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Trait Association Studies through Genotypic and Phenotypic Correlation Analysis in Chilli (*Capsicum annuum* L.)

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Abstract: A field experiment was conducted during at Regional Horticultural Research and Extension Centre (RHREC), Kumbapur, Dharwad, University of Horticultural Sciences (UHS), Bagalkote. The experiment was laid out in Randomized Complete Block Design with 16 chilli (*Capsicum annuum* L.) genotypes. The result expresses that a narrow variance was noticed between the genotypic and phenotypic association for individual characters. This conceals that there was less impact of environment in appearance of the traits. It also reveals the presence of strong heritable association among the attributes. In the present investigation, substantial and desirable genotypic and phenotypic relationships of fruit yield per plant was recognized with traits like secondary branches at 120 DAT, tertiary branches at 120 DAT, days to first flowering, days to 50% flowering, days to first harvest, average fruit weight, fruit length, fruit diameter and fruit weight.

Keywords: Chilli, *Capsicum annuum* L, Correlation, Genotypic and Phenotypic

INTRODUCTION

Chilli (*Capsicum annuum* L.) belongs to the genus capsicum under the solanaceae family with chromosome number 2n = 24. The *Capsicum annuum* shows variability regard to fruit. The increased population necessitated the demand for more chilli production. To increase the production of chilli, area is the key to increasing production. Instead, screening of high yielding genotypes can be used as parental lines to develop high yielding hybrids. Yield is a complex character and is governed by polygenic system. Moreover, it is highly influenced by environmental fluctuations. Selection for such character may not necessarily lead to its improvement unless the unfavorable linkages among such components are favorably altered through hybridization. The correlation characters may be due to genetic linkage or pleiotropy (Harland, 1939).

Correlation study measures the natural relationship between various characters and helps in determining the component characters on which selection is feasible for yield improvement. Correlation coefficient measures the degree of association either in positive or negative direction.

There are three types of correlations, *viz*., phenotypic, genotypic and environmental correlations. Phenotypic correlation is the observable correlation between two variables, which includes both genotypic and environmental effects. Genotypic correlation on the other hand, is the inherent association between two variables and it may be either due to pleiotropic action of genes or linkage or

both. Environmental correlation arises entirely due to environmental effects.

Understanding the inter-relationship between yield and yield influencing characters is vital importance because this would facilitate effective selection for real-time progression in one or more yield attributing characters. In the present study, both genotypic and phenotypic correlations were analyzed for fruit yield per plant and its attributing characters.

MATERIALS AND METHODS

The study on *Capsicum annuum* L. genotypic and phenotypic correlation was conducted at Regional Horticultural Research and Extension Centre (RHREC), Kumbapur, Dharwad, University of Horticultural Sciences (UHS). The field experiment was conducted in the red sandy loam soil (Alfisol) with a uniform fertility. It is located at an altitude of 678 meters above mean MSL at 15°16′N latitude and 75°07′ E longitude in the Northern transition Zone of Karnataka (Zone-III). The RCBD design was followed to remove heterogenous of the soil composition. The number of replications was 3. The N:P: K (19:19:19) solution at 1g/lit was applied after fifteen days of sowing, to get good rooting and growth. The preventive sprays were taken to avoid pests and diseases. FYM was applied at the rate of 25t/ha and mixed well in the soil at the time of land preparation. According to the recommended dose of fertilizer, 150:75:75 kg/ha was applied. Half dose of N and full dose of P&K was applied in the form of urea, SSP and MOP. The field was irrigated before transplanting and seedlings were transplanted at a spacing of 70 x 45 cm. Remaining half dose of nitrogen (75kg/ha) was top dressed on 45 days after transplanting.

Out of sixteen genotypes SRS-02, BKNO-10, GCS-946 and GPM-1205 were collected from RHREC, Dharwad (Regional Horticultural Research and Extension Centre), DCA-218, DCA-118, DCA-154, DCA-268, DCA-07 and DCA-67 are collected from HRES, Devihosur (Horticulture Research and Extension Station) and GLP-18, GLP-28, GLP-32, GLP-43, GLP-51 and GLP-48 are collected from NBPGR, New Delhi (National Bureau of Plant Genetic Resources). Various growth and yield parameters were taken from five randomly selected plants from each treatment and were tagged.

Genotypic (r_g) and phenotypic (r_p) correlation coefficients were estimated as suggested by Al-Jibourie *et al.* (1958).

Genotypic correlation =

$$= r_{xy}(g) = \frac{Cov_{xy}(G)}{\sqrt{V_x(G) \times V_y(G)}}$$

Phenotypic correlation =

$$r_{xy}(p) = \frac{Cov_{xy}(P)}{\sqrt{V_x(P) \times V_y(P)}}$$

Where,

Cov_{xy} (G) = Genotypic covariance between x and y

Cov_{xy} (P) = Phenotypic covariance between x and y

V_x (G) = Genotypic variance of character 'x'

V_x (P) = Phenotypic variance of character 'x'

V_y (G) = Genotypic variance of character 'y'

V_y (P) = Phenotypic variance of character 'y'

Test of significance of correlation was tested by comparing the r value with obtained value.

