Character association and path analysis studies in some gentoypes of brinjal (*Solanum melongena* L) under low hill conditions of Himachal Pradesh

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ABSTRACT

Present investigations included character association among twenty brinjal (*Solanum melongena* L) genotypes for the fifteen quantitative traits viz days to 50 per cent flowering, days to first picking, pedicel length, fruit length, fruit diameter, average fruit weight, number of marketable fruits per plant, total soluble solids, number of primary branches per plant, plant height, stem diameter, plant spread, number of seeds per fruit, 100-seed weight and marketable fruit yield per plant. The results revealed that the traits days to 50 per cent flowering, number of marketable fruits per plant and stem diameter had positive and significant correlation for marketable fruit yield per plant. Path analysis study reported that the highest positive direct effect was exhibited by the trait marketable fruit yield per plant through number of marketable fruits per plant followed by fruit diameter on the marketable fruit yield per plant. Hence these traits were found to be important for the selection of desirable and superior genotypes of brinjal with high marketable fruit yield per plant.

Keywords: Brinjal; path analysis; correlation coefficient; direct effect; indirect effect

INTRODUCTION

Brinjal (*Solanum melongena* L), also known as eggplant or aubergine, is a member of nightshade family ie Solanaceae which is extensively cultivated all over the world. It is grown for its immature fruits which are used for preparation of various dishes like Bhartha, curry, Chatni, pickles, Bhaji etc. It is a rich source of proteins, carbohydrates, vitamins and minerals. Brinjal is said to be the native of India. The correlation studies determine the mutual relationship between the various horticultural traits of the crop which helps in the determination of component characters on which selection is based for genetic improvement in yield. The knowledge of correlation between yield and its contributing characters measures only mutual association between two traits and it does not imply the cause and effect of relationship. Under such conditions, the use of path coefficient analysis would be more beneficial as it clearly forms the direct and indirect associations and identifies the most reliable yield contributing character. Path analysis is a standardized partial regression analysis which further permits the partitioning of correlation coefficient into components of direct and indirect effects of independent variables on the dependent variable (Wright 1921). Therefore the present investigations were undertaken to reveal character association and path analysis in brinjal.

MATERIAL and METHODS

The present investigations comprised twenty brinjal genotypes (16 local accessions and 4 commercial varieties) grown in completely randomized block design with three replications at the experimental farm of the Department of Vegetable Science, College of Horticulture and Forestry, Neri, Hamirpur, Himachal Pradesh carried out in 2018. The seedlings were transplanted with a spacing of 60 cm x 45 cm. The observations were recorded on five randomly taken plants in each replication for fifteen quantitative traits viz days to 50 per cent flowering, days to first picking, pedicel length, fruit length, fruit diameter, average fruit weight, number of marketable fruits per plant, total soluble solids, number of primary branches per plant,

plant height, stem diameter, plant spread, number of seeds per fruit, 100-seed weight and marketable fruit yield per plant. The correlation coefficients among all character combinations at phenotypic and genotypic level were estimated as per the formula given by Al-Jibouri et al (1958). Path coefficient analysis suggested by Wright (1921) and Dewey and Lu (1959) was carried out to know the direct and indirect effect of the morphological traits on the marketable fruit yield per plant.

RESULTS and DISCUSSION

Correlation: The data in Table 1 reveal that marketable fruit yield per plant had positive and significant correlation with days to 50 per cent flowering, number of marketable fruits per plant and stem diameter indicating that the fruit yield per plant increased with the increase in the magnitude of these characters. These findings are similar to those obtained by Dashmohapatra and Sharma (2018), Chattopadhayay et al (2011), Patel et al (2017), Srivastava et al (2018), Lakshmi et al (2014) and Tiwari et al (2019). Days to first picking had negative and significant association with the trait fruit length (-0.28) at genotypic level and the trait number of primary branches per plant (-0.32) at phenotypic level only suggesting that the long fruited varieties were earlier and had more primary branches as compared to the varieties with short fruit length. The correlation coefficients were higher in magnitude at genotypic level in comparison to phenotypic level for most of the characters studied indicating strong association between these characters genetically. However for these traits the phenotypic value was lessened mainly due to the significant interaction of the environment.

