



PER SE PERFORMANCE OF OKRA GENOTYPES UNDER V.R. GUEDEM CONDITIONS (ANDHRA PRADESH), INDIA

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Abstract

Thirty okra genotypes (includes two check varieties, Arka Anamika and local check) were grown and evaluated for yield and yield attributing traits at Horticultural College and Research Institute, the Department of Vegetable Science, Venkataramannagudem, West Godavari (Andhra Pradesh), India during the period of 2014-15. Under the present investigation, it is observed that among vegetative parameters the traits *viz.*, plant height, number of primary branches per plant, number of nodes on main stem and intermodal length were found to record higher values or at par to higher values in those genotypes which recorded more number of fruits per plant and fruits per plot and *vice versa*. Similarly, among the reproductive parameters number of fruits per plant, length of fruit and girth of fruit, number of pickings and picking duration were found to record higher values in high yielding genotypes and *vice versa*. However, days taken for 50% flowering, days to first picking and the node number at which first flower appeared were comparatively at lower range in the high yielding genotypes indicating their negative association with fruit yield.

Key words : Okra (*Abelmoschus esculentus*), yield, randomized block design (RBD), high yielding genotypes.

Introduction

Okra [*Abelmoschus esculentus* (L.) Monech] is an annual, often cross-pollinated crop belonging to the family Malvaceae. It is one of the important vegetables grown for its immature green non-fibrous edible fruits in the tropical and subtropical parts of the world. Okra is also referred as gumbo, lady's finger and bhendi. It has several uses. Its tender fruits are used as vegetable, eaten boiled or in culinary preparations as sliced and fried pieces. It is also used in thickening of soups and gravies because of its high mucilage content. Fruits are also sliced and sun-dried or canned and pickled for off-season use.

The crop provides an important source of vitamins and minerals (Lamont, 1999). Okra pods in the immature edible stage are rich sources of vitamin A and B and minerals like calcium, phosphorous and iron. It is an excellent source of iodine, thus it could be used in the control of goitre (Purewal and Randhawa, 1947). As a good source of protein, carbohydrate, vitamins and minerals in the diet, the mucilaginous property of crop makes easy the consumption of bulky food (Adeniji and

Kehinde, 2012). Apart from its nutritive value, mature fruits and stems containing crude fibre are used in paper industry. Mucilaginous extracts of the green stem are commonly employed in India for clarifying the sugar cane juice. Dry seeds of okra contain 40 per cent oil and 20 to 30 per cent crude protein (Berry *et al.*, 1988). Sometimes the seeds are roasted and used as a substitute for coffee (Martin, 1982). Okra is said to be very useful against genito-urinary disorders, spermatorrhoea and chronic dysentery.

India is the largest producer of okra in the world and exports considerable amount of fresh okra to the international market, after fulfilling domestic demand (Anonymous, 2005). In India, it is mostly grown during *kharif* season. It is also grown during early winter season of mid cool temperatures when price remains very high and farmers earn handsome remuneration from such a crop. It has good potential as foreign exchange earner and accounts for 60 per cent of the export of fresh vegetables excluding potato, onion and garlic (Sharma and Arora, 1993).

Materials and Methods

The experiment was conducted at Horticultural College and Research Institute, Dr. Y. S. R. Horticultural University, Venkataramannagudem, West Godavari district with 30 diverse okra genotypes during *kharif*, 2014. The experiment was laid out in randomized block design with three replications. Seeds were sown at a spacing of 60 cm between rows and 45 cm between the plants. The observations were recorded on five randomly selected plants per replication for each genotype for eighteen characters.

Results and Discussion

The data on the mean values for eighteen characters under study are presented in tables 1, 2 and 3.

Mean values of the vegetative parameters in okra genotypes (table 1)

Plant height (cm)

Significant differences were observed among the genotypes with respect to plant height at final harvest (table 1). The genotype IC 14909 had the maximum plant height (173.83 cm) which was on par with IC 90079 (170.00 cm), while IC 433420 recorded the minimum plant height of 120.66 cm. The genotypes IC 14909(173.83 cm), IC 90079(170.00 cm) and IC 18533(168.17 cm) were significantly taller than the local check (141.33 cm).

