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GENETIC ASSESSMENT STUDIES FOR YIELD AND YIELD PARAMETERS IN DIVERSE GENOTYPES OF EGGPLANT (*Solanum melongena* L.)

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ABSTRACT
In the present investigation an attempt was made to assess the phenotypic and genotypic coefficient of variation, heritability, genetic advance, and genetic gain for various quantitative traits in eggplant during *Kharif* season of 2015 at Vegetable Research Farm of Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University , Varanasi. From the Analysis of variance it was clear that there were significant differences among all the 17 genotypes of eggplant. Highest values of GCV (31.26) and PCV (31.65) were obtained for average fruit weight whereas maximum heritability (98.33%) was found in fruit length. High values for both genetic advance (79.45%) as well as genetic gain (63.59%) were exhibited in fruit weight. It was noted that all the research works conducted for studying the diverse genotypes of eggplant is fulfilled as indicated by wide range of variation among genotypes and also relative parameters obtained in fourteen characters.

INTRODUCTION

A large number of vegetable crops are grown in different agro climatic zones of India and our country stands next only to China in total vegetable production. In spite of being second in the total vegetable production, the constraint of the low productivity as compared to many developed countries still exists. Special attention is needed to exploit the full potential of hybrid technology in vegetables, which will ensure the surplus production for fresh market, export purpose along with the requirement of post-harvest industries. Brinjal or eggplant (*Solanum melongena* L.) is an important solanaceous crop of sub-tropics and tropics (Rashid and Singh, 2014). India is considered as the native of Brinjal (Thompson and Kelly, 1957). The name brinjal is popular in Indian subcontinents and is derived from Arabic and Sanskrit whereas the name eggplant has been derived from the shape of the fruit of some varieties, which are white and resemble in shape to chicken eggs. The brinjal is of much importance in the warm areas of Far East, being grown extensively in India, Bangladesh, Pakistan, China, and the Philippines. In India, it is one of the most common, popular and principal vegetable crops grown all over the country except higher altitudes. It is a versatile crop adapted to various agro-climatic regions. It is botanically perennial in nature but commercially grown as an annual crop. A number of cultivars are grown in India, consumer preference being dependent upon fruit colour, size, and shape. The varieties of *Solanum melongena* L. display a wide range of fruit shapes and colours, ranging from oval or egg-shaped to long club-shaped; and from white, yellow, green through degrees of purple pigmentation to almost black. Most of the commercially important varieties have been selected from the long established types of the tropical India and China. Brinjal is known to have ayurvedic medicinal properties and is good for diabetic patients. It has also been recommended as an excellent remedy for those suffering from liver complaints (Shukla and Naik, 1993). The glycoalkaloid contents in the Indian commercial cultivars vary from 0.37 mg/100 g fresh weight to 4.83 mg (Bajaj *et al.*, 1981). Fruit yield of a crop being a complex character is influenced by many of its contributing characters controlled by polygenes as well as environmental factors. The success of any crop improvement programme depends upon the nature and magnitude of genetic variability existing in breeding material with which plant breeder is working, choice of parents for hybridization and selection procedure (Meena and Bahadur, 2013). An understanding of inheritance of yield and its component related traits, heritability, expected genetic advance is necessary for planning effective selection procedure for evolving high yielding genotypes. The variability for the characters of economic importance is the basic pre requisite to bring improvement in a crop. To explore the purpose of the improvement by selection it is essential to first study the extent of genetic variability and heritability along with the genetic advance. Considering the above facts, the

present investigation was conducted to find out the mean performances, heritability, coefficient of variation (phenotypic and genotypic), genetic advance, and genetic gain for yield and yield attributing parametres in the eggplant.

MATERIALS AND METHODS

The present experiment was conducted at the Vegetable Research Farm, Department of Horticulture, Institute of Agricultural Sciences, BHU, Varanasi, Uttar Pradesh during the *Kharif* season of 2015. The soil of the experimental field is light sandy loam in texture. The experimental materials in the form of seeds were collected from the ICAR-Indian Institute of Vegetable Research, Varanasi and Department of Horticulture, Institute of Agricultural Sciences, BHU, Varanasi. The seventeen genotypes of eggplant were used in the investigation. The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. The experimental field was thoroughly ploughed with the help of disc plough followed by proper planking. The required tilth was obtained before transplanting. Basal dose of fertilizers is given as per the recommendations. Healthy and vigorous seedlings of 35 days old were selected from the nursery and transplanted in the plots at a spacing of 60 cm X 60 cm. The observations were recorded from 5 competitive plants from each plot on fourteen parameters *viz*., days to first flowering, days to 50% flowering, number of flowers per plant, number of flower clusters per plant, average fruit weight, fruit length, fruit girth, number of fruits per plant, plant spreading (both directions), plant height (cm), number of branches per plant, fruit yield per plant, and fruit yield per hectare at one per cent level of significance. The data was analyzed statistically by analysis of variance for randomized complete block design model as proposed by Panse and Sukhatme (1985). Phenotypic and genotypic coefficients of variability were calculated as per the method suggested by Burton and Devane (1953). Heritability (h^2) in the broad sense (in per cent) was computed by the formula given by Johnson *et al*. (1955). To calculate the expected genetic advance, the formula given by Lush (1949) was used.

