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Studies on variability, heritability and genetic advance in F₂ generation of Brinjal (*Solanum melongena* L.) for different yield attributing characters

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Abstract

The mean, range, phenotypic coefficient of variation (PCV), Genotypic coefficient of variation (GCV), heritability, genetic advance and genetic advance as per cent of mean were worked for the selection superior crosses in the F₂ generation. The phenotypic and genotypic coefficient of variation were high for the characters like number of fruits per plant, fruit yield per plant, little leaf incidence (%) and shoot and fruit borer infestation (%). The heritability (broad sense) were found high for the characters studied *i.e.*, plant height (96.82%), days to 50% flowering(99.81%), fruit length(99.81%), number of fruits per plant(66.20%), fruit yield per plant (96.81%), days to final harvesting(74.80%), little leaf incidence (74.59%) and shoot and fruit borer infestation(91.32%). The genetic advance was high for days to final harvesting (21.42%) and the genetic advance as per cent of mean were high for the characters like days to 50% flowering(25.50%), fruit length(23.71%), number of fruits per plant(23.66%), fruit yield per plant(59.67%), little leaf incidence (32.20%) and shoot and fruit borer infestation(45.08%).

Keywords: Brinjal, PCV, GCV, heritability, genetic advance and GAM

Introduction

Brinjal (*Solanum melongena* L.) is native of India and belonging to family Solanaceae, is one of the most common, popular, and principal vegetable crops grown in India and other parts of the world. Solanum is a very large genus and among the 22 Indian species of brinjal all are diploid with somatic chromosome number $2n = 2x = 24$. It is highly productive and usually referred as the poor man's crop. It is usually self pollinated crop but the extent of cross pollination has been reported as high as 29 per cent due to heterostyly condition and hence it is classified as often cross pollinated crop or facultative cross pollinated crop.

The success of breeding programme for high yield and quality depends on the nature and magnitude of variation available in the genotypes. Greater the variability in a population, greater is the chance for effective selection for desirable types (Vavilov, 1951)^[1]. Evaluation of the brinjal genotypes is necessary to know the performance in terms of yield and other yield attributing characters and the promising genotypes needs to be identified. The genotypes performing well can be released as a variety or it can be put to further use in the breeding programme as a breeding line by the breeder.

Materials and methods

The present investigation was carried in College of Horticulture, Venkataramannagudem, Dr.Y.S.R Horticultural University, West Godavari (A.P) during *kharif* 2019-20. The experiment consists of seven F₂ brinjal progenies *viz.*, Babajipet-1 x EC-169084, Tuni local x EC-169089, EC-169084 x Bhagyamati, EC-169089 x Pennada, Babajipet-1 x Babajipet-2, EC 169084 x Pennada and Babajipet-2 x EC-169084 with the objective of selecting superior genotypes for economically important traits and to assess the effectiveness of selection by estimating per cent genetic gain and to study the effect of selection on other genetic parameters *viz.* variability, heritability and expected genetic advance in various characters. Parameters of variability were estimated as per formulae given by Burton and Devane (1953)^[3]. Heritability in the broad sense was calculated by formula given by Burton and Devane (1953)^[3] and Allard (1960)^[1]. The genetic advance was estimated as per formulae given by Allard (1960)^[1] and the genetic advance as per cent of mean calculated using the formulae given by Johnson *et al.* (1955)^[6].

Results and Discussion

Among the various parameters of variability, high PCV and GCV were recorded in traits fruit yield per plant, little leaf incidence (%) and shoot and fruit borer infestation (%) indicating that wide range of variations and offered better scope for improvement through selection. Similar results were observed Divya Arti and Sharma (2018) [4] for fruit yield per plant and shoot and fruit borer infestation (%) in brinjal. Moderate PCV and GCV were found in traits number of fruits per plant and fruit length. These finding are in general agreement with the finding of Balas *et al.* (2019) [2] for fruit length in brinjal and Gautham *et al.* (2018) [5] for no.of fruits per plant in bitter gourd. Where as low PCV and GCV were recorded in plant height, days to 50% flowering and days to final harvesting. These results where conformity with Balas *et al.* (2019) [2] for days to 50% flowering and days to final harvesting in brinjal, Priyanka *et al.* (2018) [9] for plant height in brinjal.

All the characters studied in the present investigation exhibited high level of heritability (66.20% 0 91.81%).High heritability for different traits indicated the large proportion of phenotypic variance was attributed to genotypic variance and

therefore, reliable selection could be made for these traits on the basis of phenotypic expression. Similar results were conformity with Jyothi *et al.* (2019) [7] for days to 50% flowering, plant height, fruit length, number of fruits per plant, fruit yield per plant and shoot and fruit borer infestation (%) in brinjal. Balas *et al.* (2018) and Divya Arti and Sharma (2018) [4] for days to final harvest and Ramesh *et al.* (2013) [10] for little leaf incidence (%).

The high heritability coupled with high genetic advance was found for days to final harvesting (21.42%) indicating that predominantly due to additive gene effect therefore, selection based on the phenotypic performance will be useful to improve these characters in future as suggested by Prasad *et al.* (2004) [8]. High heritability coupled with high genetic advance as per cent of mean was found for days to 50% flowering, fruit length, number of fruits per plant, fruit yield per plant, little leaf incidence (%) and shoot and fruit borer infestation (%) indicated that these characters were also controlled by additive gene and selection would be effective for further improvement. Similar results were reported by Divya Arti and Sharma (2018) [4] for days to 50% flowering, fruit

Table 1: Mean values, variability and heritability parameters for different characters in F₂ generation over seven crosses.

