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Response to Selection for the Quantitative Traits in Bottle Gourd [*Lagenaria siceraria* (Mol.) Standl.]

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Present investigations were carried out in bottle gourd to assess the heritability and genetic advance for yield and quality traits. Fifteen hybrids of bottle gourd generated along with their six parents evaluated in a randomized complete block design with three replication at the Main Experiment Station, Department of Vegetable Science A.N.D. University of Agriculture & Technology, Narendra Nagar, Kumarganj, Ayodhya during the season of *Zaid* 2020 and *Zaid* 2021. High heritability was observed for number of primary branch per plant, days to first pistillate flower anthesis, days to first fruit harvest, days to first staminate flower anthesis and vine length during in Y_1, days to first staminate flower anthesis, node number to first pistillate flower appearance, days to first fruit harvest, days to first pistillate flower anthesis and non-reducing sugar during in Y_2, days to first pistillate flower anthesis, days to first staminate flower anthesis, days to first fruit harvest and non-reducing sugar during in pooled. High genetic advance as percent of mean was observed for average fruit weight, number of fruit per plant, fruit yield per plant and reducing sugar during seasons Y_1 and Y_2. The results indicated that these traits had additive gene effect and therefore, these are more reliable for effective selection for their further improvement.

Keywords: Heritability; genetic advance; bottle gourd.

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1. INTRODUCTION

Bottle gourd (*Lagenaria siceraria* (Mol.) Standl., 2n= 2x= 22) is an important cultivated annual cucurbitaceous crop grown all over the country. "Being warm season vegetable crop it thrives well in warm and humid climate but at present its off season cultivation has progressively stretched throughout the year in northern Indian plains. Bottle gourd has been found in wild forms in South Africa & India, both as a rainy season and summer season vegetables" [1]. It is also commonly grown in Africa, Ethopia, Central America and other warmer regions of the world. In India, the total area covered under bottle gourd is 0.189 million hectare with production of 3.106 million tonnes and its productivity is 16.434 tonnes per ha.[1].

Cucurbits are cross-pollinated crops. It is very popular among a large section of people. It is easily digestible and is used extensively as vegetable. Due to its delicate and nutty flavour, bottle gourd is widely used for preparing many delectable recipes. Fruits are used in sweets, pickles, petha, halwa, kapoorkand, paratha, kofta, and rayata especially in the hills. Bottle gourd is a rich source of minerals and vitamins. It contains higher concentrations of dietary fiber, vitamin A, vitamin C, vitamin E, vitamin K, vitamin B_6, folate, manganese, potassium, protein, thiamine, rioboflavin, panthothenic acid, calcium, iron, magnesium, phosphorus and selenium. It also contains many nutritional properties are calories- 22 Kcal, carbohydrates- 5.4 g, protein- 0.9 g and sodium- 347 mg [1]. The fruit is rich in pectin also, which showed good quality prospects for jelly preparation. A decoction made from the leaf is a very good medicine for jaundice. The fruit has cooling effect, it is a cardiotonic and diuretic, good for people suffering from biliousness and convalescences *i.e.,* regain health after illness. The pulp is good for overcoming constipation, cough, night blindness and as an antidote against certain poisons. Bottle gourd was one of the first plant species to be domesticated for human use, providing food, medicine and a wide variety of utensils and musical instruments made from large hard shelled mature fruits. Dry hard shells of the fruits has been used for making a wide range of articles of common use including bowls, bottles containers for finishing nets and musical instruments [2].

The genetic parameters such as heritability, genetic advance provide effective tools in hand of a breeder to select a genotype having the most desirable characters for yield. Many of the quantitative characters such as number of fruits per plant and yield per plant are highly influenced by environmental and hence partitioning of the overall heritable and non-heritable components which will be the immense use for planning breeding programme.

2. MATERIALS AND METHODS

The present research work was conducted during Zaid seasons of 2019-20 (Y_1) and 2020-21 (Y_2) to study the heritability and genetic advance using diallel mating design (except reciprocal) at the Main Experiment Station (MES), Department of Vegetable Science A.N.D. University of Agriculture & Technology, Narendra Nagar, Kumarganj, Ayodhya (U.P.). The observations were recorded on seventeen quantitative traits. Geographically, experimental site falls under humid sub-tropical climate and is located in between 24.47^0 and 26.56^0 N latitude and 82.12^0 and 83.98^0 E longitude at an altitude of 113 (m) above the mean sea level in the Gangetic Alluvial Plains of Eastern Uttar Pradesh. The soil type of experimental site was sandy loam with average soil fertility level and pH in the range 7.5 – 8.5. This farm received an annual rainfall of about 1200 mm. The monsoon starts in the month of June to the end of September. Sometimes, cloudy weather with heavy rainfall, for longer period drastically affects the agricultural production. Occasional showers are also very common in cool season (Dec. to Jan.). The hot period of *Zaid* season generally start somewhere from middle of April and continuous till the middle of July. Fifteen F_1's and their six parents were evaluated for various yield and yield attributing traits. The experiments were laid out in randomized block design (RBD) with three replication. The crop was sown in rows spaced at 3 meters apart with a plant to plant spacing of 0.50 meter. Observations were recorded for days to first staminate flower anthesis, days to first pistillate flower anthesis, node number to first staminate flower appearance, node number to first pistillate flower appearance, days to first fruit harvest, fruit length, fruit circumference, average fruit weight, number of fruit per plant, fruit yield per plant, vine length, number of primary branches per plant, total soluble solids (TSS), dry matter content, reducing sugars, non-reducing sugars and total sugars. The observations were recorded for some ancillary traits as well. Heritability in narrow-sense was estimated as per the

