



## Performance Evaluation of Some Selected Okra Genotypes

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### Authors' contributions

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

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### ABSTRACT

The experiment was conducted at the experimental farm, Department of Horticulture, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur to evaluate the Performance of Selected Okra Genotypes for Growth and Yield Parameter. The study was laid out in Randomized Complete Block Design (RCBD) from March 2008 to July 2008. The studied characters were plant height, branches plant<sup>-1</sup>, days to first flowering, days to first fruit harvest, picking duration, fruit length, fruit diameter, fruits plant<sup>-1</sup>, fruit weight, picking duration, yield plant<sup>-1</sup>, yield hectare<sup>-1</sup> and virus infestation. The results showed that studied genotypes differed significantly regarding all the character studied. The maximum plant height (173.92 cm), days to first flowering (40.00), days to first fruit harvest (9.33), picking duration (49.33) found in Green glory genotypes while maximum branches plant<sup>-1</sup> (2.50) found in Seminis. The highest fruit length (15.85 cm) and fruit weight (17.81 g) was recorded in IPSA okra, fruit diameter (18.54 mm) in Green glory, fruits plant<sup>-1</sup> (15.27), yield plant<sup>-1</sup> (250.24 g), yield hectare<sup>-1</sup> (13.73 t ha<sup>-1</sup>) in Jhalak while lowest virus infestation also recorded in Jhalak in all the studied days after sowing. From the present investigation, it can be concluded that the genotypes 'Jhalok' and 'BARI Dherosh 1' performed better among the studied genotypes and can be recommended for commercial cultivation.

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**Keywords:** Okra; genotypes; yield; performance.

## 1. INTRODUCTION

Okra (*Abelmoschus esculentus*) is a popular green fruit vegetable in Bangladesh [1]. It is one of the most widely known and utilized species of the family *Malvaceae* [2]. It is an annual herbaceous hairy vegetable crop grown in tropical and sub-tropical parts of the world and also grows well in the warm season [3]. Another name of the crop is Lady's finger and locally called 'Dherosh' or 'Bhendi' [4]. Okra is a multipurpose crop due to its various uses of the fresh leaves, buds, flowers, pods, stems and seeds [5]. Its immature green fruits are consumed as vegetables, can be used in salads, soups and stews [6]. It offers mucilaginous consistency after cooking. Okra pods contain some minerals like Calcium, Iron and Zinc [6]. Vegetable production and supply are not uniform round the year in Bangladesh [7]. Vegetables are abundant in winter but scanty in summer, and the shortage is acute during September to mid-November [2]. Okra production in Bangladesh is mainly limited from February to July [8]. It's sowing time and numbers of crops in a year are determined by the temperature conditions [9]. Summer season crop, in general, is seen to suffer from pest infestation which is mainly determined by climatic factors. So, the okra production in the summer season may meet up the market demand by using higher yield potential cultivar during the lean period of vegetable supply and improve the nutritional status of the people. Of the total vegetable production around 30% is produced during the Kharif season and around 70% is produced in the Rabi season [10]. So, as a vegetable, okra can get importance in summer season production. So, to meet up our daily vegetable requirements as well as the shortage of vegetable production, okra can improve vegetable production in our country [11]. The unavailability of quality seed is the most important reason for low yield [12]. High yield potential genotype with good characteristics is the basis of successful crop production and is an important for increasing productivity [13]. Good knowledge of genetic resources might also help in identifying desirable cultivars for commercial cultivation. Lack of high yielding, disease and pest tolerant variety is the main constraints toward its production. There are a lot of okra varieties are available in the market. Farmers choose any one of okra variety without knowing the quality but only trust the traders. Sometime

they may succeed or fail to achieve their goal. To rescue the okra vegetable farmers from such uncertainty the present study was undertaken to know the performance and also to know the status of virus infestation of the <sup>studied</sup> okra genotypes.

## 2. MATERIALS AND METHODS

### 2.1 Plant Material, Experimental Design and Growing Condition

This experiment was conducted at the experimental farm, Department of Horticulture, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur, Bangladesh from March 2008 to July 2008. The location of the site is 24.09°N latitude and 90.26°E longitude with an elevation of 8.2 m from sea level [14]. The climate of the experimental site is subtropical that is characterized by heavy rainfall from May to September and scanty during the rest of the year. The soil of the experimental site was sandy loam in texture having a pH of 6.3. It belongs to the silty clay loam of shallow red-brown terrace soil under the Salna series. Fourteen genotypes of okra were included in this experiment. These varieties are cultivated commercially widely as well as popular at farmer's level in the country. The name of the varieties with their country of origin and name of organization or company is presented in Table 1. The experiment was carried out in Randomized Complete Block Design (RCBD) with three replications. The unit plot size was 4.0 m X 1.5 m. Each of the unit plots was separated by 0.50 m and block to block were 1.0 m apart. Every unit plot had 3 rows with 10 plants of each row. So, the total number of plants per plot was 30.

