



## Research Article

# Genetic variability studies in Brinjal (*Solanum melongena*) for fruit yield and quality.

C.Vidhya<sup>1\*</sup> and N.Kumar<sup>2</sup>

<sup>1</sup>Department of Vegetable Crops,

<sup>2</sup>Faculty of Horticulture,

Horticultural Research Station, Pechiparai, India.

\*Email: vidhya\_hort@rediffmail.com

(Received:24 Feb 2015; Accepted:25 Mar 2015)

### Abstract

The genetic parameters like range, mean, phenotypic coefficient of variation (PCV), genotypic coefficient of variation (GCV), heritability and genetic advance as percentage over mean were studied in 30 brinjal genotypes for eleven traits. The study revealed highly significant differences for most of the traits. Genotypic and phenotypic coefficients of variations were highest for fruit girth followed by number of fruits per plant. The high heritability and high genetic advance has been observed for fruit girth, single fruit weight and marketable yield per plant.

### Key words

Borer infestation, PCV, GCV, Heritability, Genetic advance

### Introduction

Brinjal (*Solanum melongena* L.) is a popular and common vegetable grown in most parts of India. Although many cultivars and hybrids have been developed and released for cultivation, most of them are not resistant or tolerant to the most important pest of brinjal viz., shoot and fruit borer (*Leucinodes orbonalis* Guenee.) which often cause economic loss to the tune of 54 to 60 per cent (Krishnaiah, 1980).. Hence the primary objective of crop improvement in brinjal is to identify or develop resistant or tolerant types for shoot and fruit borer. In any crop improvement programme, knowledge of the extent of genetic variability and their heritable nature is essentially important to embark selection based on phenotype (Atta *et al.*, 2008). In this study, genetic variability for certain yield and yield-related traits besides infestation by shoot and fruit borer were assessed in 30 genotypes of brinjal.

### 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 *kharif* 2012. A total of 30 genotypes of brinjal were raised in a randomized block design (RBD) with three replications. The recommended cultural practices were followed for raising crop. Five plants at random were taken from each plot recording the observations on plant height, branches per plant, days to 50% flowering, fruit length, fruit girth, number of fruits per plant, single fruit weight, shoot borer incidence, fruit borer incidence, yield per plant and marketable yield. The mean over replications for each character was subjected to statistical analysis. The phenotypic and genotypic coefficients of variations (PCV,

GCV) were estimated by using the formulae suggested by Burton (1952). Heritability in broad sense and expected genetic advance at 5% selection intensity were computed by using formulae suggested by Johnson *et al.*, 1955.

### Results and discussion

A wide range of variation was observed among the 30 brinjal genotypes evaluated for eleven characters. The *per se* performance of the genotypes (Table 1) revealed a wide range of variation for traits such as plant height (59.33 cm in IC466277 to 143.43cm in IC374928)), branches per plant (6.33 in IC112907 to 12.00 in HD1), days to 50% flowering (46.00 in HD1 to 64.67 in IC310889), fruit length (6.50cm in 2S to 14.00cm in IC089914), fruit girth (4.33cm in 2S to 18.33cm in IC261843), number of fruits per plant (32 in IC249353) to 70.33 in HD1), single fruit weight (43g in EC305118 to 116 g in IC466277), yield per plant (1.97kg in EC305118 to 4.16kg in HD1) and marketable yield per plant (1.40kg in EC305118 to 3.68kg in HD1), shoot borer incidence (10.20% in HD1 to 22.57% in EC305118) and fruit borer incidence (11.50% in HD1 to 30.16% in IC011317). The least incidence of shoot and fruit borer in HD1, HD2 and HD3 as compared to the rest of genotypes was expected as they are the hybrid derivatives of crosses between *Solanum melongena* and *Solanum viarum* and these genotypes were included in this study mainly to have maximum tolerance in shoot and fruit borer infestation.

Relatively, all these hybrid derivatives had higher *per se* performance for number of fruits per plant, total and marketable yield because of their tolerance nature for shoot and fruit borer. In

respect of single fruit weight, these hybrid derivatives did not have higher *per se* performance as fruit weight is a genetically controlled trait and which in multiple effect with number of fruits decides the total yield in brinjal (Table 1).

