SHORT COMMUNICATION

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Correlation and phenotypic path coefficient studies in rice under system of aerobic rice production

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ABSTRACT

*Study revealed a positive and significant correlation with yield of grain due to straw yield, filled grains panicle^{-1}, number of ear bearing tiller m^{-2}, length of panicle and leaf area index. The range of simple correlation 'r' being .668** (LAI) to .969** (Straw yield). Correlation matrix indicated that most of the characters are positively and significantly correlated with each other except plant height, test weight and number of chaffs per panicle. Positive direct contribution to grain yield as observed through phenotypic path analysis was observed through straw yield (.700), straw yield and number of filled grains panicle^{-1} exhibited the highest positive indirect effect across the characters with corresponding values of .969 and .920.*

Key words: *Correlation, phenotypic, path coefficient, aerobic rice, system*

Information on association of characters with yield and their inter relations is an important criteria to understand the degree of contribution towards the biological yield. Correlation and path coefficient helps in identifying such direct and indirect effects. In the correlation studies, numbers of fertile spikelets panicle^{-1}, grain weight, grains panicle^{-1}, spikelet fertility and harvest index have shown positive and significant correlation with yield of grain as reported by Rastogi et al., (1996). Aditya and Bhartiya (2013) noticed estimate of phenotypic coefficient of variation to be the highest for grain yield per plot followed by fertile grains panicle^{-1} and grains panicle^{-1} and observed it to be variety dependent. The concept of aerobic rice is gaining attention in recent times. Thus, it was thought worth while to make a study on correlation and phenotypic path coefficient in rice grown under aerobic irrigated condition during wet season.

A field study was carried out at Agronomy Main Research Farm, Department of Agronomy, College of Agriculture, Orissa University of Agriculture and Technology, Bhubaneswar during wet season of 2014 in split plot design with three replications. Eighteen treatment combinations consisting of six establishment methods (M_1- direct seeding with 20 cm row to row spacing, M_2- Aerobic conventional rectangular transplanting at 20 cm x 10 cm spacing with 2-3 seedling hill^{-1}, M_3- Aerobic square transplanting at 20 cm x 20 cm spacing with 1 seedling hill^{-1}, M_4 - Aerobic square transplanting at 25 cm x 25 cm spacing with 1 seedling hill^{-1}, M_5- Aerobic square transplanting at 20 cm x 20 cm spacing with 2 seedling hill^{-1}, M_6 - Aerobic square transplanting at 25 cm x 25 cm spacing with 2 seedling hill^{-1}) in main plot and three rice varieties (V_1- Naveen, V_2- Hiranmayee, V_3- Aerobic rice Pyari) in sub-plot were laid out under aerobic (un-puddle un-flooded) condition. The soil of the experimental site was sandy loam in texture at surface with pH 5.34 having organic carbon 0.44% and EC 0.151 dSm^{-1}. The total available nitrogen, phosphorus and potassium was 214.10, 54.32 &110.12, respectively. Nitrogen, phosphorus and Potassium @ 80-40-40 kg ha^{-1} were applied to all the plots through urea, DAP and MOP. Well decomposed FYM @ 5t ha^{-1} was incorporated into the soil at final ploughing. Full dose of P and K and 25% of N was

Table 1. Correlation matrix between yield and associated characters

Characters	Plant height	EBT	LAI	Length of panicle	Filled grain panicle^{-1}	Chaffs panicle^{-1}	1000 grain weight	Straw yield
	1	2	3	4	5	6	7	8
2	.242							
3	.282	.619**						
4	.226	.608**	.565*					
5	.068	.661**	.588*	.680**				
6	-.366	-.444	-.518*	-.230	-.535			
7	.191	-.044	.198	-.149	.135	-.176		
8	.141	.811**	.729**	.699**	.885**	.472	.131	
9	.081	.781**	.668**	.686**	.920**	.504*	.201	.969**

applied at final ploughing. Rest of N was applied in 2:1 ratio at tillering and panicle initiation stage, respectively. Crop during its growing period received a rainfall of 1348.7 mm in 78 rainy days. Crop was irrigated during dry spell to supplement rainfall during the growth period. Seeds were directly sown in rows on well pulverised un-puddle condition as per treatment under M_1. For other treatments (M_2-M_6) seedlings were raised in dry nursery for transplanting on the same date of sowing as of M_1 treatment. For transplanting one seedling (M_3 and M_4 treatments) and two seedling (M_5 and M_6) per hill at two leaf stage were used while for conventional transplanting (M_2) 2-3 seedlings per hill at four leaf stage were transplanted. One pre transplant irrigation was provided to well pulverised soil to facilitate the process. Data on growth, yield attributing characters and the yield of grain and straw were recorded across the treatments and correlation matrix along with phenotypic path analysis was made as per the method given by Dewey and Lu (1959).

