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Genetic correlation and path coefficient analysis in chilli (*Capsicum annum* L.) genotypes for growth and yield contributing traits

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Abstract
Forty two genotypes of chilli were used to study the correlation and path analysis for growth and yield contributing characters. The experiment was laid out in randomized block design with three replication at Kittur Rani Channamma College of Horticulture Arabhavi during *Kharif* season, 2016. The results revealed that plant height had positive and significant correlation with number of secondary branches, fruit length, green fruit weight and green fruit yield per plant. The path coefficient analysis brought out the number of fruits per plant, fruit width and average fruit weight as major yield components, which could be considered as selection indices for improvement. The results suggested that due emphasis should be on to the genotypes that are having maximum number of fruits per plant, fruit length, fruit girth and fruit weight in the selection process due to their high positive direct effect on green fruit yield.

Keywords: Chilli, correlation, path coefficient analysis, yield traits

Introduction
Chillies are the natures wonder. The genus *Capsicum* is a source of products that are utilised around the globe as a vegetable, spice, condiment, culinary supplement, medicine and also as an ornamental plant. Chilli is the indispensable spice, essentially used in every Indian cuisine as they provide heat, colour and flavour. It is valued for its pungency, which is due to crystalline acrid volatile alkaloid capsaicin, present in the placenta of fruits. Capsaicin has diverse prophylactic and therapeutic uses in allopathic and ayurvedic medicine (Sumathy Kutty and Mathew, 1984) [22]. Apart from rich source of vitamin C, it contains higher amount of carotene (pro vitamin A), vitamin E, B_1 (thiamine), B_2 (riboflavin), B_3 (niacin) and small quantity of proteins, fats, carbohydrates and traces of minerals (Hosmani, 1993) [8]. Early flowering is generally an indication of early yield, which is most preferred by the growers to fetch the high market price prevailing in the early cropping season and also reduce the risk of crop maintenance in late season (Patil *et al.* 2012) [18]. Since yield is a complex trait, governed by a large number of components 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. Wright (1921) [24] was first to propose the correlation and path analysis to organize the relationship between the predictor and response variables. Correlation simply measures the association between yield and other traits, whereas path coefficient analysis permits the separation of correlation into direct effects (path coefficient) and indirect effects (effects exerted through other variables). Hence the present investigation was carried out with a view to study the character association and direct and indirect effect of different independent characters on dependent variable, green chilli yield in chilli genotypes.

Materials and Methods
The present investigation was carried out at Kittur Rani Chanamma College of Horticulture Arabhavi, Karntaka. Forty two diverse chilli genotypes collected from different parts of India were evaluated in a Randomized Complete Block Design with three replications during *Kharif* 2015 -16. Sowing was carried out during second week of July in the nursery. Forty days old healthy seedlings were transplanted to main field during late august at a spacing of 60 cm x 45 cm. All the recommended cultural practices were followed to raise good crop. Observations were recorded from the five randomly selected plants in each experimental plot for 19 growth and yield contributing parameters. Observations were recorded on days to first flowering, days to 50 percent flowering, fruit length (cm), fruit girth (cm), fruit weight (g), plant height (cm), number of branches per plant, number of fruits per plant, green fruit yield (g/plant) and

(g/plant) and dry (red) yield (g/plant).Statistical analysis for calculation of correlation was worked out as per Al-Jibouri *et al.* (1958) [2] and path coefficient of various characters was calculated according to Dewey and Lu (1959) [4].

Results and Discussion

The magnitude of genotypic correlation coefficients in general was higher than the phenotypic correlation coefficients (Table 1), which reveals least influences of environment on the expression of traits. Highest positive phenotypic and genotypic correlation coefficients were observed between days to first flowering and days to fifty percent flowering (0.957 and 0.997 respectively). Highest negative significant phenotypic and genotypic correlation coefficient was observed between fruit girth and number of green fruits per plant (-0.252 and -0.389 respectively).