Path analysis: Path coefficient analysis (Table 2) suggested that the highest positive direct effect on the dependent trait marketable fruit yield per plant was exhibited by the trait number of marketable fruits per plant (10.92) followed by fruit diameter (8.82) and 100-seed weight (3.64). These findings are similar to those reported by Chauhan et al (2017), Ravali et al (2017) and Dahatonde et al (2010). The highest value for indirect positive effect on marketable fruit yield per plant was found for the trait days to first picking through the independent trait viz number of seeds per fruit (7.40) followed by the trait average fruit weight through trait fruit length (7.26). These results are in confirmation to the findings of Dahatonde et al (2010) and Thangamani and Jansirani (2012) in brinjal.

CONCLUSION

The present investigations indicated that the direct selection for the genotypes with more number of marketable fruits per plant, higher fruit diameter and higher 100-seed weight helped in the selection of the genotypes with higher marketable fruits per plant. The late flowering genotypes with more number of marketable fruits and more stem diameter recorded higher marketable fruit yield per plant.

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Table 1. Genotypic and phenotypic correlation coefficients between marketable fruit yield per plant and its component characters in brinjal (*Solanum melongena* L)

		X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15
X1	G	1	0.94**	0.27*	-0.17	0.23	-0.09	0.21	-0.25*	-0.67**	-0.56**	-0.04	-0.27*	-0.44**	-0.22	-0.40**
	P	1	0.50**	0.21	-0.13	0.15	-0.06	0.07	-0.14	-0.41**	-0.35**	-0.08	-0.17	-0.28*	-0.14	0.2
X2	G		1	0.08	-0.28*	0.01	0.08	-0.01	0.16	-0.46**	-0.67**	0.06	-0.59**	-0.57**	-0.08	0.28*
	P		1	0.09	-0.23	0.01	0.06	-0.01	0.15	-0.32*	-0.59**	0.04	-0.52**	-0.49**	-0.07	0.11
X3	G			1	0.22	0.1	-0.30*	0.1	-0.02	-0.18	0.34**	0.08	0.25	-0.54**	-0.2	-0.2
	P			1	0.17	0.08	-0.28*	0.07	-0.01	-0.11	0.33**	0.05	0.23	-0.49**	-0.18	-0.1
X4	G				1	-0.1	-0.60**	0.48**	-0.11	-0.09	0.01	-0.02	0.40**	-0.29*	0.19	0.12
	P				1	-0.12	-0.58**	0.47**	-0.1	-0.09	0.02	-0.01	0.39**	-0.28*	0.18	0.04
X5	G					1	0.45**	-0.33**	-0.01	0.01	0.05	-0.47**	0.04	0.30*	-0.09	0.01
	P					1	0.32*	-0.23	0.09	0.01	0.04	-0.32*	0.03	0.21	-0.059	0.09
X6	G						1	-0.82**	-0.08	0.18	-0.14	-0.24	-0.28*	0.26*	0.34**	-0.24
	P						1	-0.80**	-0.07	0.17	-0.14	-0.23	-0.28*	0.25*	0.34**	-0.14
X7	G							1	-0.11	-0.17	0.07	0.38**	0.12	0.01	-0.25	0.86**
	P							1	-0.1	-0.15	0.06	0.36**	0.12	0.01	-0.249	0.49**
X8	G								1	0.23	0.09	-0.36**	-0.06	0.06	-0.14	-0.35**
	P								1	0.17	0.09	-0.27*	-0.06	0.03	-0.11	-0.19
X9	G									1	0.46**	-0.13	0.1	0.47**	-0.01	-0.23
	P									1	0.45**	-0.14	0.09	0.44**	-0.01	-0.13
X10	G										1	-0.07	0.50**	0.36**	-0.1	-0.13
	P										1	-0.07	0.49**	0.36**	-0.1	-0.08
X11	G											1	-0.04	-0.14	-0.09	0.53**
	P											1	-0.04	-0.14	-0.08	0.30*
X12	G												1	0.07	0.05	-0.14
	P												1	0.07	0.05	-0.08
X13	G													1	-0.02	0.24
	P													1	-0.02	0.15
X14	G														1	-0.09
	P														1	-0.06
X15	G															1
	P															1