Number of primary branches per plant

The number of primary branches per plant was found to show significant differences among the genotypes under study. The genotype IC 10256-A produced the maximum number of branches per plant (2.50) on par with IC 90077 (2.40), while the genotype IC 18534 had the minimum number of primary branches per plant (1.30). A total of 15 genotypes showed significantly higher number of primary branches per plant when compared to the commercial check Arka Anamika (1.63).

Number of nodes on main stem

There were significant differences among the genotypes in respect of number of nodes on main stem. The genotype IC 14909 recorded the highest number of nodes on main stem (29.00) followed by IC 18533 (25.67). Minimum number of nodes on main stem (14.00) was recorded by IC 433420. The genotypes IC 14909 (29.00) and IC 18533 (25.67) recorded significantly greater number of nodes on main stem as compared to the commercial check Arka Anamika (22.67).

Internodal length (cm)

The variation observed in intermodal length among the genotypes was found to be significant. The minimum

internodal length (5.43 cm) was recorded by the IC 433430, which was on par with IC 33065-A (5.67 cm), whereas the maximum internodal length (9.83 cm) was recorded in IC 89871. Significantly lower intermodal length was observed in 19 genotypes as compared to the commercial check Arka Anamika (6.60 cm).

Leaf area (cm²)

The data given in table 1 revealed that there were significant differences among genotypes with respect to leaf area. The genotype IC 15537 showed maximum leaf area (404.00 cm²) followed by IC 03307 (392.00 cm²) whereas, IC 15438 showed minimum leaf area (234.00 cm²). Fifteen genotypes excelled the commercial check Arka Anamika (307.00 cm²) with respect to leaf area.

Petiole length (cm)

There were significant differences among the genotypes with regard to petiole length. Petiole length was maximum (25.73 cm) in the genotype IC 15537 and minimum (17.00 cm) in IC 15027. Eight genotypes had significantly maximum leaf area than the commercial check Arka Anamika (20.40 cm).

Mean values of flower and fruit parameters in okra genotypes (table 2)

Days to 50 per cent flowering

Significant differences among the genotypes in respect of days to 50% flowering. The genotypes IC 89881 and IC 15027 took minimum number of days (44) to 50 per cent flowering, whereas IC 433420 took maximum number of days (117.08) to 50 per cent flowering. All genotypes were significantly early in flowering as compared to the commercial check Arka Anamika (50.00 days).

Node at which first flower appeared

Significant differences were observed among the genotypes with respect to first flowering node. The genotype IC 18530 produced flower at lower node (4.10) which was on par with IC 18534 (4.17). The genotype IC 433420 produced flower at the highest node (node number 6.40). Twenty five genotypes produced their first flowering at significantly lower node as compared to the local check (4.40).

Fruit length (cm)

The differences observed in fruit length among the genotypes were found to be significant (table 2). Fruit length was maximum in IC 15537 (19.27 cm) on par with IC 14909 (19.20 cm) and minimum fruit length was recorded in IC 433420 (11.20 cm). The genotypes IC 15537(19.27 cm), IC 14909 (19.20 cm), IC 18533 (19.00 cm), IC 18544 (16.50 cm) and IC 03307 (16.00 cm) had significantly longer fruits than the local check (13.80 cm).

Table 1 : Mean values of the vegetative parameters in okra genotypes.