Table 1: Phenotypic and genotypic correlation coefficients among growth, earliness and yield parameters in green chilli

Characters		1	2	3	4	5	6	7	8	9
1	(P)	1	0.957**	0.130	0.063	0.035	0.096	0.015	0.083	0.093
	(G)		0.997**	0.176	0.031	0.058	0.124	0.036	0.130	0.136
2	(P)		1	0.216*	0.112	0.022	0.138	-0.004	0.129	0.110
	(G)			0.295**	0.120	0.032	0.158	0.001	0.187	0.163
3	(P)			1	0.622**	0.302**	0.139	0.196	0.506**	0.396**
	(G)				0.795**	0.343**	0.179	0.266*	0.609**	0.508**
4	(P)				1	0.331**	0.279*	0.276*	0.547**	0.487**
	(G)					0.409**	0.335**	0.421**	0.768**	0.769**
5	(P)					1	0.054	0.247*	0.490**	0.485**
	(G)						0.053	0.363**	0.548**	0.629**
6	(P)						1	-0.252 *	0.154	0.052
	(G)							-0.389**	0.164	0.071
7	(P)							1	0.277*	0.667**
	(G)								0.344**	0.693**
8	(P)								1	0.815**
	(G)									0.884**
9	(P)									1
	(G)									

1. Days to first flowering
2. Days to 50 percent flowering
3. Plant height
4. Number of secondary branches
5. Fruit length
6. Fruit girth
7. Number of fruits per plant
8. Green fruit weight
9. Green fruit yield per plant

Critical r Value=0.2145 at 5 percent and 0.2796 at 1 percent

* and ** indicate significant at 5 and 1 percent probability level, respectively

Days to first flowering had positive and significant correlation with days to fifty percent flowering at both phenotypic and genotypic level. Days taken to first flowering exhibited non-significant correlation with other characters under study. Days to 50 percent flowering exhibited positive and significant correlation with plant height at phenotypic and genotypic level (0.126 and 0.295 respectively), whereas it exhibited non significant correlation with other characters.

Plant height exhibited positive and significant genotypic and phenotypic correlation with number of secondary branches (0.622 and 0.795 respectively), fruit length (0.343 and 0.343 respectively), green fruit weight (0.506 and 0.609 respectively), green fruit yield per plant (0.396 and 0.508 respectively).

At both phenotypic and genotypic level, number of primary branches exhibited positive and significant association with fruit length (0.331 and 0.409 respectively), fruit girth (0.279 and 0.335 respectively), number of fruits per plant (0.276 and 0.421 respectively), green fruit weight (0.547 and 0.768 respectively), green fruit yield per plant (0.487 and 0.769 respectively)

Fruit length showed positive and significant correlation with number of fruits per plant (0.247 and 0.363 respectively), green fruit weight (0.490 and 0.548 respectively), green fruit yield per plant (0.485 and 0.629 respectively). Fruit girth showed negative and significant correlation with number of fruits per plant (-0.252 and -0.389 respectively).

Number of primary branches exhibited positive and significant correlation with green fruit weight (0.277 and 0.344 respectively), green fruit yield per plant (0.667 and 0.693 respectively). Green fruit weight showed positive and significant correlation with green fruit yield per plant (0.815 and 0.884 respectively).

These results are in conformity with Ajjappalavara *et al.* (2005) [1], Pasudesai *et al.* (2006) [17], Smitha and Basavaraja (2006) [21], Satish (2007) [20], Krishna *et al.* (2007) [13], Hosamani and Shivkumar (2008), Ganeshreddy *et al.* (2008), Kannan *et al.* (2009) [7], Jabeen *et al.*, (2009) [9], and Chattopadhyay *et al.* (2011) [3], who have observed significance of various yield attributing traits with fruit yield.