X1- Days to 50% flowering, X2- Days to first picking, X3- Pedicel length (cm), X4- Fruit length (cm), X5- Fruit diameter (cm), X6- Average fruit weight (g), X7- Number of marketable fruits/plant, X8- Total soluble solids (%), X9- Number of primary branches/plant, X10- Plant height (cm), X11- Stem diameter (cm), X12- Plant spread (cm^2), X13- Number of seeds/fruit, X14- 100-seed weight (g), X15- Marketable fruit yield/plant (kg); *Significant at 5% LoS, **Significant at 1% LoS

Table 2. Genotypic path coefficient analysis for direct and indirect effects of component characters on yield in brinjal (*Solanum melongena* L)

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15
X1	-4.11	-6.97	-0.86	2.11	2.07	0.22	2.30	-0.07	-1.27	1.97	0.05	0.02	5.75	-0.81	0.40
X2	-3.87	-7.41	-0.26	3.37	0.16	-0.18	-0.15	0.04	-0.88	2.38	-0.07	0.06	7.40	-0.31	0.28
X3	-1.13	-0.36	-3.11	-2.73	0.96	0.72	1.13	-0.01	-0.35	-1.20	-0.09	-0.02	7.01	-0.73	-0.20
X4	0.72	2.08	-0.70	-12.01	-0.94	1.42	5.32	-0.03	-0.17	-0.06	0.03	-0.04	3.82	0.69	0.12
X5	-0.96	-0.14	-0.33	1.28	8.82	-1.06	-3.68	-0.01	0.01	-0.18	0.55	-0.01	-3.95	-0.34	0.01
X6	0.38	-0.59	0.96	7.26	4.00	-2.34	-8.96	-0.02	0.35	0.49	0.28	0.03	-3.37	1.26	-0.24
X7	-0.86	0.10	-0.32	-5.85	-2.97	1.92	10.92	-0.03	-0.33	-0.25	-0.44	-0.01	-0.06	-0.92	0.86
X8	1.05	-1.20	0.07	1.14	-0.11	0.19	-1.26	0.28	0.44	-0.34	0.43	0.01	-0.79	-0.53	-0.35
X9	2.75	3.43	0.57	1.09	0.03	-0.43	-1.94	0.06	1.90	-1.64	0.16	-0.01	-6.18	-0.03	-0.23
X10	2.30	5.01	-1.06	-0.23	0.45	0.33	0.79	0.02	0.88	-3.51	0.09	-0.05	-4.77	-0.39	-0.13
X11	0.20	-0.48	-0.25	0.32	-4.15	0.56	4.14	-0.10	-0.26	0.27	-1.18	0.01	1.80	-0.33	0.53
X12	1.10	4.37	-0.77	-4.90	0.40	0.67	1.38	-0.01	0.19	-1.76	0.05	-0.10	-0.96	0.20	-0.14
X13	1.83	4.25	1.68	3.55	2.70	-0.61	0.05	0.01	0.91	-1.30	0.16	-0.01	-12.91	-0.10	0.24
X14	0.92	0.64	0.62	-2.30	-0.83	-0.81	-2.76	-0.04	-0.02	0.38	0.10	-0.01	-0.37	3.64	-0.09

X1- Days to 50% flowering, X2- Days to first picking, X3- Pedicel length (cm), X4- Fruit length (cm), X5- Fruit diameter (cm), X6- Average fruit weight (g), X7- Number of marketable fruits/plant, X8- Total soluble solids (%), X9- Number of primary branches/plant, X10- Plant height (cm), X11- Stem diameter (cm), X12- Plant spread (cm^2), X13- Number of seeds/fruit, X14- 100-seed weight (g), X15- Marketable fruit yield/plant (kg); Residual effect= -0.11826

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