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Correlation study for yield contributing traits in aerobic rice (*Oryza sativa* L.)

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Abstract
Grain yield or economic yield, in almost all the crops, is the complex character which manifests from multiplicative interactions of several other characters that are termed as yield components. The genetic architecture of grain yield in rice as well as other crops is based on the balance or overall net effect produced by various yield components directly or indirectly by interacting with one another. Therefore, selection for yield *per se* alone would not matter much as such unless accompanied by the selection for various component characters responsible for conditioning it.

Keywords: correlation coefficient, significant, non-significant

Introduction
India is the largest rice growing country in the world, but its productivity per unit area as compared to world average is low. Asia is considered as 'Rice bowl' of the world, occupying 90% world's rice area. More than 90 per cent of the world's rice is grown and consumed in Asia, where 60 per cent of Earth's people live. Rice accounts for 35 per cent to 75 per cent of the calories consumed by more than 3 billion Asians. In India rice is cultivated in an area of about 43.50 million hectares with an annual production of about 159.20 million tonnes with average productivity of 3659.8 kg per hectare (Anonymous, 2013) [1]. In Uttar Pradesh, the area of rice is about 13.84 million hectares and production is 14.00 million tones with productivity of 2358 kg per hectare (Anonymous, 2012) [2]. Cultivation of aerobic rice appears to be one of the potential approaches for meeting the challenge of sustaining rice production under water scarcity. Aerobic rice is the new concept to further decrease water requirements in rice production in water short areas. Aerobic rice is defined as high yielding rice grown in non-puddled and non-flooded aerobic soil. It is usually grown under supplementary irrigation and with fertilizer inputs (Wang *et al*., 2002) [2].

Materials and Methods
The present investigation was carried out at the Crop Research Farm, Masodha, N.D. University of Agriculture and Technology, Narendra Nagar (Kumarganj), Faizabad. The germplasm along with check varieties were evaluated during *Kharif*, 2013. Geographically this place is located in between 26.47^0N latitude, 82.12^0E longitude and at an altitude of 113 meters above from mean sea level. This area falls in sub-tropical climatic zone. The climate of district Faizabad is semi-arid with hot summer and cold winter. The germplasm evaluation experiment involved evaluation of 56 germplasm lines along with three checks *viz*., Shusksamrat, NDR 2064 and NDR 359.The 56 germplasm lines along with three checks were evaluated in augmented design during *Kharif*, 2013. The experimental field was sub-divided in to 4 blocks of 17 plots each. The three checks were allocated randomly to three plots in each block, while remaining 14 plots in a block were used for accommodating the unreplicated test genotypes.

Result and Discussion
The estimates of simple correlation coefficients computed between twelve characters under study are presented in Table 1. The grain yield per plant exhibited highly significant and positive correlation with 1000-grain weight (0.510) and biological yield per plant (0.487) and significant positive correlation with harvest-index (0.277) while significant and negative correlation was recorded between grain yield per plant and days to maturity (-0.243). Harvest-index showed highly significant and positive correlation with 1000-grian weight (0.482) but it had highly significant and negative correlation with biological yield per plant (-0.686) and

negative significant correlation with panicle bearing tillers per plant (-0.283). Biological yield per plant exhibited positive and significant correlation with plant height (0.287). The 1000-grain weight had negative association of significant nature with plant height (-0.258). Spikelet fertility possessed highly significant and positive associations with flag leaf area (0.394) along with negative and highly significant correlation with Spikelet per panicle (-0.866) and negative and significant association with panicle length (-0.249). Spikelet per panicle possessed significant and positive association with panicle length (0.240). Panicle bearing tillers per plant recorded positive and highly significant correlation with panicle length (0.342) and positive and significant correlation with days to maturity (0.296).days to 50% flowering was positively correlation with days to maturity (0.240). The estimates of correlation coefficients between remaining character pairs were found to be non-significant in this analysis.

