



P-ISSN: 2349-8528

E-ISSN: 2321-4902

IJCS 2018; 6(6): 2442-2445

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Received: 05-09-2018

Accepted: 10-10-2018

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Evaluation of studies of different varieties/ hybrids of okra [*Abelmoschus esculentus* (L.) Moench] under Chhattisgarh region

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Abstract

The present investigation entitled evaluation of studies of different varieties/ hybrids OF Okra [*Abelmoschus esculentus* (L.) Moench] under Chhattisgarh region was carried out to evaluate eight open pollinated and eight hybrid varieties of okra at research cum instructional farm at department of Horticulture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) during spring summer season two separate experiments were laid out in RBD replicated thrice. Data recorded on yield and its attributes revealed that in open pollinated varieties Arka Anamika proved its superiority over other open pollinated varieties for number of fruits per plant, number of primary and secondary branches, plant height and yield hybrids, Uphar performed better over other hybrids for the above cited traits. In both open pollinated varieties and hybrid varieties, fruit yield found to be correlated positively with days to first flowering, node at which first flower appeared, days to 50% flowering, number of fruits per plant, fruit length, fruit girth, fruit weight, plant height, nodes per plant, duration of fruiting, days to first harvest, fruit yield/plant(g).

Keywords: evaluation, varieties, okra, *Abelmoschus esculentus*, Chhattisgarh

Introduction

Okra [*Abelmoschus esculentus* (L.) Moench] has occupied a prominent position among vegetables. Okra is known by many local names in different parts of the world. It is called lady's finger in England, Gumbo in U.S.A. and Bhindi in India. Okra is a polyploid, belonging to the family Malvaceae with $2n = 8x = 72$ or 144 chromosome. According to Vavilov (1951)^[15], it was probably domesticated in the Ethiopian region. Okra is an often cross pollinated crop, occurrence of out crossing to an extent of 4 – 19 % pollination. The fruits are a green capsule containing numerous white seeds when immature (Jesus *et al.*, 2008)^[6] and the flowers and upright plants give okra an ornamental value (Duzyaman, 1997)^[4]. The okra fruit can be classified based on the shape, angular or circular (Mota *et al.*, 2005)^[11].

In India it is being cultivated in 5.33 lakh ha. And its annual production is 6346.0 thousand MT. (Anonymous, 2014)^[1]. In Madhya Pradesh okra is grown in 26.51 thousand ha area and 305.91 thousand MT. (Anonymous, 2014)^[1]. Okra is an annual and day neutral plant cultivated in all seasons for its delicious tender pods in one and other different parts of the country. Fresh okra fruit contains 35 calories, 89.6 g water, 6.4 g carbohydrate, 1.9 g protein, 0.2 g fat, 1.2 g fiber and minerals per 100 g of edible portion (Gopalan *et al.*, 2007)^[5]. Okra is said to be very useful against genito-urinary disorders, spermatorrhoea and chronic dysentery (Nadkarni, 1927)^[13]. Okra is an often cross pollinated crop, Heterosis is being exploited in form of development of hybrids. Hence, genetic divergence is an important tool while selecting the parents for hybrid breeding.

Divergence analysis is more authentic and powerful tool for systematic identification of the diverse genotypes for hybridization purposes (Mahalanobis, 1936)^[9]. To develop high yielding varieties, genetic diversity is an important tool to select genetically diverse parents with high yield and wider adaptability in breeding programme. Progress of any breeding programmes depends to a great extent on the availability of genetic variability for desirable traits in genotypes (Kumar *et al.*, 2013, Balai *et al.*, 2014)^[7, 2]. Genetic diversity helps the breeders in deciding the most appropriate breeding method to increase the genetic potentialities as well as to surpass the yield barrier (Langade *et al.*, 2013)^[8]. Use of genetically diverse parents in recombination breeding supposed to give maximum heterosis in F1's and also getting broad

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spectrum of variability for quantitative traits in segregating generations to select desirable recombinant. Therefore, genetic diversity is prerequisites for any successful breeding programme.

