Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.2807

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **5 (2):** 931-936 (2017)

Research Article

International Journal of Pure & Applied Bioscience

OPEN ACCESS

Studies on Correlation and Path Coefficient Analysis in Tomato [*Solanum lycopersicon* (Mill.) Wettsd.]

Arvind Kumar Singh[1], C. N. Ram[1], G.C. Yadav[1], R.K. Srivastava[2], Chandra Deo[1], Jeetendra Kumar Rao[3], Deepak Kumar Gautam[1*] and Pushpendra Kumar[1]

[1]Department of Vegetable Science, [2]Seed Technology and [3]P.G. College Ghazipur

Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad (U.P.) India

*Corresponding Author E-mail: pkgoyal4699@gmail.com

Received: 7.04.2017 | Revised: 15.04.2017 | Accepted: 16.04.2017

ABSTRACT

An experiment was conducted to identify the potential genotype of tomato with high productivity and good quality. Thirty-five genotypes of tomato collected from various location were evaluated for ten quantitative characters in Randomized Complete Block Design with three replications at Main Experiment Station, Department of Vegetable Science, Narendra Deva University of Agriculture and Technology, Narendra Nagar (Kumarganj), Faizabad (U.P.) during 2013-2014. The most important economic trait, fruit yield per plant exhibited highly significant and positive phenotypic correlation with number of fruit per plant followed by average fruit weight and number of primary branches per plant. Path coefficient analysis revealed appreciable amount of direct positive effect of fruit per plant followed by average fruit weight. On fruit yield per plant. Substantial positive indirect effect by number of fruits per plant and average fruit weight on fruits yield per plant was exerted via primary branches per plant.

Key words: *Tomato, Colour, Flavour, Productivity, Fruit*

INTRODUCTION

Tomato [*Solanum esculenton* (Mill.) Wettsd.] is one of the most important vegetable crop with diploid chromosome number 2n=2x=24. Ripe fresh tomato fruit is consumed fresh as salads and consumed after cooking and utilized in the preparation of range of processed products such as puree, paste, powder, ketchup, sauce, soup and canned whole fruits. Unripe green fruits are used for preparation of pickles and chutney. All the species of tomato are native to Western South America[9]. Tomatoes are important source of lycopene (an antioxidant), ascorbic acid and ß-carotene and valued for their colour and flavour. It is one of the most popular and widely cultivated vegetable throughout the world and ranking second in importance after potato in many countries including India[1]. Tomato is a typical day neutral plant and is mainly self-pollinated, but a certain percentage of cross-pollination also occurs. It is a warm season crop reasonably resistant to heat and drought and grows under wide range of soil and climatic conditions.

Cite this article: Singh, A.K., Ram, C. N., Yadav, G.C., Srivastava, R.K., Deo, C., Rao, J.K., Gautam, D.K. and Kumar, P., Studies on Correlation and Path Coefficient Analysis in Tomato [*Solanum lycopersicon* (Mill.) Wettsd.], *Int. J. Pure App. Biosci.* **5(2):** 931-936 (2017). doi: http://dx.doi.org/10.18782/2320-7051.2807

Considering the potentiality of this crop, there is a need for improvement and to develop varieties suitable to specific agro-ecological conditions and also for specific end use. Yield is a complex character controlled by a large number of contributing characters and their interactions. Study of correlation between different quantitative characters provides an idea of association that could be effectively exploited to formulate selection strategies for improving yield components. The path coefficient technique helps in estimating direct and indirect contribution of various components in finding out the total correlation towards yield. On the basis of these studies the quantum importance of individual characters is marked to facilitate the selection programme for better gains.