The field was plowed and cross-plowed several times to get a good tilth. The weeds and stubbles were removed and the land was finally prepared by the addition of well-decomposed cowdung at the rate of 5 t ha<sup>-1</sup>. The plots were raised 10 cm from the soil surface to keeping the drain around the plot. To grow okra genotypes, the following rate and methods of manure and fertilizer are applied [15] which is shown in Table 2.

The seeds were sown in rows of the raised bed. The row to row and plant to plant spacing was maintained 50 cm and 40 cm, respectively. Two to three seeds were sown in each pit. Then the seeds were covered with fine soil. The necessary

**Table 1. List of okra genotypes used in the experiment**

Genotypes	Origin/Country	Company/Organization
Anamika	India	Chad seed company
Antara	India	Rajib seed store
Arka Anamika	India	United seed store
BARI Dherosh 1	Bangladesh	BARI, Gazipur
Ghinuk	Bangladesh	United seed store
Green Boy	Bangladesh	United seed store
Green Glory	Bangladesh	East west seed ltd.
IPSA Okra	Bangladesh	BSMRAU, Gazipur
Jhalok	Bangladesh	United seed store
Kanchan	Bangladesh	United seed store
Liza-151	India	Hi seed company
Rupaly	Bangladesh	United seed store
Seminis	USA	Hi seed company
Sobuj Bangla	Bangladesh	United seed store

**Table 2. Name and doses of manure and fertilizer with their application methods**

Manure/fertilizer	Total amount (kg ha <sup>-1</sup> )	Basal dose (kg ha <sup>-1</sup> )	Top dressing (kg ha <sup>-1</sup> )		
			First (30 days after sowing)	Second (50 days after sowing)	Second (80 days after sowing)
Cowdung	14000	Entire amount	-	-	-
Urea	150	75	25	25	25
Triple Super Phosphate	100	Entire amount	-	-	-
Muriate of Potash	150	75	25	25	25

intercultural operations were done throughout the cropping season for the proper growth and development of the plants. Five to six days after germination only one healthy seedling was kept to grow in each pit and other seedlings were removed. Irrigation was given after the germination of seedling up to fruiting as and when required. The stagnant water was effectively drained out at the time of heavy rain. The mulching was done at regular intervals to break the soil crust. For controlling borer insect, Malathion @ 0.2 ml L<sup>-1</sup> was sprayed thrice at an interval of 7 days started as soon as the pest appeared. Admare @ 0.5 ml L<sup>-1</sup> was sprayed three times at an interval of 7 days when hopper and Jassid found in the experiment field. Ten plants were selected from each plot at a random for collecting data. The studied characters were plant height, branches plant<sup>-1</sup>, days to first flowering, days to first fruit harvest, fruit length, fruit diameter, fruit weight, fruits plant<sup>-1</sup>, picking duration, yield plant<sup>-1</sup>, yield hectare<sup>-1</sup> and virus infestation.

## 2.2 Statistical Analysis

The recorded data on different parameters were statistically analyzed by using MSTAT-C

software to find out the significance of variation resulting from the experimental treatments. The difference between the treatment means was judged by Duncan's Multiple Range Test (DMRT) according to Gomez and Gomez [16].

## 3. RESULTS AND DISCUSSION

### 3.1 Plant Height

A significant variation was observed in plant height among the genotypes (Table 3). Plant height in the study varied from 123.17 to 174.22 cm. The tallest plant was produced by 'Rupaly' (174.50 cm) which was identical to 'Green Glory' 'Ghinuk' and 'Seminis' (173.92, 171.17 and 170.25 cm, respectively). Plants of 'Kanchan' and 'Sobuj Bangla' were significantly shorter in stature (123.17 and 131.50 cm, respectively) than those of the other eight genotypes. It might be due to inherent potentiality of the genotypes. Muhammad et al. [17] Reported similar results in case of variety Akra Anamikca.

