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Evaluation of Okra [*Abelmoschus esculentus* (L.) Moench] hybrids for growth parameters under Allahabad agro climatic condition

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Abstract

The present investigation was carried out at Vegetable Research Farm, Department of Horticulture, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad (Uttar Pradesh), during 2014-15 with an aim to evaluate okra hybrids for growth parameters under Allahabad condition. Various morphological parameters viz., days to 50% germination, plant height(cm), number of leaves/plant, number of branches/plant, inter nodal length(cm), days to first flower appears, days to emergence of 50% blooming, first pod (fruit) occurring node, length of fruit (cm), fruit girth (cm), fresh weight of fruit (g), number of seeds per fruit, number of fruits per plant, fruit yield per plant (g) were recorded. Among all hybrids, OKHYB-8 took minimum (3) days for 50% germination whereas hybrid OKHYB-12 took maximum (6.5) days for 50% germination. Hybrid OKHYB-15 was rated as superior for plant height, length of fruit, fresh weight of fruit, number of seeds per fruit, number of fruits per plant and fruit yield per plant. Result obtained from present study provided useful information on variability among various morphological traits of okra hybrids which can be used in Allahabad region for cultivation of hybrids. From the present investigation it can be concluded that okra hybrid OKHYB-15 performed well for various growth and yield traits under Allahabad condition.

Keywords: Okra, hybrids, growth, yield, morphological traits

Introduction

Okra (*Abelmoschus esculentus* L. Moench) also known as lady's finger or bhendi belongs to family Malvaceae, having highest chromosome number among vegetables ($2n=130$). It is native to Africa and grown in tropical and subtropical parts of the world. India is one the leading okra producer with the production of 6.346 million tones per year from an area of 0.532 million ha, with the productivity of 11.9 t/ha (National Horticulture Board 2014) and it is cultivated extensively round the year for its immature fruits Javed, H., Aziz, M. A. and Leghari, R. A. K., (2009) [1]. Tender fruits are used as vegetables or in culinary preparations as sliced or dried pieces. Mature fruits and stem containing crude fiber and are used in paper industry. Its fruits have high nutritive, medicinal and industrial value and export potential. Its fruits are rich in vitamins, calcium, potassium and other mineral matters Camciuc, M., Bessifre, J. M., Vilarem, G. and Gaset, A., (1981) [3]. Okra contains highest amount of iodine which prevents from goiter disease and often recommended by nutritionists because it control cholesterol level and weight reduction programmes. Okra is very effective in frightening against ulcers, physiological conditions and depressions. The antioxidant activity of this crop is due to presence of vitamin A, B and C that prevents the oxidative damages by free radicals also helps in lowering down the aging process Phisut, N., Rattanawedee, M. and Aekkasak, K., (2013) [2]. Okra production and productivity is seriously affected by the use of low yielding local varieties, sub optimal plant density, heavy attack of insect pests, diseases and weeds etc. One of major problem in okra cultivation is the selection of low yielding varieties due to which productivity in India is less as compared to other countries. Higher production of this crop is possible by the cultivation of varieties or hybrids which show remarkable enhanced returns, compared to other cultivars grown at same climatic conditions and inputs applied. However, productivity could be improved through careful evaluation and selection of proper okra varieties or hybrids based on location Deepak, K., Saryam, S. K., Mitra, A. K., Mehta, Prajapati, S. and Kadwey, S., (2015) [4]. Keeping these considerations in view, the present investigation was carried out with an objective to evaluate the growth and yield parameters of okra hybrids.

Materials and Methods

The present investigation was carried out at Vegetable Research Farm, Department of

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Horticulture, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad (Uttar Pradesh) during 2014-15. Experimental material comprised 14 okra hybrids (Table 1). All hybrids were evaluated in a randomized block design with three replications. The soil of the plot was sandy loam in texture having good fertility, properly levelled and well drained.

Row –to- Row and Plant –to- Plant 60cm and 30cm respectively. Cultural and agronomic practices were followed as per the standard recommendations and need based plant protection measures were taken up to maintain healthy crop stand. Observations were recorded on five competitive plants excluding border plants in each replication in each hybrid for days to 50% germination, plant height(cm)(30, 60 and 90DAS), number of leaves/plant(30, 60 and 90DAS), number of branches/plant, inter nodal length(cm), days to first flower appears, days to emergence of 50% blooming, first pod (fruit) occurring node, length of fruit (cm), fruit girth (cm), fresh weight of fruit (g), number of seeds per fruit, number of fruits per plant, fruit yield per plant (g).

