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GENETIC VARIATION AND TRAIT RELATIONSHIP IN THE EXOTIC AND LOCAL EGGPLANT GERMPLASM

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Abstract

Sixteen genotypes of local and exotic germplasms were studied to estimate variability, hcritability, genetic advance, and correlation coefficients. High genotypic and phenotypic coefficients of variation were obtained for number of fruits/plant, individual fruit weight, and yield per plant. Heritability and genetic advance were also high for these traits indicating the possibility of selection to improve these characters. Yield of fruits showed highly significant and positive association with number of fruits per plant and individual fruit weight, which indicate the importance of these characters during selection for high yielding genotypes in eggplant. Among the genotypes, Islampuri produced the highest fruit yield (58.8 t/ha) followed by Tall begun (52.8 t/ha) and EG 120 (49.6 t/ha). Incidence of borer infestation ranged from 3.0 to 20.6 %. The lowest borer infestation was found in EG 120 (3.0%), while it was the highest in EG 192 (20.6%)

Kew Words: Genetic variation, trait relationship, exotic and local germplasm, eggplant.

Introduction

Brinjal *(Solanum melongena)* is one of the important vegetable crops grown in all parts of Bangladesh (Rashid, 1995). It has a positive role in both summer and winter to fulfill the market demand of vegetables of Bangladesh. Yield potentiality of the varieties cultivated in Bangladesh is less and choice of brinjal size, shape, and skin colour varies in different locations. Improvement in fruit yield, colour, and insect resistances will certainly enhance the production and consumption of the crop. Genetic variability of brinjal has been studied by various workers in India (Misra, 1961; Thakur *et al.*, 1968) and also in Bangladesh (Basar, 1999; Chowdhury, 2005). For improvement programme, the information about variability is a prerequisite. The phenotypic variability among a collection of genetic stocks gives an indication of potential genotypic variability, however, the quantitative characters are greatly influenced by the environment. Therefore, information of the extent of variability available in some important economic traits and their heritability will be helpful to the breeders to formulate sound breeding programmes. Hence, the present study was undertaken

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to evaluate yield performance, to estimate the extent of variability, heritability and expected genetic advance of sixteen exotic and local eggplant germplasm.

Materials and Method

The present study was conducted at Agriculture Research Station, Pahartali, Chittagong with 16 diverse genotypes of eggplant during November 1999 to March 2000. Twelve genotypes of eggplant were collected from AVRDC, Taiwan and remaining four were from local source. The experiment was set up in a randomized complete block design with three replications. Seeds were sown on 17 November in the nursery bed and one month old seedlings were transplanted in the main field. Manures and fertilizers were applied as per recommendation given by Rashid (1995). Unit plot size was 1.5 m x 5.0 m where plants were spaced at 75 cm × 50 cm. Irrigation and other cultural operations were done as and when necessary. Observations were recorded from 10 randomly selected plants of each plot for plant height, days to flowering, number of fruits per plant, individual fruit weight, yield, fruit length, and breadth and percent borer infested fruit. The analysis of variance and simple correlation and coefficient were worked out according to Panse and Sukhatme (1967). Phenotypic and genotypic coefficient of variability, heritability, and expected genetic advance were determined according to Burton and De Vane (1953).

Results and Discussion

The mean performances of the genotypes for yield and yield attributes are given in Table 1. The extent of variability for the characters in different genotypes measured in terms of range and coefficient of variation, genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV) along with the amount of heritability (h^2) expected genetic advance as percent at mean are given in Table 2.

The genotypes differed significantly for all the characters studied except plant height. Days to first flowering were ranged from 67 days to 70 days. Ahmed *et al.* (1988) also found that 59 to 94 days were required for first flower depending upon the variety. The line EG195 and BJ001 took 67 days to first flower, while it was 78 days for EG219. Significant variation was found in number of fruits production per plant. The line EG 120 produced the highest number of fruits per plant (46.6), which was identical to Uttara (46.0). The lowest number of fruits was produced by the genotype EG195 (6.6). Fruits obtained from the genotype S56B were found smaller in respect of individual fruit weight (25.3 g), while Tall begun and Islampuri had the fruits with higher individual fruit weight (157 g and 128 g, respectively). Similarly highest per hectare yield was obtained from the variety Islampuri (58.8 t/ha) followed by Tall begun (52.8 t/ha) and EG 12O (49.6 t/ha). The genotype EG192 showed the lowest yielding potentiality (85 t/ha). Basar (1999) also observed significant variation for number of flowers per inflorescence, number of fruits per plant, fruit

length, fruit breadth, and fruit weight among 30 brinjal genotypes. Fruit infestation by borer ranged from 3% to 20%. Fruits of EG 120 were less infested by borer (3%), while 20% of the fruit of EG192 was infested.

Table 1. Yield and yield attributes of 16 eggplant germplasm.

