

Correlation and Path Coefficient Analysis in Chilli (*Capsicum annuum* L.) for Yield and Yield Attributing Traits

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Abstract: The correlation and path coefficient analysis were studied in sixteen genotypes in chilli for 15 different qualitative and quantitative characters. Correlation coefficients at genotypic and phenotypic levels indicated that fruit yield per plant was positively and significantly correlated with fruit weight at edible maturity, number of fruits per plant, fruit length, number of branches per plant and ascorbic acid content but negative and significant association was found with days to 50% flowering indicating that early flowering and early picking might be associated with increasing the fruits yield per plant. Path coefficient analysis revealed that the highest positive direct effect on fruit yield per plant was exerted by fruit weight at edible maturity followed by number of fruits per plant and fruit length, while as highest negative direct effect on fruit yield per plant was exerted by number of branches per plant and pedicel length. Therefore, selection should be practiced for fruit weight at edible maturity, number of fruits per plant and fruit length for direct improvement of fruit yield per plant.

Keywords: *Capsicum annuum* L., Correlation and Path coefficients.

1. Introduction

Chilli pepper (*Capsicum annuum* L.) is one of the most important spice crop of India and finds a variety of uses. Chilli, also known as hot pepper, was introduced into India from Brazil during 1584 by the Portuguese [1]. The word „Chilli“ is of Mexican origin and is still under use in India [2]. India is the world leader in chilli production with total area of 7.75 lakh hectare and production of 14.92 lakh tones next only to China and Pakistan [3]. The productivity of the crop is low in view of coverage of large area under low yielding genotypes. Hence, there is need for development of new varieties and hybrids with high productivity. Knowledge of inter character relationship is very important in plant breeding for indirect selection for characters that are not easily measured.

However, under complex situation, correlation alone become insufficient to explain relationships among characters and thus path analysis of economic yield components with yield is important. However in green chilli is meager to the study on correlation and path analysis in chilli for green vegetable yield. Therefore, field investigation was carried out with yield is important. However in green chilli is meager to the study on correlation and path analysis in chilli for green vegetable yield [4]. Therefore, field investigation was carried out with a view to study the character association and direct and indirect effect of independent characters on dependent green chilli yield by assessing the chilli germplasm stock maintained at Vegetable Research Block of Veer Chandra Singh Garhwali Uttarakhand University of Horticulture and Forestry, Ranichauri Campus, Tehri-Garhwal during *Kharif* 2014.

2. Materials and Methods

Sixteen genetically diverse chilli genotypes comprising of established varieties and different lines were grown in a randomized block design with three replication during at Vegetable Research Block of Veer Chandra Singh Garhwali Uttarakhand University of Horticulture and Forestry, Ranichauri Campus, Tehri-Garhwal during *Kharif* 2014. 47 days old seedling were transplanted at spacing of 45×45 cm. Each treatment per plots was consisting of three rows of five plants each. All the recommended cultural practices were followed to raise good chilli crop. Ten randomly selected plants in each experimental plot were used for recording observations on plant height at 50% flowering (cm), days to 50% flowering, days to first picking, leaf area (cm²), number of branches per plant, fruit length (cm), fruit diameter (cm), pedicel length (cm), pericarp thickness (mm), dry matter content (%), ascorbic acid content (mg/100 g fruit), plant height at last picking (cm), number of fruits per plant, fruit weight at edible maturity (g) and fruit yield per plant (g). The phenotypic correlation coefficient and genotypic correlation coefficient and direct and indirect effects were computed by using procedure given by Dewey and Lu (1959) [5].

3. Results and Discussion

The correlation coefficient at both genotypic and phenotypic levels indicated that fruit yield per plant was significantly and positively correlated with fruit weight at edible maturity, number of fruits per plant, fruit length, number of branches per plant and ascorbic acid content (Table 1). Similar results were reported by Gupta *et al.* (2009) [6], Ullah *et al.* (2011) [7], Chattopadhyay *et al.* (2011) [8], Kumar *et al.* (2012) [9] and Yatunget *et al.* (2014) [10] for fruit weight at edible maturity, number of fruits per plant, fruit length and number of branches per plant whereas Kumar *et al.* (2012) also reported the significant and positive correlation between

fruit yield and ascorbic acid content. Negative and significant correlation of fruit yield per plant was observed with days to 50% flowering at both genotypic and

phenotypic level also been reported by Basavaraj (1997) [11], Nandapuriet *al.* (1970)[12] and Dhahiyaet *al.* (1991) [13].

