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Evaluation of Quantitative Characters of Okra [*Abelmoschus esculentus* (L). Moench] Genotypes

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Authors' contributions

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

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ABSTRACT

The present investigation was carried out to evaluate the quantitative characters of different genotypes of okra planted in plot size of 5.40 m^2 with the spacing of 60 X 30 cm. Observations were recorded on plant height, number of branches per plant, stem diameter at final harvest, days to 50% flowering, number of pods per plant, weight of pods per plant, pod length, pod diameter and average pod weight. On the basis of overall performance of okra genotypes, it may be concluded that there was significant variation observed for growth and yield. Among all two genotypes namely, PB-520 and PB-236 were found better and superior for most of the characters and these genotypes may be recommended for cultivation under Tarai conditions of Uttarakhand.

Keywords: Okra; genotype; characters; Uttarakhand.

1. INTRODUCTION

Okra (*Abelmoschus esculentus* L Moench) belongs to the Family Malvaceae having a chromosome number 2n = 130. It is commonly known as Bhindi in India. It apparently originated in Ethiopia, higher parts of the Anglo-Egyptian Sudan [1]. Nutritive value of okra varies in different cultivars and depending upon the agro – climatic conditions. It contains protein,

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carbohydrate and vitamin C [2] and plays a vital role in human diet [3]. Okra commonly known as "lady finger" is primarily suitable for cultivation as a garden crop as well as on large commercial farms. It is a popular vegetable grown throughout the country in different agro-climatic zones. The crop grows well in hot weather, especially in the regions with warm nights (>200C) [4]. *Abelmoschus esculentus* is cultivated throughout the tropical and warm temperate regions of the world for its fibrous fruits or pods containing round and white seeds. It is most heat and drought-tolerant vegetable species in the world and will tolerate soils with heavy clay and intermittent moisture but frost can damage the pods [5]. However, kharif season is the main growing season for cultivation of okra. During this season the plants grow tall and vigorous. But in the summer season crop, the germination of seeds is generally poor; plants are dwarf and lower yield because of unfavourable environmental conditions.

In recent years public sector and a number of private seed companies in India have been able to develop a good number of commercial cultivars. Genotypes developed by the various agencies are not suitable to all the regions of the country. They are varying in various characters from one region to another. Now a day's large numbers of okra genotypes are available in the market but all these are not adapted and suited to all the regions of the country. No specific recommendations about the suitability of genotypes for a particular area are available. Farmers are facing problems in selecting genotypes for a particular area for commercial cultivation. Considering the above mentioned facts, there is a need to compare some of the available genotypes to select high yielding, better adaptable genotypes/cultivars for commercial cultivation.

2. MATERIALS AND METHODS

The present investigation was conducted at Vegetable Research Centre of Govind Ballabh Pant University of Agriculture & Technology, Pantnagar, Uttarakhand, during the rainy season of the year, 2008. Geographically, this research center is situated at latitude of 29.50 N, longitude of 79.30 E and at an altitude of 243.84 meters above the mean sea level in the foot hills of Himalayas, a narrow belt called Tarai. The experimental materials were comprised of 12 high yielding genotypes/cultivars of okra obtained from various research institute and seed companies of India. A brief description of genotypes/cultivars comprising their names and sources presented in Table 1. The experiment consisted of three replications under randomized block design (RBD) with plot size 1.80 X 3 =5.40 m^2. Sowing was done in spacing of 60 X 30 cm with two seeds per hill on 04 July, 2008. After germination excess plants were thinned out to maintain one plant at desired distance. Plant protection and agronomic practices were carried out during crop growth. For data recording and observations, 5 plants were randomly selected from each plot and observations were recorded on quantitative characters like, plant height (cm), number of branches per plant, stem diameter (cm) at final harvest, days to 50% flowering, number of pods per plant, pod yield (q/h), weight of pods per plant (g), pod length (cm), pod diameter (cm) and average pod weight (g). The data were analyzed in randomized block design as per procedure of [6].

