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Evaluation of Okra *Abelmoschus esculentus* (L.) Monech Genotypes for Yield and Yield Traits

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Abstract

Forty genotypes of okra were evaluated to assess the performance of okra Abelmoschus esculentus (L.) Monech genotypes for yield and yield traits under Varanasi conditions. The analysis of variance with respect to 12 characters viz. plant height, number of branches per plant, number of nodes per plant, node at which first flower appears, intermodal distance, fruit length, fruit width, fruit weight, number of fruits per plant, number of seeds per fruit, yield per plant, yield per hectare showed significant variance. The study showed the importance of these characters in selection program for improvement in yield and yield traits of okra.

Key words : Okra, Genotypes, Evaluation, Yield, Yield traits.

Okra is an important vegetable in the tropics and sub-tropics. In the northern plains, it is grown mainly in two seasons during *kharif* and spring-summer. *Kharif* is the main season crop which grows tall, vigorous and bears a large number of pods resulting in increased productivity. Okra finds prominent place among vegetables grown in india and is available in the market all round the year. It is cultivated throughout the country in different agro-climatic regions. Okra is also important for paper industry and its stem is utilized for fiber (1). Despite its wide adoptability, yield of okra is largely influenced by the regional climatic variation. The variety found suitable at a location may not perform well at other location. Hence the performance study is of immense importance with the view to select the promising variety before making any recommendation for commercial cultivation. The present investigation was undertaken to find out the performance of okra genotypes in Varanasi region.

Methods

The experiment was carried out during *kharif* season 2008 at the Vegetable Research farm, Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, India, which is situated at $25^0 18''$N latitude and $83^0 03''$ E longitude and 75.7 m above the mean sea level. The soil was sandy loam in texture with pH 6.8, organic carbon 0.58, total N 0.098, available P 0.086 and K 0.556. The trial was laid out on 40 genotypes of okra in randomized block design with three replications. The spacing between the rows was 60 cm and between the plants was 45 cm. The seeds were sown in july, 2008 at the rate of 3 seeds per hill. Watering was done immediately after sowing and furrow irrigation was applied at an interval of 7—10 days and hand weeding was done three times. Thinning was done at 21, 28 and 35 days after sowing to keep one plant per hill, Fertilizer was gives in both organic and inorganic form, nitrogen 120 kg/ha, phosphorus 60 kg/ha and potash 60 kg/ha respectively. Observations were recorded from randomly selected five plants on twelve characters viz. plant height (cm), number of branches per plant, number of nodes per plant, node at which first flower appears, intermodal distance (cm), fruit length (cm), fruit width (cm), fruit weight (g), number of fruits per plant, number of seeds per fruit, yield per plant (g), yield per hectare (q). The data were analyzed statistically following the standard procedure (2).

Results and Discussion

Table 1 reveals that the plant height was recorded

to be maximum (73.00 cm) in genotype MB-10 with a close similarity in genotype MB-4 (64.67 cm) , followed by MB-15 (61.00 cm) and Varsha Uphar (56.00 cm). MB-1 proved to be dwarfest (32.33 cm), among all the genotypes. Number of primary branches per plant was not much variable in different genotypes even through a few genotypes performed with high number of branches than the others. The maximum number of branches per plant was recorded in the genotype JBS-2 (5.00) followed by COS-2206(4.33) and MB-20 (4.00), whereas genotype MB-14 (2.67) recorded lowest number of branches.

Table 1. Mean value of plant height (cm), number of branches per plant, number of nodes per plant of 40 genotypes of okra.

