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Correlation and Path coefficient analysis of 55 Rice (*Oryza sativa* L.) germplasm

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Abstract
Correlation and path analysis were carried out in rice germplasm for eight characters. The experiment was conducted at instructional cum Research Farm, Department of Genetics and Plant Breeding, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) during *kharif* 2017 to acces association analysis of the 55 germplasm accessions of rice along with popular standard checks Chattisgarh Zinc rice 1, Samleshwari Danteshwari, Indira Barani dhan and Indira Aerobic1. Association analysis studies indicated that 100 grain seed weight is positive and significant correlation with grain yield per plant (0.559). Number of effective tillers per plant (0.261) has significant and positive correlation with grain yield per plant. Plant height showed negative and significant correlation associated with grain yield per plant. Path coefficient analysis revealed that the selection for 100 grain seed weight and plant height would likely bring the improvement in grain yield per plant.

Keywords: Rice, *Oryza sativa* L., *kharif*, Zinc rice

Introduction
Rice (*Oryza sativa* L.) (2n=24) is the most important cereal crop that has been referred as "Global Grain" because of its use as prime staple food in about 100 countries of the world. In world, rice has occupied an area of 160.6 million hectares, with a total production of 738.20 million tonnes and productivity 3424.41 kg/ha. In India rice is cultivated round the year in one or the other part of the country in diverse ecologies spread over 43.38 million hectares with a production of 104.32 million tonnes during 2015-16. Chhattisgarh popularly known as "Rice Bowl of India" occupies an area around 37.73 lakh hectares with the production of 60.28 lakh tonnes and productivity 1597 kg/ha. In any crop, germplasm plays as an important role as a source and provides scope for wide variability. The base for any crop improvement programme relies on availability of amount and direction of genetic association of the traits in the base population (Girma *et al*., 2018) [6]. Correlation in combination with path coefficient analysis will be an important tool to find out the association and quantify the direct and indirect influence of one character upon another (Dewey and Lu, 1959) [3]. Correlation study should aim in selecting traits showing positive association with grain yield. The Association of different characters was essential to determine their contribution towards yield.

Materials and Method
The accessions of rice were evaluated in the field during *kharif* 2017 at Research Cum Instructional Farm, Deptt. of Genetics & Plant Breeding, College of Agriculture, IGKV, Raipur. The field trials were conducted under irrigated transplanted condition. The plant materials were sown in raised bed nursery on 2nd July 2017. Twenty five days old seedlings were subsequently transplanted into the field in augmented design (only checks are replicated) in *kharif* -2017. Each entry was transplanted in two rows with 20 cm of spacing between row to row and 15 cm between plant to plant. The check varieties were randomized within blocks. Fertilizer dose @ of 80 N: 50 P: 30 K kg/ha was applied. The entire dose of phosphorus and potassium along with half the dose of nitrogen was applied as basal dose before transplanting.

The remaining dose of nitrogen was applied in two splits, first at the time of beginning of tillering and second one week after it. The standard agronomic practices were adopted for normal crop growth.

Results and Discussion

Measurement of correlation coefficient helps to identify the relative contribution of component characters towards yield (Panse, 1957) [8]. In Correlation association analysis eight yield attributing traits of 55 rice germplasm accessions were analyzed and plant height (0.618), panicle length (0.405) and days to maturity (0.993) were positively and substantially linked with days to 50% flowering. Grain yield per plant (0.261) was positively and strongly associated with the number of effective tillers. Days to 50% flowering (0.618), panicle length (0.548) and days to maturity (0.633) all had positive and significant correlations with plant height. Plant height is negative and significantly correlated with 100 grain weight (-0.306), grain yield per plant (-0.282). Panicle length showed positive significant correlation with days to 50% flowering (0.405), plant height (0.548), days to maturity (0.411). Days to maturity showed positive and significant correlation with days to 50% flowering (0.993), plant height (0.633) and panicle length (0.411). 100 grain weight showed positive and significant correlation with grain yield per plant (0.560) and negative and significant correlation with plant height (-0.306). Grain yield per plant is positive and significant correlation with 100 grain weight (0.560) and number of effective tillers (0.261) and negative and significant correlation with plant height (-0.282). Ekka *et al.* (2011) [4] and Babu *et al.* (2012) [1], as well as Singh *et al.* (2015), all verified the found positive connection of grain production with 100 grain weight (2015). Babu *et al.* (2012) [1] found that panicle length is positively and strongly connected with days to 50% flowering, and that plant height is similarly positively and significantly correlated with panicle length. Babu *et al.* (2012) [1] have found a favorable association between plant height and panicle length and positive correlation of days to 50% blooming with plant height and panicle length.

