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Association of characters in Brinjal (*Solanum melongena* L.) land races

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Abstract
A study was conducted in the Department of Vegetable Crops, Horticultural College and Research Institute, TNAU, Coimbatore. Fifty landraces of brinjal were raised and evaluated for eighteen quantitative and qualitative characters *viz.*, plant height, number of branches per plant, days to first flowering, days to 50 per cent flowering, days to first harvest, fruit length, fruit girth, fruit weight, number of fruits per plant, fruit yield per plant, shoot borer infestation, fruit borer infestation, marketable yield per plant and five qualitative characters *viz.*, dry matter content per fruit, protein content, ascorbic acid content and total phenols. Correlation coefficient was estimated for yield and related traits in all 50 eggplant genotypes. Correlation analysis indicated that the plant height, number of branches per plant, fruit length, fruit weight, number fruits per plant and fruit yield per plant had highly positive significant correlation on fruit yield per plant.

Keywords: Brinjal, land races, genotypic and phenotypic correlation and coefficient between yield traits, correlation and coefficient among yield traits

Introduction

Brinjal (*Solanum melongena* L.) is one of the most widely grown vegetable in India. Efforts are being made to increase its productivity by developing superior varieties. The demand for brinjal variety/hybrids or the existing land races is always desired for the attributes like higher yield, more number of fruits, high fruit weight, good size fruits and earliness to enhance productivity and subsequently improve income generation to the local producers (Kumar *et al*., 2020) [8].

Yield is the most important trait aimed in breeding programme for the benefit of the growers. Yield is a complex character depends upon many contributing characters and the yield is influenced by various yield attributing plant traits, hence direct selection for improvement or increase the yield is difficult. Yield and its components have been of an immense value in selecting suitable plant type. While evaluating the yield potential of any variety, it is necessary to give attention to all the yield contributing characters.

Information derived from correlation studies will reveal the possibility of simultaneous improvement of various attributes and also helps in increasing the efficiency of selection of complex inherited traits. The correlation coefficient indicates the degree of relationship between characters (Bende *et al.*, 2019) [5] but it alone does not give a picture of association between yield and its components. Therefore knowledge in respect of the nature and magnitude of associations of yield with various component characters and the interrelationship among different traits are pre-requisite to bring improvement in the desired direction.

A study of correlation between different quantitative characters provides an idea of association of various traits with yield. It could be effectively exploited to formulate selection strategies for improving yield and quality. Association of characters like yield, its components and other economical traits is important for making selection in the breeding programme. Therefore it is essential to assess the degree of association of various quantitative characters in order to initiate effective selection programme.

Materials and Methods

The present study was carried out at the College Orchard, Department of Vegetable Crops, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore during 2017 which is situated at 11° N latitude and 77° E longitude and at an elevation of 426.6 m above mean sea level. Fifty genotypes of brinjal were raised in a randomized block design (RBD) with two replications. All the recommended agronomic practices were followed to raise a healthy crop.

Five plants at random were taken from each plot recording the observations on plant height, number of branches per plant, days to first flowering, days to 50% flowering, days to first harvest, fruit length, fruit girth, fruit weight, number of fruits per plant, fruit yield per plant, shoot borer incidence, fruit borer incidence, marketable yield, dry matter content per fruit, protein content, ascorbic acid content, total phenol content and solasodine content.

The mean over replications for each character was subjected to statistical analysis. The association between yield and component traits and among themselves was computed based on *per se* performance of the genotypes as genotypic correlation coefficients (Goulden, 1952) [6]. The variance and covariance components were utilized to calculate genotypic correlation coefficients as outlined by Aljibour *et al.* (1958) [2].

Results and Discussion

The correlation coefficient between yield and its components and inter correlations among the different yield attributes were estimated and presented in Tables 1 and 2. In general, the study results revealed that the genotypic correlation coefficients were of higher magnitude than the phenotypic correlation coefficients.

