



## STUDY ON MORPHO-PHYSIOLOGICAL AND YIELD CHARACTERISTICS OF SIXTEEN OKRA VARIETIES

M.K. Hasan, Sk. Rahul, M. Rakibuzzaman, A.K. Mahato and AFM Jamal Uddin\*

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### Abstract

An experiment was conducted at the research farm of Sher-e-Bangla Agricultural University, Dhaka, from March to July 2014 to identify the high yielding okra variety. Sixteen okra varieties, viz., Shaymol Bangla, Sarosh-3, BARI Dherosh-1, Porosh Plus, OK-285, Deb-412, Parvani Kranti, Kalatia, Green soft, Arka Anamika, Malvika, Green valley, Toa DK-2, Shehzadi, Gunjon, Kochi were used in this study. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. All growth and yield parameters showed significant difference. Early anthesis occurred in OK-285 prior to any other varieties (at 23.66 days). Minimum incidence of YVMV was found from the variety Sharosh-3 (5.54%). All other characteristics viz. plant height (114.83 cm), Chlorophyll content ( $6.5 \text{ mg g}^{-1}$ ), days required for 80% germination (4.33 days), net assimilation rate ( $1.683 \text{ g m}^{-2}\text{d}^{-1}$ ), intercellular  $\text{CO}_2$  concentration (8.63 ppm), respiration rate (65.40 ppt/s) and stomatal conductance ( $0.64 \text{ molm}^{-2}\text{s}^{-1}$ ), pods plant<sup>-1</sup> (10.96) and pod yield ( $14.26 \text{ t ha}^{-1}$ ) were superior for variety Green valley.

**Key words:** YVMV, Stomatal conductance, Intercellular  $\text{CO}_2$  concentration, Chlorophyll.

### Introduction

Vegetables are one of the essential items of daily requirement. Okra (*Abelmoschus esculentus* L.) is a popular and important vegetable crop grown mainly for its tender green fruits in Bangladesh. The cultivation of okra in terms of area has gradually been increasing in Bangladesh, although per hectare production is either remain static or gradually declining (BBS, 2009). Total production of okra was 42,366 MT produced from 10,204 ha of land in the year 2009-2010 and the average yield was 3.92 t/ha, which is very low compared to that of other developed countries where the yield was as high as 14.0-15.0 t/ha (Gondane and Bhattia 2009). Again, biological potential of most varieties ranges from 15 to 16 t/ha<sup>-1</sup>. Unfortunately, the crop rarely reaches its yield potential in most of these areas, primarily due to the use of unimproved cultivars (Eshiet and Brisibe, 2015). Again in our country we have only one BARI released HYV of okra (BARI Dherosh-1). Local germplasm has not been exploited much. Most of the varieties found in local market are hybrid varieties developed by private organizations. Their performance trial is very meager in research institute or in universities. Growers in all regions of the country have come across with many problems. Okra Yellow Vein Mosaic Virus (YVMV) transmitted by white fly (*Bemisia tabaci*) is one of these (Ali *et al.*, 2000). All locally grown recommended varieties of okra are susceptible to this disease (Sastry and Singh 1974). Varietal resistance is the only effective way to check this loss. Again, (Grindal 1980) commented that Okra production is greatly influenced by agronomic practices. (Dash *et al.* 2013) said that there is scope of increasing okra yield per unit area with appropriate selection of cultivar. Hence the research is designed with some cultivars to work in field condition with the following objectives: To study the morpho-physiological and identify the high yielding on their growth and yield attributes of 16 okra germplasm.

### Methods and material

The experiment was conducted at the research field of Agronomy Department, Sher-e-Bangla Agricultural University, Dhaka. The soil of the experiment field belongs to the general soil type, shallow red brown terrace soil under Tejgaon series. Top soils are silty clay in texture, olive-gray with common fine to medium distinct dark yellowish brown mottles. The experiment area was flat having available irrigation and drainage system. The analyses were done from Soil Resources and Development Institute (SRDI), Dhaka. Sixteen different okra varieties were used as planting materials viz Shaymol Bangla, Sarosh-3, BARI Dherosh-1, Porosh Plus, OK-285, Deb-412, Parvani Kranti, Kalatia, Green soft, Arka Anamika, Malvika, Green valley, Toa DK-2, Shehzadi, Gunjon, Kochi. Among them BARI Dherosh-1 is the only BARI (Bangladesh Agricultural Research Institute) released variety of okra. Kalatia is a local variety. Other varieties were commercial varieties collected from local markets. The experiment was laid out in a Randomized Complete Block Design (RCBD) comprising three replications. Before sowing of the seeds, germination tests were made in the laboratory and germination percentage counted over 92 using the following formula-1. The dose of manure and fertilizers used was recommended in the study of