Table 1: Okra hybrids used in present investigation

Name of Hybrids	Source
OKHYB-1	IIVR,VARANASI
OKHYB-2	IIVR,VARANASI
OKHYB-4	IIVR,VARANASI
OKHYB-5	IIVR,VARANASI
OKHYB-6	IIVR,VARANASI
OKHYB-7	IIVR,VARANASI
OKHYB-8	IIVR,VARANASI
OKHYB-10	IIVR,VARANASI
OKHYB-12	IIVR,VARANASI
OKHYB-13	IIVR,VARANASI
OKHYB-15	IIVR,VARANASI
Pusa Sawani	IIVR,VARANASI
Arka Anamika	IIVR,VARANASI
HOK-152	IIVR,VARANASI

Results and Discussion

Okra hybrids exhibit variability with respect to various growth and yield traits (Figure 1, 2 and Table 2). Days required for 50% germination ranged from 3 to 6.5 (Table 2). The hybrid OKHYB-12 took maximum days to 50% germination (6.5 days) followed by Pusa sawani (4 days) and OKHYB-5 (3.83 days). Minimum days to germination were observed in OKHYB-8 (3 days) followed by OKHYB-7(3.08 days). The quick germination in hybrid OKHYB-8 may be due to soft seed coat and good ability of the seed to adapt in the soil conditions and the other reason may be due to hard seed coat characteristic of other varieties except OKHYB-8. The result from present investigation on 50% germination is confirmation with the findings of Falusi *et al.* (2012) [5]. Plant height was recorded at 30, 60 and 90 days after sowing (DAS). The Plant height of okra hybrids at 90 DAS varied from 93.6 to 163.07 cm (Figure 1). The maximum plant height at 90 DAS was recorded in OKHYB-15 (163.07 cm) followed by OKHYB-10 (141.27 cm). However, minimum plant height was observed in OKHYB-12 (93.6 cm) followed by OKHYB-12 (108.59 cm). This may be because of the hybrid OKHYB-15 capability in tolerance for yellow vein mosaic virus. However other hybrids were affected by yellow vein mosaic virus and thus the plant parameters such as plant height was affected. Similar findings were reported by Chadha *et al.* (2014) [6] and Singh *et al.* (2015) [7]. Number of leaver per plant was recorded at 30, 60 and 90DAS. It was

ranged from 21.87 to 58.07 leaves (Figure 2). The maximum number of leaves at 90 DAS was recorded in Arka Anamika (58.07 leaves) followed by HOK-152 (42.2 leaves) and minimum number of leaves were observed in OKHYB-7 (21.87 leaves) followed by OKHYB-12 (23.13 leaves). This variation in number of leaves per plant may be due to variation in number of branches and plant height as well as photosynthesis ability of each hybrid. Optimum number of branches per plant with upright behaviour is considered as desirable trait in okra. Number of branches per plant varied from 2.67 to 4.6 (Table 2). Among the 14 hybrids, maximum number of branches per plant were reported in check variety Arka Anamika (4.6 branches) followed by HOK-152 (4.33branches) and OKHYB-4 (4.2 branches). The minimum number of branches per plant were observed in OKHYB-8 and OKHYB-2 (2.67 branches) followed by OKHYB-13 (2.73 branches). This variation in number of branches per plant might be due to variation in plant height as well as photosynthetic ability of the each hybrid. The result from present study is in confirmation with the findings of Nwangburuka *et al.* (2012) [10] Singh and Jain (2012) [11] and Reddy *et al.* (2013) [12]. Days to first flowering ranged from 34.33 days to 41 days. The minimum days to first flowering was recorded in OKHYB-8 (34.33 days) followed by OKHYB-1 and OKHYB-5 (35 days). Maximum days were taken by OKHYB-4 (41 days) followed by Arka Anamika (40.33 days) (Table 2). The variation might be due to its genetic makeup of short vegetative phase which enhance its early flowering. Similar results have been reported by Tiwari and Singh. (2003) [8] and Wankhade *et al.*, (1995) [14]. The intermodal length ranged from 3.55 cm to 4.42 cm (Table 2). The minimum intermodal length was recorded in OKHYB-6 (3.55 cm) followed by OKHYB-7 (3.57 cm), maximum intermodal length was observed in Pusa sawani (4.42 cm) followed by OKHYB-4 (4.32 cm). The variation in length of inter nodes per plant might be due to specific genetic make-up of different hkykbrids and prevailing environmental condition. Reddy *et al.*, (2013) [12]. The results indicated that all the hybrids showed significant differences in relation to days taken to 50% flowering. The minimum days (36.33) to 50% flowering were recorded in OKHYB-5 followed by 36.67 days in OKHYB-8. The maximum days to 50% flowering were noticed in Arka Anamika, OKHYB-4 i.e. 43.67 days followed by 42.42 days in HOK-152 and 42.00 days in OKHYB-6. The difference in days to 50% flowering in different hybrids may be due to difference in their genetic makeup and prevailing environmental conditions. Similar results have been reported by Dhankhar and Dhankhar (2002) [16] and Singh and Singh, (2008) [17]. In out of 14 hybrids studied, minimum first pod appears node were found (4.80 node) in hybrid OKHYB-12, followed by (4.93 node) in hybrid OKHYB-7. Whereas maximum first pod appears nodes were notified (6.80 node) in OKHYB-4 followed by (6.60 node) in hybrid OKHYB-6 and Arka Anamika. The difference in first pod appears node in different hybrids may be due to difference in their genetic make-up and prevailing environmental condition. Similar results have been reported by Reddy *et al.*, (2013) [12]. The maximum fruit length (cm) were observed in OKHYB-15 (13.26cm) followed by (12.28cm) in hybrid OKHYB-10 and (11.68cm) in OKHYB-6 whereas minimum fruit length (10.32cm) was found in OKHYB-12. The difference in average fruit length (cm) in different hybrids may be due to difference in their genetic make-up. Similar results have been reported by Singh and Jain, (2006) [19] and Singh and Jain. (2007) [18]. The maximum