Grain yield or economic yield, in almost all the crops, is the complex character which manifests from multiplicative interactions of several other characters that are termed as yield components. The genetic architecture of grain yield in rice as well as other crops is based on the balance or overall net effect produced by various yield components directly or indirectly by interacting with one another. Therefore, selection for yield *per se* alone would not matter much as such unless accompanied by the selection for various component characters responsible for conditioning it. Thus, identification of important components and information about their association with yield and with each other are very useful for developing efficient breeding strategy for evolving high yielding varieties. The correlation coefficient is the measure of degree of symmetrical association between two variables or characters which helps us in understanding the nature and magnitude of association among yield and yield components. In the present investigation, simple correlation coefficients were computed among 12 characters (Table 1). Grain yield per plant showed highly significant and positive

Table 1: Estimates of simple correlation coefficients between 12 characters in aerobic rice

Characters	Days to maturity	Plant height (cm)	Panicle length (cm)	Panicle bearing tillers per plant	Spikelets per panicle	Flag leaf area (cm^2)	Spikelet fertility (%)	1000-grain weight (g)	Biological yield per plan (g)	Harvest index (%)	Gain yield/plant (g)
Days to 50% flowering	-0.240	0.016	-0.096	0.095	0.032	0.193	0.060	0.109	-0.139	0.220	0.112
Days to maturity		0.034	0.000	0.296*	-0.108	-0.195	0.098	-0.149	-0.052	-0.141	-0.243*
Plant height (cm)			-0.089	0.005	-0.007	-0.073	0.020	-0.258*	0.287*	-0.211	0.148
Panicle length(cm)				0.342**	0.240	0.017	-0.249*	-0.166	-0.102	0.075	-0.093
Panicle bearing tillers per plant					-0.201	-0.024	0.114	-0.037	0.215	-0.283*	-0.017
Spikelets per panicle						-0.058	-0.866**	-0.149	-0.107	0.163	0.066
Flag leaf area(cm^2)							0.394**	0.237	-0.167	0.203	0.002
Spikelet fertility (%)								0.224	-0.049	0.016	-.0.069
1000- grain weight (g)									-0.054	0.482**	0.510**
Biological yield per plant (g)										-0.686**	0.487**
Harvestindex											0.277

*, ** Significant at 5% and 1% probability levels, respectively.

correlation with 1000-grain weight, followed by biological yield per plant and harvest-index. Therefore, these characters emerged as most important associates of grain yield in aerobic rice. The strong positive association of grain yield with the characters mentioned above has also being reported in aerobic rice by earlier workers Kiani (2012) [3]; Sudharani *et al.* (2013) [6]; Venkanna *et al.* (2014) [7].The harvest-index showed highly significant and positive correlation with 1000-grian weight besides having strong positive association with grain yield. The above characters except flag leaf area had strong positive association with grain yield which augurs well for providing correlated response during selection for improving these characters. The above observations of strong positive associations between yield and yield components are in agreement with the available literature in aerobic rice reported by earlier workers Sudharani *et al.* (2013) [6]; Lakshmi *et al.* (2014) [4]. Days to 50% flowering, plant height, flag leaf area and panicle length had very high positive correlations with each other. This indicated that the taller genotypes possessed greater flag leaf area and panicle length besides having late flowering which appears logical. The positive associations between these characters have also been reported by Sudharani *et al.* (2013) [6]; Lakshmi *et al.* (2014) [4]. Similarly, spikelets per panicle were strongly correlated with plant height and panicle length.

In the present study, majority of significant estimates of correlations between yield and yield components were positive in nature. This represents highly favourable situation for obtaining high response to selection in improving yield and yield components in aerobic rice. Thus, selection practiced for improving these traits individually or simultaneously would bring improvement in other due to correlated response. This suggested that selection would be quite efficient in improving yield and yield components in context of germplasm collections evaluated. The negative and highly significant correlation with Spikelet's per panicle. Panicle bearing tillers per plant, days to maturity and plant height exhibited negative associations with Spikelet's per panicle were observed. In order to take care of occurrence of negative correlations along with majority of positive correlations between important yield components, a reasonable compromise would be required for attaining their proper balance for obtaining maximum combined contribution towards manifestation of grain yield. However, occurrence of positive and significant or non-significant correlations revealed a far less complex situation in respect of character associations encountered in the present study than generally encountered in rice. This would make easier to attain proper balance between yield and yield components in context of aerobic rice germplasm used in present study. The estimates of correlation coefficients obtained in present study are broadly in conformity with previous reports in aerobic rice by Rao *et al*., 2011) [5]; Lakshmi *et al.* (2014) [4].

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