Table 1. List of genotype/cultivars and their sources

Sl. no	Name of variety	Source
1.	PB-27-1	Pantnagar
2.	PB 31-1	Pantnagar
3.	PB-174	Pantnagar
4.	PB-195	Pantnagar
5.	PB-236	Pantnagar
6.	PB-266	Pantnagar
7.	PB-520	Pantnagar
8.	PB-2018	Pantnagar
9.	Punjab-7	P.A.U, Ludhiana
10.	PB-57 (Parbhani Kranti)	P.K.V.U, Parbhani, M.S
11.	Pusa Sawani (C)	IARI, New Delhi
12.	Vivek (C)	V.P.K.A.S. Almora

**C= Check variety*

3. RESULTS AND DISCUSSION

3.1 Plant Height (cm)

The mean values showed significant variations among the genotypes for plant height. The plant height ranged from 102.20 to 178.33 cm (Table 2) was highest in PB-236 (178.33 cm) and lowest in Vivek-1, rest of the genotypes showed intermediate performance for this character. The genotypes PB-266 and PB-520 were statistically similar to each other and better than check cultivars Pusa Sawani (160.46 cm) and Vivek-1 (102.20 cm). Plant height is usually a good index of plant vigour which may contribute towards greater productivity. The maximum plant height may be because of longer internodal length in PB-236 and shorter in Vivek-1. Similar observation was also recorded by [7] with significant variation in plant height at final harvest ranged from 81.80 to 196.17 cm.

3.2 Number of Branches per Plant

The mean values for number of branches per plant (Table 2) revealed significant differences among genotypes with a range of 1.38 in Vivek-1 to 2.30 in Pusa Sawani. Among all the genotypes, more number of branches per plant was recorded in Pusa Sawani (2.30) followed by PB-31-1 (2.20) and PB-195 (2.00) which were statistically similar to each other but significantly better than check cultivar Vivek-1 (1.38). Rest of the genotypes performed intermediate results for this character. The highest number of primary branches per plant may be the result of variation in its genetic makeup and environmental conditions prevailing during the growth period. Variation in number of branches ranged from 1.00 to 4.26 observed by [8]. Significant variation was also noted by [9] among the different okra genotype.

3.3 Stem Diameter (cm)

The mean values for stem diameter (Table 2) revealed significant differences among genotypes with a ranged from 1.60 to 2.37cm, the minimum stem diameter was recorded in PB-31-1 (1.60 cm) and maximum in PB-236 (2.37 cm). The genotypes, namely PB-2018 (2.35 cm), PB-266 (2.32 cm) and PB-520 (2.11 cm) were statistically similar to each other; all these genotypes were performing better as compare to checks Pusa Sawani (1.95 cm). Variation in stem diameter of okra genotype ranged from 13.20 to 29.40 mm observed by [10].

3.4 Number of Days to 50% Flowering (Days)

Days to 50 per cent flowering in different genotypes were presented in Table 2 having the range of 43.33 in PB-27-1 to 46.33 in PB-520 and PB-236. There was significant variation among the genotypes for days taken to 50% flowering. The genotypes PB-27-1 (43.33), PB-174 (43.33) followed by PB-195 (44.66) and Vivek-1 (44.70) were the earliest in flowering as compare to check cultivar Pusa Sawani (45) and these genotypes were statistically similar to each other. Early flowering may be due to the better adaptability and genetic performance of the genotypes. Similar results were also found by [11]. According to [12] among the different okra accessions, 24% are early for flowering.

