VARIABILITY STUDIES IN EGGPLANT (*SOLANUM MELONGENA* L.) FOR CHHATTISHGARH PLAINS

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Abstract: Genetic variability in terms of genotypic and phenotypic coefficient of variances, heritability, expected genetic advance and expected genetic advance as per cent of mean, correlation and path coefficient were studied for fruit yield and its attributing traits in eleven hybrids, seven parents and a commercial check (Pusa Hybrid-6) of eggplant. In general it was noted that the value of phenotypic coefficient of variation were higher than genotypic coefficient of variation. The high GCV and PCV coupled for the traits number of fruits per plant per picking followed by average fruit weight, total number of fruits per plant, number of primary branches per plant, marketable fruit yield per plant, average fruit girth, average fruit length, total fruit yield per plant. The highest heritability estimate was observed for average plant height, average fruit weight, total number of fruits per plant followed by days to 50% flowering, days to first picking, average fruit length, average fruit girth, number of fruits per plant per picking, total soluble solids, number of primary branches per plant, marketable fruit yield per plant and total fruit yield per plant indicating predominance of additive gene action in the expression of these traits. High genetic advance as percent of mean was observed for total number of fruits per plant, followed by number of fruits per plant per picking, average fruit weight, average fruit length, average fruit girth, marketable fruit yield per plant, average plant height, number of primary branches per plant and total fruit yield per plant. Higher heritability estimate coupled with higher genetic advance as percent of mean were observed for total number of fruit per plant, number of fruits per plant per picking, average fruit weight, average fruit length, average fruit girth, total fruit yield per plant, marketable fruit yield per plant, average plant height and number of primary branches per plant and these traits can be improved through simple selection.

Keywords: *Eggplant, GCV, PCV, Heritability*

INTRODUCTION

Brinjal is one of the most popular and traditional fruit vegetable crop of India and Chhattisgarh as well. Varied forms, colors and shapes of brinjal are grown throughout Chhattisgarh state which also shows that ample amount of under exploitable genetic variability is available. It offers much scope for improvement through selection in variable population of brinjal. The knowledge of the extent to which the desirable characters with economic values are heritable is a prerequisite for any crop improvement programme (Roychowdhury and Tah, 2011). Breeders have continually retained their interest in the grouping of the germplasm and the pedigree of selected cultivars since the information might be particularly helpful in effective breeding strategy determination (Ali *et al*., 2011). Various traits with agro-economic value like seed weight, number of branches, leaves, flowers, leaf area, etc. are very much complex in nature because they confirm polygenic inheritance and greatly influenced by minute fluctuation of environmental factors. This may raise breeder's concern, since the genetic organization provides the base for crop enhancement of environmental adaptation, yield and other associated attributes. The presence of adequate genetic variability between treatments of a cultivar is critically important (Fasoula and Fasoula, 2002). Moreover, the genetic progress in a breeding program is actually dependent on the variation in the present gene pool (Dreisigacker *et al.*, 2004) associated with the magnitude of several genetic parameters like analysis of variance of each mean value, phenotypic and genotypic variances, phenotypic and genotypic coefficients of variation (PCV and GCV), broad sence heritability and genetic gain.The extent of variability is measured by genotypic coefficient of variance (GCV) and its phenotypic counterpart (PCV) that provides information about relative amount of variation in different characters. Variability alongwith high to medium genetic advance provides enough scope for selection; however an opposite situation of this suggests hybridization as a potential method for crop improvement (Johnson *et al.*, 1955).

MATERIAL AND METHODS

The experiment material comprised of eleven hybrids, seven parents and a commercial check (Pusa Hybrid-6) were evaluated in a Randomized Block Design with three replications in All India Coordinated Research Project on Vegetable Crops (AICRP on Vegetable Crops), Instructional cum Research Farm at Department of Genetics and Plant Breeding, IGKV, Raipur (C.G.) during 2011-12 *Kharif* season and the details of the parents and F_1's used in the present study are given in (Table 1). Observation on five randomly selected plants were recorded for twelve yield characters *viz.*, days to 50% flowering, days to first picking, plant height (cm), number of primary branches per plant, average fruit weight (gm), number fruit length (cm), fruit girth (cm), number of fruits per picking per plant, total number of fruits per plant, total fruit yield per plant (kg), marketable fruit yield per plant (kg) and total soluble solids (%).