	Genotypes	Plant height (cm)	Number of branches per plant	Number of nodes per plant	Node at which first flower appear	Fruit length (cm)	Fruit width (cm)
1	MB-1	32.33	3.00	11.00	5.00	8.37	1.86
2	MB-2	40.33	3.67	9.00	6.00	7.90	1.99
3	MB-3	46.33	4.00	12.00	5.00	9.23	2.09
4	MB-4	64.67	3.00	11.00	6.00	8.23	1.93
5	MB-5	37.67	3.00	11.00	7.00	9.23	1.95
6	MB-6	52.33	3.67	11.33	6.00	8.03	2.03
7	MB-7	42.33	3.33	12.00	5.00	10.23	1.84
8	MB-8	42.33	3.00	12.67	6.00	7.90	1.93
9	MB-9	50.00	3.33	11.67	6.00	10.30	2.04
10	MB-10	73.00	3.67	15.00	5.00	8.57	2.13
11	MB-11	42.67	4.00	11.00	6.00	8.47	2.08
12	MB-12	42.33	3.00	13.00	7.00	12.27	1.96
13	MB-13	45.00	3.33	12.67	5.00	11.45	1.92
14	MB-14	50.00	2.67	12.67	6.00	11.00	2.19
15	MB-15	61.00	3.33	12.33	7.00	12.23	1.92
16	MB-16	45.00	4.67	11.33	5.33	11.90	1.72
17	MB-17	37.33	3.33	13.67	5.33	12.97	1.85
18	MB-18	49.33	3.00	12.00	6.33	11.23	2.08
19	MB-19	46.67	4.33	13.67	6.67	9.17	1.89
20	MB-20	40.33	4.00	14.00	5.67	9.23	1.92
21	MB-21	43.67	3.33	13.67	6.00	10.27	1.99
22	MB-22	48.00	3.33	12.33	5.00	11.67	2.10
23	MB-23	47.67	3.67	10.67	6.00	10.80	2.19
24	MB-24	48.00	3.67	11.67	4.67	10.50	2.09
25	MB-25	46.00	4.00	12.00	4.75	11.00	2.08
26	Arka Anamika	41.00	4.00	15.00	6.00	11.23	2.13
27	Hisar Unnat	47.67	3.00	11.00	7.00	11.70	2.04
28	Varsha Uphar	56.00	3.00	11.00	6.00	10.90	1.95
29	Parbhani Kranti	46.33	3.67	12.00	6.00	8.27	1.87
30	VRO-3	41.33	3.67	12.00	6.00	10.80	1.96
31	VRO-4	47.00	3.00	14.00	6.00	9.43	2.15
32	VRO-5	50.33	3.67	14.00	6.00	10.13	2.05
33	VRO-6	47.67	3.00	11.67	6.00	8.23	2.29
34	COS2106	48.33	3.33	13.00	5.33	9.30	2.12
35	COS2206	42.33	4.33	13.67	5.67	11.73	2.18
36	JBS-2	42.33	5.00	13.33	7.00	8.57	2.03
37	Barkha Bahar	42.67	3.00	11.00	6.00	8.13	2.32
38	COS2306	41.67	3.00	12.33	6.67	9.63	2.10
39	COS2506	37.67	3.33	12.00	5.67	9.20	2.06
40	Sel-40	47.67	3.67	13.00	5.67	10.47	2.05
	SE ±	4.24	0.977	1.092	0.842	0.713	13.957
	CD at 5%	8.48	1.954	2.184	1.684	1.426	27.914
	CD at 1%	11.278	2.598	2.904	2.239	1.896	37.125

Table 1. Continued.

	Genotypes	Fruit weight (g)	Internodal distance (cm)	Number of fruits per plant	Number of seeds per fruit	Yield per plant (g)	Yield per hectare (q)
1	MB-1	23.67	5.40	10.33	50.00	242.00	106.43
2	MB-2	24.33	4.90	11.33	67.33	273.33	120.23
3	MB-3	22.33	7.57	13.00	64.00	289.33	127.27
4	MB-4	30.33	6.13	15.00	72.33	453.33	199.43
5	MB-5	28.67	6.03	14.00	68.33	391.33	172.17
6	MB-6	30.17	6.17	13.00	73.33	388.67	170.97
7	MB-7	28.50	4.63	14.67	55.00	414.67	182.43
8	MB-8	27.50	7.40	11.67	40.00	319.00	140.33
9	MB-9	28.00	6.33	11.0	50.33	306.67	134.90
10	MB-10	24.50	8.83	13.33	54.67	324.33	142.80
11	MB-11	32.00	10.00	12.33	50.67	391.33	172.17
12	MB-12	28.17	5.40	10.00	65.00	336.67	148.33
13	MB-13	30.00	6.15	10.75	62.00	325.25	165.00
14	MB-14	21.57	5.57	12.33	62.00	225.65	99.27
15	MB-15	22.30	5.37	12.00	63.00	287.67	126.73
16	MB-16	24.00	5.63	10.67	65.00	287.00	126.73
17	MB-17	25.00	5.50	12.00	41.00	243.00	106.87
18	MB-18	20.17	4.87	12.33	47.67	239.67	105.40
19	MB-19	17.33	4.73	10.33	58.67	213.00	93.67
20	MB-20	17.33	3.23	10.33	62.33	179.00	78.80
21	MB-21	22.67	4.83	13.00	65.00	227.67	100.80
22	MB-22	20.50	6.43	11.00	65.00	265.33	116.83
23	MB-23	19.17	4.90	12.33	59.67	210.00	92.40
24	MB-24	20.90	5.67	12.00	60.00	281.00	123.67
25	MB-25	28.00	6.15	10.75	62.25	285.25	125.00
26	Arka Anamika	33.73	6.20	14.00	59.67	471.00	207.07
27	Hisar Unnat	27.20	5.00	11.00	50.33	270.00	118.53
28	Varsha Uphar	24.10	9.77	11.67	51.00	264.00	116.13
29	Parbhani Kranti	25.97	4.80	12.00	55.00	298.00	131.07
30	VRO-3	27.17	4.07	11.33	69.00	270.00	118.53
31	VRO-4	24.00	6.50	15.00	71.00	279.00	118.37
32	VRO-5	32.50	5.97	11.00	68.00	485.00	213.40
33	VRo-6	22.83	8.50	10.00	55.00	250.00	109.97
34	COS2106	22.10	5.90	11.33	57.00	318.67	140.74
35	COS2206	26.83	6.97	14.00	54.00	266.33	117.60
36	JBS-2	23.67	6.83	11.00	63.33	254.00	111.70
37	Barkha Bahar	27.17	5.23	10.67	62.67	259.00	114.00
38	COS2306	25.87	5.40	11.67	52.67	289.00	127.13
39	COS2506	27.50	5.97	11.33	52.00	319.67	140.63
40	Sel-10	29.00	7.07	12.00	65.00	345.00	151.70
	SE±	2.455	0.733	1.185	5.063	23.931	10.535
	CD at 5%	4.91	1.466	2.37	10.126	47.862	21.07
	CD at 1%	6.530	1.949	3.152	13.467	63.656	13.906