Material and Methods

The study was carried out during *summer* season at Horticulture Research cum Instructional farm at Department of Horticulture, IGKV, Raipur. The experiment comprised of eight open pollinated varieties *viz.*, (Krishana, Arka Abhaya, Punjab -7, Arka Anamika, Parbhani Kranti, Sagun, Ankur-35) and eight hybrid varieties *viz.*, (Daftari-X2, Sel-7, Sel-8, Sel-10, Uphar, No-341, Daftari, Supriya, Pahuja), The experiment consisted of three replications under randomized block design (RBD) with plot size 1.80 X 3 =5.40 m². Sowing was done in spacing of 60 X 30 cm with two seeds per hill. 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, *viz.*, days to first flowering, node at which first flower appeared, days to 50% flowering, number of fruits per plant, fruit length, fruit girth, fruit weight, plant height, nodes per plant, duration of fruiting, days to first harvest, fruit yield/plant (g).

Results and Discussion

Plant height

A moderate variability ranging from 118.12 cm to 184.12 cm for open pollinated varieties and 120.28 cm to 176.10 cm for hybrid varieties was noticed with respect to plant height. The plant height was maximum for open pollinated varieties V4 and hybrid varieties H4 which is followed by V2 (179.73 cm) and H3 (174.20 cm) the minimum height was observed in V8 (Daftari-X2) for open pollinated varieties and H8 (Pahuja) for hybrid varieties. The findings are in agreement with the work of Chaudhary *et al.* (2006) [3] found that the five okra hybrids were grown with the okra variety Antara as a check. The results indicated that the growth parameters differed within different hybrids and check variety. The differences in genetic makeup caused this difference. The vegetative characters *viz.*, plant height and internodal length showed positive effect on yield of okra.

Number of nodes per plant

A moderate variability ranging from 118.12 cm to 184.12 cm for open pollinated varieties and from 120.28 cm to 176.10 cm for hybrid varieties was noticed with respect to plant height. The plant height was maximum for open pollinated varieties V4 and hybrid varieties H4 which is followed by V2 (179.73 cm) and H3 (174.20 cm) the minimum height was observed in V8 (Daftari-X2) for open pollinated varieties and H8 (Pahuja) for hybrid varieties.

Fruit length

A significantly medium range of variation was obtained in case of fruit length among the germplasm. A moderate variability ranging from 118.12 cm to 184.12 cm for open pollinated varieties and from 120.28 cm to 176.10 cm for hybrid varieties was noticed with respect to plant height. The plant height was maximum for open pollinated varieties V4 and hybrid varieties H4 which is followed by V2 (179.73 cm) and H3 (174.20 cm) the minimum height was observed in V8 (Daftari-X2) for open pollinated varieties and H8 (Pahuja) for

hybrid varieties. Similar result found to Somashekhar and Salimath (2011) reported that the wider range of variation as evidenced for number of branches per plant, number of fruits per plant, average fruit weight (g), fruit length.

Fruit girth

A narrow range of variation was observed among the A moderate variability ranging from 118.12 cm to 184.12 cm for open pollinated varieties and from 120.28 cm to 176.10 cm for hybrid varieties was noticed with respect to plant height. The plant height was maximum for open pollinated varieties V4 and hybrid varieties H4 which is followed by V2 (179.73 cm) and H3 (174.20 cm) the minimum height was observed in V8 (Daftari-X2) for open pollinated varieties and H8 (Pahuja) for hybrid varieties.

Fruit weight

A significantly moderate range of variation A moderate variability ranging from 118.12 cm to 184.12 cm for open pollinated varieties and from 120.28 cm to 176.10 cm for hybrid varieties was noticed with respect to plant height. The plant height was maximum for open pollinated varieties V4 and hybrid varieties H4 which is followed by V2 (179.73 cm) and H3 (174.20 cm) the minimum height was observed in V8 (Daftari-X2) for open pollinated varieties and H8 (Pahuja) for hybrid varieties. The findings are in agreement with the work of Pandey *et al.* (1994) [10] reported that Pusa Sawani and Parbhani Kranti were at par in respect of growth and yields. Under closer spacing had poor growth (plant height, branches per plant) and yield attributes (fruits per plant and seeds per fruit) than wider spacings, seed yield per unit area was markedly higher with it owing to greater plant population and LAI.