S. no.	Genotypes	Plant height (cm)	No. of primary branches/plant	No. of nodes on main stem	Internodal length (cm)	Leaf area (cm ²)	Petiole length (cm)
1.	IC 18530	156.20	2.13	19.67	6.00	266.33	22.30
2.	IC 33065-A	135.33	2.00	18.00	5.67	328.67	21.03
3.	IC 90082	148.67	1.60	18.17	7.67	255.00	20.67
4.	IC 18544	150.00	2.00	20.00	6.27	360.00	24.07
5.	IC 15537	164.17	1.97	25.00	5.93	404.00	25.73
6.	IC 433430	137.33	1.53	19.00	5.43	277.00	20.57
7.	IC 89876	140.30	2.03	17.33	9.53	344.33	21.43
8.	IC 03307	153.53	1.50	18.50	7.67	392.00	23.23
9.	IC 90077	134.63	2.40	18.33	6.83	345.33	23.50
10.	IC 433420	120.67	1.33	14.00	8.27	384.67	20.50
11.	IC 89926	151.67	1.77	19.67	7.77	338.33	23.17
12.	IC 89881	160.23	2.00	19.00	7.80	395.67	25.33
13.	IC 90079	170.00	2.10	24.33	9.40	378.67	20.83
14.	IC 90078	146.33	1.43	20.00	6.87	236.00	20.00
15.	IC 89936	158.00	1.50	19.67	9.00	324.67	23.67
16.	IC 45823	144.33	1.63	20.33	5.83	266.00	18.67
17.	IC 18534	131.33	1.30	17.00	6.17	332.33	20.60
18.	IC 433472	146.00	1.87	17.60	6.67	269.33	23.00
19.	IC 09856-A	145.17	2.03	21.00	8.47	301.00	23.00
20.	IC 15027	159.33	2.00	23.80	7.27	269.67	17.00
21.	IC 15438	138.67	2.13	17.93	9.07	234.00	19.07
22.	IC 98851	126.67	1.40	17.93	6.53	248.00	17.00
23.	IC 89871	163.00	2.20	21.67	9.83	274.00	21.00
24.	IC 09823-B	134.20	1.60	20.67	7.53	324.33	19.83
25.	IC 14909	173.83	2.00	29.00	8.53	315.33	18.80
26.	IC 10256-A	148.00	2.50	20.00	8.03	249.67	22.40
27.	IC 18533	168.17	1.53	25.67	7.00	304.67	23.83
28.	IC 18532	127.33	2.03	19.87	7.00	384.00	20.00
29.	Arka Anamica (C)	137.00	1.63	22.67	6.60	307.00	20.40
30.	Local (C)	141.33	1.37	22.00	6.80	280.67	19.00
Mean		147.05	1.82	20.26	7.38	313.02	21.32
SE (m)		9.35	0.12	0.87	0.45	3.86	0.93
CV (%)		11.01	11.65	7.42	10.53	2.14	7.54
CD (5%)		26.46	0.35	2.46	1.27	10.94	2.63

Fruit girth (cm)

The data presented in table 2 revealed that there were significant differences among the genotypes in respect of fruit girth. The genotype IC 15537 had maximum girth of 4.87 cm which was on par with IC 03307 (4.60 cm) and minimum fruit girth (2.97 cm) was recorded in the Local check. A total of 27 genotypes had significantly stouter fruits as compared to the commercial check Arka Anamica (3.23 cm).

Fruit weight (g)

Significant differences were observed among the genotypes with respect to fruit weight. The highest fruit weight (23.10 g) was recorded by IC 433430 which was on par with IC 18532 (22.27), IC 15537 (22.00) and IC 433472 (22.00), whereas the lowest fruit weight (16.83 g) was observed in IC 89926. Nine genotypes produced significantly heavier fruits as compared to the local check (18.30).

Table 2 : Mean values of flower and fruit parameters in okra genotypes.

S. no.	Genotypes	Days to 50% flowering	Node at which first flower appeared	Fruit length (cm)	Fruit girth (cm)	Fruit weight (g)	No. of fruits/plant
1.	IC 18530	45.67	4.10	14.53	3.23	18.77	21.47
2.	IC 33065-A	45.67	4.47	12.63	3.03	19.17	17.33
3.	IC 90082	48.67	4.87	15.23	3.13	18.63	21.13
4.	IC 18544	45.33	5.07	16.50	3.10	20.03	19.00
5.	IC 15537	45.00	4.40	19.27	4.87	22.00	27.33
6.	IC 433430	46.67	5.20	15.07	4.57	23.10	16.83
7.	IC 89876	46.33	5.47	12.47	3.83	19.17	21.00
8.	IC 03307	50.00	4.27	16.00	4.60	17.27	24.33
9.	IC 90077	46.00	5.13	13.13	4.23	17.13	21.00
10.	IC 433420	53.00	6.40	11.20	4.33	20.67	16.00
11.	IC 89926	49.00	4.23	14.23	4.03	16.83	23.33
12.	IC 89881	44.00	4.53	13.77	4.57	18.33	22.00
13.	IC 90079	45.00	4.53	15.13	3.47	19.33	24.67
14.	IC 90078	47.00	4.47	12.00	4.00	20.17	19.50
15.	IC 89936	50.00	5.13	13.33	3.43	20.50	22.33
16.	IC 45823	46.00	5.37	14.73	4.07	19.73	21.33
17.	IC 18534	46.00	4.17	13.73	3.90	19.37	19.67
18.	IC 433472	47.00	4.53	15.23	3.10	22.00	17.00
19.	IC 09856-A	45.33	4.80	15.00	3.13	20.10	22.67
20.	IC 15027	44.00	4.40	15.37	4.23	19.27	22.67
21.	IC 15438	47.00	4.73	13.17	3.13	19.43	19.67
22.	IC 98851	48.67	4.80	13.83	3.20	18.20	18.00
23.	IC 89871	45.67	4.53	15.17	3.97	17.93	23.67
24.	IC 09823-B	47.00	4.40	13.57	3.07	17.57	20.00
25.	IC 14909	46.00	4.43	19.20	4.27	18.40	30.00
26.	IC 10256-A	46.33	4.77	17.00	3.83	19.20	21.67
27.	IC 18533	47.00	4.80	19.00	3.50	17.80	27.00
28.	IC 18532	48.33	4.67	14.43	3.63	22.27	16.00
29.	Arka Anamica (C)	50.00	4.93	13.57	3.23	17.53	21.67
30.	Local (C)	51.00	4.40	13.80	2.97	18.30	19.00
Mean		47.09	4.73	14.71	3.72	19.27	21.24
SE (m)		0.69	0.29	0.75	0.24	0.54	1.20
CV (%)		2.54	10.64	8.81	10.95	4.88	9.82
CD (5%)		1.95	0.82	2.12	0.67	1.54	3.41

