Plant Archives Vol. 25, No. 1, 2025 pp. 1253-1256 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2025.v25.no.1.185

CHARACTER ASSOCIATION AND PATH ANALYSIS STUDIES IN BRINJAL (*SOLANUM MELONGENA* L.)

C.P. Bal[1*], S.G. Bhave[1], R.L. Kunkerkar[1], A.V. Mane[1], P.B. Sanap[2] and M.S. Joshi[3]

[1]Department of Agricultural Botany, College of Agriculture, Dr.B.S.K.K.V. Dapoli 4157125(M.S) India.
[2]Department of Horticulture, College of Horticulture, Dr.B.S.K.K.V.Dapoli 4157125(M.S) India.
[3]Department of Plant Pathology, College of Agriculture, Dr.B.S.K.K.V.Dapoli 4157125(M.S) India.
*Corresponding author E-Mail: chinmayee.bal05@gmail.com
(Date of Receiving-26-01-2025; Date of Acceptance-01-04-2025)

ABSTRACT

The present investigation was carried out at Central research station, Vegetable Division Wakawali, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli (MH.) during *Rabi* 2023-24. The experimental materials comprised of eight genotypes, their 15 F_1's made by LXT mating design and two checks. Fruit yield per plant was found to be positively and significantly correlated with number of fruits per plant (0.420), fruit length (0.730), fruit weight (0.412). The number of fruits per plant and fruit lenght exhibited a significant positive phenotypic and genotypic correlation with fruit yield per plant. Thus, the number of fruits per plant and fruit length seems to have predominated effect on fruit yield per plant. The higher magnitude of a positive direct effect on fruit yield per plant was exerted by number of fruits per plant (1.443) followed by fruit weight (1.323), fruit length (0.412), fruit diameter (0.361). Hence, from the above finding, it may be concluded that selection for above mention traits should be given importance in a selection programme to increase fruit yield.

Key words: Brinjal, Genotypic correlation, Phenotypic correlation, Path analysis, Yield

Introduction

Brinjal or eggplant (*Solanum melongena* L.) is a popular solanaceous crop of sub-tropics and tropics. It is one of the most prevalent, well-liked, and important vegetable crops growing in India, with the exception of higher altitudes. The crop can be grown all year round and is adaptable to many agro-climatic areas. It is perennial but for commercial purpose it is cultivated as annual crop. India produces a variety of cultivars, with consumer preference based on fruit colour, size, and form.

India is the world's second-largest producer of brinjal after China. A total of 1.85 million hectares of brinjal are grown worldwide, with an annual production of 56.62 million tonnes and a productivity of 30.64 tonnes/hectares (FAOSTAT, 2022). In India it is grown on an area of about 0.74 million hectares having annual production of 12.77 million tonnes with productivity of 17.24 tonnes/ hectares. In Maharashtra brinjal is cultivated over 0.02 million hectares with annual production of 0.34 million tonnes and productivity 17 tonnes/ hectares (NHB, First Advance estimates 2021-22).

Unripe brinjal fruit is mostly eaten as a cooked vegetable in a variety of ways, and in rural regions, dried shoots are used as fuel. It has little calories and fats and is primarily made up of water, along with some protein, fibre, and carbohydrates. In addition to being a strong source of minerals and vitamins, it also contains a lot of amide proteins, free reducing sugars, and total water-soluble sugars. The ayurvedic medicinal benefits of brinjal are well known, and it is beneficial for diabetes patients. Also, it has been suggested as a helpful remedy for those having liver issues.

Correlation and path co-efficient analysis are important to determine the association between the yield and yield components. The characters that are positively correlated with yield are considerably important to plant

Table 1: List of Brinjal genotypes with their sources.

Sr. No	Genotypes				
Lines		Testers		Checks	
1	Bandhtiware (BDHE)	1	Konkan Prabha (KP)	1	Konkan Prabha (KP)
2	Kali Ravai (KR)	2	Swarn Pratibha (SP)	2	Kali Ravai (KR)
3	Kasral (KL)	3	Singnath (S)		
		4	Lanja Local (LL)		
		5	BB 64 (BB64)		

breeder for selection purpose. Correlation provides a measure of genetic association between the characters and reveals the traits that might be useful as an index of the selection. According to Feyzian *et al.*, (2009) investigation of the interrelationships between yield and its components will improve the efficiency of a breeding programme with appropriate selection criteria. All the changes in the components need not, however be expressed by changes in the yield. This is due to varying degrees of positive and negative correlations between yield and its components and among the components themselves. A study of the association of these characters helps in the selection of genotypes and also suggests the advantage of a selection scheme for more than one character at a time, which could be explained that improvement of one trait results in improvement of all positively related characters. In the present study, the simple correlation coefficients between yield and its components and their inter correlations among the components were estimated. Although the correlation co-efficient indicates the nature of association among the different traits, path analysis splits the correlation co-efficient into a measure of direct and indirect effects, thus providing an understanding of the direct and indirect association of each character towards yield. Hence, the present investigation was planned to unravel the correlation and path co-efficient of yield and yield attributing traits in brinjal.