### 3.2 Branches Plant<sup>-1</sup>

The number of branches plant<sup>-1</sup> showed significant variation (Table 3) and the genotype

'Seminis' (2.50) was highest in this respect. The genotype 'Kanchan' and 'Green Glory' (2.43 and 2.42 respectively) were statistically similar while 'IPSA Okra' produced significantly lowest (1.00) number of branches plant<sup>-1</sup> which were identical with 'Green Boy' and 'Sobuj Bangla' (1.33 and 1.42 respectively). The other genotypes were produced more or less the same number of branches. Branches plant<sup>-1</sup> in the study varied from 1.00 to 2.50. This variation in number of leaves plant<sup>-1</sup> may be due to variation in number of branches and plant height as well as photosynthesis ability of each hybrid. Optimum number of branches plant<sup>-1</sup> with upright behavior is considered as desirable trait in okra. Singh et al. [18] reported that branch production changed due to changes in both environment and varieties.

### 3.3 Days to First Flowering

The fourteen genotypes showed significant variation in respect of days to first flowering (Table 3). Genotypes required around 35 to 40 days to first flowering. The earliest flowering was recorded from 'Jhalok' (35 days) and 'Sobuj Bangla' (35 days) which was at par with 'Rupaly' 'Liza-15' 'Ghinuk' 'Kanchan' and 'BARI Dherosh 1' while the late flowering was observed in 'Green Glory' (40 days) and 'IPSA Okra' (38.33 days). Thakur et al. [9] recorded that the earliest to flowering in 45 days after sowing in an evaluation trial with four high yielding okra genotypes. Days to first flowering were lower in the present study compared to the reported result it might be due to the difference of genotypes used in the present study as well as the difference of growing environment.

### 3.4 Days to First Fruit Harvest

There was significant variation was observed among the genotypes for days to first fruit harvest (Table 3). Among the genotypes, the earliest fruit harvest was done in the genotype 'Arka Anamika' which required only 5.22 days after anthesis followed by the genotype 'Rupaly' (6.00 days). On the other hand, the late fruit harvest was done in the case of 'Green Boy' 'Antara' and 'Green Glory' (9.33 days) day after anthesis. The rest of the nine genotypes i.e. 'Seminis' 'Sobuj Bangla' 'Liza-151' 'Jhalok' 'Anamika' 'Ghinuk' 'Kanchan' 'BARI Dherosh 1' and 'IPSA Okra' took (6.33 to 8.67) days which was statistically similar. Days to first fruit harvest were found to vary from 5.22 to 6.33 days after anthesis in present investigation which is in agreement with the findings of Mathew et al. [19].

### 3.5 Picking Duration

The fourteen genotypes showed significant variation in respect picking duration (Table 3). Among all the genotypes, fruit harvesting was done in the case of 'Green Glory' continued for the longest period of 49.33 days. The genotypes 'Green Boy' and 'Antara' carried a longer time (47.33 and 47.33 days, respectively) which were statistically similar, while the 'Sobuj Bangla' had significantly shortest duration (42.67 days) of picking. The genotypes 'Seminis', 'Arka Anamika', 'Rupaly', 'Liza-151', 'Jhalok', 'Anamika', 'Ghinuk', 'Kanchan', 'BARI Dherosh 1' and 'IPSA Okra' which were statistically similar. The duration of picking in the study varied from 42.67 to 49.33 days. Islam et al. [20] Reported that picking duration varied from 35.92 to 46.83 days in an evaluation of three okra cultivars. The present result is within the range of the reported result.

### 3.6 Fruit Length

A significant variation was recorded in fruit length among the genotypes (Table 4). The longest fruit was observed in 'IPSA Okra' (15.85 cm) which was at par with 'Green Glory' and 'Jhalok' while the shorted fruit was produced in the genotype 'Kanchan' (12.55 cm). Fruit length in the study varied from 12.55 to 15.85 cm. Thakur et al. [9] reported that fruit length varied from 12.55 to 12.88 cm. The present result is within the range of the reported result.

### 3.7 Fruit Diameter

The widest fruit diameter found in genotype 'Green glory' (18.54 mm) which was at par with 'BARI Dherosh 1' 'Jhalok' 'Ghinuk' and 'Green Boy' (Table 4). The 'Kanchan' have the shortest (15.57 mm).

'Seminis' (15.72 mm). Fruit diameter in the study varied from 15.57 to 18.54 mm. 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 Deepak [21].

