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Correlation Studies Between Yield and its Components in Advanced Breeding Lines in Rice (*Oryza Sativa* L.) Under Salinity

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ABSTRACT

Correlation studies between yield and its components under saline conditions is carried out in 69 advanced breeding lines of rice. Results revealed that significant positive correlation of grain yield/plant with ear bearing tillers/plant, panicle length and spikelet fertility and positive non significant correlation with plant height, number of filled grains/panicle and test weight. The association between grain yield/plant and initial and final salinity scores was negative and significant. Based on the association between the yield and its traits, selections can be made for improvement of yield especially under saline conditions, by taking the positive significant associated traits.

Key words : Components, Rice, Salinity.

Rice is the world's second most important cereal after wheat and is staple food for more than half of the world's population. In India, it is cultivated in an area of 44 million hectares with an annual production of 1,592 million tonnes and an average productivity of 3.6 t/hectares (Faostat.Fao.Org, 2013-2014). Andhra Pradesh is one of the important state contributing to the production and productivity of rice in the country with an area of about 41.9 lakh hectares with an annual production of 97.46 lakh tonnes and an average productivity of 2.93 t/ hectares.

Rice production is affected by many biotic and abiotic stresses throughout the world. Among the abiotic stresses, soil salinity is a major factor limiting the crop production globally which affects large areas of the world cultivated land causing 40-50% yield loss (Tavakkoli *et al*., 2011). Out of the total rice cultivated area in India, 8.6 million hectares of area, is salt-affected including 3.4 million hectares sodic soils. About 6.3 lakh hectares of land is affected by salinity in Andhra Pradesh.

Many scientists have examined the effect of salt stress on crop growth and development with the aim of discovering mechanism used by stress-tolerant genotypes that confers tolerance but the success was to a limited extent only. Among all the growth stages, seedling stage (2-3 leaf stage) is most susceptible to salt stress (Flowers and Yeo, 1981).

Reclamation of salinity is difficult and expensive, and not the permanent solution to the problem. Introduction of salt-tolerant varieties is the realistic approach to obtain better yield under saline conditions (Ashraf *et al*., 2008 and Saeed *et al*., 2012).

Number of plant traits have been found associated with sustained yield under stress conditions. If some of the easily visible morphological traits follow strong association with complex traits like yield it could be a reliable marker for selection of tolerant variety in the stress conditions. The present study aimed to study the association of characters among themselves and also with yield under saline conditions as the nature and strength of relationship between these traits will give an idea, how selection of one trait affects the other.

MATERIAL AND METHODS

In the present study, 69 advanced breeding lines developed under DBT-IRRI funded project were evaluated for salinity tolerance under hydroponics, during rabi season at APRRI & RARS, Maruteru.

Data regarding eight characters *viz.*, initial and final salinity scores, plant height, ear bearing tillers/plant, panicle length, number of filled grains/ panicle, spikelet fertility, test weight and grain yield/ plant was collected at random and Phenotypic

Table 1. Estimates of phenotypic correlation coefficient studies between yield and yield traits in saline conditions.

S. No	Character	Plant height (cm)	EBT/ plant	Panicle length (cm)	Number of filled grains/ panicle	Spikelet fertility %	Test weight (g)	Salinity Initial Score (10 days)	Salinity Final score (16 days)	Grain yield/ plant (g)
1	Plant height (cm)	1.0000	0.1854	0.2135	-9.1973	-0.3053**	-0.0911	0.0853	0.0616	0.0438
2	EBT/ plant		1.0000	0.0047	-0.8203**	-0.0327	0.1322	-0.0638	-0.0203	0.2566*
3	Panicle length (cm)			1.0000	0.3273**	-0.0695	-0.1743	0.2099	-0.0091	0.5078**
4	Number of filled grains/panicle				1.0000	0.1571	-0.2775*	-0.0665	-0.1362	0.2205
5	Spikelet fertility %					1.0000	0.0926	-0.3146**	-0.1929	0.2853*
6	Test weight (g)						1.0000	-0.1946	0.1648	0.0094
7	Salinity Initial Score(10 days)							1.0000	0.5722**	-0.0509*
8	Salanity Final score(16 days)								1.0000	-0.1092*
9	Grain yield/plant (g)									1.0000

*indicates significance at 5 % level and ** indicates significance at 1 % level

correlation coefficients were calculated using formulae suggested by Al-Jibouri *et al.* (1958).

RESULTS AND DISCUSSION

Correlation studies revealed that the trait, plant height, exhibited significant negative correlation with spikelet fertility and positive correlation with all other traits including grain yield/plant. Ear bearing tillers/plant showed significant positive correlation with grain yield/plant while it exhibited negative significant correlation with number of filled grains/ panicle (Table.1).

A positive significant correlation was observed for the character panicle length with number of filled grains/panicle and grain yield/plant while the correlations were negative between panicle length and all other traits. The trait, number of filled grains/panicle exhibited negative significant correlation with test weight and negative correlation with initial and final salinity scores while there was a positive correlation between filled grains/panicle and grain yield/plant.

The trait, spikelet fertility, showed positive significant correlation with grain yield/plant while it showed significant negative correlation with initial salinity score and negative correlation with final salinity score. A positive association was observed between test weight and grain yield/plant while the correlation was negative between test weight and initial salinity score.

The most important trait along with grain yield was initial and final salinity score. A positive and significant correlation was observed between initial and final salinity scores while the initial score exhibited negative and significant correlation with grain yield/plant. Further, the initial salinity score exhibited non significant positive correlation with plant height and panicle length while the correlation was negative with ear bearing tillers/plant, number of filled grains/panicle, spikelet fertility and test weight.

The trait final salinity score has prominent role in the present study. A significant negative correlation was exhibited by the final salinity score with grain yield/plant. Also a positive association was observed between final salinity score and plant height and test weight while it exhibited negative correlation with all the yield attributing traits.

Grain yield/plant exhibited significant positive correlation with ear bearing tillers/plant, panicle length and spikelet fertility. The association between grain yield/plant and initial and final salinity scores was negative and significant. Also the association between the grain yield/plant and plant height, number of filled grains/panicle and test weight was positive. The findings might prove

valuable, if they were found linked complexly inherited traits of economic value such as yield and its major components, tolerance to abiotic stresses etc.

Thus, grain yield is a highly complex trait that can be divided into component characters, *viz.,* plant height, EBT/ plant, panicle length, number of filled grains/panicle, Spikelet fertility and test weight. In the present study, most of the yield contributing traits showed correlation among themselves as well as with yield and more importantly with salinity tolerance. The association between grain yield/plant and initial and final salinity scores was negative and significant, indicate the effect of salt tolerance on yield.

The correlation of initial salinity score was negative with ear bearing tillers/plant, number of filled grains/panicle, spikelet fertility and test weight. Final salinity score exhibited negative correlation with all the yield attributing traits.

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