

STUDIES ON GENETIC VARIABILITY, HERITABILITY AND GENETIC ADVANCE FOR YIELD AND QUALITY TRAITS IN BOTTLE GOURD [*Lagenaria siceraria* (Mol.) Standl.] GENOTYPES

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Abstract: The genetic parameters were studied to elucidate the genetic variability, heritability and genetic advance in forty bottle gourd [*Lagenaria siceraria* (Mol.) Standl.] genotypes grown in Randomized Complete Block Design in two replications. Analysis of variance revealed presence of considerable variability among the genotypes for all sixteen characters. Phenotypic coefficient of variation (PCV) was somewhat higher than genotypic coefficient of variation (GCV) for all the characters studied. High heritability combined with high genetic advance was observed for the characters first male flowering node number, first female flowering node number, length of pedicel, fruit length, fruit girth, fruit weight, number of fruits per plant, fruit yield per plant, total soluble solids, total sugar content, antioxidant activity and total chlorophyll content indicates the preponderance of additive gene action and better scope for improvement of these characters for effective selection of genotypes.

Keywords: Genetic parameters; bottle gourd; PCV; GCV; heritability and genetic advance.

Introduction

Bottle gourd [*Lagenaria siceraria* (Mol.) Standl.] belongs to the family cucurbitaceae having somatic chromosome number $2n=22$. The species *Lagenaria siceraria* presently cultivated throughout the tropical region of the world. The leading states in India, growing bottle gourd are Rajasthan, Gujarat, Punjab, Uttar Pradesh, Bihar, West Bengal, Madhya Pradesh, Andhra Pradesh and Tamil Nadu. Telangana region in India is endowed with a rich variability of bottle gourd, especially with regard to fruit characteristics (Sivaraj and Pandravada, 2005). The objective of this study is to determine the magnitude of genetic variability, heritability and genetic advance that could be realized through selection. The information obtained from this study would be helpful to specify certain traits that could be used as selection indices for identifications of potentially high yielding bottle gourd genotypes.

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Materials and methods

The experimental material consisted of forty genotypes were laid out in Randomized Complete Block Design (RCBD) with two replications at Main Vegetable Research Station, Anand Agricultural University, Anand during the *kharif* of 2015. Each genotype was represented by a single row plot of 5 m length with 5 plants sown at a distance of 2 m between rows and 1 m between plants. Observations were recorded from three randomly selected plants for the characters *viz.*, days to opening of first male flower, days to opening of first female flower, first male flowering node number, first female flowering node number, days to first picking, length of pedicel, fruit length, fruit girth, fruit weight, number of fruits per plant, fruit yield per plant, total soluble solids, total sugar content, ascorbic acid, antioxidant activity and total chlorophyll content. Analysis of variance was done based on RBD as suggested by Snedecor and Cochran (1937) and reviewed by Panse and Sukhatme (1967) for each of the characters separately. The phenotypic and genotypic coefficient of variance was calculated using the formula suggested by Burton (1952). Heritability in broad sense and genetic advance was estimated by the method described by Allard (1960).

Results and Discussion

Morphological variability observed among fruits of selected bottle gourd genotypes was shown in **Figure 1**. The analysis of variance for sixteen characters (**Table 1**) revealed highly significant differences for all the characters indicating the existence of enormous amount of genetic variability for growth and yield attributes. The mean values, coefficient of variation, heritability and genetic advance value for sixteen characters are presented in **Table 2**.

High GCV and PCV were observed for total sugar content, fruit length and fruit girth indicates the presence of wide variation for these characters which will allow further improvement by selection of the individual traits. High estimates of GCV and PCV for fruit length and fruit girth were also observed by Sharma and Sengupta (2013) and Murlidharan *et al.* (2014). The traits first female flowering node number, total chlorophyll content, total soluble solids, antioxidant activity, length of pedicel, fruit yield per plant, number of fruits per plant, first male flowering node number and fruit weight showed moderate GCV and PCV. The results were alike with the finding of Narayan *et al.* (1996) for first female flowering node number, fruit yield per plant, number of fruits per plant and first male flowering node number. Gayen and Hossain (2006) for total soluble solids and fruit weight. Little difference in GCV and PCV suggest characters are not much pliable to environmental factors, thus the selection may be effective based on the phenotypic values.