Number of fruits per plant

A significant variation was visualized in the number of fruits per plant among the genotypes ranging from 16.267 to 23.550. A moderate variability ranging from 118.12 cm to 184.12 cm for open pollinated varieties and from 120.28 cm to 176.10 cm for hybrid varieties was noticed with respect to plant height. The plant height was maximum for open pollinated varieties V4 and hybrid varieties H4 which is followed by V2 (179.73 cm) and H3 (174.20 cm) the minimum height was observed in V8 (Daftari-X2) for open pollinated varieties and H8 (Pahuja) for hybrid varieties.

Node at which first flower appeared

Significant range was observed for this trait among the genotypes evaluated. A moderate variability ranging from 118.12 cm to 184.12 cm for open pollinated varieties and from 120.28 cm to 176.10 cm for hybrid varieties was noticed with respect to plant height. The plant height was maximum for open pollinated varieties V4 and hybrid varieties H4 which is followed by V2 (179.73 cm) and H3 (174.20 cm) the minimum height was observed in V8 (Daftari-X2) for open pollinated varieties and H8 (Pahuja) for hybrid varieties. The findings are in agreement with the work of Nagre *et al.* (2011) [12] reported that the highest genotypic coefficient of variation as well as phenotypic coefficient of variation was recorded for leaf area followed by number of nodes per plant, length of fruit, number of leaves per plant, yield per plant, internodal length and chlorophyll content of leaves.

Duration of fruiting

A wide variability ranging from 35.547 to 46.263 was noticed

with respect to duration of fruiting. A moderate variability ranging from 118.12 cm to 184.12 cm for open pollinated varieties and from 120.28 cm to 176.10 cm for hybrid varieties was noticed with respect to plant height. The plant height was maximum for open pollinated varieties V4 and hybrid varieties H4 which is followed by V2 (179.73 cm) and H3 (174.20 cm) the minimum height was observed in V8 (Daftari-X2) for open pollinated varieties and H8 (Pahuja) for hybrid varieties.

Days to first flower

A moderate variability ranging from 118.12 cm to 184.12 cm for open pollinated varieties and from 120.28 cm to 176.10 cm for hybrid varieties was noticed with respect to plant height. The plant height was maximum for open pollinated varieties V4 and hybrid varieties H4 which is followed by V2 (179.73 cm) and H3 (174.20 cm) the minimum height was observed in V8 (Daftari-X2) for open pollinated varieties and H8 (Pahuja) for hybrid varieties.

Days to first harvest

A wide variability ranging from Days to first harvest 38.40 to 46.90 for open pollinated varieties and 37.80 to 47.72 for hybrid varieties was noticed with respect to days to first harvest. Days to first harvest was minimum (38.40 days) in V4 whereas it minimum is (46.90) in V8 is followed by V1 (41.35) and V6 (40.69) the maximum days was observed in V8 (Daftari-X2) for open pollinated varieties and H8 (Pahuja) for hybrid varieties.

Number of disease infected plants

A wider variation was observed for disease incidence among the varieties ranging from (0.00% V4) to 44.88 % in V7 (Ankur-35) followed by 40.96% (V6). However, V3 (32.66 %), V2 (30.22) and V1 (26.90) showed the incidence to lower magnitude. Similar result to Singh and Jain (2012) carried research on fourteen okra hybrid cultivars to identify the most suitable and high yielding hybrid cultivars for commercial cultivation in the Tarai region of the state. The observations were recorded on 12 characters as growth yield, fruit borer and Y.V.M.V. at one month interval. The minimum infestation of fruit borer was recorded in DVR-2 (10.8%) and it was higher in HIHBO-83 (29.6%).

Fruit yield per plant (g)

A significant wide range of variation for this character was recorded ranging from (255.24 to 342.10 g) per plant for open pollinated varieties and (266.13 to 374.22 g) per plant for hybrid varieties was noticed with respect to fruit yield gm per plant. The fruit yield was maximum for open pollinated varieties V4 (Arka Anamika) and hybrid varieties H4 (Uphar) which is followed by V2 (332.22 g) for open pollinated varieties and H3 (338.31 g) for hybrid varieties. The lowest fruit yield per plant (255.24) was obtained from V8 (Daftari-X2) for open pollinated varieties followed by V7 and V6. The findings are in agreement with the work of Patil *et al.* (1996 b) recorded that ten genotypes of okra were recorded no infestation of insects and minimum weight loss, noted among these PI 82009 and PI 378630 had high marketable yields (1095 and 1037 g/plant, respectively), followed by PI 489817 (745 g/plant) and PI 21729 (634 g/plant).