Material and Method

The present investigation was carried out at Central research station, Vegetable Division Wakawali, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli (MH.) during *Rabi* 2023-24. The experimental materials comprised of eight genotypes, their 15 F_1's made by LXT mating design and two checks.

The experiment was laid out in a Randomized Block Design. All the recommended package of practices were adopted for raising a healthy crop. Five randomly selected plants, from each plot of all the three replications were tagged and used for recording the observations and average values were computed. Analysis of covariance for all combinations was done and used for estimation of correlations. Phenotypic and genotypic correlations were worked out by the formulae recommended by Al-Jibouri *et al.*, (1958). Path analysis was done as per the procedure outlined by Wright (1921) and Dewey and Lu (1959).

Table 2: Line × Tester Cross combinations.

1	BDHE × KP	6	KR × KP	11	KL × KP
2	BDHE × SP	7	KR × SP	12	KL × SP
3	BDHE × S	8	KR × S	13	KL × S
4	BDHE × LL	9	KR × LL	14	KL × LL
5	BDHE × BB64	10	KR × BB64	15	KL × BB64

Results and Discussion

Correlation studies

Genetic variability studies pro-vide information on the extent of improvement could be achieved in different characters, but they do not focus on the extent and nature of relationship existing between various characters. Therefore, for rational approach towards the improvement of yield, selection has to be made for the yield contributing characters, since there may not be genes for yield per plant, but only for various yield components (Grafius, 1959). Further, many of these yield contributing characters may interact in desirable and undesirable direction. Hence, a knowledge regarding the association of various characters among themselves and with economic characters is essential. In the present study, the genotypic and phenotypic correlation coefficients were worked out for growth earliness, yield components in brinjal. The difference between the genotypic and phenotypic correlation coefficients was narrow for various traits in the present findings and this indicates the lesser influence of environment in the expression of these traits and presence of strong inherent association among the traits.

Genotypic and phenotypic correlations are presented in Table 3. Fruit yield per plant was found to be positively and significantly correlated with number of fruits per plant (0.420), fruit length (0.730), fruit weight (0.412) whereas it was found to be negatively and significantly correlated with fruit diameter (-0.412) and terminal bacterial wilt incidence (-0.703) at genotypic level. Fruit yield per plant showed positive and significant phenotypic correlation with number of fruits per plant (0.235), fruit length (0.546)

Table 3: Genotypic and Phenotypic correlation coefficient.

		FYPP	DFF	PH	NPBPP	NFPP	FL	FD	FW	TBWI
FYPP	**G**	1	-0.185	-0.005	0.037	0.420*	0.730 **	-0.412 *	0.412 *	-0.703 **
	P	1	0.034	-0.064	0.082	0.235 *	0.546**	-0.239 *	0.216	-0.555 **
DFF	**G**		1	0.373	0.003	-0.490 *	-0.572 **	0.551 **	0.421 *	0.405 *
	P		1	0.268*	0.069	-0.364 **	-0.301 **	0.442 **	0.188	0.269 *
PH	**G**			1	0.598 **	-0.435 *	0.054	0.181	0.5701**	-0.239
	P			1	0.519 **	-0.270 *	0.073	0.119	0.287 *	-0.179
NPBPP	**G**				1	-0.063	0.320	-0.157	0.233	-0.300
	P				1	-0.076	0.285*	-0.077	0.159	-0.278 *
NFPP	**G**					1	0.412 *	-0.859 **	-0.690**	-0.157
	P					1	0.355 **	-0.721 **	-0.552 **	-0.150
FL	**G**						1	-0.766 **	0.130	-0.796 **
	P						1	-0.646 **	0.093	-0.750 **
FD	**G**							1	0.542**	0.415 *
	P							1	0.470 **	0.361 **
FW	**G**								1	-0.396 *
	P								1	-0.372 **
TBWI	**G**									1
	P									1

*, **- Significant at 5 % and 1 % probability level, respectively

and negative significant phenotypic correlation with fruit diameter (-0.239) and terminal bacterial wilt incidence (-0.555). These results are similar with results reported by Arunkumar *et al.*, (2013), Lokesh *et al.*, (2013), Nayak and Nagre (2013) and Pandey *et al.*, (2016), Rameshkumar *et al.*, (2021). The number of fruits per plant and fruit length exhibited a significant positive phenotypic and genotypic correlation with fruit yield per plant.

Path Analysis

The estimation of correlation coefficients indicates only the extent and nature of the association between yield and its components but does not show the direct and indirect effects of different yield attributes on yield *per se*. Fruit yield is dependent on several traits which are mutually associated. These will in turn impair the true association existing between a component and fruit yield. A change in any one component is likely to disturb the whole network of cause and effect. Thus, each component has two paths of action *viz.*, the direct influence on fruit yield, indirect effect through components which are not revealed from the correlation studies. The path coefficient analysis was carried out from phenotypic and genotypic correlation coefficient to resolve direct and indirect effects of nine characters on fruit yield per plant. The direct effects of different characters on fruit yield were presented in Table 4. The higher magnitude of a positive direct effect on fruit yield per plant was exerted by number of fruits per plant (1.443) followed by fruit weight (1.323), fruit length (0.412), fruit diameter (0.361). The negative direct effect on fruit yield per plant was shown by number of primary branches per plant (-0.169), followed by plant height (-0.057), days to first flowering (-0.050). Similar results had also been reported by Bansal and Mehta (2008), Singh *et al.*, (2011), Singh *et al.*, (2017) and Rameshkumar *et al.*, (2021).