Path coefficient analysis permits the critical examination of direct and indirect contribution of component characters towards fruit yield was analyzed using the genotypic correlation coefficients and the results are presented in Table 2. For path analysis at the genotypic level, green fruit yield per plant was taken as dependent variable and all other traits used for correlation were considered as independent variables. The direct effect of days to first flowering on green fruit yield

per plant was positive (0.8645). It had positive indirect effect via traits like days to 50 percent flowering, plant height, number of secondary branches, fruit length, fruit girth, number of fruits per plant and green fruit weight.

Table 2: Genotypic path for selected characters

Characters	Days to first flowering	Days to 50 percent flowering	Plant height	Number of secondary branches	Fruit length	Fruit girth	Number of green fruits per plant	Green fruit weight (g)
Days to first flowering	0.8645	0.8621	0.1527	0.0271	0.0502	0.1080	0.0315	0.1125
Days to 50 percent flowering	-0.8336	-0.8359	-0.2469	-0.1009	-0.0271	-0.1327	-0.0013	-0.1564
Plant height	-0.0153	-0.0255	-0.0864	-0.0688	-0.0297	-0.0155	-0.0230	-0.0527
Number of secondary branches	0.0058	0.0223	0.1473	0.1851	0.0758	0.0621	0.0780	0.1423
Fruit length	0.0028	0.0016	0.0166	0.0197	0.0481	0.0026	0.0175	0.0264
Fruit girth	0.0118	0.0150	0.0170	0.0317	0.0050	0.0944	-0.0368	0.0155
Number of green fruits per plant	0.0146	0.0006	0.1068	0.1688	0.1457	-0.1559	0.4005	0.1380
Green fruit weight (g)	0.0858	0.1234	0.4018	0.5068	0.3613	0.1085	0.2271	0.6592
Green fruit yield (g)	0.1364	0.1635	0.5089	0.7695	0.6294	0.0714	0.6935	0.8848

R square - 0.9778, Residual effect - 0.1489

The correlation of days to first flowering (0.1125), number of secondary branches (0.1423), fruit length (0.0264), fruit girth (0.0155), number of green fruits per plant (0.1380) with fruit yield was positive and their direct effect on fruit yield was also positive (Kumar *et al.*, 2003, Leaya and Khader 2002, Verma *et al.* 2004, Krishnamurthy *et al.* 2013) [15, 16, 23, 14] emphasizing importance of these characters in chilli improvement. For green fruit yield, selection on the basis of fruit length, fruit girth, fruit weight and number of fruits per plant would be worthwhile. Khurana *et al.,* (2003) and Kharad *et al.* (2006) [12, 11] also observed direct and positive effect of fruit length, fruit girth, fruit weight and number of fruits per plant on fruit yield per plant. Thus these traits can be considered for selection for high yield. Similar results were also reported by Rani *et al.* (1996) and Gogoi and Gautam (2003) [19, 6] in chilli. The results suggested that due emphasis should be given to the genotypes that are having maximum number of fruits per plant, fruit length, fruit girth and fruit weight in the selection process due to their high positive direct effect on green fruit yield. The remaining characters also exerted considerable direct effect on yield revealing the scope for considering these traits in selection.

In conclusion, correlation studies with 42 genotypes of chilli revealed the importance of number of fruits per plant, number of secondary branches, plant height and fruit weight in determining fruit yield. The path coefficient analysis brought out the number of fruits per plant, fruit length, fruit girth and fruit weight as major yield components. Hence a perusal of correlation and path analysis studies of the present investigation reveal that the number of fruits per plant, fruit length, fruit girth and fruit weight were highly important yield components having direct effect on green fruit yield per plant