RESULT AND DISCUSSION

Correlation coefficient is a statistical measure which governs the degree of positive or negative association between various plant characters. Thus, it helps to identify the character on which selection can be imposed for improvement in associated

characters. Hence, understanding of the inter-relationship between yield and yield influencing characters is vital importance because this would facilitate effective selection for real-time progression in one or more yield attributing characters. In the present study, both genotypic and phenotypic correlations were analyzed for fruit yield per plant and its attributing characters.

In current investigation, a narrow variance was noticed between the genotypic and phenotypic association for individual characters. This conceals that there was less impact of environment in appearance of the traits. It also reveals the presence of strong heritable association among the attributes. In the present investigation (Table 1&2), substantial and desirable genotypic and phenotypic relationships of fruit yield per plant was recognized with traits like secondary branches at 120 DAT, tertiary branches at 120 DAT, days to first flowering, days to 50% flowering, days to first harvest, average fruit weight, fruit length, fruit diameter and fruit weight.

Secondary branches at 120 DAT showed highly significant positive association with days to first flowering (0.487), days to first harvest (0.455) and days to 50% flowering (0.424) at both genotypic level and phenotypic level. These results agree with Shweta *et al*. (2018).

At both genotypic and phenotypic level, Tertiary branches at 120 DAT had highly significant positive correlation with fruit yield per plant (0.302). This result agrees with Bharadwaj *et al.* (2007).

Days to first flowering showed highly significant positive relationship with days to first harvest (0.832) and days to 50% flowering (0.828) at both genotypic level and phenotypic level. These results agree with Krishnamurthy *et al.* (2013).

Days to 50% flowering showed highly significant positive relationship with days to first harvest (0.811) and average fruit weight (0.317) at both genotypic level and phenotypic level. These results agree with Sreelathakumary and Rajamony (2002).

Days to first harvest registered considerable significant positive relationship with average fruit weight (0.294) at both genotypic level and phenotypic level. These results agree with Sreelathakumary and Rajamony (2002).

Average fruit weight registered highly substantial significant positive interaction with fruit yield per plant (0.748), Dixita *et al.* (2015), fruit weight (0.955), fruit diameter (0.608) and fruit length (0.512) at both genotypic level and phenotypic level. These results agree with Vikram *et al.* (2014).

Fruit length registered highly appreciable significant positive relationship with fruit weight (0.609) and fruit yield per plant (0.604) at both genotypic level and phenotypic level. These results agree Bijalwan and Mishra (2014) and Pujar *et al.* (2017).

Fruit diameter had desirable significant positive correlation with fruit weight (0.577) and fruit yield per plant (0.317) at both genotypic level and phenotypic level. These results agree with Vikram *et al.* (2014).

Fruit weight had highly positive significant relationship with fruit yield per plant (0.815) at both genotypic level and phenotypic level. These results agree with Yatung *et al.* (2014) and Bijalwan and Mishra (2014).

SUMMARY

Fruit yield per plant had significant positive association with traits like tertiary branches at 120 DAT, average fruit weight, fruit length, fruit diameter and fruit weight at both genotypic and phenotypic level. Since these association characters are in the desirable direction, it indicates that simultaneous selection for these characters would be rewarding for improving the fruit yield per plant.

Table 1: Estimates of genotypic correlation coefficients for growth, earliness and yield parameters in green chilli (*Capsicum annuum* L.)

@	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}
X_1	**1.000**	-0.268	-0.251	-0.004	0.123	-0.033	-0.027	0.242	-0.338*	-0.178	-0.095	-0.253	-0.259
X_2		**1.000**	-0.193	-0.446**	-0.139	-0.287*	-0.349*	0.236	-0.265	-0.054	-0.034	-0.098	-0.047
X_3			**1.000**	0.123	0.487**	0.424**	0.455**	-0.167	0.266	-0.188	-0.112	0.157	-0.060
X_4				**1.000**	0.126	0.166	0.212	0.152	0.552**	0.281*	0.309*	0.485**	0.302*
X_5					**1.000**	0.828**	0.832**	-0.127	0.014	-0.265	-0.098	-0.021	0.052
X_6						**1.000**	0.811**	-0.322*	0.317*	-0.205	0.125	0.194	0.155
X_7							**1.000**	-0.262	0.294*	-0.256	0.077	0.180	0.156
X_8								**1.000**	-0.174	0.118	-0.046	0.028	-0.097
X_9									**1.000**	0.512**	0.608**	0.955**	0.748**
X_{10}										1.000	0.063	0.609**	0.604**
X_{11}											**1.000**	0.577**	0.317*
X_{12}												1.000	0.815**
X_{13}													1.000

** Significant at 1% level of Significance * Significant at 5% level of Significance

X_1 – Plant height at 120 days (cm)
X_2 - Primary branches at 120 DAT
X_3 –Secondary branches at 120 DAT
X_4 – Tertiary branches at 120 DAT
X_5 – Days to first flowering
X_6- Days to 50% flowering
X_7 – Days to first harvest
X_8 – Number of fruits per plant
X_9- Average fruit weight (g) X_{13}- Fruit yield per plant (kg)
X_{10}- Fruit length (cm)
X_{11}- Fruit diameter (cm)
X_{12} - Fruit weight (g)

Table 2.: Estimates of phenotypic correlation coefficients for growth, earliness and yield parameters in green chilli (*Capsicum annuum* L.)