RESULTS AND DISCUSSION

The analysis of variance for 14 quantitative traits revealed that mean squares were highly significant for all the traits indicating enough variability in all 17 genotypes. On the basis of mean performance the earliness for the first flowering was found in genotype Kashi Prakash followed by IBH-2 and Arka Shree while late flowering was recorded in KS-221. The earliness for 50% per cent flowering was found in Kashi Prakash, Punjab Barsati, and IBH-2 whereas late flowering was observed in CHBR-2. Maximum numbers of flowers per plant were found in DMU-01 and DBR-31 whereas DBL-24 has minimum flowering. Maximum numbers of flower clusters per plant were obtained in DMU-01 and Punjab Barsati while least numbers of flower clusters were found in DBL-24. Highest average fruit weight was observed in IBH-2 and Local selection-2 whereas least value was found in DMU-01. Maximum fruit length was recorded in Kashi Prakash and BCB-464 whereas minimum was in DMU-01. Highest fruit girth was recorded in IBH-2 and

Table 1: Mean performance for 14 characters of 17 genotypes of eggplant

Genotype	Days to first flowering	Days to 50% flowering	No. of flowers per plant	No. of flower clusters per plant	Average fruit weight(g)	Fruit length (cm)	Fruit girth (cm)	No. of fruits per plant	Plant spread (E-W) (cm)	Plant spread (N-S)(cm)	Plant height (cm)	No. of branches per plant	Fruit yield/ plant (kg)	Fruit yield (q/ha)
PLR-01	36.33	54.33	33.40	12.21	71.93	11.44	6.48	18.60	58.16	56.08	62.32	6.20	1.36	371.28
IBH-2	34.00	44.66	29.00	13.46	197.46	10.06	7.81	12.73	59.70	58.65	64.10	6.26	2.51	698.05
DBL-25	46.66	53.66	27.93	14.46	150.06	9.42	6.61	13.60	85.14	82.48	58.13	8.53	2.04	566.81
KS-221	47.66	57.66	26.80	13.06	153.86	9.51	5.76	13.06	66.09	63.09	73.31	9.53	2.01	559.08
DBR-31	47.00	55.66	33.46	14.53	74.66	13.05	3.83	18.93	67.51	64.35	63.36	3.73	1.41	392.51
Rajendra Baigan-2	46.66	50.33	28.13	14.26	99.50	13.32	3.71	15.66	50.26	47.36	56.76	6.26	1.55	433.07
Punjab Barsati	37.33	41.33	26.60	14.86	126.90	8.36	6.34	12.06	75.66	72.88	60.36	7.66	1.53	425.70
DMU-01	38.33	56.00	35.26	15.40	58.44	7.30	4.25	21.40	69.32	66.72	62.56	8.60	1.24	346.65
DBL-24	42.00	55.00	25.26	12.06	158.00	10.31	6.98	10.80	56.52	52.09	69.30	5.66	1.70	474.17
ArkaShirish	39.66	50.66	26.53	14.00	154.80	8.74	6.20	12.33	59.74	58.92	65.26	6.93	1.91	531.28
BCB-464	39.33	50.33	27.86	13.00	86.46	13.94	3.94	14.46	70.62	68.60	72.62	6.73	1.24	346.63
KashiPrakash	32.00	41.00	27.13	12.66	141.73	17.58	3.63	11.20	53.84	52.47	53.13	7.73	1.58	440.51
CHBR-2	45.00	58.00	27.46	12.20	125.16	8.43	6.69	12.40	61.77	59.80	59.19	4.66	1.55	431.29
Local selection-1	40.00	55.00	25.40	13.73	168.86	7.72	6.70	9.60	58.16	56.33	58.15	5.13	1.62	450.52
Local selection-2	46.33	54.00	25.46	12.26	137.76	8.62	6.80	8.93	56.53	54.16	57.59	5.73	1.23	341.73
Local selection-3	40.00	54.66	27.86	13.40	133.10	8.89	6.61	11.66	59.20	58.64	59.31	6.13	1.55	430.98
Arka Shree	36.00	45.66	30.46	13.80	85.26	12.13	4.18	15.06	55.52	53.55	56.64	7.66	1.28	356.23
Grand Mean	40.84	51.64	28.47	13.50	124.93	10.50	5.68	13.67	62.57	60.36	61.89	6.65	1.60	446.85
CV	6.56	4.98	7.44	9.00	4.98	3.37	6.92	4.94	8.67	8.57	10.09	7.90	6.72	6.72
CD at 5%	4.46	4.28	3.52	2.02	10.36	0.59	0.65	1.12	9.03	8.60	10.39	0.87	0.17	49.95