Correlation studies

Correlation study with selected phenotypic characters revealed highest significant and positive correlation with yield of grain (r = 0.969**) due to straw yield. It was

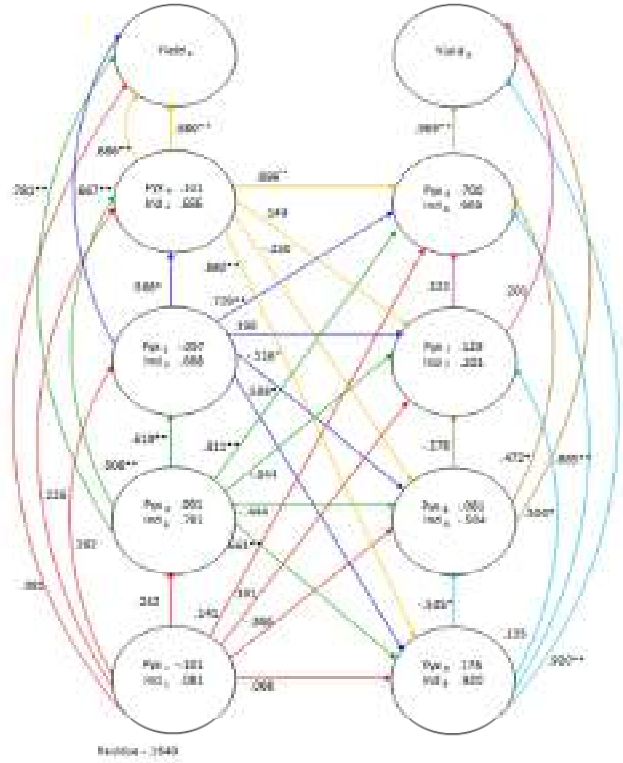

Fig. 1. Phenotypic path analysis (direct and indirect effect) and correlation matrix between yield attributing and ancillary characters in rice

followed by filled grains panicle^{-1} (0.920**), Number of ear bearing tiller m^{-2} (0.781**), length of panicle (0.686**) and leaf area index (0.668**). Number of chaffs panicle^{-1} however, bore a significant negative correlation of 0.504*. Correlation matrix indicated that the number of filled grains per panicle, EBT m^{-2}, leaf area index and length of panicle bore a significant positive correlation with yield of straw, the corresponding r values being 0.885**, 0.811**, 0.729** and 0.699**. Rice also exhibited a significant positive correlation of 0.680** and 0.661** due to length of

Table 2. Phenotypic path analysis (Direct and indirect effect) between yield and associated characters

Characters	Plant height	EBT	LAI	Length of panicle	Filled grain panicle^{-1}	Chaffs panicle^{-1}	1000 grain weight	Straw yield	Total
	1	2	3	4	5	6	7	8	
1	-.101	.022	-.027	.023	.012	.030	.025	.099	.081
2	-.024	.091	-.060	.061	.116	.036	-.006	.567	.781
3	-.029	.056	-.097	.057	.103	.042	.026	.510	.668
4	-.023	.055	-.055	.101	.119	.019	-.019	.489	.686
5	-.007	.060	-.057	.069	.176	.043	.017	.619	.920
6	.037	-.040	.050	-.023	-.094	-.081	-.023	-.330	-.504
7	-.019	-.004	-.019	-.015	.024	.014	.129	.092	.201
8	-.014	.073	-.071	.071	.155	.038	.017	.700	.969

panicle and number of ear bearing tiller with that of filled grains per panicle. Similarly, EBT was found to be positively and significantly correlated with leaf area index (r=0.619**) and length of panicle (r=0 .608**). Leaf area index also showed positive and significant correlation with length of panicle with value of r being 0.565* (Table 1 and Fig. 1). Similar results have also been reported by Nandan et al., (2010) and Sadeghi (2011).

Path analysis

Phenotypic path analysis (Table 2 and Fig. 1) through direct and indirect effect on contribution of various growth parameter indicated the highest positive direct effect on yield of grain was due to straw yield (0.700) followed by filled grains with a value of 0.129. Number of chaffs panicle^{-1} showed highest negative direct effect of 0.181. Further, yield of straw (0.969) and number of filled grains panicle^{-1} (0.920) exhibited the highest positive indirect effect across the characters. It was followed by number of ear bearing tiller m^{-2} (0.781), length of panicle (0.686) and leaf area index (0.668). The findings are in confirmation with that of Babu et al., (2012) and Sharma and Sharma (2007).

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