\*Corresponding Author's email: [jamal4@yahoo.com](mailto:jamal4@yahoo.com)

Department of Horticulture, Sher-e-Bangla Agricultural University, Bangladesh

Bangladesh Agricultural Research Institute (BARI 2011). Data were recorded on Days to anthesis, YVMV incidence (Formula-2), Pod length, Pod breadth, Number of pod/plant, Pod yield (t/ha).

**Physiological attributes:**

Leaves were sampled at 3, 9, 15 and 21 days after flowering and a segment of 20 mg from middle portion of leaf was used for chlorophyll analysis. Chlorophyll content was measured on fresh weight basis extracting with 80 % acetone and used doubled beam spectrophotometer (Model: U-2001, Hitachi, Japan). Amount of chlorophyll was calculated using following formulae-3. The average Net assimilation rate, Intercellular CO<sub>2</sub> concentratio, respiration rate, stomatal conductance per plant was recorded from the selected plants by using “LC-Pro+” (Figure-3) machine at 45 days after sowing (DAS).

1. Percentage of germination =  $\frac{\text{number of germinated seed}}{\text{number of seed set for germination}} \times 100$
2. YVMV incidence (%) =  $\frac{\text{Number of plants affected by YVMV in a plot}}{\text{Total number of plant in a plot}} \times 100$
3. Chlorophyll a (mg g<sup>-1</sup>) =  $[12.7 (OD_{663}) - 2.69 (OD_{645})] \times \frac{v}{1000 w}$   
 Chlorophyll b (mg g<sup>-1</sup>) =  $[12.9 (OD_{663}) - 4.68 (OD_{645})] \times \frac{v}{1000 w}$

Where,

OD = Optical density of the chlorophyll extract at the specific wave length.

V = Final volume of the 80% acetone chlorophyll extract (ml)

W = Fresh weight in gram of the tissues extracted.

The total chlorophyll content was estimated by adding chlorophyll a and chlorophyll b.

**Statistical analysis of data**

All the data collected on different parameters were statistically analyzed following the Analysis of Variance (ANOVA) technique and mean differences were adjudged by Duncan’s Multiple Range Test (DMRT) (Gomez and Gomez 1984) at 5% level of significance using the MSTAT-C computer package program.

**Result and discussion**

This chapter comprises of the presentation and discussion of the results from the experiment. The data have been presented in tabular and graphical form for the convenience of the reader.

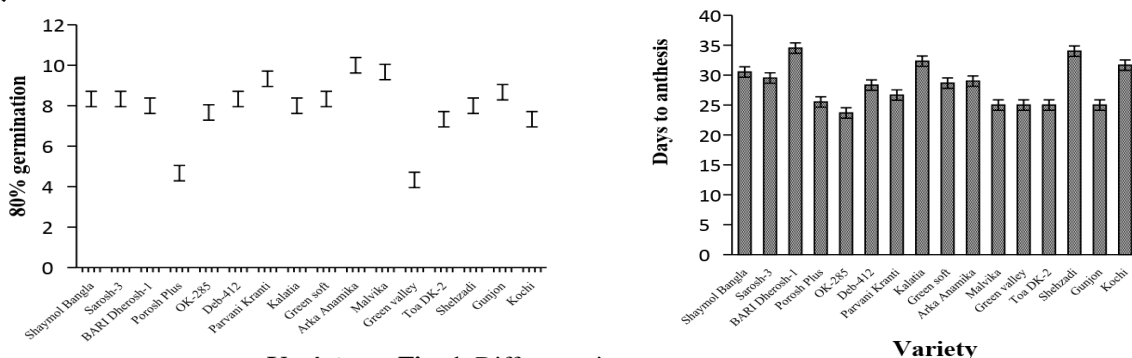
**Days required for 80% germination**

Days required for 80% germination differed significantly with varietal difference. Minimum days (4.33) required for 80% germination was for variety Green Valley. Results were shown in figure 1. Eshiet and Brisibe (2015) experimented with four okra cultivars (NHAE-47-4, V35, LD88 and a local variety) and found similar result.