Table 2: Estimate of range, mean, genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV), heritability, genetic advance, and genetic gain for 14 characters of 17 genotypes of eggplant

Characters	Range	Mean	GCV (%)	PCV (%)	Heritability (%)	Genetic Advance	Genetic gain (%)
Days to first flowering	32.00-47.66	40.84	11.53	13.27	75.53	8.43	20.65
Days to 50% flowering	41.00-58.00	51.64	10.07	11.24	80.31	9.60	18.60
No. of flowers per plant	25.26-35.26	28.74	9.55	12.11	62.22	4.42	15.52
No. of flower clusters per plant	12.06-15.40	13.50	5.58	10.59	27.77	0.81	6.06
Average fruit weight (g)	58.44-197.43	124.93	31.26	31.65	97.52	79.45	63.59
Fruit length (cm)	7.30-17.58	10.50	25.92	26.14	98.33	5.56	52.96
Fruit girth (cm)	3.63-7.81	5.68	24.36	25.33	92.52	2.74	48.28
No. of fruits per plant	8.93-21.40	13.67	24.55	25.04	96.11	6.78	49.58
Plant spread (E-W) (cm)	50.26-85.14	62.57	13.18	15.78	69.75	14.18	22.67
Plant spread (N-S) (cm)	47.36-82.48	60.36	13.49	15.99	71.25	14.16	23.47
Plant height (cm)	53.13-73.31	61.89	7.05	12.31	32.80	5.14	8.31
No. of branches per plant	3.73-9.53	6.56	22.15	23.52	88.70	2.86	42.98
Fruit yield per plant (kg)	1.23-2.51	1.60	21.10	22.15	90.79	0.66	41.43
Fruit yield (q/ha)	341.73-698.05	446.85	21.10	22.15	90.79	185.14	41.43

DBL-24 while least value in Kashi Prakash. The maximum numbers of fruits per plant were recorded in DMU-01 and DBR-31 whereas Local selection-2 had least value. Highest plant spread (East-West) was found in DBL-25 and Punjab Barsati and least in Rajendra Baigan-2. Highest plant spread (North-South) observed in DBL-25 and Punjab Barsati and minimum in Rajendra Baigan-2. Maximum plant height was found in KS-221 and BCB-464 while Kashi Prakash was the shortest. Highest number of branches was seen in KS-221 and DMU-01 whereas least branches in DBR-31. The highest fruit yield was found in genotype IBH-2, DBL-25 and KS-221 while Local selection-2 had lowest fruit yield. Analysis of variance may disclose the absolute variability and this could be accessed through standardizing the phenotypic and genotypic variances by obtaining the coefficients of variability. Hence, components of variation such as genotypic coefficients of variation (GCV) and phenotypic coefficients of variation (PCV) were computed. Heritability is very important to plant breeder as it provides basis of selection on phenotypic selection. The heritability and genetic advance are the direct selection parameter. Heritability in conjugation with genetic advance would be more beneficial for getting better response in selection from superior population (Johnson *et al.*, 1955).The phenotypic coefficient of variation and genotypic coefficient of variation were found high in average fruit weight, fruit length, number of fruits per plant, fruit girth, number of branches per plant, and fruit yield per plant. Similar results were also reported by Shirley and Shanthi (2009); Muniappan *et al*. (2010); Arunkumar *et al*. (2013); and Lokesh *et al*. (2013). 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. The experiment showed a wide range of heritability for different characters. The high heritability was observed for fruit length (98.33%) followed by average fruit weight (97.52%), number of fruits per plant (96.11%), fruit yield per plant and fruit yield (q/ha) each (90.79%), number of branches per plant (88.70%), and days to first flowering (80.31%). These results were in agreement with Ushakumari *et al*. (1991); Negi *et al*. (2000); Sharma and Swaroop (2000); Karak *et al*. (2012); and Kumar *et al*. (2010). A wide range of genetic advance for all the characters was being recorded from 0.66 to 185.14. The highest value was recorded for fruit yield q/ha (185.14%) followed by average fruit weight (79.45%) and plant spread (E-W) (14.18%). The genetic advance as a per cent of mean (genetic gain) ranges from 6.06 to 63.59. The maximum value was recorded in fruit weight (63.59%) followed by fruit length (52.96%), number of fruits per plant (49.58%) These finding are in accordance with Solaimana *et al*. (2015); and Vidhya and Kumar (2015).

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