### 3.8 Fruit Weight

A significant difference was observed among the okra genotypes in respect of individual fruit weight (Table 4). The highest fruit weight was observed in 'IPSA Okra' (17.81 g) and 'Rupaly' (17.71 g) which were statistically similar with

**Table 3. Growth parameters okra genotypes**

Genotypes	Plant height (cm)	Branches plant <sup>-1</sup>	Days to first flowering	Days to first fruit harvest	Picking duration
Anamika	160.25 ab	2.08 a-c	37.33 bc	8.67 ab	46.00 b-d
Antara	139.00 bc	2.00 a-c	38.00 bc	9.33 a	47.33 ab
Arka Anamika	135.50 bc	1.87 b-d	38.00 bc	5.33 e	43.33 fg
BARI Dherosh 1	140.50 bc	1.75 cd	36.67 b-d	6.67 c-e	45.67 b-e
Ghinuk	171.17 a	2.08 a-c	36.67 b-d	7.33 b-d	44.00 d-g
Green Boy	135.75 bc	1.33 de	38.00 bc	9.33 a	47.33 b
Green Glory	173.92 a	2.42 ab	40.00 a	9.33 a	49.33 a
IPSA Okra	157.25 ab	1.00 e	38.33 ab	6.33 c-e	44.67 c-g
Jhalok	142.67 bc	1.87 b-d	35.00 d	7.00 cd	46.67 bc
Kanchan	123.17 c	2.43 ab	36.33 cd	7.33 b-d	43.67 e-g
Liza-151	160.50 ab	2.17 a-c	36.67 b-d	7.33 b-d	44.00 d-g
Rupaly	174.50 a	2.18 a-c	36.67 b-d	6.00 de	45.33 b-f
Seminis	170.25 a	2.50 a	37.00 bc	6.33 c-e	43.33 fg
Sobuj Bangla	131.50 c	1.42 de	35.00 d	7.67 bc	42.67 g
CV%	8.63	15.78	15.78	10.42	2.60

Values in a column with same letter(s) are statistically similar at 0.05 level of significance

'Anamika', 'Arka Anamika', 'BARI Dherosh 1', 'Ghinuk', 'Green Boy', 'Green Glory', 'Jhalok' and 'Liza-151'. The fruit weight of 'Kanchan' was significantly lowest (13.96 g). Anonymous [14] recorded that the individual fruit weight in an evaluation trial with five okra cultivars. Individual fruit weight was within the range of the present study compared to the findings of Amanullah et al. [22].

### 3.9 Fruits Plant<sup>-1</sup>

The highest fruits plant<sup>-1</sup> was recorded from 'Jhalok' (15.27) which was at par with 'BARI Dherosh 1' (14.9) and statistically different from the rest (Table 4). The genotype 'Anamika' produced only 6.7 fruits plant<sup>-1</sup> which were the lowest number of fruits plant<sup>-1</sup> among the genotypes. The number of fruits plant<sup>-1</sup> is a varietal character which is largely governed by environmental factors. The fruits plant<sup>-1</sup> was found to vary from 6.7 to 15.27 in the present investigation which is the agreement with the findings of Shri-Dhar and Dhar [23].

### 3.10 Yield Plant<sup>-1</sup>

Fruit yield plant<sup>-1</sup> has differed significantly among the tested genotypes (Table 4). The highest fruit yield plant<sup>-1</sup> (250.24 g) was obtained from the plant of 'Jhalok' which was concordant with 'IPSA Okra' (240.20 g) and 'BARI Dherosh 1' (221 g). The genotype 'Anamika' produced the lowest edible fruit yield plant<sup>-1</sup> (111.61 g) which is

statistically similar with genotypes 'Kanchan' (113.48 g) and 'Green Glory' (117.63 g) par with 'Green Boy' and 'Antara' (127.63 g and 140.08 g respectively). Yield plant<sup>-1</sup> in the study varied from 111.61 to 250.24 g. The yield of fruit plant<sup>-1</sup> is directly related with high number of branches, number of fruits and fruit weight, similar results were reported by several authors [24,25].

### 3.11 Yield Hectare<sup>-1</sup>

The fruit yield significantly varied ranging from 6.04 to 13.73 t ha<sup>-1</sup> among the genotypes (Table 4). The genotype 'Jhalok' produced the highest yield per hectare (13.73 t ha<sup>-1</sup>) followed by 'BARI Dherosh 1' (13.11 t ha<sup>-1</sup>) and 'IPSA Okra' (12.10 t ha<sup>-1</sup>). The lowest yield was found in 'Anamika' (6.04 t ha<sup>-1</sup>). Fruit length, fruit diameter, individual fruit weight, fruits per plant, yield per plant and duration of picking are the determinants of the yield. The genotype 'Jhalok', 'BARI Dherosh 1' and 'IPSA Okra' showed vigorous growth and highest individual fruit weight, fruits per plant and yield per plant as well as higher yield (t/ha). Variation in seed yield per unit area among different cultivars has already been reported by Baruah [26].