Table 1: Details of the parents, F_1's and check along with notations and its source used in the study

S. No.	Parents	Notations	Source
1.	IBWL-2007-1	IBWL	IGKV, Raipur (C.G.)
2.	Green Long	GL	IGKV, Raipur (C.G.)
3.	Muktakeshi	MK	Local (C.G.)
4.	Pant Rituraj	PR	GBPUA&T, Pantnagar
5.	Pusa Purple Long	PPL	IARI, Pusa, New Delhi
6.	Pusa Purple Cluster	PPC	IARI, Pusa, New Delhi
7.	Punjab Sadabahar	PS	PAU, Punjab
S. No.	**F_1's**	**Notations**	
1	IBWL-2007-1 X Muktakeshi	IBWL X MK	
2	IBWL-2007-1 X Pusa Purple Long	IBWL X PPL	
3	IBWL-2007-1 X Punjab Sadabahar	IBWL X PS	
4	IBWL-2007-1 X Pant Rituraj	IBWL X PR	
5	Muktakeshi X Punjab Sadabahar	MK X PS	
6	Pusa Purple Long X IBWL-2007-1	PPL X IBWL	
7	Pusa Purple Long X Pusa Purple Cluster	PPL X PPC	
8	Pant Rituraj X Pusa Purple Long	PR X PPL	
9	Punjab Sadabahar X IBWL-2007-1	PS X IBWL	
10	Punjab Sadabahar X Muktakeshi	PS X MK	
11	Punjab Sadabahar X Pant Rituraj	PS X PR	
	National Check Hybrid		
1.	Pusa Hybrid-6	PH-6	IARI, Pusa, New Delhi

The all data were analyzed statistically. Mean values were subjected to analysis of variance (ANOVA) to test the significance for each character as per methodology advocated by Gomez and Gomez (1976). Phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) were calculated according to Singh and Chaudhary (1985) and its classification Sivasubrmanaian and Madhavamenon (1973). Heritability in broad sense was estimated as per Singh and Chaudhary (1985). Genetic advance of the genotypes and its per cent of mean at 5% intensity of selection pressure were worked out as per Johnson *et al.* (1955).

REULT AND DISCUSSION

The estimation of genetic variability based on the nature of extent of genetic variation for desirable traits in selection for improvement of the crop. The knowledge of genotypic and phenotypic coefficient of variation is being useful in designing selection criteria for variable population. The highest GCV was recorded for number of fruits per plant per picking (63.11 %) followed by average fruit weight (62%), total number of fruits per plant (58.46 %), number of primary branches per plant (33.85 %), marketable fruit yield per plant (32.29%), average fruit girth (31.88%), average fruit length (30.09%), total fruit yield per plant (27.61%), average plant height (25.03%), days to 50% flowering (17.2%), days to first picking (11.19%) and total soluble solids (10.08 %).The highest PCV was recorded for number of fruits per plant per picking (63.61%), average fruit weight (62.42%) followed by total number of fruits per plant (58.66%), number of primary branches per plant (34.85%), marketable fruit yield per plant (34.77%), average fruit girth (32.12%), average fruit length (30.33 %), total fruit yield per plant (30.02 %), average plant height (25.11%), days to 50% flowering (17.3%), days to first picking (11.26%) and total soluble solids (10.24 %).

The magnitude of PCV was higher than the corresponding GCV for all the traits. This might be due to the interaction of the genotypes with the environment to some degree or environmental factor influencing the expression of these traits. Close correspondence between phenotypic and genotypic coefficient of variation were observed i.e. sufficient variability among the traits is present among the genotype. Hence, the ample scope of improvement of these traits. These results are in general accordance with the findings of Mohanty and Prusti (2002), Sao (2006), Naliyadhara *et al*. (2007), Mishra *et al.* (2008), Ambade (2008), Ansari (2010), Biswas (2010).

The nature and extent of inherent capacity of a genotype for a character is an important parameter that determines the extent of any crop species. Genetic improvement of any character is difficult without having sufficient heritability, genetic advance and genetic variability; Hence heritability and genetic advance are the important parameters for selecting a genotype that permits greater effectiveness of selection by separating out the environmental influence from total variability. Heritability estimates along with genetic advance are normally more useful in predicating the gain under selection than that heritability alone. However it is not necessary that a character showing high heritability will also exhibit high genetic advance (Johnson *et al*. 1955).