Number of fruits per plant

The trait exhibited significant differences among the genotypes under study (table 2). Maximum number of fruits per plant (30) was observed in IC 14909, on par with IC 15537 (27.33) and minimum number of fruits per plant was observed in IC 433420 and IC 18532 (16). The genotypes IC 14909(30), IC 15537(27.33) and IC 18533(27.00) had significantly higher number of fruits per plant than the commercial check Arka Anamica (21.67).

Mean values of yield parameters and YVMV infestation in okra genotypes (table 3)

Days to first picking

The data presented in table 3 exhibited showed that there were significant differences among the genotypes. The genotype IC 89876 took minimum number of days (50.00) to first picking, which was on par with IC 89881 and IC 15027 (51.00 days) whereas, IC 03307 took maximum number of days (57.67) to first picking. All the genotypes took significantly lesser number of days to first

Table 3 : Mean values of yield parameters and YVMV infestation in okra genotypes.

S. no.	Genotypes	Days to first pickings	Number of picking	Picking duration (days)	Fruit yield/ plant (g)	Fruit yield/ plot (kg)	YVMV infestation (%)
1.	IC 18530	53.00	13.00	53.00	398.47	9.07	11.00 (19.31)
2.	IC 33065-A	52.67	12.00	50.33	253.63	7.00	33.33 (35.23)
3.	IC 90082	55.33	10.33	44.67	296.10	8.00	50.00 (44.98)
4.	IC 18544	52.33	11.33	46.67	339.53	10.17	12.83 (20.95)
5.	IC 15537	52.00	14.00	56.00	558.97	15.07	41.00 (39.79)
6.	IC 433430	53.67	12.67	51.33	323.17	10.67	26.33 (30.85)
7.	IC 89876	50.00	13.00	53.33	422.03	11.40	23.47 (28.95)
8.	IC 03307	57.67	11.33	49.00	514.33	12.97	52.33 (46.32)
9.	IC 90077	53.00	12.00	52.67	309.43	8.20	63.00 (52.52)
10.	IC 433420	56.00	10.33	43.00	217.00	5.87	97.33 (82.35)
11.	IC 89926	52.67	12.00	50.67	390.70	11.37	42.00 (40.38)
12.	IC 89881	51.00	12.67	52.33	453.00	11.57	46.67 (43.07)
13.	IC 90079	52.00	13.00	54.00	522.87	16.40	59.67 (50.56)
14.	IC 90078	54.00	12.00	52.00	434.13	10.83	37.40 (37.68)
15.	IC 89936	56.67	12.00	50.00	483.53	12.50	44.00 (41.53)
16.	IC 45823	52.67	12.67	52.67	503.70	14.00	55.53 (48.16)
17.	IC 18534	53.00	11.67	49.67	360.13	11.20	23.00 (28.63)
18.	IC 433472	53.67	12.00	50.33	380.00	9.40	21.67 (27.69)
19.	IC 09856-A	52.33	12.00	53.33	495.27	12.17	62.90 (52.48)
20.	IC 15027	51.00	13.00	54.00	518.67	12.50	18.00 (25.07)
21.	IC 15438	53.33	12.33	52.00	345.00	10.47	82.33 (65.16)
22.	IC 98851	55.33	11.67	49.33	248.67	7.37	41.57 (40.12)
23.	IC 89871	52.67	12.67	51.33	546.37	16.53	69.33 (56.38)
24.	IC 09823-B	54.00	13.00	54.33	266.67	6.27	40.33 (39.40)
25.	IC 14909	52.67	14.00	58.00	632.67	18.60	21.00 (27.25)
26.	IC 10256-A	53.00	12.00	49.67	555.50	15.77	34.00 (35.64)
27.	IC 18533	54.00	12.67	55.00	593.17	17.07	7.20 (15.49)
28.	IC 18532	55.33	12.00	52.33	246.67	6.40	32.00 (34.41)
29.	Arka Anamica (C)	57.00	11.67	53.33	468.83	8.27	85.67 (67.88)
30.	Local (C)	56.00	12.00	52.33	345.67	7.07	27.67 (31.71)
Mean		53.60	12.23	51.56	414.13	11.14	42.09 (40.50)
SE (m)		1.08	0.52	1.27	12.64	0.40	1.64 (1.29)
CV (%)		3.51	7.38	4.28	5.29	6.19	6.76 (5.55)
CD (5%)		3.07	1.48	3.60	35.78	1.13	4.65 (3.67)

