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RESEARCH NOTE

Correlation and path coefficient analysis in chilli (*Capsicum annuum* L.) genotypes for yield and yield attributing traits

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An experiment was undertaken to study the genetic correlations and path co-efficients among 30 genotypes/germplasm of chilli with two replications at College of Agriculture, Raichur for 12 different quantitative characters under study. Highly significant correlation was recorded between fruit yield plant^{-1} with fruit weight per fruit, and dry matter. However, positive correlation was exhibited with plant height, number of primary branches, number of fruits per plant, fruit length, fruit diameter, number of seeds per fruit, test weight, moisture content, and fruit pericarp thickness. Path coefficient analysis revealed that the maximum direct effect on fresh fruit yield was exerted by fruit weight per fruit, dry matter and test weight.

Key words: Chilli, Correlation, Path analysis

Chilli (*Capsicum annuum* L.) is an important vegetable cum spice crop grown in almost all parts of tropical and subtropical regions of the world. India is the largest producer, consumer and exporter of chilli, which contributes to 40 per cent of total world production, covering an area of 7.9 lakh hectares, 13.89 lakh tonnes of production and 1.8 million tonnes per ha of productivity respectively (Anon., 2016). The productivity of the crop is low in view of coverage of large area under low yielding genotypes. Development of high yielding cultivars requires knowledge of the existing genetic variation and the extent of association among yield contributing characters. Since yield is a complex trait governed by a large number of component traits it is imperative to know the interrelationship between yield and its component traits to arrive at an optimal selection index for improvement of yield (Singh *et al.,* 2014). Therefore, selection should be done based on these component characters after assessing their association with the yield. Path coefficient analysis has proven useful in providing additional information that describes a prior cause and effect relationships, such as yield and yield components. Further, path analysis will help for sorting out the total correlation into direct and indirect effects which is useful in selecting high yielding genotypes. Considering the importance of the crop there is need to generate more information on nature and magnitude of variability for yield and other characters present in germplasm to identify superior lines/varieties.

The experiment was conducted at the Department of Genetics and Plant Breeding, College of Agriculture, Raichur during *kharif* 2016-17 consisting 30 chilli genotypes/germplasm. The experiment was laid out using RBD with two replications. The seedlings of different chilli genotypes transplanted in 75 x 45 cm size by following the recommended agronomic practices. Data were collected from five randomly taken plants of each genotype/germplasm for yield, and other related traits like, plant height [cm], number of branches per plant, number of fruits per plant, fruit length [cm], fruit diameter [mm], fruit weight per fruit [g], number of seeds per fruit, test weight [g], dry matter [g], moisture content (%), fruit pericarp thickness [mm] and fruit yield per plant [g].

Correlation was calculated to investigate the degree of relationship between phenotypic and genotypic variances and also to test the degree of character association between parameters or traits studied. Phenotypic correlation was computed by using the formula given by Webber and Moorthy (1952). Path coefficient analysis was carried out using phenotypic correlation values of yield components on yield as suggested by Wright (1921).

The correlation coefficient among different parameters between yield and yield attributing traits and among themselves was worked out in order to determine the extent of association with each component and presented in (Table 1).

Yield is the end product of interaction of many factors known as contributing component and therefore, it is complex trait. The selection was made directly based on this complex trait is usually not very useful, but based on its component traits could be more effective. Knowledge of association between yield and its components is useful to make simultaneous selection for more than one character. The correlation analysis helps in determining the direction and number of characters to be considered in improving the yield.

Among the 12 characters, highly significant correlation was recorded between fruit yield plant^{-1} with fruit weight fruit^{-1} (0.600), and dry matter (0.496). However, positive correlation was exhibited with plant height (0.130), number of primary branches (0.043), number of fruits plant^{-1} (0.049), fruit length (0.207), fruit diameter (0.285), number of seeds fruit^{-1} (0.167), test weight (0.322), moisture content (0.226), and fruit pericarp thickness (0.200). Kannan *et al.* (2009) for plant height, number of fruits per plant, test weight and length of fruit. Ahmed *et al.* (1997) for fruit pericarp thickness. Kannan *et al.* (2009) and Chattopadhyay *et al.* (2011) for fruit length also reported positive association with total yield. These results indicated that selection for higher number of fruits and longer fruited genotype would simultaneously result in selection for higher fruit yield.

