ISSN: 0974 - 0376

The Ecoscan : Special issue, Vol. IX: 603-607: 2016
AN INTERNATIONAL QUARTERLY JOURNAL OF ENVIRONMENTAL SCIENCES
www.theecoscan.com

CORRELATION ANALYSIS OF QUANTITATIVE AND QUALITATIVE TRAITS IN CHILLI (*CAPSICUM ANNUM* L.)

Ritu Rani Minz *et al.,*

KEYWORDS

Capsicum annum L.
Phenotypic
Genotypic Correlation
Fruit yield

Proceedings of National Conference on Harmony with Nature in Context of Resource Conservation and Climate Change
(HARMONY - 2016)
October 22 - 24, 2016, Hazaribag,
organized by
Department of Zoology, Botany, Biotechnology & Geology
Vinoba Bhave University,
Hazaribag (Jharkhand) 825301
in association with
National Environmentalists Association, India
www.neaindia.org

The Ecoscan
AN INTERNATIONAL QUARTERLY JOURNAL OF ENVIRONMENTAL SCIENCES

RITU RANI MINZ*, VIVEK KUMAR KURREY, ARTI KUJUR AND SURANJANA BARA
Department of Vegetable Science,
Indira Gandhi Krishi Vishwavidyalaya Raipur - 492 012, Chhattisgarh, INDIA
e-mail: rituminz1@gmail.com

ABSTRACT

An experiment on chilli (*Capsicum annuum* L) was undertaken to study the correlations analysis among fifteen traits under study. The field experiment was conducted in the Vegetable Research Farm, Department of Horticulture, Allahabad School of Agriculture, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad (Uttar Pradesh) during 2014-2015. The mean of the different traits for Chilli (*Capsicum annum* L.) with three replications treatment were tried in Randomized Block Design (RBD). Analysis of variance indicated significant differences among the genotypes with respect to both quantitative and qualitative characters. The result expressed that fruit yield per plant was highly significant and positive correlation with yield per hectare (0.6591), Ascorbic acid (0.3256) and estimation of capsaicin (0.7316). The correlation study indicated that significant and desirable correlation between plant height and no. of branches per plant, day to first harvest, fruit diameter, and weight of seeds per fruit, fruit yield per plant, yield per hectare and estimation of capsaicin at both phenotypic and genotypic level.

***Corresponding author**

INTRODUCTION

Chilli (*Capsicum annuum* L.) is one of the most important vegetable and spice valued for its aroma, taste, flavour and pungency and is mainly cultivated for fruits which are used as vegetable in medicine as a stimulant and source of oleoresin (Samadia, 2007). Green fruit of chilli are one of the richest sources of antioxidant vitamins such as vitamin A, C and E. The capsaicin alkaloid is responsible for pungency and it has medicinal value also. In India, the major Chilli growing states are Andhra Pradesh, Karnataka, Maharashtra, Orissa, Tamil Nadu, Madhya Pradesh and Rajasthan. In India, it occupies 0.805 million ha area and annual production 1.276 million tons, while, in Madhya Pradesh it occupies 0.054 million ha area and produce 0.093 million tons (NHB, 2013-14). The chilli crop having immense commercial dietary and therapeutic values and grown throughout the year. It is cultivated throughout the country in about 7.67 lac hectares with annual production of 12.30 lac tonnes and average productivity of 1600 kg ha-1 (Anonymous, 2010), widely grown throughout India. As India has the highest area under chilli, a lot of natural variability exists in this crop. Fruit yield as well as quality improvement efforts continue to be the major objective of chilli improvement programme. Fruit yield is a complex inherited character influenced by several attributes of the plant. A wide range of variability is available in chilli genotypes which provide great scope for improving fruit yield through systematic breeding. Estimation of genetic variability present in the germplasm of a crop is a pre-requisite for designing effective breeding programme (Parkash 2012).

Chilli is an often cross pollinated crop with high natural cross pollination and this also contributes to its variability, the aim of any breeding program depends on genetic diversity, characters association and its component characters. Before going to breeding programme through selection it is essential to know the importance and inter association of various components and their association with yield. The correlation coefficient analysis measures the mutual relationship between various characters and it determines the component traits on which selection can be relied upon the effect of improvement. The study on correlation coefficients indicate the nature of association and this alone does not provide an exact insight into relative influence of each component character towards yield because a character may not be directly correlated with yield but may influence it through other characters.