Table 1: Genotypic correlation coefficient for different quantitative characters in brinjal

Characters	PH	NOB	DFF	D50%F	DFH	FL	FG	FW	NOF	FYP	SI	FI	MYP
PH	1	0.322*	0.025	-0.117	0.110	0.140	0.367**	0.337*	0.222	0.459**	-0.099	-0.423**	0.401**
NOB		1.000	-0.232	-0.276*	-0.102	-0.143	0.223	0.233	0.206	0.423**	0.094	-0.084	0.329*
DFF			1.000	0.625**	0.470**	0.068	-0.174	-0.169	0.117	-0.040	0.077	0.009	-0.005
D50%F				1.000	0.773**	-0.004	-0.085	-0.148	-0.144	-0.211	0.222	0.307*	-0.241
DFH					1.000	0.215	0.005	-0.043	-0.171	-0.170	0.168	0.137	-0.201
FL						1.000	0.188	0.280*	0.089	0.301*	-0.017	-0.196	0.294*
FG							1.000	0.480**	-0.032	0.196	0.085	-0.054	0.160
FW								1.000	0.129	0.660**	-0.210	-0.416**	0.572**
NOF									1.000	0.797**	-0.665**	-0.548**	0.824**
FYP										1.000	-0.446**	-0.813**	0.987**
SI											1.000	0.625**	-0.535**
FI												1.000	-0.878**
MYP													1.000

**Significant at 1 per cent level * Significant at 5 per cent level
PH – Plant height D50% F - Days to 50% flowering FG - Fruit girth FYP - Fruit yield plant-1 MYP - Marketable yield plant-1
NOB – Number of branches plant-1 DFH - Days to first harvest FW - Fruit weight SI - Shoot borer infestation
DFF - Days to first flowering FL - Fruit length NOF - Number of fruits plant-1 FI - Fruit borer infestation

Table 2: Phenotypic correlation coefficient for different quantitative characters in brinjal

Characters	PH	NOB	DFF	D50%F	DFH	FL	FG	FW	NOF	FYP	SI	FI	MYP
PH	1.000	0.306*	0.016	-0.115	0.087	0.112	0.313*	0.281*	0.211	0.318*	0.018	-0.312*	0.290*
NOB		1.000	-0.163	-0.202	-0.119	-0.093	0.166	0.164	0.135	0.168	0.068	-0.132	0.136
DFF			1.000	0.593**	0.448**	0.064	-0.167	-0.157	0.101	-0.054	0.035	0.015	-0.016
D50%F				1.000	0.739**	-0.004	-0.085	-0.149	-0.142	-0.195	0.121	0.216	-0.227
DFH					1.000	0.203	0.006	-0.043	-0.156	-0.138	0.105	0.090	-0.170
FL						1.000	0.187	0.280*	0.089	0.266	-0.005	-0.144	0.271
FG							1.000	0.477**	-0.030	0.173	0.047	-0.034	0.144
FW								1.000	0.130	0.596**	-0.136	-0.294*	0.533**
NOF									1.000	0.726**	-0.363**	-0.401**	0.770**
FYP										1.000	-0.296*	-0.483**	0.969**
SI											1.000	0.232	-0.348*
FI												1.000	-0.585**
MYP													1.000

**Significant at 1 per cent level * Significant at 5 per cent level
PH – Plant height D50%F - Days to 50% flowering FG - Fruit girth FYP - Fruit yield plant-1 MYP - Marketable yield plant-1
NOB – Number of branches plant^{-1} DFH - Days to first harvest FW - Fruit weight SI - Shoot borer infestation
DFF - Days to first flowering FL - Fruit length NOF - Number of fruits plant-1 FI - Fruit borer infestation

Correlation between fruit yield and its components

The marketable yield per plant was found to be significant and positively correlated with fruit yield per plant (0.987 and 0.969), number of fruits per plant (0.824 and 0.770), individual fruit weight (0.572 and 0.533) and plant height (0.401 and 0.290) both at genotypic and phenotypic levels whereas number of branches per plant (0.329) and fruit length (0.294) showed significant and positive correlation at genotypic level only, which indicated the high heritable nature of the characters (Tables 1 and 2).

Such a kind of positive association was quoted by Bansal and Mehta (2008) [4], Muniappan *et al.* (2010) [11] for fruit weight and number of fruits per plant and Nayak and Nagre (2013) [12] for plant height, Pandey *et al.* (2016) [14] for marketable fruit yield per plant, fruits per plant, primary branches per plant and fruit length, Minakshi *et al.* (2017) [10] for number of marketable fruits per plant, fruit weight, fruit length, plant height and number of branches per plant, Bende *et al.* (2019) [5] for fruit weight per plant, number of branches per plant, number of fruits per plant and plant height, Tiwari *et al.* (2019) [19] for marketable fruit yield per plant, fruits per plant, primary branches per plant and fruit length. Onyia *et al.* (2020) [13] for number of fruits per plant, with fruit weight and number of branches/plant.