Table 4: Genotypic path analysis.

Trait	DFF	PH	NPBPP	NFPP	FL	FD	FW	TBWI	FYPP
DFF	**-0.050**	-0.021	-0.0005	-0.707	-0.236	0.199	0.556	0.073	-0.185
PH	-0.018	**-0.057**	-0.101	-0.628	0.0223	0.066	0.755	-0.043	-0.005
NPBPP	-0.0001	-0.034	**-0.169**	-0.090	0.132	-0.057	0.309	-0.054	0.037
NFPP	0.0241	0.0247	0.011	**1.443**	0.170	-0.311	-0.913	-0.028	0.420 *
FL	0.029	-0.003	-0.054	0.595	**0.412**	-0.277	0.172	-0.144	0.730 **
FD	-0.027	-0.010	0.026	-1.239	-0.316	**0.361**	0.717	0.075	-0.412 *
FW	-0.021	-0.032	-0.039	-0.997	0.0537	0.196	**1.323**	-0.072	0.412 *
TBWI	-0.020	0.014	0.051	-0.227	-0.328	0.150	-0.524	**0.181**	-0.703 **

FYPP- Fruit yield per plant, **DFF-** Days to first flowering, **PH-** Plant height, **NPBPP-** Number of primary branches per plant, **NFPP-** Number of fruits per plant, **FL-** Fruit length, **FD-** Fruit diameter, **FW-** Fruit weight, **TBWI-** Terminal bacterial wilt incidence

Conclusion

From the above finding, it may be concluded that the number of fruits per plant and fruit length exhibited a significant positive phenotypic and genotypic correlation along with positive direct effect with fruit yield per plant. Thus, the number of fruits per plant and fruit length seems to have predominated effect on fruit yield per plant. There is ample scope in the enhancement of yield by selecting a genotype having a higher number of fruits with higher fruit length since they are highly correlated with positive direct effect.

References

Al-Jibouri, H.A., Miller P.A. and Robinson H.F. (1958). Genotypic and environmental variances and covariances in an upland cotton cross of interspecific origin. *Agron J*., **50**, 633-636.

Arunkumar, B., Kumar, S.S.V. and Prakash J.C. (2013). Genetic variability and divergence studies in brinjal (*Solanum melongena* L.). *Bioinfolet*, **10(2B)**, 739-744.

Bansal, S. and Mehta A.K. (2008). Genotypic correlation and path analysis in brinjal (*Solanum elongena* L.). *Natnl. J. Plant Improv*, **10**, 34-36.

Dewey, D.R. and Lu K.H. (1959). A correlation and path coefficient analysis of components of crested wheat grass seed production, *Agron. J*., **51(9)**, 515-518.

FAOSTAT (2022).

Feyzian, E., Dehghani H., Rezai A.M. and Javaran M.J. (2009). Diallel cross analysis for maturity and yield related traits in melon (*Cucumis melo* L.). *Euphytica*, **168**, 215-223.

Grafius, J.E. (1959). Correlation and path analysis in barley, *Agron J*., **51**, 515-518.

Lokesh, B., Reddy S.P., Reddy R.V.S.K. and Sivaraj N. (2013). Variability, heritability and genetic advance studies in Brinjal (*Solanum melongena* L.). *Electronic Journal of Plant Breeding*, **4(1)**, 1097-1100.

Nayak, B.R. and Nagre P.K. (2013). Genetic variability and correlation studies in brinjal (*Solanum melongena* L.). *Int. J. Appl. Biol*., **4(4)**, 211-215.

NHB, First Advance estimates (2021-22).

Pandey, P.K., Yadav G.C. and Kumar V. (2016). Correlation and path coefficient analysis among different characters in genotype of brinjal (*Solanum melongena*). *Indian J. Ecol*., **43(1)**, 370-372.

Ramesh kumar, D., Swarna Priya R., Savitha B.K., Ravikesavan R. and Muthukrishnan N. (2021). Correlation and path analysis studies on yield and yield components in brinjal (*Solanum melongena* L.), *Electronic Journal of Plant Breeding*, **12(1)**, 249-252.

Singh, A.K., Tripathi M.K., Rai V.K. and Mishra R. (2011). Character association and path coefficient analysis in brinjal (*Solanum melongena* L.). *Environ & Ecol*., **29**, 1201-1203.

Singh, N., Singh D.K., Pandey P., Panchbhaiya A. and Rawat M. (2017). Correlation and Path Coefficient Studies in Okra [*Abelmoschus esculentus* (L.) Moench]. *Int. J. Curr. Microbiol. App. Sci*., **6(7)**, 1096-1101.

Wright, S. (1921). Correlation and causation. *J Agric. Res*., **20**, 557-585.