Path co-efficient analysis was carried out at phenotypic levels taking yield as a dependent character and such of the characters found significantly correlated with fruit yield per plant *viz.,* plant height, number of primary branches per plant, number of fruits per plant, fruit weight per fruit, fruit length,

Table 1. phenotypic correlation coefficients among morphological traits of chilli genotypes/germplasm

Trait	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	Y/P(GMS)
X1	-0.118	-0.056	0.123	0.236	0.306	0.139	0.081	0.376*	-0.049	-0.126	0.130
X2		-0.040	0.009	0.008	0.059	0.028	0.079	-0.045	0.225	0.055	0.043
X3			-0.539**	-0.483**	0.007	-0.138	0.202	-0.055	-0.292	-0.058	0.049
X4				0.527**	-0.141	0.354	0.167	0.147	0.336	0.023	0.285
X5					0.137	0.424*	0.383*	0.289	0.414*	0.236	0.600**
X6						0.339	0.024	0.126	0.032	0.479**	0.167
X7							0.214	0.314	0.337	0.145	0.322
X8								0.148	0.396*	-0.052	0.496**
X9									-0.047	-0.142	0.226
X10										0.247	0.200
X11											0.207

*Significant at 5 % ** Significant at1 %

X1 = Plant height (cm) | X5 = Fruit weight fruit^{-1} (g) | X9 = Moisture content (%)
X2 = Number of primary branches plant^{-1} | X6 = number of seeds fruit^{-1} | X10 = Fruit pericarp thickness (mm)
X3 = Number of fruits plant^{-1} | X7 = Test weight (g) | X11 = Fruit length (cm)
X4 = Fruit diameter (mm) | X8 = Dry matter (g) | X12 = Fruit yield plant^{-1} (g)

Table 2. Phenotypic path coefficient analysis for quantitative traits in chilli genotypes/ germplasm

Trait	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12
X1	0.240	-0.028	-0.013	0.029	0.057	0.074	0.033	0.019	0.090	-0.012	-0.030	0.130
X2	-0.003	0.028	-0.001	0.000	0.000	0.002	0.001	0.002	-0.001	0.006	0.002	0.043
X3	-0.014	-0.010	0.247	-0.133	-0.119	0.002	-0.034	0.050	-0.014	-0.072	-0.014	0.049
X4	0.006	0.001	-0.028	0.051	0.027	-0.007	0.018	0.009	0.008	0.017	0.001	0.285
X5	0.084	0.003	-0.172	0.188	0.356	0.049	0.151	0.136	0.103	0.148	0.084	0.600**
X6	0.024	0.005	0.001	-0.011	0.011	0.080	0.027	0.002	0.010	0.003	0.038	0.167
X7	-0.018	-0.004	0.017	-0.045	-0.054	-0.043	-0.126	-0.027	-0.040	-0.043	-0.018	0.322
X8	0.017	0.017	0.043	0.036	0.082	0.005	0.046	0.214	0.032	0.085	-0.011	0.496**
X9	-0.003	0.000	0.004	-0.001	-0.002	-0.001	-0.002	-0.001	-0.007	0.000	0.001	0.226
X10	0.002	0.001	0.003	0.005	0.028	0.027	0.005	0.016	0.052	0.001	0.011	0.201
X11	-0.113	0.049	-0.052	0.021	0.212	0.429	0.130	-0.046	-0.127	0.221	0.895	0.207

*Significant at 5 % ** Significant at1 %

X1 = Plant height (cm) | X5 = Fruit weight fruit^{-1} (g) | X9 = Moisture content (%)
X2 = Number of primary branches plant^{-1} | X6 = number of seeds fruit^{-1} | X10 = Fruit pericarp thickness (mm)
X3 = Number of fruits plant^{-1} | X7 = Test weight (g) | X11 = Fruit length (cm)
X4 = Fruit diameter (mm) | X8 = Dry matter (g) | X12 = Fruit yield plant^{-1} (g)

fruit diameter, number of seeds, test weight, dry matter, moisture content and fruit pericarp thickness as independent characters and the results obtained are presented in Table2.

In the present study out of eleven characters, nine had positive and direct effect on fruit yield per plant. The character fruit length had maximum positive direct effect on fruit yield per plant followed by fruit weight per plant, number of fruits per plant, plant height, dry matter, seeds per fruit, fruit diameter, number of primary branches and fruit pericarp thickness. It indicates that if other factors are held constant, an increase in these characters individually will reflect in an increased yield. These results revealed the importance of fruit length in determining selection criteria for improvement of chilli yield. Similar results were obtained by many researchers Ahmed *et al.* (2013), Singh *et al.* (2014) and Srividhya *et al.* (2017).

Two traits *viz.*, test weight and moisture content recorded negative direct effect on fruit yield per plant still contribute positively towards yield because of positive indirect effects of these traits towards yield through other characters. These results are in conformity with the observations made by Ahmed *et al.* (2013). High direct negative effects were also shown by fruit diameter with fruit yield and these results were contradictory with Bijalwan and Mishra (2014).

Conclusion

From the present study it was concluded that characters like fruit length, fruit weight, number of fruits per plant, plant height and dry matter may be considered important for the improvement of chilli as these traits showed both positive association and positive direct effects with fruit yield. While traits test weight and moisture content were relatively unimportant.

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