Table 1: Genotypic and phenotypic correlation in green chilli yield and component characters

Characters		1	2	3	4	5	6	7	8	9	10	11	12	13	
Days to 50% flowering	G	0.7005**	-0.3716**	0.1037	-0.1571	-0.4334**	-0.3815**	-0.2899*	0.2128	0.2041	-0.5751**	-0.2945*	-0.2156	-0.3084*	
	P	0.6948**	-0.3684**	0.1037	-0.1571	-0.4262**	-0.3727**	-0.2892*	0.2135	0.2035	-0.5488**	-0.2923*	-0.2147	-0.3032*	
Days to first picking	G		0.0019	-0.1187	-0.2857*	-0.4148**	-0.2794	-0.0249	0.1308	0.1909	-0.5827**	-0.2523	-0.2192	-0.2334	
	P		-0.0002	-0.1132	-0.2819	-0.3955**	-0.2695	-0.0243	0.1364	0.1895	-0.5514**	-0.2564	-0.2173	-0.2341	
Leaf area (cm ²)	G			0.0104	0.1110	0.1337	0.3603**	0.0498	-0.3865**	-0.0649	0.1012	0.0253	0.2355	0.1844	
	P			0.0098	0.1090	0.1285	0.3504*	0.0456	-0.3839**	-0.0638	0.1005	0.0268	0.2340	0.1858	
Number of branches per plant	G				0.3275*	-0.1881	-0.4504**	-0.3467*	-0.1616	0.3094*	-0.1717	0.6246**	-0.1206	0.3919**	
	P				0.3262*	-0.1858	-0.4314**	-0.3407*	-0.1594	0.3063*	-0.1591	0.6099**	-0.1166	0.3872**	
Fruit length (cm)	G					0.2154	0.3732**	-0.1585	-0.5578**	0.4425**	-0.1064	-0.0903	0.5474**	0.4200**	
	P					0.2122	0.3642*	-0.1575	-0.5548**	0.4407**	-0.0999	-0.0921	0.5440**	0.4130**	
Fruit diameter (cm)	G						0.5755**	0.4647**	-0.0016	0.1261	0.1171	0.1119	0.1637	0.2200	
	P						0.5519**	0.4595**	-0.0015	0.1258	0.1078	0.1045	0.1613	0.1923	
Pedicel length (cm)	G							0.2740	-0.2305	0.2702	0.1967	-0.2792	0.5137**	0.1477	
	P							0.2675	-0.2213	0.2646	0.1809	-0.2670	0.5033**	0.1447	
Pericarp thickness (mm)	G								0.1181	0.0125	0.0961	-0.1406	0.1936	0.0679	
	P								0.1150	0.0118	0.0891	-0.1391	0.1911	0.0597	
Dry matter content (%)	G									-0.0911	0.3176*	0.0852	-0.3066*	-0.1952	
	P									-0.0906	0.3045*	0.0836	-0.3061*	-0.1904	
Ascorbic acid content (%)	G										-0.1255	0.1503	0.1510	0.3209*	
	P										-0.1207	0.1486	0.1508	0.3161*	
Plant height at last picking (cm)	G											0.2446	0.2079	0.2197	
	P											0.2222	0.1942	0.2138	
Number of fruits per plant	G													-0.1284	0.6248**
	P													-0.1258	0.6165**
Fruit weight at edible maturity (g)	G														0.6697**
	P														0.6583**

1. Days to first picking 2. Leaf area (cm²) 3. Number of branches per plant
 4. Fruit length (cm) 5. Fruit diameter (cm) 6. Pedicel length (cm)
 7. Pericarp thickness (mm) 8. Dry matter content (%) 9. Ascorbic acid content (mg/100 g fruit)
 10. Plant height at last picking (cm) 11. Number of fruits per plant 12. Fruit weight at edible maturity (g)
 13. Fruit yield per plant (g)

From the results on path coefficient analysis, it was evident that number of fruits per plant, fruit weight at edible maturity and fruit length had high positive direct effect on fruit yield per plant at phenotypic and genotypic levels

whereas, leaf area, days to 50% flowering, pericarp thickness, dry matter content and ascorbic acid content had high positive direct effect at genotypic level only (Table 2).

Table 2: Genotypic and phenotypic path co-efficient analysis for green chilli yield