S.NO	Character	Mean	Range	PCV	GCV	Heritability (%)	GA at 5%	GAM at 5%
			Min-Max					
1	Plant height (cm)	97.58	87.90-105.80	6.18	6.07	96.82	12.00	12.30
2	Days to 50% flowering	32.18	28.62-37.63	9.68	9.61	99.81	6.40	25.50
3	Fruit length (cm)	14.65	11.50-16.30	11.53	11.52	99.81	3.47	23.71
4	Number of fruits per plant	34.83	28.56-43.33	17.35	14.12	66.20	8.24	23.66
5	Fruit yield per plant (kg)	3.48	2.15-4.99	29.02	28.99	99.81	2.15	59.67
6	Days to final harvesting	175.66	147.66-184.66	7.84	6.78	74.80	21.42	12.09
7	Little leaf incidence (%)	6.61	4.66-8.33	21.02	18.15	74.59	2.13	32.30
8	Shoot and fruit borer infestation (%)	12.42	8.07-17.00	23.96	22.90	91.32	5.60	45.08

length, fruit yield per plant, shoot and fruit borer infestation (%) in brinjal. Balas *et al.* (2018) for number of fruits per plant and shoot and fruit borer infestation (%). Ramesh *et al.* (2013) [10] for little leaf incidence (%).

The cross EC-169084 x Bhagyamati cross also recorded the

highest number of fruits per cluster, number of fruits per plant, and lowest mean for shoot and fruit borer infestation, little leaf incidence in F₂ generation. The cross Tuni local x EC-169089 recorded the highest average fruit weight and moderate value for fruit yield per plant and days to final harvest in F₂ generation.

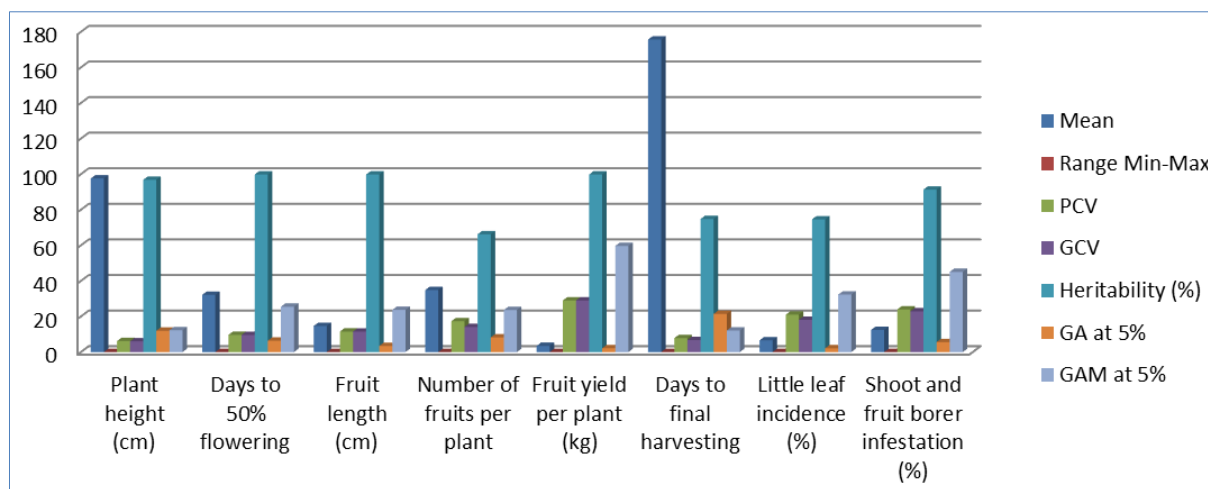


Fig 1: Mean values, variability and heritability parameters for different characters in F₂ and F₃ generations over seven crosses.

Conclusion

High PCV and GCV values were seen for number of fruits per cluster, fruit yield per plant indicating high variability available in the progenies for these characters for further

improvement. The difference between PCV and GCV values were minimum indicating that, the traits under study were less influenced by environment and these traits could be improved by following phenotypic selection. High heritability coupled

with high genetic advance as per cent of mean was observed for characters like days to 50 per cent flowering, number of fruits per cluster, number of fruits per plant, fruit yield per plant, number of flowers per inflorescence, average fruit weight, fruit girth, fruit length, fruit length to girth ratio, little leaf incidence and shoot and fruit borer infestation in F_2 generation indicating that these characters were governed by additive genes and selection will be rewarding for improvement of such traits through pure line selection, mass selection, progeny selection, hybridization and selection with pedigree breeding.

Heritability was high both in F_2 generation for most of the traits viz., days to 50% flowering, number of flowers per inflorescence, number of fruits per cluster, number of fruits per plant, fruit length, average fruit weight, fruit yield per plant, days to first harvesting, days to final harvesting, little leaf incidence and shoot and fruit borer infestation due to low error/environmental variance. There was increase in the incidence of little leaf incidence by 27.44%. The increase in the incidence could be due to the favorable climatic conditions during *Rabi* season. Shoot and fruit borer infestation was reduced by 25.28%.

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