The magnitude of heritability was observed to be high for total sugar content followed by the length of pedicel, antioxidant activity, fruit length, total chlorophyll content, first female flowering node number, fruit girth, total soluble solids, first male flowering node number, fruit weight, ascorbic acid, number of fruits per plant, days to opening of first female flower, fruit yield per plant and days to opening of first male flower. This indicated that larger portion of total variation would be under genetic control for these traits. Similar results were obtained by Yadav *et al.* (2008) and Sharma and Sengupta (2013) for fruit length, first female flowering node number, fruit girth, first male flowering node number, number of fruits per plant, days to opening of first female flower, fruit yield per plant and days to opening of first male flower. High heritability was found by Gayen and Hossain (2006) for total sugar content, total soluble solids, fruit weight and ascorbic acid. Husna *et al.* (2014) reported high heritability for the length of pedicel. Moderate heritability estimates were observed for days to first picking.

Robison *et al.* (1966) suggested that the heritability and genetic advance when considered together would be more reliable and useful in predicting the resultant effects of selection. High estimates of heritability coupled with high genetic advance expressed as percentage of mean were observed for the traits *viz.*, first male flowering node number, first female flowering node number, length of pedicel, fruit length, fruit girth, fruit weight, number of fruits per plant, fruit yield per plant, total soluble solids, total sugar content, antioxidant activity and total chlorophyll content indicates the predominance of additive gene action and better scope for improvement of these characters for effective selection of genotypes.

Based on the studies on genetic variability, it may be concluded that, the characters fruit length, fruit girth and total sugar content recorded high amount of genetic variability along with heritability and genetic advance. This reveals that there is a greater scope for improving these characters by simple phenotypic selection.

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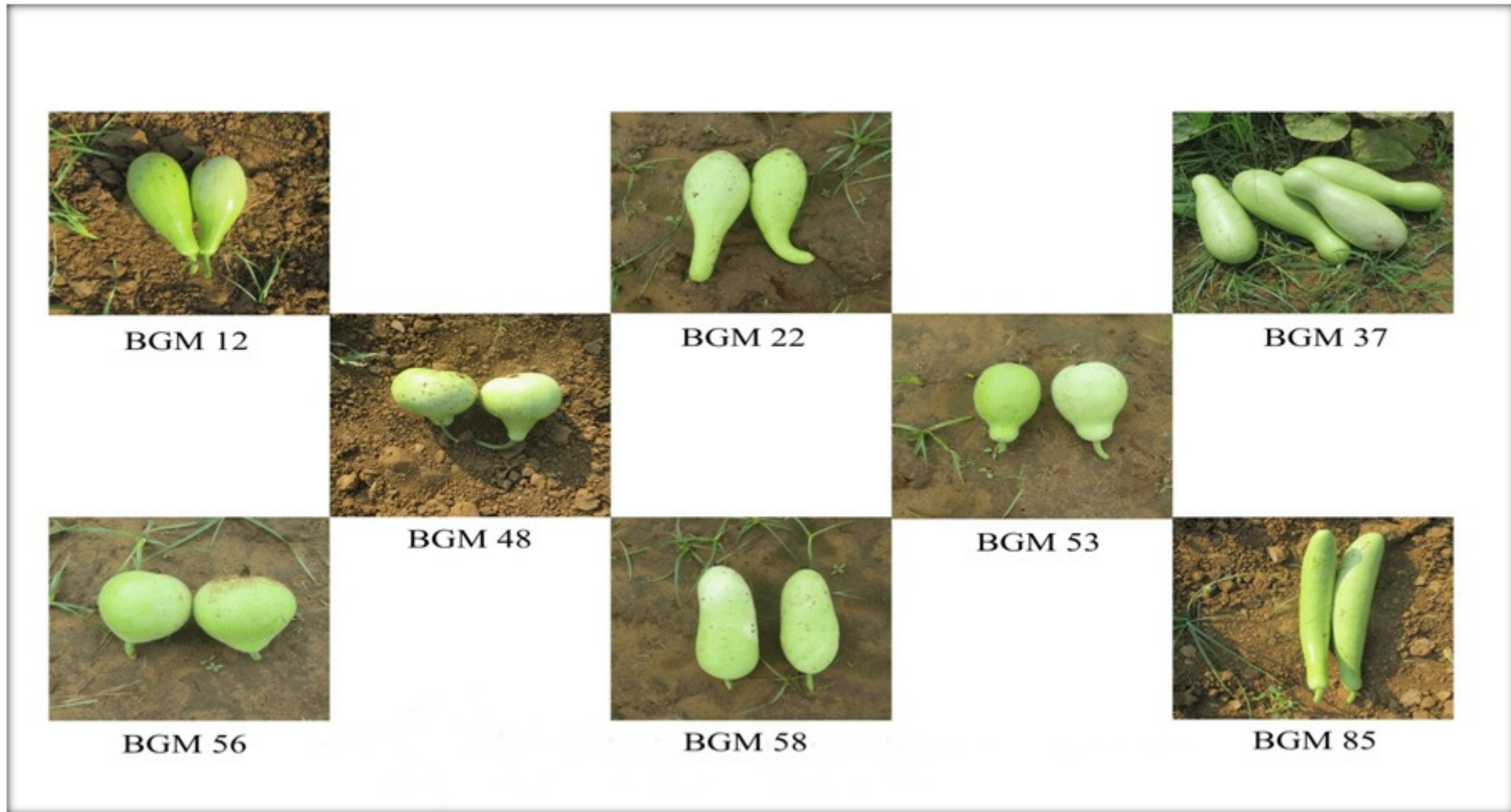