Estimates of heritability give some idea about the gene action involved in the expression of various polygenic traits .The selection should be effective if variance due to additive genes, estimated in terms of heritability. Heritability estimates remain extremely useful in the inheritance studies of quantitative traits. To facilitate the comparison of progress in various characters of different genotypes, Genetic advance was calculated as % of mean. Genetic advance and heritability are the major factor in the improvement of mean genotypic value of selected plants over the parental population. The success of genetic advance depends on; genetic variability, heritability, selection intensity. The heritability and genetic advance of the experiment is being presented in Table 2 and discussed as under.

The highest heritability estimate was observed for average plant height (99 %), average fruit weight (99 %), total number of fruits per plant (99 %) followed by days to 50% flowering (98 %), days to first picking (98 %), average fruit length (98 %), average fruit girth (98 %), number of fruits per plant per picking (98 %), total soluble solids (96 %), number of primary branches per plant (94 %) marketable fruit yield per plant (86 %) and total fruit yield per plant (84 %) indicating predominance of additive gene action in the expression of these traits. This being fixable in nature considerable progress is expected through appropriate selection scheme to be adopted. The findings are in agreement with the findings of Singh *et al.* (2003), Prasad *et al.* (2004), Sao (2006), Naik (2006), Ambade (2008), Mishra *et al.* (2008), Ansari (2010), Biswas (2010) and Chattopadhyay *et al.* (2011).

The heritability values alone however, provide no information of the amount of genetic improvement that would results from selection of superior genotypes. The heritability estimates would be more reliable if its limitation in a broad sense, additive and non additive genes where accompanied with high genetic advance (Ramanujam and Tirumalachar 1967).

High genetic advance as percent of mean was observed for total number of fruits per plant (145.45 %), followed by number of fruits per plant per picking (138.38 %), average fruit weight (129.78 %), average fruit length (76.31 %), average fruit girth (75.32 %), marketable fruit yield per plant (60.72 %), average plant height (58.67 %), number of primary branches per plant (53.04 % and total fruit yield per plant (50.91 %).

Table 2: Genetic variability for fruit yield and its components in Brinjal during *Kharif* 2011.

Characters	**Mean**	**Range**		**Heritability h^2_{bs} (%)**	**Genetic advance as % of mean**	**GCV %**	**PCV %**
		Max.	**Min.**				
Days to 50% flowering	45.63	59.00	39	98	34.40	17.2	17.30
Days to first picking	62.79	71.00	46	98	22.47	11.19	11.26
Plant height (cm)	72.25	102.00	54	99	58.67	25.03	25.11
Number of primary branches per plant	7.73	10.00	06	94	53.04	33.85	34.85
Average Fruit length (cm)	11.02	17.50	06	98	76.31	30.09	30.33
Average Fruit girth (cm)	9.32	15.90	3.6	98	75.32	31.88	32.12
Average fruit weight (gm)	69.34	194.00	33	99	129.78	62.00	62.42
Total number of fruits per plant	19.05	40.00	06	99	145.45	58.46	58.66
Number of fruits per plant per picking	7.45	15.80	04	98	138.38	63.11	63.61
Marketable fruit yield per plant (Kg)	1.11	1.71	0.63	86	60.72	32.29	34.77
Total fruit yield per plant (Kg)	1.24	1.89	0.69	84	50.91	27.61	30.02
Total soluble solids (%)	4.37	5.10	3.6	96	19.9	10.08	10.24

Moderate genetic advance as percent of mean was observed for days to 50% flowering (34.40 %) and days to first picking (22.47 %).

Low genetic advance as percent of mean was observed for total soluble solids (19.9 %).

Higher heritability estimate coupled with higher genetic advance as percent of mean were observed for total number of fruit per plant, number of fruits per plant per picking, average fruit weight, average fruit length, average fruit girth, total fruit yield per plant, marketable fruit yield per plant, average plant height and number of primary branches per plant. This indicated the role of additive genetic variance towards expression of these traits.

High heritability coupled with moderate genetic advance as percentage of mean observed for days to 50% flowering and days to first picking which is mainly due to the role of non additive gene action in their expression. On the other hand high heritability coupled with low genetic advance as percentage of mean observed for total soluble solids (%).These findings are in agreement with the findings of Singh *et al.* (2003), Prasad *et al.* (2004), Sao (2006), Mishra *et al.* (2008), Ambade (2008), Ansari (2010), Biswas (2010) and Chattopadhyay *et al.* (2011).

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