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CORRELATION AND PATH COEFFICIENT ANALYSIS IN SOME PEPPER GENOTYPES (*CAPSICUM ANNUM* L.)

Kamal Benyamin Esho

Horticulture and Landscape Design Department,
College of Agriculture and Forestry, Mosul University, Iraq.

Abstract

The present study was carried out at the vegetable field research, horticulture and landscape design, College of Agriculture and Forestry, Mosul University during growing season spring 2019, ten pepper genotypes were collected from Mosul area and from farmers, to estimated correlation and path coefficient analysis in pepper genotypes. The result showed the there was a positive significantly correlation phenotypic and genotypic between the plant height with number of days for 50% flowering, fruit length. Total yield had a positive significantly phenotypic correlation with number of fruit per plant, fruit length and fruit weight, in the other hand the total yield gave a negative significantly correlation of phenotypic and genotypic with plant height, number of branches per plant and number of days for 50% flowering The path coefficient analysis revealed there was direct and indirect effect of some traits under study on the total yield, and the all traits had a negative path coefficient analysis with the Vitamin C.

Introduction

Pepper (*Capsicum annuum* L.) is one of the most important solanaceous vegetable crops grown extensively worldwide (Singh *et al*., 1993). It is one of most important vegetable crops grown throughout the world especially in the temperate countries. The pepper plant was sowing at offer all land in Iraq, his name is felfel in Iraqi. The crop is very sensitive to environmental factors (Bhatt *et al*., 1992). It is an excellent source of pro-Vitamin A and C. The optimum temperature requirement for pepper growth ranged from 16-25^{0}C., high night temperature is more detrimental to fruit set than day temperature (Ryiski and Spigelman, 1982). The market for pepper is a segment with great potential for growth both for in natural consumption and for processing (Domenico *et al*., 2012). Yield is a complex trait and determined by many genes factors. The variation in yield and quality traits is determined by genetic and environmental factors (Zecevic *et al*., 2011). knowledge of the genetic diversity present among the accessions has great importance for the management and use of the germplasm in the genetic improvement of species. Variability presented by the individuals constitutes the genetic resources, whose traits and evaluation are essential for plant breeding projects (Bianchi *et al*., 2016). Study of correlation between the traits is very important for application of the selection, especially in processing local landraces. Most studies have sought links between plant productivity and other morphological traits (He and Wang, 1989; Munchi *et al*., 2000).

Improvement in yield and quality is the main objective at which plant breeder aims, by altering their genetic architecture. The success in crop improvement programmed depends chiefly on the availability of genetic variability in the crop. The correlation coefficient measures the mutual relationship between various traits and determines the component traits, on which selection could be made for genetic improvement for yield and yield contributing traits. The correlation analysis makes possible to analyze the magnitude and direction of the relations among traits allowing to evaluate the viability of indirect selection in breeding programs which can lead to a faster and more expressive genetic progress (Kavalco *et al*., 2014). The path coefficient analysis provides an effective mean for partitioning of direct and indirect cause of the association. it was done to identify traits having significant direct and indirect effects on fruit yield in pepper Several researchers has studied the correlation and path coefficient in pepper (Sarkar *et al*., 2009; Sharma

***Author for correspondence :** E-mail : kamalesho@rocketmail.com

et al., 2010; Priyanka and Mishra , 2013; Luitel *et al*., 2013; Kadwey, 2014; Maneet *et al*., 2015; Renat *et al*., 2017). In the past to develop the selection criteria. Therefore, the main aim of objective of this study was to examine the correlation and path coefficient analysis in some pepper genotypes under the condition of Nenevah, Iraq.

Materials and methods

The present study was carried out at the vegetable field research, horticulture and landscape design, College of Agriculture and Forestry, Mosul University during growing season spring 2019, ten pepper genotypes were collected from Mosul area and from farmers, (table 1), to estimated genetic analysis in pepper genotypes.

The experimental design was a randomized block design (R.C.B.D.) with three replication, the seed of ten genotypes were sown in 15/February under plastic house on a seed bed size of (50cm × 50cm) until the seedling were ready for transplanting. Transplanting to main filed was done when seedling reached from 20 to 25cm height and or at 50 days after sown. The number of plant per plot for each genotype was 10 plant under drip irrigation, the space between plants was 30 cm. 75 kg/donum of DAP was used as fertilizers a side dressing during the transplanting, and out of 25 kg/donum of Urea as the source of (N). Half was applied after 15 days of transplanting time and the half when plant beginning flowers, all agronomic practices such as supplemental water irrigation, weedling, and protection were implemented according to the farming field (Matlob, *et al.,* 1989).

Data were collected from the 5 middle plant for each plot for the :- plant height (cm), number of branches per plant, days of 50% of plants were flowering, number of fruits per plant, diameter, length and weight of fruit, total yield of fruits/donum, and Vitamin C per 100 gram fresh weight of fruit were collected and analyzed SAS (2017).

Table 1: Source of the seeds of the genotypes of pepper.

