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Short Communication

CORRELATION AND PATH ANALYSIS STUDIES IN GALLMIDGE RESISTANT CULTURES OF RICE (*ORYZA SATIVA* L.)

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ABSTRACT: Correlation and path coefficient analysis was carried out for yield and yield components in 21 gall midge resistant rice genotypes. Number of grains per panicle, days to 50% flowering and panicle length had a significant positive association with yield and also had a positive direct effect on grain yield. These traits contributed maximum to higher grain yield compared to other characters, thus, selection for these characters helps in selection of superior gallmidge resistant genotypes in rice.

Key words: Rice, correlation and path analysis

INTRODUCTION

The existing relationships between traits are, generally determined by the genotypic, phenotypic and environmental correlations. The phenotypic correlation measures the degree of association of two variables and is determined by genetic and environmental factors. The environmental correlation is mainly responsible for the association of traits of low heritability, such as grain yield. The genotypic correlation on the other hand, which represents the genetic portion of the phenotypic correlation, is the only one of inheritable nature and therefore, used to orient breeding programs (Falconer, 1989). However, the correlation coefficient between two characters does not necessarily imply a cause and effect relationship. The inter-relationship could be grasped best if a coefficient could be assigned to each path in the diagram designed to measure the direct influence on it. Before placing strong emphasis on breeding for yield improvement trait, the knowledge on the association between yield and yield attributes will enable the breeder in the improvement of yield. The correlation coefficient may also help to identify characters that have little or no importance in the selection programme. The existence of correlation may be attributed to the presence of linkage or pleiotropic effect of genes or physiological and development relationship or environmental effect or in combination of all (Oad et al., 2002). The basic objective of most of the crop improvement programs is to realize a marked improvement in crop yield. But yield is a complex character which is controlled by association of various characters. Thus, information on association of yield attributes and their direct and indirect effects on grain yield are of paramount significance. Hence, path analysis is of much importance in any plant breeding program. Character association and path are pre-requisites for improvement of any crop including rice for selection of superior geno-types and improvement of any trait (Krishnaveni et al., 2006). The major advantage of path analysis is that, it permits the partitioning of the correlation coefficient into its components, one component being the path coefficient that measures the direct effect of a predictor variable upon its response variable; the second component being the indirect effect(s) of a predictor variable on the response variable through another predictor variable (Dewey and Lu, 1959). In agriculture, path analysis has been used by plant breeders to assist in identifying traits that are useful as selection criteria to improve crop yield (Milligan et al., 1990; Surek and Beser, 2003). The present study was undertaken to derive information on genotypic correlation, direct and indirect effect of various traits in 21 gallmidge resistant cultures of rice.

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MATERIALS AND METHODS

Nineteen Jagtial cultures resistant gall midge biotype 3 and well adopted two check varieties viz., MTU 1010 and MTU 1001 comprise the basic material for study. These twenty one entries were evaluated in randomized block design with 4m length of 20 rows each with 20 x 15cm spacing during *kharif* 2007, 2008 and 2009 with two replications at Regional Agricultural Research Station, Jagtial (Latitude 18° 48¹ N and Longitude 78° 24¹ E) for Northern Telangana agro- climatic zone of Andhra Pradesh. Observations were recorded on five plants at random in each replication for the characters studied were days to 50% flowering, plant height (cm), panicle length (cm), filled grains per panicle and square meter for effective bearing tillers and seed yield and 1000 grain weight. Pooled data of three years were used to carry out correlation coefficients for all possible combinations of characters as per the procedure outlined by Panse and Sukhatme (1985). Path analysis was carried out following the method suggested by Dewey and Lu (1959).

RESULTS AND DISCUSSION

Analysis of variance revealed that all the entries were significantly different for all the characters studied indicting the presence of considerable genetic variation in the experimental material. The characters days to 50 per cent flowering, effective bearing tillers and panicle length exhibited significant positive association with grain yield per plant. The results were supported by the earlier findings of Krishna *et al.,* (2008), Yugandhar Reddy *et al.,* (2008) and Bhadru *et al.,* (2011) for all the traits. Negative significant association of plant height with grain yield per plant was observed. It was in contrary to earlier finding of Yugandhar Reddy *et al.,* (2008) and Bhadru *et al.,* (2011). This reveals the importance of these components increasing the grain yield. The highest degree of association between days to 50% flowering, effective bearing tillers and panicle length were the most reliable component of grain yield and can be very well utilized as an indicator of grain yield.