MATERIALS AND METHODS

Present investigation was conducted at the Main Experimental Station, Department of Vegetable Science, Narendra Deva University of Agriculture and Technology, Narendra Nagar (Kumarganj), Faizabad (U.P.) during *Rabi* 2013-2014. The experiment was conducted to evaluate 35 genotypes of tomato. Seeds were sown in nursery bed and 30 days old healthy seedlings were transplanted in the experimental field in November 2013 in two rows of 3 m length with inter and intra row spacing of 60 and 45 cm, respectively. Three check varieties (Punjab Chhuhara, NDT-8 and Angoorlata) and 35 genotypes were planted in two rows, maintaining 8 plants in each row. The 35 genotypes were planted in Randomized Block Design with three replications. All recommended cultural practices were followed to maintain good crop stand and growth of the plants. Data were recorded for nine characters *viz* days to 50 per cent flowering, plant height (cm), number of primary branches per plant, number of locules per fruit, pericarp thickness (mm), average fruit weight (g), total soluble solids, number of fruits per plant and fruit yield per plant (g).

RESULTS AND DISCUSSION

Correlation coefficients

The fruit yield or economic yield, in almost all the crops, is referred as super character, which resulted from multiple interactions of several other component characters that are termed as yield components. Thus, identification of important yield components and information about their inter relationship with each other will be very useful for developing efficient breeding strategy[2]. In the present study, correlations between nine characters were worked out in all possible combinations at phenotypic and genotypic levels are presented in Table-1 and 2. In general, the magnitude of genotypic correlation coefficients were higher than the corresponding values of the phenotypic correlation coefficients. This indicated a strong genetic association between these traits. The present study also suggested that both genotypic and phenotypic correlation were similar in direction. Kumar *et al*[3]., also reported higher estimates of genotypic than the corresponding phenotypic correlation coefficients between yield and yield components.

The most important trait, fruits yield per plant had exhibited highly significant and positive phenotypic correlation with number of fruits per plant followed by average fruit weight and number of primary branches per plant. Average fruit weight had highly significant and positive association with number of primary branches per plant. Total soluble solids had highly significant and positive correlation with pericarp thickness, average fruit weight and primary branches per plant significant and negative correlation with 50 per cent flowering and average fruit weight. Similar finding was also reported by Rani *et al*[8]. Number fruits per plant had highly significant and positive correlation with number of primary branches per plant these findings are accordance with previous workers[3,4,5]. Thus, number of fruit per plant, average fruit weight and number of primary branches should taken into considerable while selection for yield improvement.

Table 1: Estimates of phenotypic correlation coefficients between nine characters in tomato

Characters	Days to 50% Flowering	Number of primary branches / plant	Plant Height (cm)	Average Fruit Weight (g)	Number of Fruits/ Plant	Pericarp Thickness (mm)	Number of Locules/ Fruit	Total Soluble Solids (^{o}Brix)	Fruits Yield/ Plant (g)
Days to 50% Flowering	**1.0000**	-0.1169	-0.1068	-0.1590	-0.0632	-0.0572	0.1722	-0.3892*	-0.1450
Number of primary branches /plant		**1.0000**	0.3498*	0.3115**	0.2697**	0.1177	-0.0357	0.2540**	0.3620*
Plant Height (cm)			**1.0000**	0.0526	0.1833	0.0347	-0.1192	0.1380	0.1450
Average Fruit Weight (g)				**1.0000**	-0.1674	0.0920	-0.0165	0.4516*	0.5030*
Number of Fruits/ Plant					**1.0000**	-0.1712	0.0103	-0.2014*	0.7239*
Pericarp Thickness (mm)						**1.0000**	-0.1176	0.5534**	-0.1103
Number of Locules/ Fruit							**1.0000**	-0.1137	0.0731
Total Soluble Solids (^{o}Brix)								**1.0000**	0.1018
Fruits Yield/ Plant (g)									1.0000

*- Significant at 5 per cent probability level

**- Significant at 1 per cent probability level

Table 2: Estimates of genotypic correlation coefficient between nine characters in tomato