fruit girth was recorded in hybrid OKHYB-2 (6.33 cm), followed by Pusa Sawani (6.25 cm) and OKHYB-15 (6.23 cm) which were at par with each other. The minimum fruit girth was noted in Arka Anamika (5.66 cm) followed by OKHYB-12 (5.72 cm). The difference in fruit girth in different hybrids may be due to difference in their genetic makeup. Similar findings were also reported by Jindal and Arora. (2010) [20]. The maximum fresh weight of fruit (g) was observed in hybrids OKHYB-15 (14.12g) followed by OKHYB-10 (14.09g) and OKHYB-7 (13.82g) whereas minimum fresh weight of fruit was found in HOK-152 (11.15g) followed by Arka Anamika (11.18g). This variation might be due to differences in the vegetative growth of hybrids which leads to variation in photosynthesis and ultimately fruit weight. Dhall *et al.*, (2003) [21] and Saitwal *et al.*, (2011) [22]. Also reported more or less similar findings in his experiment. The maximum number of seeds per fruit was observed in hybrids OKHYB-15 (64.33 seeds) followed by HOK-152 (64.20 seeds) and OKHYB-4 (62.67seeds) whereas minimum number of seed per fruit (44.83 seeds) was found in

OKHYB-10 followed by OKHYB-1 (45.47 seeds).The difference in number of seeds per fruit in different hybrids may be due to difference in their genetic make-up. These findings are in close conformity with the findings of Muhammad *et al.*, (2001) [23]. The maximum number of fruits per plant was observed in OKHYB-15 (31.27 fruits) followed by OKHYB-10 (29.47 fruits) and OKHYB-4 (28.47 fruits) whereas minimum number of fruits per plant (21.00 fruits) was found in OKHYB-12 followed by OKHYB-5 (22.32 fruits). This shows that when number of branches, less internodal length and plant height increased number of fruits also increased. Similar results were observed by Sachan, V. K., (2006). The fruit yield per plant was maximum in the treatment OKHYB-15 (441.48g) followed by treatment OKHYB-10 (415.19g), OKHYB-4 (388.47gms) and the minimum fruit yield per plant was observed in OKHYB-12 (265.11g). The yield of fruit per plant is directly related with high number of branches, number of fruits and fruit weight, similar results were reported by Mahapatra *et al.* (2007) [25] and Simon *et al.* (2013) [26].

