Panicle length	Grain number per panicle	100 grain weight
1.	ADT 16/CO 33	-0.0332 ^{NS}	-0.0704 ^{NS}	0.0352 ^{NS}	0.0133 ^{NS}	-0.0891 ^{NS}
2.	Co 33/ADT 16	-0.0186 ^{NS}	-0.0354 ^{NS}	-0.0786 ^{NS}	0.0421 ^{NS}	-0.0020 ^{NS}
3.	Co 33/Co 37	-0.1208 ^{NS}	-0.1103 ^{NS}	-0.1089 ^{NS}	-0.0378 ^{NS}	0.0541 ^{NS}
4.	Co 37/Co 33	-0.0108 ^{NS}	-0.0227 ^{NS}	-0.0410 ^{NS}	-0.0028 ^{NS}	-0.0393 ^{NS}
5.	Co 37/ADT 16	-0.0720 ^{NS}	0.1786*	0.2418**	-0.1657*	0.0001 ^{NS}
6.	ADT 36/Co 37	-0.0784 ^{NS}	-0.0842 ^{NS}	-0.0838 ^{NS}	0.0260 ^{NS}	0.7695**

Table 3. Correlation coefficient between plant height with other traits.

S.No.	Crosses	Number of productive tillers per plant	Panicle length	Grain number per panicle	100 grain weight
1.	ADT 16/CO 33	0.1702*	0.0775 ^{NS}	-0.1051 ^{NS}	0.4787**
2.	Co 33/ADT 16	0.3367**	0.5388**	0.2948**	0.0181 ^{NS}
3.	Co 33/Co 37	0.2387**	0.3957**	0.2365**	0.1044 ^{NS}
4.	Co 37/Co 33	0.2353**	0.5753**	0.0679 ^{NS}	0.0583 ^{NS}
5.	Co 37/ADT 16	0.2664**	0.7158**	-0.1401*	0.3526 ^{NS}
6.	ADT 36/Co 37	0.4223**	0.5079**	-0.0973 ^{NS}	0.1489*

plant height with grain number observed in the three crosses was a limiting factor for increasing the yield.

The present investigation showed the existence of positive and significant association between number of productive tillers per plant and panicle length (Table 4). This is in agreement with the reports of Rajagopalan *et al.* (1973) and Das and Borthakur (1973). Both positive and negative associations between tiller number and grain number and grain weight were observed. The tall parent ADT 16 produced plants with less number of tillers with low grain weight, whereas the semi-dwarf parents Co 33 and Co 37 produced high number of productive tillers with high grain weight per panicle. This indicated that the tiller number should be given due consideration in a selection scheme. This was in agreement with the reports of Sathypathy and Nanda (1978). In

this study, negative association between tiller number and grain weight was observed. Similar associations were recorded by Gopal Reddy and Goud (1970) and Gopinath *et al.* (1984). This might be due to the increase in the tiller number and equal distribution of synthates among the tillers in a plant.

There was positive and significant association between panicle length and grain number in this study. Similar close association of panicle length with grain number was reported by Rajagopalan *et al.* (1973), Natarajamoorthy (1979) and Gopinath *et al.* (1984). But panicle length was negatively and significantly correlated with grain weight. Similar results were reported by Rao *et al.* (1980).

The present study further indicated that there was a significant negative association between grain number per panicle and

Table 4. Correlation coefficient between number of productive tillers per plant, panicle length and grain number per panicle with other traits.

S. No.	Crosses	Number of productive tillers per plant			Panicle Length		Grain number per panicle
		Panicle Length	Grain number per panicle	100 grain weight	Grain number per panicle	100 grain weight	100 grain weight
1.	ADT 16/CO 33	0.3270**	-0.1678*	-0.0150 ^{NS}	0.0388 ^{NS}	-0.2415**	-0.1525**
2.	Co 33/ADT 16	0.3235**	0.0164 ^{NS}	-0.0028 ^{NS}	0.2814**	-0.2820**	-0.3756**
3.	Co 33/Co 37	0.3464**	0.0892 ^{NS}	-0.0566 ^{NS}	0.1631**	0.1497*	-0.3450**
4.	Co 37/Co 33	0.3638**	-0.1862**	-0.1077 ^{NS}	0.5168**	-0.0074 ^{NS}	-0.4589**
5.	Co 37/ADT 16	0.3161**	-0.4510**	0.2966**	-0.1340 ^{NS}	0.3048**	-0.3897**
6.	ADT 36/Co 37	0.3022**	-0.4362**	0.7487**	-0.1076 ^{NS}	0.1295 ^{NS}	-0.2521**

** Significant at 1 per cent level

* Significant at 5 per cent level

NS - Not significant

grain weight in the six cross combinations. When there was an increase in grain number in a panicle, there was corresponding reduction in grain size and weight. This was true in the case of tall plants. Negative association between grain number and grain weight was reported by Gopinath *et al.* (1984). According to Newall and Eberhart (1961) when two characters show negative phenotypic and genotypic correlations, it would be difficult to exercise simultaneous selection of these characters in the development of a variety. Hence, under such situations judicious selection programme might be formulated for simultaneous improvements of such important developmental and component characters.

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