Figure 1. Morphological variability appeared in fruit of bottle gourd in selected genotypes

Table 1. Analysis of variance for different characters in bottle gourd

Sr. No.	Character	Source of Variance		
		Replications	Genotypes	Error
	Degree of freedom	1	39	39
1	Days to opening of first male flower	0.800	7.982**	1.655
2	Days to opening of first female flower	5.002	9.359**	1.177
3	First male flowering node number	0.050	3.399**	0.155
4	First female flowering node number	4.050	5.524**	0.175
5	Days to first picking	57.800	13.108**	4.133
6	Length of pedicel	0.145	8.339**	0.101
7	Fruit length	0.166	170.480**	3.386
8	Fruit girth	3.549	93.874**	3.543
9	Fruit weight	0.004	0.053**	0.004
10	Number of fruits per plant	0.003	2.264**	0.266
11	Fruit yield per plant	0.008	1.406**	0.206
12	Total soluble solids	0.005	0.538**	0.024
13	Total sugar content	0.032	37.977**	0.203
14	Ascorbic acid	0.143	0.821**	0.092
15	Antioxidant activity	0.000022	0.00019**	0.0000026
16	Total chlorophyll content	0.00018	0.076**	0.002

** Significant at p = 0.01

Table 2. Variability parameters for different characters in bottle gourd

Sr. No	Character	Mean	GCV (%)	PCV (%)	h^2_b (%)	GA	GA (%)
1	Days to opening of first male flower	49.19	3.62	4.46	65.7	2.97	6.04
2	Days to opening of first female flower	55.96	3.61	4.10	77.6	3.67	6.56
3	First male flowering node number	6.9	18.44	19.30	91.2	2.51	36.28
4	First female flowering node number	12.37	13.22	13.64	93.8	3.26	26.37
5	Days to first picking	63.85	3.32	4.60	52.0	3.15	4.93
6	Length of pedicel (cm)	12.26	16.54	16.75	97.5	4.12	33.64
7	Fruit length (cm)	30.61	29.85	30.45	96.1	18.46	60.29
8	Fruit girth (cm)	23.66	28.40	29.50	92.7	13.33	56.34
9	Fruit weight (kg)	0.804	19.48	21.15	84.8	0.30	36.95
10	Number of fruits per plant	5.66	17.66	19.85	79.2	1.84	32.37
11	Fruit yield per plant (kg)	4.403	17.59	20.39	74.5	1.38	31.27
12	Total soluble solids (°brix)	3.38	14.97	15.64	91.5	1.00	29.50
13	Total sugar content (%)	1.4	49.50	49.77	98.9	1.43	101.42
14	Ascorbic acid (mg/100 g)	6.94	8.71	9.75	79.8	1.11	16.03
15	Antioxidant activity (%)	0.05	16.37	16.60	97.3	0.02	33.26
16	Total chlorophyll content (mg/100 g fresh weight)	1.39	13.83	14.11	96.0	0.39	27.92