The genetic parameters (Table 2.) revealed that PCV and GCV were medium for fruit girth (27.38%, 26.88%) followed by marketable yield per plant (26.84%, 25.62%), fruit borer infestation (25.87%, 25.14%), single fruit weight (24.85, 24.30%) offering scope for further improvement by selection. These findings are in close agreement with the results obtained by Sherly and Shanthi (2009). The PCV was higher than corresponding GCV for all the traits which might be due to the interaction of genotypes with the environment to some degree or due to higher influence of environmental factors in the expression of these characters. Wide differences in PCV and GCV were observed for single fruit weight, plant height, branches per plant depicting their susceptibility to environmental fluctuation. Narrow difference between PCV and GCV for the remaining characters implied their relative resistance to environmental variation, suggesting that genetic factors were predominantly responsible for expression of these attributes and selection could be made effectively on the basis of phenotypic performance. This result was in consonance with that of Mohanty and Prusti (2002)

The estimates of heritability in broad sense ranged from 96.34 % for fruit girth to 73.35% for all the traits. Such high values of broad sense heritability reflect that the phenotypes were the true representative of their genotypes and selection based on phenotypic performance would be reliable. Similar reports were given by Baswana *et al.*(2002) in brinjal. High estimates of genetic advance were obtained shoot borer infestation (56.37), marketable yield per plant (56.36), fruit girth (54.35), while it was moderate for single fruit weight, plant height, fruit length, shoot borer infestation and yield per plant which illustrated that they could be improved to a large extent.

High estimate of heritability coupled with moderate to high GCV and genetic advance as observed in fruit girth, single fruit weight, number of fruits per plant, marketable yield per plant and fruit borer infestation might be attributed to additive gene action conditioning their expression. and genetic improvement can be achieved in yield and its important components such single fruit weight, branches per plant in brinjal by simple method of selection.

High estimates of heritability coupled with low GCV and genetic gain were displayed by days to 50% flowering and number of branches per plant. It may be inferred that these characters were

regulated by non additive gene action and there was high influence of genotype x environment interaction. The heritability is being exhibited due to favourable influence of environment rather than the genotype and simple selection will not be rewarding.

Thus, the investigation indicated that the present germplasm provided a wide base of variability and an appropriate genetic background for further selection to improve the yield and yield components of brinjal along with tolerance to borer infestation.

#### References

- Atta, B. M., M. A. Haq and T. M. Shah. 2008. Variation and interrelationships of quantitative traits in chickpea (*Cicer arietinum* L.). Pak. J. Botany. 40(2): 637-647
- Baswana, K., M. K. Bhatia and D. Dharamveer. 2002. Genetic advance and heritability studies in brinjal (*Solanum melongena* L.). Harayana J. Hort. Sci., 31:143-145
- Burton, G. W. 1952. Quantitative inheritance in grasses. Proc. Int. Grassesland cong., 1:277- 283
- Johnson, H.W., H. F. Robinson and R. F. Comstock. 1955. Estimates of genetic and environmental variability in soybean. Agron. J., 47(10):314-318
- Krishnaiah, K. 1980. Assessment of crop losses due to pests and diseases. In: Govindu HC (ed) University of Agricultural Sciences Technology Series, 33: 259-267
- Mohanty, B. K. and A. M. Prusti .2002. Variability and selection parameters for economic characters in brinjal. The Orissa Journal of Horticulture 30(1): 1-4
- Sherly.J. and A. Shanthi (2009). Variability, heritability and genetic advance in brinjal (*Solanum melongena* L.). Res. on Crops. 10(1): 106-108



Table 1. *Per se* performance of thirty brinjal genotypes for eleven different traits