**Days to anthesis**

Days to anthesis differed significantly with varietal difference. Minimum days (23.66) required to anthesis was for variety OK-285 followed by variety Malvika (25 days). Results were shown in fig. 1.

In an similar experiment by Ali *et al.* (2000) four varieties, viz., T-6, BINA Til-1, BARI Til-2, BARI Til-3 were studied and was found that the variation of days needed for flowering in the different sesame varieties was found significant. The variety BINA Til-1 or BARI Til-3 hastened by 2 to 3 days as compared to the days required for flowering by T-6 and BARI Til-2.



**Fig. 1.** Difference in days to require for 80% germination and days to anthesis for varietal difference (LSD<sub>0.05</sub>=6.42)

**YVMV incidence**

Effect of different varieties on incidence of YVMV was found significant. Minimum incidence of YVMV was found in the variety Sharosh-3 (5.54%). Maximum incidence was found for variety Ok-285. Results were shown in fig. 2.

Similar experiment was conducted by Sarker (2014). In case of % disease incidence, the lowest disease incidence was found in CV Parvani kranti (9.74%) and the highest disease incidence was found in cv Yuvraj (81.14%) followed by Arka anamika (80.81%).

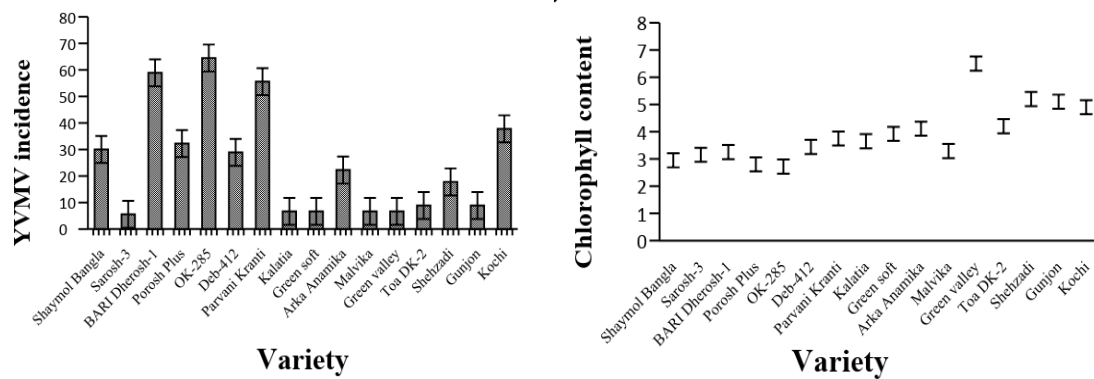


Fig. 2. Difference in YVMV incidence and chlorophyll content for varietal difference (LSD<sub>0.05</sub>=32.65)

**Pod length**

Effect of different varieties on the length of pod was found significant. Maximum Pod length was found for variety Porosh Plus. Minimum value was found for variety Kochi. Results were shown in table 1.

Similar experiment was carried out by Sarker (2014). The average highest fruit length was recorded from the cv Parvani kranti (17.33) followed by cv BARI dherosh-1(16.87) and both are statistically identical. The average lowest fruit length was recorded in the cv Yuvraj (12.77) preceded by cv Tower seed (12.83) and these are statistically similar with each other.

Table 1. Yield attributes of the difference okra varieties

Treatment	Yield Attributes							
	Pod Length (cm)		Pod Breadth (cm)		Pod per Plant	Pod Yield (t/ha)		
Shaymol Bangla	8.72	bc	1.53	cd	20.54	b	5.99	e
Sarosh-3	7.06	cd	1.39	fg	20.21	b	6.03	e
BARI Dherosh-1	7.72	cd	1.48	de	19.54	b	5.39	e
Porosh Plus	13.06	a	1.39	fg	30.88	a	10.23	b
OK-285	8.00	bcd	1.25	h	20.00	b	6.53	de
Deb-412	12.67	a	1.40	efg	19.67	b	5.77	e
Parvani Kranti	8.00	bcd	1.40	efg	20.00	b	5.23	e
Kalatia	9.00	bcd	1.24	h	21.00	b	8.27	cd
Green soft	10.00	bcd	1.34	g	22.33	b	6.47	e
Arka Anamika	11.00	bcd	1.59	abc	21.33	b	8.80	bc
Malvika	11.00	bcd	1.62	ab	19.00	b	6.83	de
Green valley	10.00	b	1.56	bc	32.33	a	14.27	a
Toa DK-2	7.00	cd	1.47	de	19.67	b	6.43	e
Shehzadi	7.33	cd	1.65	a	24.00	b	6.80	de
Gunjon	8.67	bcd	1.53	cd	22.67	b	6.40	e
Kochi	6.67	d	1.46	def	22.67	b	6.43	e
LSD(0.05)	2.02		0.08		6.00		1.79	
CV%	14.14		3.35		16.19		14.84	