3.5 Number of Pods per Plant

The significant variation in the number of pods per plant among different genotypes was observed (Table 2). The mean values for the number of pods per plant revealed a range of 13.46 in Vivek-1 and 21.46 in PB-520. The numbers of pods per plant were significantly higher in PB-520 (21.46) followed by PB-236 (20.53). These entries had significant variation but statistically similar to each other and better than check cultivar Pusa Sawani (16.63). On the other hand, significantly lesser number of pods per plant was recorded in Vivek-1 (13.46). Variation in number of pods may be due to the greater plant height, more number of branches per plant may be because of getting more space for fruit development as also reported by [13].

3.6 Weight of Pods per Plant (g)

A perusal of the data (Table 3) revealed that there were significant differences among genotypes in weight of pods per plant. The mean weight of pods per plant in different genotypes exhibited a range of 222.36 g/plant in Vivek-1 to 343.41 g/plant in PB-520. The highest weight of pods per plant was exhibited in PB-520, PB-31-1, PB-236, PB-2018, and PB-266, and these genotypes were statistically differ and better than check cultivar Pusa Sawani (247.96 g/plant). These findings may be due to more number of pods/plant, greater plant height, more number of branches per plant, fruit length, seed number and

weight of seeds per pod and less incidence of YVMV. [13,11] reported that higher pod weight of plant was affected by different genotypes.

3.7 Pod Length (cm)

The mean values for pod length (Table 3) revealed significant differences among genotypes with a range of 10.57 in Pusa Sawani to 12.42 in PB-195. The maximum pod length was recorded in PB-195 (12.42), PB-27-1(11.72) and PB-2018 (11.53). They were statistically similar to each other but better than the check genotype Pusa Sawani (10.57). All the genotypes produced longer fruits than the check cultivar. The cultivars Vivek-1 and Pusa Sawani were produced smallest fruits than the other genotypes. This result may be due to environment influence and varietal characteristics of the genotypes as reported by [10] with the pod length ranged from 9.76 to 25.02 cm.

Table 2. Plant height, number of branches, stem diameter, days to 50% flowering and number of pods of Okra genotypes

Sl. no.	Genotypes/cultivar	Plant height (cm)	Number of branches/ plant	Stem diameter (cm)	Days to 50% flowering	Number of pods per plant
1.	PB-27-1	166.00	1.93	1.97	43.33	15.56
2.	PB 31-1	153.66	2.20	1.60	45.66	17.97
3.	PB-174	163.40	1.86	1.89	43.33	16.67
4.	PB-195	152.86	2.00	2.05	44.66	16.54
5.	PB-236	178.33	1.93	2.37	46.33	20.53
6.	PB-266	170.13	1.40	2.32	45.00	16.08
7.	PB-520	172.66	1.66	2.11	46.33	21.46
8.	PB-2018	158.26	1.66	2.35	46.00	17.99
9.	Punjab-7	161.06	1.66	2.02	45.00	15.57
10.	PB-57	166.73	1.73	2.25	45.00	18.15
11.	Pusa Sawani (C)	160.46	2.30	1.95	45.00	16.63
12.	Vivek (C)	102.20	1.38	1.89	44.70	13.46
	S. Em.±	0.87	0.87	0.93	0.63	0.35
	CD at 5%	2.55	2.55	0.27	1.87	1.03

Table 3. Weight of pods/ plant, pod length, pod diameter and pod weight and pod yield of okra genotypes

Sl. no.	Genotypes/ cultivar	Weight of pods per plant (g)	Pod length (cm)	Pod diameter (cm)	Average pod weight (g)	Pod yield (q/h)
1.	PB-27-1	273.64	11.72	1.60	17.58	150.50
2.	PB 31-1	312.52	11.42	1.68	17.38	171.88
3.	PB-174	283.10	11.19	1.45	16.98	155.70
4.	PB-195	257.95	12.42	1.45	15.58	141.87
5.	PB-236	311.64	11.17	1.59	15.18	171.40
6.	PB-266	288.12	11.31	1.63	17.91	158.46
7.	PB-520	343.41	11.08	1.51	15.99	188.87
8.	PB-2018	295.02	11.53	1.57	16.39	162.26
9.	Punjab-7	246.21	11.48	1.47	15.80	135.94
10.	PB-57	286.01	12.22	1.51	15.75	157.30
11.	Pusa Sawani (C)	247.96	10.57	1.58	14.90	136.37
12.	Vivek (C)	222.36	10.70	1.66	16.51	122.29
	S. Em.±	0.31	0.31	0.48	0.80	2.77
	CD at 5%	0.93	0.92	0.14	0.98	8.14