Genotypes	Plant height (cm)	Number of branches per plant (count)	Days to 50% flowering (days)	Fruit length (cm)	Fruit girth (cm)	Number of fruits per plant (count)	Single fruit weight (g)	Yield per plant (Kg)	Marketable yield per plant (Kg)	Shoot borer infestation (%)	Fruit borer infestation (%)
HD1	109.33	12.00	46.00	8.67	14.00	70.33	59.00	4.16	3.68	10.20	11.50
HD2	97.00	11.67	47.00	9.00	15.67	68.00	56.50	3.82	3.38	11.20	12.05
HD3	99.00	11.00	48.25	8.33	12.50	65.00	54.00	3.52	3.15	12.90	12.32
IC011317	62.23	9.35	52.32	10.00	17.33	39.00	68.00	2.66	1.58	19.33	30.16
IC261786	72.33	7.32	54.00	12.00	11.83	47.00	54.00	2.55	1.89	19.70	26.55
IC089914	78.67	9.33	50.33	14.00	13.40	50.00	66.67	3.44	2.41	16.00	19.65
IC261843	87.33	9.33	54.00	10.33	18.33	47.00	65.00	3.06	2.65	13.13	15.59
IC215020	100.67	6.67	51.00	13.67	11.83	41.67	81.00	3.37	2.34	20.10	24.35
IC354721	109.33	11.66	47.33	10.50	14.83	52.33	75.00	3.92	3.27	12.36	17.18
IC285124	96.00	7.67	51.33	8.17	9.67	43.67	63.67	2.77	1.48	19.80	28.97
IC466277	59.33	11.33	62.00	12.83	15.83	35.00	116.00	4.07	1.94	17.43	19.21
IC454561	60.00	11.00	54.33	10.00	12.00	43.66	81.00	3.55	2.49	18.27	26.34
IC090828	103	10.67	54.67	13.00	6.50	45.67	73.67	3.37	2.82	19.50	24.33
IC383345	66.33	9.00	59.00	9.33	8.17	32.00	80.00	2.56	2.69	21.63	28.65
IC098735	85.67	10.67	61.33	9.50	8.67	39.33	75.00	2.96	1.54	21.75	29.32
IC305348	65.66	9.33	55.00	8.17	12.50	49.33	71.33	3.52	2.10	18.33	23.78
IC316258	101.00	10.33	56.33	7.00	13.50	39.00	71.00	2.77	2.95	18.57	20.46
IC112814	72.00	9.33	52.00	6.67	14.51	55.67	66.00	3.68	1.92	19.20	22.67
IC249353	87.00	6.67	54.00	8.33	9.67	35.00	66.00	2.32	1.47	21.44	29.65
IC261884	93.00	7.00	52.00	8.83	17.83	43.00	75.00	3.23	2.38	18.80	26.56
IC279555	105.67	7.33	52.00	7.55	8.17	41.00	54.33	2.22	1.60	21.67	28.72
IC112907	107.00	6.33	55.33	7.00	8.50	44.00	53.33	2.35	1.70	21.83	27.54
IC310889	106.66	10.00	64.67	12.67	13.33	40.33	95.00	3.83	3.12	17.73	19.55
IC112908	124.33	7.73	52.67	7.17	14.33	39.33	102.67	4.04	2.55	18.47	17.68
IC104076	85.33	11.33	55.00	9.17	15.17	42.67	63.00	2.70	1.93	18.43	28.66
EC305118	79.00	8.67	53.00	10.34	13.17	45.33	43.00	1.97	1.40	22.57	28.79
IC374928	143.33	10.33	52.00	11.17	12.33	51.00	61.67	3.15	2.39	22.50	24.54
IC383103	86.66	10.67	54.00	9.00	15.50	43.00	83.33	3.59	2.54	20.70	28.43
1S	88.67	9.33	56.33	12.67	15.67	44.33	89.67	3.97	3.36	13.57	15.44
2S	71.00	11.67	51.33	6.5	4.33	62.33	32.67	2.04	2.29	12.33	20.32
Mean	90.09	9.48	53.67	9.72	12.64	46.50	69.93	3.17	2.37	17.98	22.97
S.E.	7.05	0.57	1.91	1.02	0.54	1.93	2.95	0.20	0.16	0.63	1.14
C.D. at 5%	15.02	1.14	3.82	2.03	1.08	3.86	5.91	0.39	0.32	1.27	2.27



Table 2. Genetic parameters for eleven traits in 30 genotypes of Brinjal

Traits	Mean	Range		Variability (%)		Heritability h <sup>2</sup> (BS) (%)	Genetic advance as percentage over mean
		Min.	Max.	PCV	GCV		
Plant height (cm)	90.09	59.33	143.33	23.38	21.04	80.97	39.00
Number of branches per plant	9.48	6.33	12.00	19.35	17.90	85.56	34.10
Days to 50% flowering	53.67	46.00	64.67	8.61	7.43	74.49	13.21
Fruit length (cm)	9.72	6.50	14.00	24.81	21.25	73.35	37.48
Fruit girth (cm)	12.64	4.33	18.33	27.38	26.88	96.34	54.35
Number of fruits per plant	46.50	32.00	70.33	20.90	20.27	94.09	40.52
Single fruit weight (g)	69.93	43.00	116.00	24.85	24.30	95.66	48.96
Yield per plant (kg)	3.17	1.97	4.15	21.38	19.99	87.43	38.50
Marketable yield per plant(kg)	2.37	1.40	3.67	26.84	25.62	91.07	50.36
Shoot borer infestation (%)	17.98	10.20	22.57	20.38	19.92	95.51	40.11
Fruit borer infestation (%)	22.97	11.50	30.16	25.87	25.14	94.51	50.37

Abbreviations used: PCV–Phenotypic coefficient of variance, GCV –Phenotypic coefficient of variance, H<sup>2</sup>(BS)-Heritability(Broad sense), GA-Genetic advance