Table 1. Heritability (ns) and genetic advance in bottle gourd over two seasons (Y_1, Y_2) and pooled

S. No.	Parameters Characters	Heritability (h^2ns %)			Genetic advance in per cent of mean		
		Y_1	Y_2	Pooled	Y_1	Y_2	Pooled
1	Days to first male flower anthesis	50.46	40.08	53.20	5.04	3.10	2.39
2	Days to first female flower anthesis	67.29	35.82	54.55	4.51	3.39	2.57
3	Node number to first male flower appearance	20.96	24.52	9.15	4.98	7.44	5.22
4	Node number to first female flower appearance	00.92	39.87	7.80	5.68	6.03	3.18
5	Days to first harvest	52.53	39.42	49.27	3.46	2.90	2.20
6	Fruit length (cm)	18.62	22.23	20.37	12.97	18.32	9.25
7	Fruit circumference (cm)	27.25	23.79	27.31	12.60	7.59	4.16
8	Average fruit weight (kg)	23.45	20.96	16.13	28.33	20.93	7.77
9	Number of fruit per plant	12.04	31.71	15.66	41.83	24.93	14.00
10	Fruit yield per plant (kg)	10.44	24.44	15.37	35.77	33.17	15.62
11	Vine length (m)	43.03	11.38	10.21	15.18	15.68	3.54
12	Primary branches per plant	89.41	2.43	2.37	13.59	12.12	4.31
13	Total soluble solids (%)	16.95	12.45	7.74	13.10	8.93	6.87
14	Dry matter content (g)	7.40	1.79	2.84	31.15	13.08	10.20
15	Reducing sugars (%)	17.17	19.10	16.64	32.04	32.36	8.13
16	Non- reducing sugar (%)	28.21	35.51	31.34	20.81	19.79	2.38
17	Total sugars (%)	11.41	14.73	11.82	19.69	18.77	6.30

procedure given by Amangoua [3]. The heritability percentage was categorized according to Crumpacker and Allard [4] as (i) High (> 30%), (ii) Moderate (above 10% to 30%) and low (< 10%). Genetic advance was classified in to three groups such as high, moderate and low by following Johnson *et al.* [5], high (20% and above), Moderate (> 10% to 20%) and low (< 10%).

3. RESULT AND DISCUSSION

The perusal of Table-1 reveals that was estimated for number of primary branch per plant, days to first pistillate flower anthesis, days to first fruit harvest, days to first staminate flower anthesis and vine length during Y_1, days to first staminate flower anthesis, node number to first pistillate flower appearance, days to first fruit harvest, days to first pistillate flower anthesis and non-reducing sugar during Y_2, days to first pistillate flower anthesis, days to first staminate flower anthesis, days to first fruit harvest and non-reducing sugar during pooled. Moderate heritability (10 to 30%) was found for fruit circumference, fruit length, average fruit weight, fruit yield per plant, reducing sugar and total sugar during both the season and pooled, rest of the character show low heritability (<10) such as node number to first staminate flower appearance, node number to first pistillate flower appearance, total soluble solids, dry matter weight and number of primary branches per plant during over season pooled.

High estimate of genetic advance in percent of mean (>20%) was observed for average fruit weight, number of fruit per plant, fruit yield per plant and reducing sugar during seasons Y_1 and Y_2 estimated high genetic advance. Moderate genetic advance (> 10 to 20%) were observed for fruit length, vine length, number of primary branch per plant and total sugar during both seasons Y_1 and Y_2, while low genetic advance (< 10%) was observed for days to first staminate flower anthesis, days to first pistillate flower anthesis, node number to first staminate flower appearance, node number to first pistillate flower appearance and days to first fruit harvest during both seasons Y_1, Y_2 and pooled. Similar finding for high estimate of narrow sense heritability and genetic advance for different bottle gourd traits have been also reported by Deepthi *et al*. [6], Damor *et al.* [7], Rehan *et al.* [8], Singh *et al.* [9] and Lal *et al*. [10].

Thus, there exist ample scope of improvement in fruit yield per plant of bottle gourd.

4. CONCLUSION

High genetic advance as percent of mean was observed for average fruit weight, number of fruit per plant, fruit yield per plant and reducing sugar during seasons Y1 and Y2. The results indicated that these traits had additive gene effect and therefore, these are more reliable for effective selection for their further improvement.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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