Similar letter within the parenthesis do not differ significantly at 5% level of significance according to Duncan's Multiple Range Test.

**Pod breadth**

Effect of different varieties on the breadth of pod was found significant. Maximum value was found for variety Shehzadi. Minimum value was found for variety Kalatia. Results were shown in table 1.

Similar experiment was carried out by Sarker (2014). The average highest fruit breadth was obtained in the cv Parvani kranti followed by cv BARI dherosh-1 and both are statistically identical with each other.

**Pods plant<sup>-1</sup>**

Effect of different varieties on Number of Pod/plant was found significant. Maximum value was found for variety Green Valley. Minimum value was found for variety Kalatia. Results were shown in table 1.

Similar field experiment was conducted by Dash et al. (2013). Three varieties (BARI Dherosh-1, Arka Anamika and Annie Oakley) were used as treatment variables. The highest number of pods/plant (10.96) was recorded in the variety Annie Oakley. On the other hand the lowest number of pods/plant (8.25) was recorded in the variety BARI Dherosh-1.

### Pod yield ha<sup>-1</sup>

Effect of different varieties on Pod yield/ha was found significant. Maximum value was found for variety Green Valley followed by variety Porosh Plus. Results were shown in table-1.

Significant variation was also found in respect of pod yield per hectare among the varieties by Martin and Rhodes (1999) and Dash et al. (2013).

### Chlorophyll content

Varietal difference produced significant difference on chlorophyll content. Maximum Chlorophyll content 6.5 mg g<sup>-1</sup> fresh weight was obtained for variety Green valley. Minimum value 2.72mg gm<sup>-1</sup> was obtained for OK-285. It differed mainly due to difference in level of infestation of leaves of different varieties by YVMV. Results were shown in fig. 2.

Similar results were obtained by Sarker (2014) in an experiment with nine okra cultivars viz. BARI dherosh-1, Green finger, Anguli, Tower seed, Raja, Yuvraj, Shyamol bangla, Parvani kranti and Orka onamika were used as treatments. Maximum value was 6.51mg gm<sup>-1</sup> for Parvani kanti.

### Net assimilation rate

The maximum net assimilation rate per plant was recorded in cv Green valley (1.683 g m<sup>-2</sup>d<sup>-1</sup>) followed by cv Gunjon (1.55 g m<sup>-2</sup>d<sup>-1</sup>). The minimum net assimilation rate per plant was recorded in cv Shaymol bangla (1.02 g m<sup>-2</sup>d<sup>-1</sup>) preceded by cv Kalatia (1.09 g m<sup>-2</sup>d<sup>-1</sup>). The results are presented in table 2.

**Table 2.** Physiological attributes of the difference okra varieties

Treatment	Physiological parameters			
	Net assimilation rate (g m <sup>-2</sup> d <sup>-1</sup> )	Intercellular CO <sub>2</sub> concentration (ppm)	Respiration rate (ppt/s)	Stomatal conductance (mol m <sup>-2</sup> s <sup>-1</sup> )
Shaymol Bangla	1.02 k	4.02 n	39.42 m	0.31 h
Sarosh-3	1.27 fgh	5.42 f	45.30 k	0.35 ef
BARI Dherosh-1	1.39 cd	6.33 d	50.19 i	0.34 fg
Porosh Plus	1.39 cd	6.41 c	52.72 g	0.41 d
OK-285	1.22 hi	4.30 k	48.77 j	0.38 e
Deb-412	1.29 fg	5.31 g	54.59 f	0.44 bc
Parvani Kranti	1.33 ef	6.42 c	55.74 e	0.63 a
Kalatia	1.09 j	3.95 o	44.06 l	0.43 cd
Green soft	1.41 c	7.11 b	59.74 b	0.44 bc
Arka Anamika	1.17 i	4.14 m	50.74 h	0.44 bcd
Malvika	1.24 gh	4.21 l	56.20 d	0.42 cd
Green valley	1.72 a	8.63 a	65.40 a	0.64 a
Toa DK-2	1.35 de	5.51 e	58.21 c	0.46 b
Shehzadi	1.27 fgh	4.43 j	56.27 d	0.33 gh
Gunjon	1.55 b	4.95 h	58.40 c	0.32 gh
Kochi	1.28 fg	4.87 i	59.38 b	0.34 fg
LSD <sub>0.05</sub>	0.06	0.04	0.44	0.03
CV%	2.69	0.42	0.49	3.94