These indicate that the taller the plant, the better the genetic complement for enhanced production.

The study results revealed that increase in plant height, number of branches per plant, number of fruits per plant, individual fruit weight and fruit length were complemented for increasing the yield.
Shoot borer (-0.535 and -0.348) and fruit borer infestation (-0.878 and -0.585) recorded significant and negative correlation with marketable yield per plant at both genotypic and phenotypic levels (Tables 1 and 2). This negative correlation showed that if the borer infestation increases, yield gets decreased and vice versa. This suggests that the genotypes with lower level of shoot and fruit borer infestation should be taken into consideration for brinjal improvement programme. These results were in consonance with the reports of Patel *et al*. (2004) [15], Lakshmi *et al*. (2014) [9] Vidhya and Kumar (2015) [22], Bende *et al.* (2019) [5] for negative correlation of shoot borer and fruit borer infestation with yield.

Correlation among yield components

The plant height registered positive significant association with number of branches per plant (0.322 and 0.306), fruit girth (0.367 and 0.313), fruit weight (0.337 and 0.281) and fruit yield per plant (0.459 and 0.318) at both genotypic and phenotypic levels. Fruit borer infestation (-0.423 and -0.312) showed negative and significant association both at levels. Number of primary branches per plant registered a positive and significant association with fruit yield per plant (0.423) at genotypic level. A negative and significant correlation was recorded with days to 50% flowering (-0.276) at genotypic level (Tables 1 and 2).
Days to first flowering at both genotypic and phenotypic levels exhibited positive significant association with days to 50% flowering (0.625 and 0.593) and days to first harvest (0.470 and 0.448). Days to 50 per cent flowering registered a positive and significant association with days to first harvest (0.773 and 0.739) at both genotypic and phenotypic levels. The fruit borer infestation (0.307) showed positive and significant association at genotypic level (Tables 1 and 2).
The fruit length recorded positive and significant correlation with fruit weight (0.280 and 0.280) at both the levels of genotypic and phenotypic, where as fruit yield per plant showed positive and significant correlation at genotypic level. A positive and significant association of fruit width was recorded with fruit weight (0.480 and 0.477) at genotypic and phenotypic levels. Individual fruit weight showed significant positive inter correlation with fruit yield per plant (0.660 and 0.596) both at genotypic and phenotypic levels. The same trait exhibited negative significant inter correlation with fruit borer infestation (-0.416 and -0.294) at both the levels (Tables 1 and 2).
Significant positive inter correlation was observed by number of fruits per plant with fruit yield per plant (0.797 and 0.726) at both the levels. However, this trait had negative and significant association with shoot borer infestation (-0.665 and -0.363) and fruit borer infestation (-0.548 and -0.401) both at phenotypic and genotypic levels. Fruit yield per plant showed negative significant association with shoot borer infestation (-0.446 and -0.296) and fruit borer infestation (-0.813 and -0.483) at both phenotypic and genotypic levels (Tables 1 and 2).
Shoot borer infestation exhibited positive significant association with fruit borer infestation (0.625) at genotypic level (Tables 1 and 2). These results were in agreement with Reena and Mehta (2007) [17], Muniappan *et al*. (2010) [11], Adeshkumar *et al*. (2011) [1], Arunkumar *et al*. (2013) [3], Kranthi and Celine (2013) [7], Ullah *et al.* (2014) [20], Vandana *et al.* (2014) [21], Solaimana *et al*. (2015) [18], Vidhya and Kumar (2015) [22] Patel *et al.* (2017) [16], Minakshi (2017) [10], Bende (2019) [5] Tiwari *et al.* (2019) [19] and Onyia *et al.*(2020) [13].
Among the inter correlated yield components positive and significant inter correlation was noted by number of fruits per plant with yield, fruit width and fruit length with fruit weight were correlated among themselves, indicating selection based on these characters might improve the per plant yield.

Conclusion

The conclusion that can be reached from the association analysis is that, intentional selection of plant height, number of branches per plant, fruit length, fruit weight, number of fruits per plant and fruit yield per plant may result in simultaneous improvement of marketable yield per plant. Further, it clearly indicated that these characters are highly reliable components of fruit yield and could very well be utilized as yield indicator while exercising selection.

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