* Figures in parenthesis indicates arc sin transformation values.

picking as compared to the local check (56.00).

Number of pickings

There were significant differences among the genotypes with respect to number of pickings. The genotypes IC 15537 and IC 14909 gave maximum number of pickings (14.00) whereas IC 90082 and IC 433420 recorded minimum number of pickings (10.33). Genotypes IC 15537(14.00) and IC 14909(14.00) had significantly

maximum number of pickings as compared to the local check (12.00).

Picking duration (days)

The differences noticed in respect of picking duration among the genotypes under study were found to be significant. The genotype IC 14909 recorded maximum picking duration (58.00) which was on par with IC 15537 (55.00). The genotype IC 433420 recorded minimum

picking duration (43 days). Genotype IC 14909 had significantly maximum fruiting period as compared to the commercial check Arka Anamika (53.33 days).

Fruit yield per plant (g)

The genotypes varied significantly in terms of fruit yield per plant. The highest fruit yield per plant (632.67 g) was recorded by IC 14909 followed by IC 18533 (593.17 g) whereas, IC 433420 produced the lowest yield per plant (217 g). Eight genotypes had significantly higher fruit yield per plant as compared to the commercial check Arka Anamika (468.83 g).

Fruit yield per plot (kg)

The fruit yield per plot exhibited significant differences among the genotypes studied. Maximum fruit yield per plot at 18.60 kg was recorded by IC 14909 followed by IC 18533 (17.07 kg) whereas, IC 433420 recorded the lowest yield per plot (5.87 kg). Nineteen genotypes had significantly maximum fruit yield per plot as compared to the commercial check Arka Anamika (8.27 kg).

YVMV infestation (%)

The percentage infestation of YVMV varied significantly among the genotypes. The genotype IC 18533 recorded significantly minimum percentage of infestation 7.20% (15.49% arc sin value) which was on par with IC 18530 11.00% (19.31% arc sin value) whereas, IC 433420 recorded maximum percentage of infestation 97.33% (82.35% arc sin value). Seven genotypes were significantly resistant as compared to the local check 27.67% (31.71% arc sin value).

It is interesting to note from the above results that among vegetative parameters the traits viz., plant height, number of primary branches per plant, number of nodes on main stem and internodal length were found to record higher values or at par to higher values in those genotypes which recorded more number of fruits per plant and fruits per plot and *vice versa*. Similarly among the reproductive

parameters number of fruits per plant, length of fruit and girth of fruit, number of pickings and picking duration were found to record higher values in high yielding genotypes and *vice versa*. However, days taken for 50% flowering, days to first picking and the node number at which first flower appeared were comparatively at lower range in the high yielding genotypes indicating their negative association with fruit yield.

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