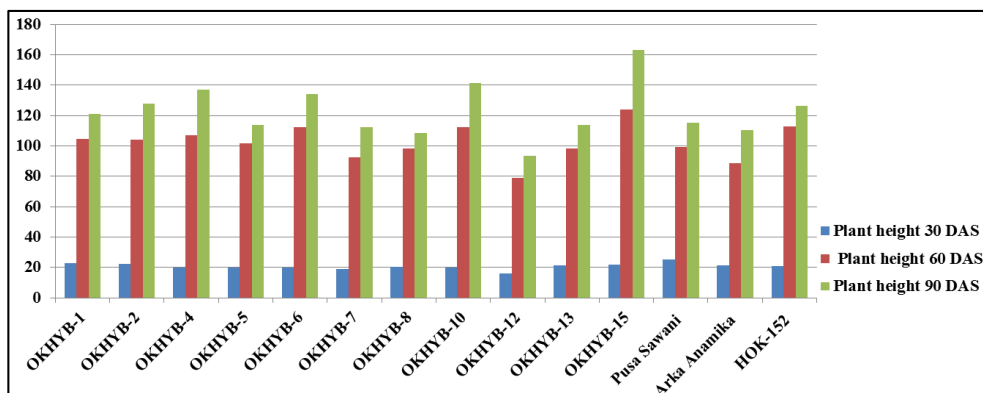


Fig 1: Plant height of various Okra hybrids at different day’s intervals

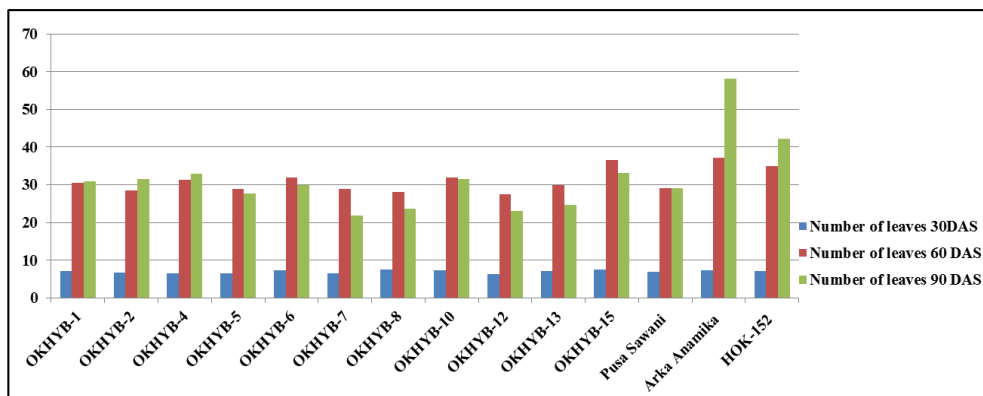


Fig 2: Number of leaves of various Okra hybrids at different days intervals

Table 2: Performance of okra hybrids for various growth and yield traits

Parameters	Treatments												Pusa Sawani	Arka Anamika	HOK-152
	Okhyb-1	Okhyb-2	Okhyb-4	Okhyb-5	Okhyb-6	Okhyb-7	Okhyb-8	Okhyb-10	Okhyb-12	Okhyb-13	Okhyb-15				
50% Germination	3.17	3.42	3.25	3.83	3.33	3.08	3	3.58	6.5	3.58	3.5	4	3.58	3.33	
Number of Branches/Plant	3.07	2.67	4.2	3.2	3.53	2.87	2.67	3.47	2.87	2.73	3.8	2.8	4.6	4.33	
Internodal Length (cm)	4.16	3.85	4.32	4.16	3.55	3.57	3.83	3.64	4	3.73	3.73	4.42	4.24	3.77	
Days to First flower Appears	35	35.33	41	35	38.67	35.67	34.33	38.58	38.25	36.67	38.33	36	40.33	39.33	
Days to Emergence of 50% Blooming	37.17	37.33	43.67	36.33	42	39	36.67	40.75	40.83	39.33	41.67	39.93	43.67	42.42	
First pod Occuring Node	5.2	5.07	6.8	5	6.6	4.93	5.27	5.4	4.8	5	5.4	5.33	6.6	6.07	
Length of Fruit (cm)	11.36	11.15	11.55	11.62	11.68	10.95	11.34	12.28	10.32	10.5	13.26	10.54	10.54	10.77	
Fruit Girth (cm)	6.02	6.33	6.16	6.09	6.19	5.83	6.04	6.11	5.72	5.83	6.23	6.25	5.66	5.79	
Avgerage Fresh Weight of Fruit (g)	13.52	13.81	13.65	13.22	13.36	13.82	13.34	14.09	12.62	13.16	14.12	12.59	11.18	11.15	
Number of Seeds per Fruit	45.47	48.33	62.67	54.42	49.07	47.47	49.93	44.83	51.13	57.33	64.33	55.93	47	64.2	

Number of Fruits per Plant	24.63	24.8	28.47	22.32	27.81	22.38	23.07	29.47	21	24.87	31.27	22.87	24.7	27.45
Fruit yield Per Plant (g)	332.97	342.35	388.47	295.08	371.54	309.14	307.87	415.19	265.11	327.24	441.48	287.86	276.43	306.05

Conclusion

It is concluded that based on the mean performance of all the fourteen growth and yield attributes hybrid OKHYB-15 was found to have maximum plant height (163.07 cm), maximum pod (fruit) length (13.26 cm), maximum fruit fresh weight (14.12 g), maximum number of seeds per fruit (64.33 seeds), highest number of fruits per plant (31.27 fruits) and maximum fruit yield per plant (441.48 g) over the check varieties Pusa sawani, Arka Anamika and HOK-152.

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