Similar letter within the parenthesis do not differ significantly at 5% level of significance according to Duncan's Multiple Range Test.

### Intercellular Carbon dioxide concentration

The maximum intercellular carbon-di-oxide concentration per plant was recorded in cv Green valley (8.63 ppm) followed by cv Green soft (7.11ppm). The minimum intercellular carbon-di-oxide concentration per plant was recorded in cv Kalatia (3.95ppm) preceded by cv Shaymol bangla (4.02ppm). The results are presented in table 2.

### Respiration rate

The highest respiration rate per plant was recorded in the cv BARI Dherosh-1 (65.40 ppt/s) followed by cv Kochi (59.38 ppt/s). The lowest respiration rate per plant was recorded in the cv. Shyamol bangla (39.42 ppt/s) preceded by cv Kalatia (44.6 ppt/s). The results are presented in table 2.

### Stomatal conductivity

The highest stomatal conductivity per plant was recorded in the cv Green valley (0.64 molm<sup>-2</sup>s<sup>-1</sup>) followed by Toa DK-2(0.46). The minimum stomatal conductivity per plant was recorded in the cv Shaymol bangla (0.3100 molm<sup>-2</sup>s<sup>-1</sup>). The results are presented in table 2.

### Conclusion

Although different varieties showed promising result in different characters, Green Valley was superior in most of the morphological attributes and physiological attributes. Among 16 okra varieties studied, Green Valley is the best variety in growth and yield. Further research with this variety can bring in outstanding result.

**Reference**

- Ali M., Hossain M. Z. and Sarker N. C. (2000). Inheritance of yellow vein mosaic virus (YVMV) tolerance in a cultivar of okra (*Abelmoschus esculentus* (L.) Moench). *Euphytica* 111: 205-209.
- BARI (2011). Krishi Projukti Hatboi (Handbook on Agro-technology), 5th edition, Bangladesh Agricultural Research Institute, Gazipur 1701, Bangladesh.
- BBS (2009). Statistical Yearbook Of Bangladesh. Bangladesh Bureau Of Statistics. p 96.
- Dash, P. K., Rabbani, M. G. and Mondal, M. F. (2013). Effect of variety and planting date on the growth and yield of okra. *Int. J. Biosci.* 3(9):123-131.
- Eshiet, A. J. and Brisibe, E. A. (2015). Morphological Characterization and Yield Traits Analysis in Some Selected Varieties of Okra (*Abelmoschus Esculentus* L. Moench). *Adv Crop Sci Tech* 3: 197.
- Gomez, A. K. and Gomez, A. A. (1984). Statistical Procedures for Agricultural Research. 2<sup>nd</sup> Edition. John Wiley and Sons, Inc. New York. Pp 96-107, 199-205.
- Gondane, S.U. and Bhattia, G.L. (2009). Response of okra genotypes to different environments. *PKV Res. J.*, 19: 143–6.
- Grindal, E. W. (1980). Everyday Gardening in India. 2nd edition. B.D. Taraporevala Sons & Co. (private) Ltd., Bombay. 159.
- Sarker (2014). Varietal screening of okra against *Yellow Vein Clearing Mosaic Virus (YVCMV)*. ) MS thesis, Department of Plant Pathology, SAU.
- Sastry, K. S. M. and Singh, S. J. (1974). Effect of yellow vein mosaic virus infection on growth and yield of okra crop. *Indian Phytopathology* 27 : 294-297.
- Martin, F. W. and Rhodes, M.A. (1999). Seed characteristics of okra and related *Abelmoschus species*. *Qualitas Plantarum Plant Food for Human Nutrition* 32(2): 45-51.