MATERIALS AND METHODS

The experiment was conducted in the Vegetable Research Farm, Department of Horticulture, Allahabad School of Agriculture, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad (Uttar Pradesh) during 2014-2015. The basic material for the study involved 15 diverse chilli genotypes laid in three replications in randomised block design. Five plants were selected randomly from each genotype and replication. The data were recorded on both quantitative and qualitative traits. The analysis of variance was done as suggested by Snedecor and Cochran (1967). Variability for different characters were estimated as suggested by Burton and De Vane (1953). The percentage of oleoresin and the total extractable

colour as capsanthin content was estimated as per the procedures outlined by Roserbrook *et al*. (1968). The total extractable pungency as capsaicin content was determined by the procedure outlined by Bajaj and Kaur (1979). Correlations and path analysis were carried out as per Al-Jibouri *et al*. (1958) and Dewey and Lu (1959) respectively. Correlation of various biometrical characters was undertaken as per the procedure suggested by Singh and Choudhary (1979).

RESULTS AND DISCUSSION

A complex association exists among different plant characters and character themselves do not exist in isolation. These characters are often correlated with each other; either due to pliotrophy is due to genetic linkage (Harland, 1939).

Correlation coefficient were worked at phenotypic and genotypic level for all possible combination of yield and its attributing traits in chilli (Table1 and 2). The results indicated that genotypic coefficient of correlation in general were of higher magnitude than the corresponding phenotypic ones.

Highly significant positive association was observed with plant height and no. of branches per plant, day to first harvest, fruit diameter, and weight of seeds per fruit, fruit yield per plant, yield per hectare and estimation of capsaicin at both phenotypic and genotypic level. It is significantly positively correlated with fruit length and no. of fruit per plant at genotypic level only.

Fruit yield per plant, showed significant and positive association with plant height, no. of branches per plant, days to first harvest, fruit length, fruit diameter and average fruit weight. Higher yield could be obtained by operating selection pressure over any of these traits. Similar results were reported in hot pepper by Gogoi and Gautam (2003), Hari *et al*. (2005), Karad *et al*. (2006) and Chatterjee *et al*. (2007) and in sweet pepper by Islam and Singh (2009).

No. of branches per plant showed positive and significantly correlation with fruit length at both genotypic and phenotypic level and also positive and significantly correlation with day to 50% flowering, days to first harvest, fruit diameter, fruit yield per plant and yield per hectare at genotypic level only.

Days to flower first anthesis showed positive and significant correlation with average fruit weight and no. of seeds per fruit at both phenotypic and genotypic level.

Days to flower first anthesis showed positive and significant correlation with Ascorbic acid and days to first harvest at both phenotypic and genotypic level. It is significantly positively correlated with weight of seeds per fruit at genotypic level only.

Days to 50% flowering showed positive and significant correlation with Fruit diameter and estimation of capsaicin. . It is significantly positively correlated with fruit length at genotypic level only.

Days to first harvest showed positive and significant correlation with weight of seeds per fruit at both phenotypic and genotypic level. It is significantly positively correlated with no. of fruit per plant, fruit yield per plant, yield per hectare, ascorbic acid and estimation of capsaicin at genotypic level only.

Table 1: Phenotypic correlation coefficient for 15 characters for chilli Genotypes

Character	Plant height (cm)	Number of branches per plant	Plant spread	Days to flower first anthesis	Days to 50% flowering	Day to first harvest	Fruit length	Fruit diameter (cm)	Average fruit weight (g)	Number of seeds per fruits	Weight of Seeds/ fruits (mg)	Number of fruits /plant	Fruit yield per plant (g)	Yield per hectare (q)	Ascorbic acid (mg/100g)	Estimation of capsaicin (ºBrix)
Plant height (cm)	1.0000	0.2379*	-0.4706**	0.0261	0.0653	0.4569*	0.2172	0.4517*	-0.4219**	-0.3998**	0.3689**	0.2450	0.3422**	0.3567**	-0.1593	0.2964*
Number of branches per plant		1.0000	-0.3564*	-0.3112*	0.1455	0.2141	0.2774*	0.1140	-0.1361	-0.1120	0.1070	0.0834	0.2500	0.0423	0.1333	0.2404
Plant spread			1.0000	0.1233	0.0169	-0.4049*	0.0242	-0.0186	0.4136**	0.4087**	-0.2810*	-0.0880	-0.0865	-0.2488	0.0512	0.0638
Days to flower first anthesis				1.0000	-0.2685*	0.3284*	-0.4804*	-0.2582	-0.2002	-0.0936	0.2596	0.0801	0.1029	0.0311	0.3776**	0.0569
Days to 50% flowering					1.0000	0.1062	0.4282	0.4115*	0.0746	0.0727	-0.0206	0.0047	0.1292	-0.0485	-0.1391	0.3010*
Day to first harvest						1.0000	-0.2274	0.0531	-0.3086*	-0.2898*	0.5530**	0.2066	0.2374	0.1142	0.1863	0.2164
Fruit length							1.0000	0.7388*	-0.0809	-0.0418	-0.3030*	-0.2623*	0.4233**	0.0945	-0.1826	0.5208**
Fruit diameter (cm)								1.0000	-0.1143	-0.0228	0.0208	-0.1497	0.3527**	0.0520	-0.4047**	0.5693**
Average fruit weight (g)									1.0000	0.8543**	-0.1265	0.0796	-0.4507**	-0.2407	-0.2105	-0.2731
Number of seeds per fruits										1.0000	-0.0871	0.0756	-0.2438	-0.1832	-0.2177	-0.2086
Weight of Seeds/fruits (mg)											1.0000	0.6129**	0.0890	0.0730	0.0637	0.0732
Number of fruits /plant												1.0000	-0.0436	0.1118	-0.0390	-0.1416
Fruit yield per plant (g)													1.0000	0.2717*	0.1929	0.5144**
Yield per hectare (q)														1.0000	0.0007	0.1299
Ascorbic acid (mg/100g)															1.0000	0.4858**