References

1. Ajjappalavara PS, Patil SS, Hosmani RM, Patil AA, Gangaprasad S. Correlation and path coefficient analysis in chilli. Karnataka J Agric. Sci. 2005; 18(3):748-751.
2. Al-Jibourie HA, Miller PA, Robinson HV. Genotypic and environmental variances and co- variances in addition to upland cotton cross of interspecific origin. Agron. J. 1958; 50:533-536.
3. Chattopadhyay A, Amit BS, Nuka D, Subrata D. Diversity of genetic resources and genetic association analyses of green and dry chillies of eastern India. Chilean. J Agric. Res. 2011; 71(3):350-356.
4. Dewey DR, Lu KH. a correlation and path coefficient analysis of components of crested wheat grass seed production. Agron. J. 1959; 51:515-518.
5. Ganeshreddy M, Kumar H, Salimath P. Correlation and path analysis in chilli. Karnatka Journal of Agricultural Sciences. 2008; 21:259-261.
6. Gogoi D, Gautam BP. Correlation and path coefficient analysis in chilli (*Capsicum annuum* L). Agriculture Science Digest. 2003; 23:162-166.
7. Hosamani RM, Shivkumar. Correlation and path coefficient analysis in chilli. Indian Journal of Horticulture. 2008; 65(3):349-352.
8. Hosmani MM. Chilli Crop (*Capsicum annuum*), Bharat photo offset works, Dharwad, 1993.
9. Jabeen N, Sofi PA, Wani SA. Character association in chilli (*Capsicum annuum* L). Revista UDO Agrícola. 2009; 9(3):487-490.
10. Kannan K, Jawaharlal M, Prabhu M. Correlation studies in paprika (*Capsicum annuum* var *Longum*) cv. ktpl-19, Agric. Sci. Digest. 2009; 29(3):186-189.
11. Kharad SR, Navale PA, Kadam DE. Variability and path-coefficient analysis in chilli (*Capsicum annuum* L). International Journal of Agricultural Science. 2006; 2(1):90-92.
12. Khurana DS, Singh P, Hundal JS. Studies on genetic diversity for growth, yield and quality traits in chilli (*Capsicum annuum* L). Indian Journal of Horticulture. 2003; 60(3):277-282.
13. Krishna U, Patil MP, Madalageri MB, Mulge R, Jagadeesha RC. Character association and path analysis studies in green chilli for yield and yield attributes. Karnataka J Agril. Sci., 2007; 20(1):99-101.
14. Krishnamurthy SL, Reddy KM, Rao AM. Genetic variation, path and correlation analysis in crosses among Indian and Taiwan parents in chilli. Vegetable Science. 2013; 40(2):210-213
15. Kumar BK, Munshi AD, Joshi S, Kaur C. Correlation and path coefficient analysis for yield and biochemical characters in chilli (*Capsicum annuum* L). Capsicum Eggplant Newsletter. 2003; 22:67-70.
16. Leaya J, Khader KMA. Correlation and path coefficient analysis in chilli (*Capsicum annum* L). Capsicum Eggplant Newsletter. 2002; 21:56-59.
17. Pasudesai M, Bendale V, Bhave S, Sawant S, Desai S. Association analysis for fruit yield and its components in chilli. Crop Research. 2006; 31:291-294.

18. Patil BT, Bhalekar MN, Shinde KG. Heterosis studies in chilli (*Capsicum annuum* L) for earliness, growth and green fruit yield. Vegetable Science. 2012; 39(1):73-75.
19. Rani K, Natarajan S, Thamburaj S. Correlation and path analysis in chilli (*Capsicum annuum* L). South Indian Horticulture. 1996; 44:8-11.
20. Satish PR. Morphological and molecular diversity studies in chilli (*Capsicum annuum* L.). M. Sc. (Agri.) Thesis, Univ. Agric. Sci., Bengaluru, Karnataka, India, 2007.
21. Smitha RP, Basavaraja N. Variability and correlation studies in chilli (*Capsicum annuum* L.). Karnataka J. Agril. Sci. 2006; 19(4):975-977.
22. Sumathy Kutty MA, Mathew AG. Chilli processing. Indian Cocoa, Arecanut and Spice Journal. 1984; 7:112-113.
23. Verma SK, Singh RK, Arya RR. Genetic variability and correlation studies in chillies. Progressive Horticulture. 2004; 36:113-117.
24. Wright S. Correlation and causation. J Agric. Res. 1921; 20:557-587.