Number of nodes had direct correlation with the number of pods. Maximum number of nodes was recorded in genotypes Arka Anamika (15.00) followed by VRO-4 (14.00), COS-2206 (13.67), JBS-2 (13.33) while genotype MB-2 produces minimum number of nodes per plant (9.00). The node at which first flower appears play an important role to obtain higher yield of fruit as well as early crop. Most of the 40 genotypes had their first node of fruiting from 5.00 to 7.00 nodes, except MB-24 (4.67 nodes) (Table 1). This character could be attributed to genetical and growth pattern of the plant (3). The internodal distance is variable

from genotype, which is the genetical characteristics of plant. The maximum internodal distance was recorded in the genotype MB-11 (10.00 cm) followed by Varsha Uphar (9.77 cm), MB-10 (8.83 cm) and lowest internodal distance was recorded in genotype MB-20 (3.23 cm). The results of Amanullah et al. (4) in okra are in complete agreement with the present study.

Genotype MB-17 had maximum fruit length (12.97 cm) followed by MB-12 (12.27 cm), MB-15 (12.23 cm) and lowest fruit length was recorded in genotype MB-8 (7.90 cm). Maximum fruit width was recorded in genotype Barkha Bahar (2.32 cm) followed by VRO-6 (2.29 cm), COS2206 (2.18 cm) and MB-16 has minimum fruit width (1.72 cm). Genotype Arka Anamika having the maximum fruit weight (33.73 g) followed by VRO-5(32.50 g), MB-11 (32.00 g), MB-4 (30.33 g) and lowest fruit weight was recorded in genotype MB-20 (17.33 g). The number of fruits per plant play important role to decide the total yield of plant. The number of fruits per plant is directly proportionate to the weight of fruit, if number of fruit increases than the individual weight of fruit decreases. Maximum numbers of fruits per plant were recorded in genotype VRO-4 (15.00) followed by MB-7 (14.67), Arka Anamika (14.00), MB-10 (13.33) and minimum number of fruits per plant was recorded in genotype MB-12 (10.00).

The number of seeds per fruit varies from genotype to genotype, which is the genetical characteristics of the plant. The seed is main constituent of the plant system and the viability of seed indicates the germination percentage of individual seed. Most of the fruits contain a valuable amount of seeds, which decides the seed yield of particular crop (5). The genotype MB-6 (73.33) had maximum number of seeds followed by MB-4 (72.33), COS2106 (57.00). The lowest number of seeds was obtained in the genotype MB-8 (40.00). The yield per plant is the most variable factor in any successful crop production programme. The yield per plant decides, the total numbers of fruits borne by individual plant. If plant bears a large number of fruits per plant, than the total yield per plant increases (6). The maximum yield was found in case of genotype VRO-5(485.00 g) followed by Arka Anamika (471.00 g), MB-4 (453.00 g) and MB-7 (414.67 g) whereas the minimum yield was observed in case of MB-20 (179.00 g). The total yield is affected by the soil characteristics, type of varieties/genotype, fertilizers, rate of irrigation, plant protection measures, post-harvest management, growing season, picking rate and other environmental factors which influence the total yield of the crop (7). The maximum yield was recorded in VRO-5 (213.40 q/ha) followed by Arka Anamika (207.07 q/ha) and MB-5 (199.43 q/ha). The minimum yield was found in the genotype of MB-20 (78.80 q/ha). Similar findings were reported by Maurya et al. (8) while evaluating the lines of okra in Varanasi conditions.

Conclusion

Thus, it can be concluded that okra genotypes/ varieties MB-10, MB-4, COS2106, Arka Anamika, Varsha Uphar, Parbhani Kranti, COS-2206, VRO-3, VRO-4, VRO-5, VRO-6, Barkha Bahar, Hisar Unnat, JBS-2, MB-10, MB-20 and Sel-10, were found to be the best among all the genotypes and found to be most suitable for the commercial cultivation in Varanasi region of UP to get maximum production. These genotypes can be used for further breeding program of okra.

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