Association analysis among yield component characters revealed that number of grains per panicle, days to 50% flowering and panicle length had strong positive significant association with other. Similarly, strong positive significant association of each other of test weight and effective bearing tillers. Number of grains per panicle, days to 50% flowering, panicle length, test weight and effective bearing tillers, selection would offer the scope for simultaneous improvement in all these traits in addition to improving the yield. Negative and significant association observed test weight, plant height, effective bearing tillers and number of grains per panicle each other.

Table 1: Genotypic correlations for yield and yield contributing characters in rice

Characters	Days to 50% flowering	Plant height (cm)	Effective bearing tillers/ m^2	Panicle length (cm)	Test weight (g)	Number of grains per panicle	Grain yield/m^2(g)
Days to 50% flowering	**1.0000**	0.1304	0.0103	0.1127	-0.2057 **	0.2863 **	0.3724**
Plant height (cm)		**1.0000**	-0.2994 **	0.1488 *	-0.1432 *	-0.0152	-0.2173**
Effective bearing tillers/ m^2			**1.0000**	-0.2379 **	0.3769 **	-0.3562 **	0.1759*
Panicle length (cm)				**1.0000**	-0.0138	0.3042 **	0.1739*
Test weight (g)					**1.0000**	-0.4732 **	0.1399
Number of grains per panicle					-	**1.0000**	0.057

The correlation coefficients were inadequate to interpret the cause and effect relationships. However, path analysis technique furnishes a method portioning the correlation coefficients between various characters into direct and an indirect effect provides the actual contribution of an attribute and its influence through the other traits. The path coefficient analysis (table2) revealed that days to 50 per cent flowering, panicle length, test weight and effective bearing tillers per panicle had maximum direct effect on seed yield. These results conforming the earlier reports of Panwar and Mashiat Ali (2007) for days to 50 per cent flowering, Eradasappa *et al.,* (2007) and Krishna *et al.* (2008) for effective bear tillers. This study given us scope of indentify potential genotypes with days to 50% flowering, more number of grains and lengthy panicles.

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Table 2: Genotypic path coefficients for yield and yield contributing characters in rice

Characters	Days to 50% flowering	Plant height (cm)	Effective bearing tillers/ m^2	Panicle length (cm)	Test weight (g)	Number of grains per panicle	Grain yield/m^2(g)
Days to 50% flowering	**0.4231**	0.0552	0.0044	0.0477	-0.087	0.1211	0.3724**
Plant height (cm)	-0.0337	**-0.2582**	0.0773	-0.0384	0.037	0.0039	-0.2173**
Effective bearing tillers/m^2	0.0007	-0.0217	**0.0726**	-0.0173	0.0274	-0.0259	0.1759*
Panicle length (cm)	0.0217	0.0287	-0.0459	**0.1929**	-0.0027	0.0587	0.1739*
Test weight (g)	-0.0311	-0.0217	0.0571	-0.0021	**0.1514**	-0.0716	0.1399
Number of grains per panicle	-0.0084	0.0004	0.0104	-0.0089	0.0139	**-0.0293**	0.057

Residual effect: 0.8488

Moderate to low level of indirect effect was exerted on grain yield per plant by via days to 50% flowering through plant height, effective bearing tillers, panicle length and number of grains per panicle. Positive low level of indirect effect was exerted on grain yield per plant by panicle length through days to 50% flowering, plant height and number of grains per panicle. Number of grains per panicle had the indirect positive effect on grain yield through effective bearing tillers and test weight. Characters, number of grains per panicle, days to 50% flowering and panicle length had direct positive effect and significant positive association with seed yield. Hence, these traits contributed maximum to higher seed yield compared to other characters. Correlation in grouping with path analysis would give a better insight into cause and effect relationship between different pairs of characters (Jayasudha and Sharma, 2010). Partitioning of total correlation into direct and indirect effect by path coefficient analysis helps in making the selection more effective (Priya and Joel, 2009).

In plant breeding, it is very difficult to have complete knowledge of all component traits of yield. The residual effects permit precise explanation about the pattern of interaction of other possible components of yield. Residual effect (0.8488) was very high, indicating that characters included in the present study were not able to explain the direct and indirect effects on dependent variable.

The genetic architecture of grain yield is based on the balance or overall net effect produced by various yield components interacting with one another. Characters, number of grains per panicle, days to 50% flowering and panicle length had direct positive effect and significant positive association with seed yield. Hence, it may be concluded that these traits contributed maximum to higher seed yield compared to other characters, thus simultaneous selection for these characters is expected to improve grain yield in selection of superior genotypes with resistance to gall midge resistance in rice.

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