Table 2: Genetic correlation coefficient for 15 characters for chilli Genotypes.

Character	Plant height (cm)	Number of branches per plant	Plant spread	Days to flower first anthesis	Days to 50% flowering	Day to first harvest	Fruit length	Fruit diameter (cm)	Average fruit weight (g)	Number of seeds per fruits	Weight of Seeds./ fruits (mg)	Number of fruits /plant	Fruit yield per plant (g)	Yield per hectare (q)	Ascorbic acid (mg/ 100g)	Estimation of capsaicin (ºBrix)
Plant height (cm)	1.0000	0.5096**	-0.7869**	-0.0354*	0.0977	0.5883**	0.2747*	0.5324**	-0.5085**	-0.4255**	0.4625**	0.2667*	0.5564**	0.4719**	-0.2084	0.3078*
Number of branches per plant		1.0000	-0.9502**	-0.5344**	0.6310**	0.3175*	0.6377**	0.3205*	-0.2753*	-0.2176	0.0436	0.0345	0.6994**	0.8406**	0.2098	0.5435**
Plant spread			1.0000	0.1457	-0.0009	-0.6711**	-0.0723	-0.1933	0.6009**	0.5827**	-0.3753*	-0.2461**	-0.3044*	-0.4108**	0.1785	0.0170
Days to flower first anthesis				1.0000	-0.4096	0.4105**	-0.5113**	-0.3480**	-0.2363	-0.1108	0.3972**	0.0968	0.1750	-0.3376*	0.4831**	0.0670
Days to 50% flowering					1.0000	0.0482	0.7043**	0.5530**	0.1802	0.1071	-0.0381	0.0152	0.2616	0.0783	-0.1942	0.3884**
Day to first harvest						1.0000	-0.1471	0.0132	-0.4635**	-0.3452*	0.7787**	0.2740*	0.3069*	0.2392*	0.2831*	0.2631*
Fruit length							1.0000	0.9008**	-0.1116	-0.0497	-0.3622*	-0.3550**	0.5865**	0.3455*	-0.2039	0.6854**
Fruit diameter (cm)								1.0000	-0.1094	-0.0378	-0.0608	-0.2081	0.4104**	0.0742	-0.4683**	0.4677**
Average fruit weight (g)									1.0000	0.9418**	-0.1523	0.1125	-0.5198**	-0.3250*	-0.2487*	-0.3291*
Number of seeds per fruits										1.0000	-0.1113	0.0715	-0.3359*	-0.2609*	-0.2430*	-0.2697*
Weight of Seeds./fruits (mg)											1.0000	0.7651**	0.0308	0.1618	0.0981	0.0328
Number of fruits /plant												1.0000	-0.0758	0.4203**	-0.0592	-0.2159
Fruit yield per plant (g)													1.0000	0.6591**	0.3256*	0.7316**
Yield per hectare (q)														1.0000	-0.0067	0.1926
Ascorbic acid (mg/100g)															1.0000	0.5382**

Fruit length showed and positive and significant correlation with fruit diameter, fruit yield per plant and estimation of capsaicin at both genotypic and phenotypic level. It is significantly positively correlated with yield per hectare at genotypic level only.

Fruit diameter (cm) showed positive and significant correlation with fruit yield per plant and estimation of capsaicin at both genotypic and phenotypic level.

Average fruit weight (g) showed positive and significant correlation with no. of seed per fruit at both genotypic and phenotypic level.