No.	The name of genotyp	Source
1	Antaqia	Shahbaa copanay, Syria, Alpepo
2	Qurn Ghassal syrian	Shahbaa copanay, Syria, Alpepo
3	Every Green	Arbel Garden, Arbel, Kurdistan, Iraq
4	Zhong Jiao	Hong Tu Seed
5	Pepperno Quadrato D3 ti Rosso	Pagarro Gostaulino and Fllisp Etalia
6	Peperno Quadrato Giallo	Pagarro Gostaulino and Fllisp Etalia
7	Qurn Ghassal Mosuly	Rasheedia, Mosul, Nenevah, Iraq
8	Marconi Rosso	Pagarro Gostaulino and Fllisp Etalia
9	Peperone Friariello	Pagarro Gostaulino and Fllisp Etalia
10	Peperon Icineco Ornamentale	Pagarro Gostaulino and Fllisp Etalia

The genotypic correlation (r) between pairs of variable were estimated by equation

$$gp \quad \frac{COVg(xy)}{\sigma^2 gx \quad \sigma^2 gy} \qquad rp \quad \frac{COVp(xy)}{\sigma^2 px \quad \sigma^2 py}$$

Where COVg(xy) is the genotypic covariance between the traits X and Y. , σ^2gx is the genotypic variance of the variable X; and σ^2gy is the genotypic variance of the variable Y. COVp(xy) is the phenotypic covariance between the traits X and Y.; σ^2px is the phenotypic variance of the variable X; and σ^2py is the phenotypic variance of the variable Y. This was calculated as per Al-Jibouri *et al*., (1958).

Estima the path coefficient analysis the direct and indirect paths were obtained according to method given by Dewey and Lu (1959).

3. Results and Discussion

Phenotypic correlation coefficients between different pairs of traits are presented in table 1 elucidated that plant height had maximum magnitude of positive significant correlation with fruit length (0.679) followed by number of days for 50% flowering (0.575) and negative correlation coefficients with fruit weight (- 0.482) followed by fruit diameter (- 0.301) and total yield (- 0.217). Number of branches per plant had a positive significant correlation with number of fruits per plant (0.598) followed by fruit weight (0.541) and number of days for 50% flowering. Whoever, it had negative significant correlation with total yield (-0.297) and Vitamin C (-0.209). number of days had positive significant correlation with fruit length (0.426) and negative significant correlation with total yield (-0.306). In the other hand number of fruits per plant had positive significant correlation with total yield, fruit weight and fruit diameter and negative significant correlation with Vitamin C. Fruit length had positive significant correlation with total yield (0.311) and negative significant correlation with fruit weight followed by Vitamin C. Fruit diameter gave higher negative significant correlation with Vitamin C.

Table 2 revealed the genotypic correlation coefficient between different pairs traits. Plant height had higher positive correlation with fruit length (0.701) followed by number of days for 50% flowering and fruit weight (0.473) and negative correlation with fruit diameter (- 0.314), total yield (- 0.263) and number of fruits per plant (- 0.242). number of branches per plant had a high positive

Table 1: Phenotypic correlation in pepper and component traits

Traits	Plant height(cm.)	No. of branches/plant	No. of days for 50% flowering	No. of fruits/plant	Fruit length(cm.)	Fruit diameter(cm.)	Fruit weight(g.)	Total yield (ton/hectare)	Vitamin C. (mlg/ 100 fresh weight)
Plant height (cm.)	1	-0.128	0.575**	-0.191	0.679**	-0.301**	-0.482**	-0.217*	-0.017
No. of branches/plant		1	0.315**	0.598**	-0.099	-0.071	0.541**	-0.297*	-0.209*
No. of days for 50% flowering			1	0.047	0.426**	0.054	0.017	-0.306**	0.016
No. of fruits/plant				1	-0.137	0.290*	0.351**	0.919**	-0.521**
Fruit length (cm.)					1	-0.147	-0.389**	0.311**	-0.216*
Fruit diameter (cm.)						1	0.112	0.120	-0.526**
Fruit weight (g.)							1	0.696**	-0.051
Total yield (ton/hectare)								1	-0.204*

Table 3: The path co-efficient analysis for pepper yield

Traits	Plant height(cm.)	No. of branches/plant	No. of days for 50% flowering	No. of fruits/plant	Fruit length(cm.)	Fruit diameter(cm.)	Fruit weight(g.)	Vitamin C. (mlg/ 100 fresh weight)
Plant height (cm.)	4.159	-0.595	2.699	-1.006	2.915	-1.306	-2.013	-0.204
No. of branches/plant	0.762	-5.328	-1.556	-4.076	0.410	0.298	-3.436	1.113
No. of days for 50% flowering	-3.342	-1.504	-5.149	-0.690	-2.508	-0.396	-0.154	-0.196
No. of fruits/plant	-2.204	6.968	1.221	9.108	-1.202	4.099	4.308	-6.358
Fruit length (cm.)	2.737	-0.301	1.901	-0.515	3.905	-0.566	-1.542	-0.894
Fruit diameter (cm.)	-4.96	-0.088	0.122	0.711	-0.229	1.580	0.169	-0.844
Fruit weight (g.)	-1.519	2.025	0.094	1.485	-1.240	0.336	3.139	-0.160
Vitamin C. (mg/100 fresh weight)	-0.360	-1.534	0.279	-5.122	-1.680	-0.534	-0.374	7.337
Total yield (ton/hectare)	-0.263	-0.356	-0.389	-0.105	0.371	0.126	0.096	-0.204