Traits		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	G	0.1969	0.1379	-0.0732	0.0204	-0.0309	-0.0853	-0.0751	-0.0571	0.0419	0.0402	-0.1133	-0.0580	-0.0425	-0.3084
	P	0.0554	0.0385	-0.0204	0.0058	-0.0087	-0.0236	-0.0207	-0.0160	0.0118	0.0113	-0.0304	-0.0162	-0.0119	-0.3032
2	G	-0.1433	-0.2046	-0.0004	0.0243	0.0585	0.0849	0.0572	0.0051	-0.0268	-0.0391	0.1192	0.0516	0.0449	-0.2334
	P	0.0517	0.0745	0.0000	-0.0084	-0.0210	-0.0294	-0.0201	-0.0018	0.0102	0.0141	-0.0411	-0.0191	-0.0162	-0.2341
3	G	-0.0893	0.0005	0.2403	0.0025	0.0267	0.0321	0.0866	0.0120	-0.0929	-0.0156	0.0243	0.0061	0.0566	0.1844
	P	-0.02576	0.0000	0.0698	0.0007	0.0076	0.0090	0.0244	0.0032	-0.0268	-0.0044	0.0070	0.0019	0.0163	0.1858
4	G	-0.0581	0.0665	-0.0058	-0.5602	-0.1835	0.1054	0.2523	0.1942	0.0905	-0.1733	0.0962	-0.3499	0.0676	0.3919
	P	-0.0193	0.0211	-0.0018	-0.1864	-0.0608	0.0346	0.0804	0.0635	0.0297	-0.0571	0.0297	-0.1137	0.0217	0.3872
5	G	-0.0734	-0.1334	0.0518	0.1529	0.4668	0.1006	0.1742	-0.0740	-0.2604	0.2066	-0.0497	-0.0422	0.2555	0.4200
	P	-0.0448	-0.0804	0.0311	0.0930	0.2851	0.0605	0.1038	-0.0449	-0.1581	0.1256	-0.0285	-0.0263	0.1551	0.4130
6	G	0.0602	0.0576	-0.0186	0.0261	-0.0299	-0.1389	-0.0799	-0.0645	0.0002	-0.0175	-0.0163	-0.0155	-0.0227	0.2200
	P	0.0085	0.0079	-0.0026	0.0037	-0.0042	-0.0199	-0.0110	-0.0091	0.0000	-0.0025	-0.0021	-0.0021	-0.0032	0.1923
7	G	0.1118	0.0819	-0.1056	0.1320	-0.1094	-0.1686	-0.2930	-0.0803	0.0675	-0.0792	-0.0576	0.0818	-0.1505	0.1477
	P	0.0528	0.0382	-0.0496	0.0611	-0.0516	-0.0782	-0.1416	-0.0379	0.0313	-0.0375	-0.0256	0.0378	-0.0713	0.1447
8	G	-0.0469	-0.0040	0.0081	-0.0561	-0.0256	0.0752	0.0443	0.1618	0.0191	0.0020	0.0155	-0.0227	0.0313	0.0679
	P	-0.0257	-0.0022	0.0041	-0.0303	-0.0140	0.0409	0.0238	0.0889	0.0102	0.0011	0.0079	-0.0124	0.0170	0.0597
9	G	0.0333	0.0205	-0.0605	-0.0253	-0.0872	-0.0002	-0.0361	0.0185	0.1564	-0.0143	0.0497	0.0133	-0.0480	-0.1952
	P	0.0107	0.0068	-0.0192	-0.0080	-0.0277	-0.0001	-0.0111	0.0057	0.0500	-0.0045	0.0152	0.0042	-0.0153	-0.1904
10	G	0.0249	0.0232	-0.0079	0.0377	0.0539	0.0153	0.0329	0.0015	-0.0111	0.1218	-0.0153	0.0183	0.0184	0.3209
	P	0.0078	0.0073	-0.0025	0.0118	0.0170	0.0048	0.0102	0.0005	-0.0035	0.0385	-0.0046	0.0057	0.0058	0.3161
11	G	0.1335	0.1353	-0.0235	0.0398	0.0247	-0.0272	-0.0457	-0.0223	-0.0737	0.0291	-0.2321	-0.0568	-0.0482	0.2197
	P	0.0181	0.0181	-0.0033	0.0052	0.0033	-0.0035	-0.0060	-0.0029	-0.0100	0.0040	-0.0329	-0.0073	-0.0064	0.2138
12	G	-0.3186	-0.2730	0.0273	0.6757	-0.0977	0.1210	-0.3020	-0.1521	0.0921	0.1626	0.2646	1.0818	-0.1389	0.6248
	P	-0.2480	-0.2176	0.0227	0.5176	-0.0782	0.0886	-0.2266	-0.1180	0.0709	0.1261	0.1886	0.8487	-0.1067	0.6165
13	G	-0.1393	-0.1417	0.1522	-0.0780	0.3538	0.1058	0.3320	0.1251	-0.1982	0.0976	0.1343	-0.0830	0.6463	0.6697
	P	-0.1446	-0.1463	0.1576	-0.0785	0.3663	0.1086	0.3389	0.1287	-0.2062	0.1015	0.1308	-0.0847	0.6734	0.6583

1. Days to 50% flowering 2. Days to first picking 3. Leaf area (cm²)
 4. Number of branches per plant 5. Fruit length (cm) 6. Fruit diameter (cm)
 7. Pedicel length (cm) 8. Pericarp thickness (mm) 9. Dry matter content (%)
 10. Ascorbic acid content (mg/100 g fruit) 11. Plant height at last picking (cm)
 12. Number of fruits per plant 13. Fruit weight at edible maturity (g)
 14. Genotypic (rg) and phenotypic (rp) correlation with fruit yield per plant

Therefore, effective selection could be made based on these characters for improvement of fruit yield per plant in chilli. Corroborating the findings of present investigation positive and direct effect on fruit yield per plant has also been reported by Sujata *et al.* (2003) [14], Kumar *et al.* (2003) [15], Mishra *et al.* (2010) [16] and Chattopadhyay *et al.* (2011) for fruit length, Rathod *et al.* (2002) [17] for days to 50% flowering, Jabeen *et al.* (2009) [18] for fruit weight and Ullah *et al.* (2011) for fruit weight, days to 50% flowering and fruit length.

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