Characters	Days to 50% Flowering	Number of primary branches / plant	Plant Height (cm)	Average Fruit Weight (g)	Number of Fruits/ Plant	Pericarp Thickness (mm)	Number of Locules/ Fruit	Total Soluble Solids (^{o}Brix)	Fruits Yield/ Plant (g)
Days to 50% Flowering	**1.0000**	-0.3607	-0.3073	-0.3168	-0.1820	-0.2886	0.0788	-0.7169	-0.2732
Number of primary branches/ plant		**1.0000**	0.3425	0.2947	0.2602	0.0652	-0.0928	0.2238	0.3560
Plant Height (cm)			**1.0000**	0.0272	0.1803	-0.0038	-0.1671	0.0954	0.1316
Average Fruit Weight (g)				**1.0000**	-0.1847	0.0690	-0.0450	0.4511	0.4997
Number of Fruits/ Plant					**1.0000**	-0.2170	-0.0101	-0.2340	0.7329
Pericarp Thickness (mm)						**1.0000**	-0.1769	0.5675	0.1365
Number of Locules/ Fruit							**1.0000**	-0.1748	0.0581
Total Soluble Solids (^{o}Brix)								**1.0000**	0.0831
Fruits Yield/ Plant (g)									1.0000

Table 3: Direct and indirect effects at phenotypic level in tomato for nine characters

Characters	Days to 50% Flowering	Number of primary branche/ plant	Plant Height (cm)	Average Fruit Weight (g)	Number of Fruits/ Plant	Pericarp Thickness (mm)	Number of Locules/ Fruit	Total Soluble Solids (^{o}Brix)	Correlation with fruits yield per plant (g)
Days to 50% Flowering	**-0.0059**	0.0007	0.0006	0.0009	0.0004	0.0003	-0.0010	0.0023	-0.1450
Number of primary branches/ plant	0.0081	**-0.0693**	-0.0242	-0.0216	-0.0187	-0.0082	0.0025	-0.0176	0.3620
Plant Height (cm)	0.0016	-0.0052	**-0.0149**	-0.0008	-0.0027	-0.0005	0.0018	-0.0021	0.1420
Average Fruit Weight (g))	-0.1062	0.2081	0.0351	**0.6681**	-0.1118	0.0615	-0.0110	0.3017	0.5030
Number of Fruits/ Plant	-0.0540	0.2306	0.1567	-0.1431	**0.8550**	-0.1464	0.0088	-0.1722	0.7239
Pericarp Thickness (mm)	0.0006	-0.0013	-0.0004	-0.0010	0.0018	**-0.0107**	0.0013	-0.0059	-0.1103
Number of Locules/ Fruit	0.0123	-0.0025	-0.0085	-0.0012	0.0007	-0.0084	**0.0712**	-0.0081	0.0731
Total Soluble Solids (^{o}Brix)	-0.0014	0.0009	0.0005	0.0017	-0.0007	0.0020	-0.0004	**0.0037**	0.1018

Table 4: Direct and indirect effects at genotypic level in tomato for nine characters

Characters	Days to 50% Flowering	Number of primary branches/ plant	Plant Height (cm)	Average Fruit Weight (g)	Number of Fruits/ Plant	Pericarp Thickness (mm)	Number of Locules/ Fruit	Total Soluble Solids (^{o}Brix)	Correlation with fruits yield per plant (g)
Days to 50% Flowering	**0.2482**	-0.0895	-0.0763	-0.0786	-0.0452	-0.0716	0.0196	-0.1780	**-0.2732**
Number of primary branches / plant	0.0191	**-0.0530**	-0.0181	-0.0156	-0.0138	-0.0035	0.0049	-0.0119	0.3560
Plant Height (cm)	-0.0105	0.0117	**0.0341**	0.0009	0.0061	-0.0001	-0.0057	0.0032	0.1316
Average Fruit Weight (g)	-0.2166	0.2014	0.0186	**0.6836**	-0.1263	0.0472	-0.0308	0.3084	0.4997
Number of Fruits/ Plant	-0.1751	0.2503	0.1734	-0.1777	**0.9619**	-0.2087	-0.0097	-0.2251	0.7329
Pericarp Thickness (mm)	-0.0015	0.0003	0.0000	0.0004	-0.0011	**0.0052**	-0.0009	0.0030	-0.1365
Number of Locules/ Fruit	0.0092	-0.0108	-0.0194	-0.0052	-0.0012	-0.0206	**0.1163**	-0.0203	0.0581
Total Soluble Solids (^{o}Brix)	-0.1461	0.0456	0.0194	0.0919	-0.0477	0.1156	-0.0356	**0.2038**	**0.0831**
Days to 50% Flowering	**0.2482**	-0.0895	-0.0763	-0.0786	-0.0452	-0.0716	0.0196	-0.1780	**-0.2732**