@	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}
X_1	**1.000**	-0.262	-0.231	-0.008	0.114	-0.033	0.018	0.235	-0.330*	-0.174	-0.088	-0.243	-0.250
X_2		**1.000**	-0.190	-0.428**	-0.136	-0.277	-0.321*	0.223	0.252	-0.054	-0.029	-0.097	-0.043
X_3			1.000	0.120	0.471**	0.412**	0.432**	-0.168	0.256	-0.179	-0.110	0.160	-0.058
X_4				**1.000**	0.128	0.165	0.214	0.152	0.544**	0.277	0.301*	0.477**	0.300*
X_5					**1.000**	0.809**	0.806**	-0.126	0.014	-0.260	-0.094	-0.022	0.052
X_6						**1.000**	0.980**	-0.316*	0.307*	-0.193	0.112	0.189	0.152
X_7							1.000	-0.257	0.288*	-0.249	0.073	0.174	0.156
X_8								**1.000**	-0.171	0.120	-0.048	0.027	-0.098
X_9									**1.000**	0.508**	0.596**	0.951**	0.744**
X_{10}										**1.000**	0.065	0.603**	0.595**
X_{11}											**1.000**	0.568**	0.312*
X_{12}												1.000	0.811**
X_{13}													1.000

** Significant at 1% level of Significance * Significant at 5% level of significance

X_1 – Plant height at 120 days (cm)
X_2 - Primary branches at 120 DAT
X_3 –Secondary branches at 120 DAT
X_4 – Tertiary branches at 120 DAT
X_5 – Days to first flowering
X_6- Days to 50% flowering
X_7 – Days to first harvest
X_8 – Number of fruits per plant
X_9- Average fruit weight (g) X_{13}- Fruit yield per plant (kg)
X_{10}- Fruit length (cm)
X_{11}- Fruit diameter (cm)
X_{12} - Fruit weight (g)

REFERENCES

Al-Jibouri, H. A., Miller, P. A. and Robinson, H. V., 1958, Genotypic and environmental variances and co-variances in a upland cotton cross of inter specific origin. *Agron. J.,* **50**: 633-636.

Bharadwaj, D. N., Harvinder, S. and Yadav, R. K., 2007, genetic variability and association of component characters for yield in chilli (*Capsicum annuum* L.). *Progress. Agric.,* **7**(2):72-74.

Bijalwan, P. and Mishra, A. C., 2014, Correlation and path coefficient analysis in chilli (*Capsicum annuum* L.) for yield and yield attributing traits. *Int. J. Sci. Res*., 2319-7064.

Dixita, K., Patel, B. R., Patel, J. R., Patel, Gopal, V. and Kuchhadiya, 2015, Genetic variability and character association studies for green fruit yield and quality component traits in chilli (*Capsicum annuum* var. *longum*). *Electron. J. Plant Breed.*, **6**(2): 472-478.

Krishnamurthy Bhutiaa, N. D., Setha, T., Shende, V. D., Duttac, S., Chattopadhyayc, A., 2015, Estimation of heterosis, dominance effect and genetic control of fresh fruit yield, quality and leaf curl disease severity traits of chilli pepper (Capsicum annuum L.). *Sci. Hortic*., **182**:47-55.

Pujar, U. U., Tirakannanavar, S., Jagadeesha, R. C., Gasti, V. D. and Sandhyarani, N., 2017, Genetic variability, heritablity, correlation and path analysis in chilli (*Capsicum annuum* L.). *Int. J. Pure App. Biosci*., **5** (5): 579-586.

Shweta, Basavarajappa, H. R., Satish, D., Jagadeesha, R. C., Hanachinmani, C. N. and Dileepkumar, A. M., 2018, Genetic correlation and path coefficient analysis in chilli (*Capsicum annum* L.) genotypes for growth and yield contributing traits. *J. Pharmacogn. Phytochem.*, **7**(2): 1312-1315.

Sreelathakumary, I. and Rajamony, L., 2002. variability, heritability and correlation studies in chilli (*Capsicum spp*.) under shade. *Indian J. Hort*. **59**(1):77–83.

Yatung, T., Dubey, R. K. R., Singh, V., Upadhyay, G. and Pandey, A. K., 2014, Selection parameters for fruit yield and related traits in chilli (*Capsicum annuum* l.). *Bangladesh J. Bot*., **43**(3): 283-291.