3.8 Pod Diameter (cm)

The data recorded for pod diameter (Table 3) revealed significant differences among the genotypes. The maximum pod diameter was observed in PB-31-1 (1.68) followed by Vivek-1 (1.66), PB-266 (1.63) and PB-27-1 (1.60). These genotypes were statistically similar to each other and better than the standard checks Pusa Sawani (1.58). This result may be due to environment influence and varietal characters as reported by [11].

3.9 Average Pod Weight (g)

The data recorded on average pod weight (Table 3) revealed significant differences among the genotypes. The mean values for the average pod weight of different genotypes showed a range of 14.18 in PB-236 to 17.91 in PB-266. The higher average pod weight was observed in PB-266 (17.91) followed by PB-27-1 (17.58), PB-31-1 (17.38) and PB-174 (16.98). These genotypes did not differ significantly to each other but better than the Pusa Sawani (14.90). The lowest average pod weight was observed in PB-236 (15.18) followed by Pusa Sawani (14.90). This result may be due to higher pod diameter with their genetic response to environmental conditions as reported by [14]. The lowest average pod weight was observed in PB-236 (15.18 g) followed by Pusa Sawani (14.90 g). These two genotypes were statistically differed from each other and PB-236 was better and superior than Pusa Sawani. These results are in accordance with the findings of [15]. Also wide range of variation in fruit weight in okra genotypes was reported [16,17,18].

3.10 Pod Yield (q/ha)

Mean estimates of genotypes for pod yield per hectare (Table 3) exhibited significant variation and had a range of 122.29 in Vivek-1 to 188.87 in PB-520. The genotypes PB-520 produced significantly highest pod yield per hectare (188.86), which was best among all the genotypes and produced 38.49% higher yield over check Pusa Sawani. Next in order were PB-31-1, PB-236 and PB-2018, they differed significantly from each other. These three genotypes produced 24.04%, 25.69% and 18.99% higher pod yield, respectively, as compare to Pusa Sawani (136.37). On the other hand, Punjab-7 (135.9) and PB-195 (141.87) did not differ significantly to each other but produced significantly higher pod yield per hectare than the Vivek-1 (122.29). Number and weight of pods per plant is the most important index for selecting genotypes with a high yield potential per unit area, which determine their commercial importance. The higher pod yield per hectare was observed in PB-520 (38.49%), PB-31-1 (26.04%) and PB-236 (25.69%) produced and higher yield over check Pusa Sawani. The superior performance of these genotypes for pod yield was due to their higher ranking for number of pods per plant, weight of pods per plant, number of branches per plant, pod length, plant height and less infection of yellow vein mosaic virus, which caused greater assimilation of photosynthates. The inherent yield potential of these genotypes was also responsible for higher production of pods. The genotypes received better adoptability to the environment and get the congenial conditions for the better growth and development of the plant as well as for flowering and fruiting. These findings were also in accordance with the [15,9] who have reported better adaptation of the genotypes with environment and also get the variation among the genotypes for different characters. These observations were also confirming the finding of [14] who have reported that plant height and number of green pods had the direct effect on total fruit yield.

4. CONCLUSION

On the basis of overall performance of okra genotypes, it may be concluded that there was significant variations observed for growth and yield. Among all the genotypes two genotypes namely, PB-520 and PB-236 were found better and superior for most of the characters and these genotypes may be recommended for cultivation under Tarai condition of Uttarakhand.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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