Table 1: Mean performance for fruit yield & its component in Okra.

Varieties/ hybrids	Plant height (cm)	Number of nodes per plant	Fruit length (cm)	Fruit girth (cm)	Fruit weight (g)	Number of fruits per plant	Node at which first flower appeared	Duration of fruiting	Days to first flowering	Days to first harvest	Number of disease infected plants	Fruit yield per plant (g)	
V1	Krishana	176.00	27.13	15.66	6.43	20.44	18.27	5.93	43.59	35.39	41.35	26.90	320.22
V2	Arka Abhaya	179.73	28.93	16.81	6.53	23.02	21.27	6.73	44.59	36.59	46.29	30.22	332.22
V3	Punjab -7	176.67	28.60	16.47	6.44	20.47	21.00	6.20	44.38	35.60	45.36	32.66	325.10
V4	Arka Anamika	184.12	29.16	17.34	6.74	23.12	22.20	7.36	46.20	37.40	38.40	00.00	342.10
V5	Parbhani Kranti	166.80	26.00	15.41	6.30	19.50	17.40	5.67	43.22	35.37	40.78	38.66	302.55
V6	Sagun	160.40	25.80	15.00	6.28	19.38	19.60	5.53	43.03	33.58	40.69	40.96	282.88
V7	Ankur-35	145.10	24.93	13.83	6.15	14.83	21.60	5.13	42.10	32.92	45.36	44.88	254.92
V8	Daftari-X ₂	118.12	25.53	14.07	6.26	17.87	20.67	5.20	42.22	33.03	46.90	40.22	255.24
H ₁	Sel-7	167.20	26.70	16.02	6.12	20.27	20.40	6.63	46.03	38.58	45.10	18.90	321.69
H ₂	Sel-8	144.13	24.47	13.19	5.88	19.88	19.67	4.90	4.18	31.85	39.37	19.91	241.90
H ₃	Sel-10	174.20	26.73	16.74	6.17	21.67	21.13	6.93	46.67	40.10	44.41	15.99	338.31
H ₄	Uphar	176.10	29.80	17.60	6.30	21.90	21.42	7.75	47.20	42.42	37.80	10.12	374.22
H ₅	No.341	162.73	26.40	15.89	5.97	18.40	20.20	6.47	45.81	37.81	42.66	24.17	305.09
H ₆	Daftari	158.67	26.00	15.75	5.94	18.07	20.13	5.83	43.96	37.55	45.07	25.88	290.91
H ₇	Supriya	150.53	25.60	15.44	5.83	17.67	19.13	5.40	43.85	37.45	42.88	28.55	273.50
H ₈	Pahuja	120.28	25.20	15.16	5.72	16.10	18.67	5.30	40.03	35.53	47.72	30.66	266.13
	SE(±)	12.55	2.33	1.80	0.90	1.66	3.00	1.33	4.12	2.66	2.66	6.22	33.22
	C. D. (0.05)	34.55	5.44	3.78	1.88	3.22	9.44	3.44	12.33	6.88	6.33	17.90	94.56

Table 2: Analysis of variance for fruit yield and its component characters in okra.

S. no.	Characters	Mean sums of square		
		Replication (2)	Genotypes (18)	Error (34)
1.	Plant height (cm)	980.533**	533.090**	340.035
2.	Nodes per plant	33.686**	14.030**	8.568
3.	Fruit length (cm)	0.736	5.768**	1.866
4.	Fruit girth (cm)	0.106	0.205	0.076
5.	Fruit weight (g)	2.358	19.468**	1.971

6.	Number of fruits per plant	3.658	9.109**	3.461
7.	First flowering node	0.942	1.763	0.753
8.	Duration of fruiting	2.133	31.082**	5.019
9.	Days to first flowering	1.064	12.306**	4.066
10.	Days to first harvest	1.407	16.637**	3.979
11.	Number of disease infected plant	86.357**	1216.514**	84.466
12.	Yield per plant (g)	4900.886**	7066.161**	2228.008

*: Significant at 5%, **: Significant at 1%.

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