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Correlation studies in magic *indica* plus population and Indian rice germplasm

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Abstract
One hundred and two MAGIC *indica* plus lines, one hundred and four rice accessions, along with four standard checks of rice (*Oryza sativa* L.) were evaluated during Kharif 2017 to study the nature and extent of correlation among yield and yield attributing characters *viz.*, days to 50 per cent flowering, plant height, number of productive tillers per plant, panicle length, number of filled grains per panicle, number of grains per panicle, spikelet fertility, thousand-grain weight, grain yield per plant. The results revealed that grain yield plant per plant to be positively and significantly associated with with number of filled grains per panicle (r_p= 0.657**; r_g= 0.665), spikelet fertility (r_p= 0.301**; r_g= 0.321), number of productive tillers per hill (r_p= 0.153**; r_g= 0.068), panicle length (r_p= 0.133**, r_g= 0.114) indicating importance of these traits as selection criteria in yield improvement programmes.

Keywords: Rice, MAGIC *indica* plus population, Indian rice germplasm, yield, correlation

Introduction
Rice (*Oryza sativa* L.) is one of the pivotal staple cereal crops feeding more than half of the world population. In view of the growing population, the basic objective of the plant breeders would always be towards yield improvement in staple food crops. It is estimated that the demand for rice will be 121.2 million tonnes by the year 2030, 129.6 million tonnes by the year 2040 and 137.3 million tonnes by the year 2050 (Anonymous, 2015) [2]. The grain yield is a complex trait, quantitative in nature and a combined function of several constituent traits. Consequently, selection for yield *per se* may not be much satisfying unless other yield component traits are taken into consideration (Satheeshkumar and Saravanan, 2012) [13]. Understanding of correlation between yield and yield components are fundamental to find out strategies for plant selection (Hasan *et al.*, 2011) [7]. The present study was, therefore, undertaken to understand the character associations in rice accessions for yield improvement.

Materials and Methods
The present study comprised of 102 MAGIC *indica* plus lines, 104 rice accessions and 4 checks, the experiment were carried out at the College farm, College of Agriculture, PJTSAU, Rajendranagar, Hyderabad during *kharif*, 2017. The experiment trial was laid out in Alpha Lattice Design with 3 replications. Each entry was planted in 4 rows with a spacing of 15 x 15 cm^2. Data on the basis of 5 randomly taken competitive plants excluding borders were recorded on seven quantitative characters *viz.*, plant height, number of productive tillers per plant, panicle length, number of filled grains per panicle, number of grains per panicle, spikelet fertility, thousand-grain weight, grain yield per plant while days to fifty percent flowering was recorded on a whole plot basis. Correlation coefficients were calculated at genotypic and phenotypic level using the formulae suggested by Falconer (1964) [6].

Results and Discussion
The estimates of simple correlation coefficients (phenotypic and genotypic) computed between eight characters under study are presented in Table-1 and Table-2.
In the present study, grain yield per plant possessed positive and highly significant correlation with number of filled grains per panicle (r_p= 0.657**; r_g= 0.665), spikelet fertility (r_p= 0.301**; r_g= 0.321), number of productive tillers per hill (r_p= 0.153**; r_g= 0.068), panicle

length (r_p= 0.133**, r_g= 0.114). These findings were also corroborated by Ekka *et al*. (2011) [5], Lakshmi *et al*. (2014) [11], Hossain *et al*. (2015) [8], Babu *et al*. (2012) [3], Anis *et al*., (2016) [1], Kumar *et al*. (2018) [10], Swapnil *et al*. (2020) [14], Parimala *et al*. (2020) [12] and Khan *et al*. (2020) [9]. It indicated that grain yield can be increased whenever there is an increase in characters that showed positive and significant association with grain yield. Hence, these characters can be considered as criteria for selection for higher yield as these were mutually and directly associated with yield. On contrary, plant height showed negative and significant correlation associated with grain yield per plant ((r_p= -0.103*; r_g= -0.104). Negative correlation coefficient of plant height with grain yield indicated that in general, tall genotypes were low yielders due to accumulation of photosynthates in vegetative parts as compared to reproductive parts (*i.e.* seed formation and grain filling) and were lodging susceptible (Zahid *et al.*, 2006) [16]. Negative and non-significant associated of 1000 grain weight with grain yield per plant (r_p= 0.039; r_g= -0.023). Similar kind of negative and non-significant association of phonological characters with grain yield per plant was reported earlier for observations on 1000 grain weight (Babu *et al*. 2012) [3].

The results revealed that the genotypic correlation coefficients in most cases were higher than their phenotypic correlation coefficients indicating the association was largely due to genetic reason (Bhattacharyya *et al*. 2007) [4]. However, the phenotypic correlation coefficients in some cases were higher than their genotypic correlation, which indicates the suppressing effect of the environment that can alter the expression of characters at the phenotypic level. Our finding is in agreement with the previous result in early maturing rice presented by Tiwari *et al*., (2019) [15].

Table 1: Estimation of phenotypic correlation coefficients between yield and yield related attributes in 210 rice accessions

Character	Days to 50% Flowering	Plant Height (cm)	No. of Productive Tillers/ Hill	Panicle Length (cm)	No. of Filled Grains/Panicle	Spikelet Fertility (%)	1000 Grain Weight (g)	Grain Yield/Plant (g)
Days to 50% flowering	1.000	0.140**	0.074	-0.055	0.042	-0.175**	-0.213**	-0.006
Plant height (cm)		1.000	0.069	0.369**	-0.005	-0.176**	0.014	-0.103*
No. of productive tillers/ Hill			1.000	0.006	0.003	-0.103*	-0.059	0.153**
Panicle length (cm)				1.000	0.278**	0.002	0.166**	0.133**
No. of filled grains/ Panicle					1.000	0.500**	-0.094	0.657**
Spikelet Fertility						1.000	0.010	0.301**
1000 grain weight (g)							1.000	0.039
Grain yield/Plant (g)								1.000

** Significant at 1 per cent level * Significant at 5 per cent level

Table 2: Estimation of genotypic correlation coefficients between yield and yield related attributes in 210 rice accessions

Character	Days to 50% flowering	Plant height (cm)	No. of productive tillers/ Hill	Panicle length (cm)	No. of filled grains/panicle	Spikelet fertility (%)	1000 grain weight (g)	Grain yield/Plant (g)
Days to 50% flowering	1.000	0.158	0.056	-0.098	0.032	-0.207	-0.273	-0.013
Plant height (cm)		1.000	0.085	0.451	-0.005	-0.200	0.015	-0.104
No. of productive tillers/ Hill			1.000	-0.057	-0.105	-0.195	-0.197	0.068
Panicle length (cm)				1.000	0.234	-0.075	0.131	0.114
No. of filled grains/ Panicle					1.000	0.494	-0.193	0.665
Spikelet fertility						1.000	-0.041	0.321
1000 grain weight (g)							1.000	-0.023
Grain yield/Plant (g)								1.000

** Significant at 1 per cent level * Significant at 5 per cent level

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