correlation with number of fruits per plant, fruit weight and number of days for 50% flowering and negative correlation with total yield. Number of days per plant had positive correlation with fruit length (0.487) and negative correlation with total yield (- 0.389). Number of fruits per plant showed high positive correlation with fruit weight (0.473) followed by fruit weight (0.450) and total yield (0.405). Fruit length had positive correlation with fruit weight and total yield and negative correlation with Vitamin C. Fruit weight had positive correlation with total yield (0.796). This situation suggests that there was inherent association among the traits but the environment minimized the phenotypic association. Thus suggesting that these traits are important yield components and the effective improvement in yield can be achieved through selection based on these traits Similar results of positive association of plant growth traits with yield have been reported by (Sarkar *et al*., 2009; Sharma *et al*., 2010; Kavalco *et al*., 2014; Kadwey, 2014; Renata *et al*., 2017; Vaishnavi *et al*., 2017 and Khan and Sridevi, 2018). Hence, selection strategy involving this trait would help in yield improvement. Correlation studies indicated that number of fruit per plant, fruit weight, fruit length and fruit diameter deserve greater weightage during selection for fruit yield in pepper.

The result of phenotypic and genotypic path coefficient analysis showed in table 3 revealed that the plant height exhibited high positive direct effects (4.159) and indirectly via number of days for 50% flowering (2.699) and fruit length (2.915) and negative indirectly effect via number of fruits per plant (-1.006), fruit diameter (-1.306), fruit weight (- 2.013). Number of branches had negative direct effect (-5.328) and negative indirectly effect via number of days for 50% flowering (-1.556), number of fruits per plant (-4.076). fruit weight (- 3.436) and positive

Table 2: Genotypic correlation in pepper and component traits

Traits	Plant height(cm.)	No. of branches/plant	No. of days for 50% flowering	No. of fruits/plant	Fruit length(cm.)	Fruit diameter(cm.)	Fruit weight(g.)	Total yield (ton/hectare)	Vitamin C. (mlg/ 100 fresh weight)
Plant height (cm.)	1	-0.143	0.649**	-0.242*	0.701**	-0.314**	0.473**	-0.263*	-0.049
No. of branches/plant		1	0.292*	0.473**	-0.077	-0.056	0.645**	-0.356**	-0.209*
No. of days for 50% flowering			1	0.134	0.487**	0.077	0.030	-0.389**	0.038
No. of fruits/plant				1	-0.132	0.450**	0.473**	0.405**	-0.698**
Fruit length (cm.)					1	-0.145	0.701**	0.371**	-0.229*
Fruit diameter (cm.)						1	0.107	0.126	-0.534**
Fruit weight (g.)							1	0.796**	-0.051
Total yield (ton/hectare)								1	-0.183

indirectly effect via Vitamin C. (1.113). Among the fruit traits high positive direct effect of fruit per plant (9.108) and positive indirectly effect via number of fruits per plant (6.968), number of days for 50% flowering (1.221), fruit diameter (4.099) and fruit weight (4.308) and negative indirectly effect via plant height (-2.204), fruit length (-1.202) and Vitamin C (-6.358). Fruit length had direct effect (3.905) and positive indirectly effect via plant height (2.737), number of days for 50% flowering (1.901), fruit length (3.905), Fruit diameter had direct positive effect (1.580) and negative indirectly effect via all the traits under the studies. Result obtained from the path coefficient analysis revealed that yield was primarily influenced by number of branches per plant, number of fruit per plant showed maximum direct effect on yield. Hence it would be rewarding to lay emphasis on fruits per plant while developing selection strategies in the population. The results are in conformity with reported with some researches, Luitel *et al*., 2013; Vikram *et al*., 2014; Maneet *et al*., 2015; Sahu et al., 2016; Renata *et al*., 2017; Vaishnavi *et al*., 2017; Khan and Sridevi, 2018. In our results among the study on path coefficient analysis suggested that selection for number of fruits per plant, fruit weight, fruit length, number of branches per plant would be effective for improving total yield in pepper.

Conclusion

From this research, it cold be concluded that phenotypic and genotypic correlation and path coefficient analysis revealed the importance of plant height, days for flowering 50%, number of fruit per plant, fruit length, diameter and weight. It was aimed to assess the magnitude of fruit traits like fruit weight, length and diameter also showed positive significant association with yield indicating that one should also include these traits while selecting for yield.

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