Lines	Days to first flowering	Plant height (cm)	No. of fruits/plant	Individual fruit wt(g)	Yield/ pland (kg)	Yield (t/ha)	% shoot and fruit borer infestation
S3	686ab	78.6	9.7ab	84.3g	0.81d	21.7d	8.8abc
S474	75.3ef	73.2	7.0a	64.6ef	0.45abc	11.98abc	13.6bcd
SS6B	740de	7.53	23.6e	25.3a	0.58c	15.5c	5.6ab
S69	69.6ab	77.0	13.3bc	30.3ab	0.39a	10.4a	5.8abc
S90	68.6ab	75.3	16.0cd	35.3bc	0.56bc	14.9bc	7.6abc
EG120	69.3abc	74.3	46.6g	40.0c	1.86fg	49.6fg	3.0a
EG192	72.0b-e	72.0	5.3a	60.3e	0.32a	8.5a	20.6d
EG193	70.0a-d	74.3	12.0bc	34.6bc	0.41ab	10.9ab	13.3a-d
EG195	67.0a	74.2	6.6a	67.3f	0.44abc	11.8abc	15.0cd
EG203	70.6a-d	75.4	12.0bc	67.6f	0.81d	21.1d	7.7abc
EG219	78.6f	74.5	9.3ab	51.0d	0.47abc	12.3abc	11.1abc
EG190	72.0b-e	76.8	27.6e	34.0bc	0.93d	24.3d	8.9abc
Uttara	73.0cde	76.4	46.0g	38.3c	1.76f	45.7f	5.8abc
Tall Begum	72.0b-e	75.8	13.0bc	157.6i	2.03g	52.8g	7.8abc
BJ001	67.0a	77.8	33.0f	37.6c	1.23e	32.1e	4.2ab
Islampuri	68.0ab	75.4	17.6d	128.3h	2.26h	58.8h	8.5abc
CV (%)	3.2	4.5	13.2	5.9	10.2	9.5	50.9

Means followed by the same letter (s) in a column are not significantly different at 5% level.

The highest GCV (70.7) associated with higher heritability (96%) resulting in a highest amount of genetic advance (144) as percent of mean was observed for number of fruits per plant. The fruit yield per plant also exhibited high GCV (69%) and heritability (98.5%) with genetic advance of 141 as percent of mean. Ushakumary *et al.* (1991) evaluated 54 eggplant genotypes and observed that phenotypic coefficients of variation were higher than genotypic coefficients of variation for all the characters and all characters showed high heritability and genetic advance. Robinson *et al.* (1959) has arbitrarily categorized the estimates of heritability as low (5-10%), medium (10-30%), and high (above 30%). Following the classification, the heritability estimates obtained for all the characters except plant height and % borer infestation were quite high in the present investigation (Table 2). Such high heritability estimates have been found to be helpful in making selection of superior genotypes on the basis of phenotypic performance for quantitative characters. However, the heritability estimates along with genetic gain is more useful than the heritability values alone in predicting the resultant effect for selecting the best individuals. In present investigation, number of fruits per plant, individual fruit weight, and yield per

Table 2. Variability and heritability estimates in eggplant genotypes

Traits	Range	Mean	Genotypic variance	Phenotypic variance	GCV	PCV	Heritability (%)	Genetic advance (GA)	GA in % of mean
Days to first flowering	67.0-78.8	70.6	8.6	13.7	4.18	5.2	62.7	5.5	7.8
Plant height	72.0-78.6	75.4	1.025	12.72	1.33	4.7	8.01	0.95	1.2
Number of fruits/pant	7.0-46.0	18.6	173.0	179.0	70.7	72.0	96.0	26.9	144.0
Individual fruit fruits wt (g)	25.3-157.6	59.7	1355	1367	61.6	62.0	99.0	75.8	126.0
Yield/pant (kg)	0.39-2.26	0.95	0.43	0.44	69.0	70.0	96.5	1.32	141.0
Fruit length (cm)	3.7-18.5	10.6	18.4	20.1	40.46	44.8	91.5	8.7	82.2
Fruit breadth (cm)	2.6-7.7	4.2	1.54	1.68	29.5	30.8	91.6	2.53	91.0
% Borer infestation	4.2-20.6	9.2	11.8	34.5	37.86	63.8	34.2	5.5	59.0

Table 3. Correlation coefficient between yield and different yield attributes.

Traits	Days to first flowering	Plant height (cm)	No. of fruits/plant	Individual fruit wt. (g)	Fruit length (cm)	Fruit breadth (cm)	% Borer infestation	Yield/ plant (kg)	Yield (t/ha)
Days to first flowering		-0.06	-0.081	-0.073	0.096	-0.038	0.03	-0.2	-0.18
Plant height			0.18	-0.014	-0.015	0.22	-0.37	0.058	0.14
Number of fruits/pant				-0.33	-0.21	-0.11	-0.47	0.47**	0.59**
Individual fruit fruits weight (g)					0.23	0.71	0.081	0.3	0.53
Yield/pant (kg)						-0.37	0.49**	0.15	0.15
Fruit length (cm)							-0.3	0.12	-0.62
Fruit breadth (cm)								-0.62	-0.62
% Borer infestation									0.40**

**Significant at 1% level

plant exhibited very high heritability with very high genetic advance as percent of mean. Fruit length and fruit breadth also showed high heritability with high genetic advance. In general, the characters, which exhibit high heritability with high genetic advance, are significantly controlled by additive genes (Panse, 1967) and can be improved through mass selection, progeny selection or any other modified selection procedures. The high heritability and high genetic advance for number of fruits per plant, individual fruit weight, and yield per plant indicated that selection could be made for improvement.

The values for correlation coefficient are presented in Table 3. Number of fruits per plant and individual fruit weight were highly and positively correlated (r=0.59** and 0.53**, respectively) with fruit yield (t/ha). Therefore, those parameters should be kept in mind for better planning of any improvement programme in eggplant.

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