Weight of Seeds/fruits (mg) showed positive and significant correlation with no. of fruit per plant at both genotypic and phenotypic level.

Number of fruits/plant showed positive and significant correlation with yield per hectare at genotypic level only.

Fruit yield per plant showed positive and highly significant correlation with yield per hectare and estimation of capsaicin at both genotypic and phenotypic level. It is significantly positively correlated with ascorbic acid at genotypic level only.

Yield per hectare showed positive and highly significant correlation with plant height, no. of branches per plant, days to first harvest, fruit length, no. of fruits per plant and fruit yield per plant. similar results were also reported by Singh and Singh (2004), Datta and Jana (2010), Raika *et al*. (2005), Shabarish and Dharmatti (2014), Sheela *et al*. (2014) in Cluster bean.

Ascorbic acid (mg/100g) showed positive and significant correlation with estimation of capsaicin at both genotypic and phenotypic level.

REFERENCES

Anonymous 2010. Indian Horticulture Data Base. 2010. National Horticulture Board, Ministry of Agriculture, Govt. of India, Gurgaon. p. 8.

Al-Jibouri, H. R., Miller, P. A. and Robinson, H. F. 1958. Genotypic and environmental variance and covariance in an upland cotton crop of interspecific origin. *Agron. J.* **50:** 633-637.

Bajaj, K. L. and Gurudeep Kaur 1979. Colorimetric determination of capsaicin in capsicum fruits with the Folin-Ciocateu reagent. *Mikrochimica Acta.* **1:** 81-86.

Burton, G. W. and DeVane, E. H. 1953. Estimating heritability in tall fescue (*Festuca arundinacea*) from replicated clonal material. *Agron. J.* **45:** 478-481.

Chatterjee, B., Chenga Reddy, V., Ramana, J. V., Ravi Sankar, C. and Panduranga Rao, C. 2007. Correlation and path analysis in chilli (*Capsicum annuum L*). *Andhra Agric. J.* **54:** 36-39.

Datta, S. and Jana, J. C. 2010. Genetic variability, heritability and correlation in chilli genotypes under Terai zone of West Bengal. *SAARC J. Agri.* **8(1):** 33-45.

Dewey, D. R. and Lu, K. H. 1959. Correlation and path coefficient analysis of components of crested wheat grass seed production. *Agron. J.* **51:** 515-518.

Gogoi, D. and Gautam, B. P. 2003. Correlation and path coefficient analysis in chilli (*Capsicum annuum* L). *Agric. Sci. Digest.* **23:** 162-166.

Hari, G. S., Rao, P. V. and Reddy, Y. N. 2005. Correlation studies in paprika (*Capsicum annuum* L). Crop Res. 29: 495-498.

Harland, S. C. 1939. *The Genetics of Cotton*. Janardhan Publication, London, pp. 35-39.

Islam, S. and Singh, R. V. 2009. Correlation and path analysis in sweet pepper (*Capsicum annuum* L). *Veg. Sci.* **36:** 128-130.

Karad, S. R., Navale, P. A. and Kadam, D. E. 2006. Variability and path-coefficient analysis in chilli (*Capsicum annuum* L.). *Int. J. Agric.Sci.* **2(1):** 90-92.

Parkash, C. 2012. Estimation of genetic variability and implications of direct effects of different traits on leaf yield in bathua (*Chenopodium album*). *Indian J. Agri. Sci*. **82:** 71–74.

Shabarish, P. R. and Dharmatti, P. R. 2014. Correlation and path analysis for cluster bean vegetable pod yield. *The Bioscan*. **9(2):** 811-814.

Sheela, N., Malaghan, M. B., Madalageri and Y. K., Kotikal 2014. Correlation and path analysis in cluster bean [*Cyamopsis tetragonoloba* (L.) taub.] for vegetable pod yield and its component characters. *The Bioscan* (supplement on genetics and plant breeding). **9(4):** 1609-1612.

Snedecor, G. W. and W. G. Cochran 1967. Statistical methods. The lowa state university press, Amens, Lowa.

Singh, M. D. and Singh, M. G. 2004. Correlation and path analysis studies in selected local chillies (*Capsicum annuum* L.). *Envi. And Eco*. **22(Spl.4):** 672-675.

Samadia, D. K. 2007. Genetic variability studies in chilli germplasm under hot arid ecosystem. *Indian J. Hort.* **64:** 477-479.

Roserbrook, D. D., Prolze, C. C. and Barney, J. E. 1968. Improved method for determination of extractable colour in capsicum species. *J. Assoc. Anal. Chem*. **51:** 637-643.