### 3.12 Virus Infestation (%)

A significant variation was observed among the okra genotypes with respect to virus infestation (Table 4). At seedling stage, there was no any virus-infected plant in the experiment plot.

**Table 4. Yield contributing characteristics of okra genotypes**

Genotypes	Fruit length (cm)	Fruit diameter (mm)	Fruits plant <sup>-1</sup>	fruit weight (g)	Yield plant <sup>-1</sup> (g)	Yield (t ha <sup>-1</sup> )
Anamika	14.99 a-d	16.42 cd	6.7 f	16.39 ab	111.61 e	6.04 e
Antara	13.37 c-f	16.82 cd	9.2 de	15.23 bc	140.08 cde	7.63 cde
Arka Anamika	13.16 def	17.08 bc	9.9 cd	16.91 ab	167.55 bc	9.13 bc
BARI Dherosh 1	15.31 abc	18.24 ab	14.9 a	16.14 abc	240.20 a	13.11a
Ghinuk	14.72 a-e	17.71 abc	8.33 e	16.10 abc	133.53 cde	7.28 cde
Green Boy	13.27 def	17.47 abc	8.03 ef	15.84 abc	127.63 de	6.96 de
Green Glory	15.57 ab	18.54 a	7.77 ef	15.05 bc	117.63 e	6.41 e
IPSA Okra	15.85 a	17.27 abc	12.47 b	17.81 a	221.96 a	12.10 a
Jhalok	15.55 ab	18.20 ab	15.27 a	16.48 ab	250.24 a	13.73 a
Kanchan	12.55 f	15.57 d	8.1 ef	13.96 c	113.48 e	6.17 e
Liza-151	13.67 b-f	16.70 cd	11.23 bc	15.86 abc	178.66 b	9.74 b
Rupaly	14.93 a-e	17.08 bc	10.47 cd	17.71 a	185.35 b	10.10 b
Seminis	13.84 a-f	15.72 d	10.53 cd	14.95 bc	157.48 bcd	8.59 bcd
Sobuj Bangla	12.89 ef	17.01 bc	10.1 cd	15.32 bc	154.45 bcd	8.42 bcd
CV (%)	7.44	4.02	7.63	7.39	11.98	11.75

Values in a column with same letter(s) are statistically similar at 0.05 level of significance

**Table 5. Virus infestation rate of okra genotypes at different days after sowing**

Genotypes	Virus infected (%)			
	45 <sup>NS</sup> DAS	60 DAS	75 DAS	90 DAS
Anamika	1.00	48.90 a-c	77.77 a	100 a
Antara	3.00	47.76 a-d	68.90 ab	93.34 ab
Arka Anamika	1.00	44.43 b-e	66.67 ab	92.24 ab
BARI Dherosh 1	3.00	42.23 c-e	68.90 ab	87.77 ab
Ghinuk	1.00	30.00 f	66.67 ab	85.57 ab
Green Boy	3.00	52.23 ab	72.24 ab	95.57 ab
Green Glory	0.00	45.56 b-e	71.10 ab	98.90 ab
IPSA Okra	0.00	40.00 de	71.10 ab	88.90 ab
Jhalok	0.00	15.66 g	40.00 c	65.57 c
Kanchan	2.30	38.90 e	60.00 b	83.34 ab
Liza-151	1.00	30.00 f	64.44 ab	84.44 ab
Rupaly	1.00	26.66 f	62.24 ab	86.67 ab
Seminis	1.00	41.10 c-e	62.24 ab	82.24 b
Sobuj Bangla	2.30	54.43 a	73.34 ab	90.00 ab
CV (%)	21.08	11.20	13.16	9.60

Values in a column with same letter(s) are statistically similar at 0.05 level of significance

NS-indicates In-significant

DAS-indicates Day after Sowing

With the increase of days, the infestation of the virus became higher. The highest numbers of virus-infected plants were found in genotype 'Sobuj Bangla' (54.44%), Anamika' (77.77%) and Anamika' (100%) while the lowest in 'Jhalok' (15.57%), 'Jhalok' (40.00%) and 'Jhalok' (65.57%) at 60, 75 and 100 DAS respectively. The virus infestation was varied from 15.57% to 100%. Mathew et al. [19] Recorded a virus infestation between 2.31% to 54.0%. The present result is higher than the reported result because of genotypic variance.

#### 4. CONCLUSIONS

The genotypes 'Jhalok' and 'BARI Dherosh 1' performed best among the genotypes in respect of different studied characters and they also less affected by virus. So, these genotypes can be recommended for commercial cultivation.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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