R SQUARE = 0.9873 RESIDUAL EFFECT = 0.1126

Thus, on the basis of above it can be concluded that selection for number of fruit per plant, average fruit weight, primary branches per plant would be effective for yield improvement. Emphasis for selection of these traits in desired direction for higher yield had also been suggested by earlier workers[6,10].

Path coefficient Analysis

In present study, the path coefficient analysis was carried out at phenotypic as well as genotypic levels (Table-3and 4). High positive direct effect was exerted by number of fruits per plant and average fruit weight on fruit yield per plant. This indicates that direct selection for number of fruit per plant, average fruit weight in desired direction would be very effective for yield improvement these findings are in accordance with previous workers[4,6,10].

Path coefficient analysis is a tool to partition the observed correlation coefficient substantial positive indirect effect was exerted by number of fruit per plant and average fruit weight on fruit yield per plant via plant height. Line wise reasonable amount of indirect effect on yield per plant was also exerted on fruit yield per plant via total soluble solids. Similar result was also reported by Prashanth *et al*[7]., This indicates that direct selection for average fruit weight and fruits per plant in desired direction would be very effective for yield improvement.

REFERENCES

1. Anonymous, FAO website: March 2012 and for India data *Indian Horticulture Board* (2011).
2. Johnson, H.W., Robinson, H.F. and Comstock, Estimates of genetic and environmental variability in soybean. *J.Agri.*, **45:** 478-481 (1955).
3. Kumar, S., Singh, T., Singh, B. and Singh, J.P., Studies on correlation coefficient and path analysis among the different characters including fruit yield of tomato (*Lycopersicon esculentum* Mill.). *Plant Archives,* **4(1):** 191-193 (2004).
4. Makesh, S., Ramaswamy, N. and Puddan, M., Character association and path coefficient analysis in tomato (*Lycopersicon esculentum* Mill.). *Res. Crops*., **7(2):** 496-499 (2006).
5. Maurya, V., Singh, A.K., Rai, V.K. and Mishra, R., Genetic variability, correlation and path coefficient analysis of tomato (*Lycopersicon esculentum* Mill.). *Environment and Ecology*, **29(3):** 1076-1081 (2011).
6. Narolia, R.K., Reddy, R.V.S.K. and Padma, M., Correlation and path coefficient analysis of growth, yield and quality of tomato (*Lycopersicon esculentum* Mill.). *Indian J. Tropical Biodiversity*, **20(1):** 65-69 (2012).
7. Prashanth, S.J., Jaiprakashnarayan, R.P., Mulge, R. and Madalageri, M.B., Correlation and path analysis in tomato (*Lycopersicon esculentum* Mill.). *Asian Journal of Horticulture*., **3:** 403-408 (2008).
8. Rani, C.I., Muthuvel, I. and Veeraragavathatham, D., Correlation and path coefficient for yield components and quality traits in tomato (*Lycopersicon esculentum* Mill.). *Agricultural Science Digest*., **30(1):** 11-14 (2016).
9. Rick, C.M., Tomato. Evaluation of Crop Plant. *London. pp*. 268-273 (1976).
10. Singh, A. K., Correlation and path coefficient studies in tomato under cold arid conditions of ladakh. *Haryana J. Hort. Sci.*, **36(¾):** 346-347 (2007).
11. Singh, J. K., Singh, J. P., Jain, S. K. and Joshi, A., Correlation and path coefficient analysis in tomato. *Prog. Horti.* **36(1):** 82-86 (2004).