Path coefficient, which is a standard partial regression coefficient, specifies the cause and effect relationship and measures the relative importance of each variable (Wright, 1921) [9]. The number of effective tillers, 100 grain weight and plant height all have a direct impact on grain production per plant, according to a path association study of 8 yield attributing factors of 55 rice germplasm accessions. Grain yield per plant is significantly correlated (0.560) with 100 grain seed weight, which has a favorable direct effect (0.472). The number of effective tillers (0.013), plant height (0.07), grain length width ratio (0.02) and days to maturity (0.09) all have a positive and indirect influence on seed yield per plant. These traits, however, had a detrimental indirect influence via Panicle length (-0.032) and days to 50% flowering (-0.065). Number of effective tillers has a direct impact on grain yield per plant (0.250), it has a positive significant (0.261) link with grain yield per plant, as revealed by this study. Plant height (-0.217) had negative direct effect on seed yield and negative significant (-0.282) correlation on grain yield per plant. This trait had indirect positive effect via, number of effective tillers (0.036), panicle length (0.122), grain length width ratio (0.002) and days to 50% flowering (0.37) on grain yield. However this trait had negative indirect effect *via* day to maturity (-0.45) and 100 grain weight (-0.144) on grain yield. Similar type of result were also reported by Babu *et al.* (2012) [1], Mourya *et al.* (2018) [7], Gupta *et al.* (2020) [2] for number of effective tillers per plant, Ekka *et al.* (2011) [4] for plant height, Ekka *et al.* (2015) [5] for 100 grain weight.

High residual effect of 0.55533 depicts that number of observed traits in present study is not sufficient for the study.

Table 1: Correlation for 8 yield attributing traits of 55 rice germplasm accessions

Characters	Day to 50% flowering	Number of effective tillers	Plant height	Panicle length	Days to maturity	Grain length width ratio	100 grain weight	Grain yield per plant
Day to 50% flowering	1.000							
Number of effective tillers	0.024	1.000						
Plant height	0.618**	0.146	1.000					
Panicle length	0.405**	0.013	0.548**	1.000				
Days to maturity	0.993**	0.005	0.633**	0.411**	1.000			
Grain length width ratio	0.079	0.037	0.018	-0.118	0.068	1.000		
100 grain weight	-0.109	0.054	-0.306*	-0.143	-0.126	0.127	1.000	
Grain yield per plant	-0.191	0.261*	-0.282*	-0.025	-0.216	0.160	0.560**	1.000

* Significant at 5 percent level, ** Highly significant at 1 percent level

Table 2: Path coefficient showing direct and indirect effect of different characters on grain yield per plant

S. No.	Characters	Days to 50% flowering	Number of effective tillers	Plant height	Panicle length	Days to maturity	Grain length width ratio	100 grain weight	Correlation to Grain yield per plant
		1	2	3	4	5	6	7	8
1.	Days to 50% flowering	0.601	0.006	-0.134	0.091	-0.712	0.009	-0.052	-0.191
2.	Number of effective tillers	-0.014	0.250	-0.031	0.002	-0.003	0.004	0.025	0.261*
3.	Plant height	-0.19	0.039	-0.217	0.122	-0.454	0.002	-0.144	-0.282*
4.	Panicle length	0.243	0.003	-0.118	0.224	-0.294	-0.014	-0.067	-0.025
5.	Days to maturity	0.597	0.001	-0.137	0.091	-0.718	0.008	-0.059	-0.216
6.	Grain length width ratio	0.047	0.009	-0.004	-0.026	-0.048	0.122	0.059	0.160
7.	100 grain weight	-0.065	0.013	0.066	-0.032	0.091	0.015	0.471	0.560**
Residual effect = 0.555									

Conclusion

On the basis of correlation analysis100 grain seed weight is positively significantly correlated with grain yield per plant (0.559). 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. Plant height showed negative and significant correlation associated with grain yield per plant. Negative correlation coefficient of plant height with grain yield indicated that in general, tall genotypes were low yielders due to accumulation of photosynthesis in vegetative parts as compared to reproductive parts.

On the basis of path analysis suggested that the selection for 100 grain seed weight and plant height would likely bring the improvement in grain yield per plant.

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