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Varietal Preference of Okra Shoot and Fruit Borer, *Earias vittella* (Fab.) under Field Condition in Bangladesh

Rahman MA, Uddin MM, Haque MA and Rahman MM

Department of Entomology, Bangladesh Agricultural University, Mymensingh, Bangladesh
*Corresponding Author's e-mail: rahmanmm_ent@bau.edu.bd

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An experiment was carried out in the Entomology Field Laboratory of Bangladesh Agricultural University during February to May2014 to investigate the varietal preference of okra shoot and fruit borer, *Earias vittella* among different okra varieties. Seven okra varieties viz., Taj Vendhi, BARI Dharos-1, Arka Anamika, Green Finger, Green Soft, OK-285 and Nabik were taken for varietal preference. Among the seven varieties, Taj Vendhi was the most preferable variety as the highest average shoot and fruit infestation (about 26%, and 24% respectively) were recorded. On the contrary, Arka Anamika was found least preferable variety with lowest shoot and fruit infestations, 10% and 11% respectively. Moderately preferred varieties were OK-285 followed by Green Soft and Green Finger. Preference rank for okra shoot and fruit borer among seven okra varieties was Taj Vendhi> OK-285 > Green Soft > Green Finger >BARI Dharos-1 >Nabik>Arka Anamika. Therefore, cultivation of Arka Anamika will be the best choice to decrease pest problem for the better production of okra.

Key word: Okra, okra shoot and fruit borer, *Earias vittella*, variety, preference

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INTRODUCTION

Okra (*Abelmoschus esculentus* L.) is one of the most common summer vegetable grown in Bangladesh. It is well distributed in the Indian subcontinent and East Asia (Kochhar, 1986). It contains proteins, carbohydrates and vitamin C (Dilruba et al., 2009), and plays a vital role in human diet (Kahlon et al., 2007; Saifullahet al., 2009). It contributes greatly in filling up the gaps when the market suffers from the scarcity of winter vegetables in Bangladesh. Okra yield was recorded 3.87 tonsha^{-1} in 2007 while it was increased to 4.25 tons ha^{-1} in 2011 (BBS, 2011). However, the yield is still very low compared to the yield 9.7-10 tons ha^{-1} of other developed countries (Thomson et al. 1979). The yield of okra in Bangladesh is affected by many factors. Critical analysis for such low productivity revealed that major portion of okra produced is being damaged by dread insect pests.

Several insect pests have so far been recorded to attack okra like okra shoot and fruit borer (OSFB), jassid, aphid, whitefly, and cotton leaf roller. Among these pests OSFB (*Earia ssp.*) is considered as the most important one (Aziz et al., 2011) which causes both quantitative and qualitative losses of okra (Butani and Jotwani, 1984).

Earias sp. alone causes damage up to71% (Pareek and Bhargava, 2003) whereas in general the overall pod damage is about 49%and 42% according to Kanwar and Ameta (2007) and Fletcher and Mishra (1990) respectively. Moreover, Radake and Undirwade (1981) reported that 88-100% fruits can be damaged by the okra shoot and fruit borer. The adult female okra shoot and fruit borer lays eggs individually on leaves, floral buds and on tender fruits. After hatching, small brown caterpillars bore into the top shoot and feed inside the shoot before fruit formation. The shoots wilt and dry results the development of side branches. When fruits become available, caterpillars bore into the fruits and feed inside as a result the infested plant bears smaller and deformed pods (Mohan *et al.* 1983, Atwal, 1976)

Knowledge on varietal preference of okra shoot and fruit borer can play a significant role in the successful okra production and its management. Unfortunately, very limited efforts were given in this regards. Considering the above situation, the present research was conducted to screen out the resistant okra variety which might be an important tool for the management of this pest.

MATERIALS AND METHODS

The experiment was carried out in the Entomology Field Laboratory of Bangladesh Agricultural University, Mymensingh-2202, during February to May, 2014 to investigate the varietal preference of okra shoot and fruit borer, *Earias vittella* among seven okra varieties. Experimental field was prepared thoroughly by ploughing and cross ploughing followed by laddering and weeding for growing okra plants. Recommended doses of fertilizers were applied during final land preparation. Seeds of seven different okra varieties viz. Taj Vendhi, BARI Dharos-1, Arka Anamika, Green Finger, Green Soft, OK-285 and Nabik were collected from the seed dealer of Mymensingh town. Seeds were soaked in water overnight and sown directly in the pits @3 seeds per pit. Pits were prepared maintaining line to line distance 50 cm and pit to pit distance 40 cm. The experiment was laid out in a Randomized Complete Block Design (RCBD) with 3 replications in the field. The whole experimental field was 15 m length and 7.5 m breadth, which was divided into 3 equal blocks and each block was divided into eight plots. The unit plot size was 180 cm x 170 cm. Each of the unit plots was separated by 45 cm and block to block distance was 60 cm. Every unit plot had 3 rows with 4 pits at each row. Firstly three to four seeds were sown per pit and finally single plant was allowed to grow per pit uprooting the rest of the seedlings when they attained at three inches height. Therefore, total number of plants per plot was 12.

The varietal preference of okra shoot and fruit borer at different stages of the plants was determined by counting the number of total shoots, infested shoots, total fruits and infested fruits for each experimental plot. The extent of damage both on shoot and fruit of different varieties were calculated and expressed in percentage (Rahman et al., 2012). Data were collected at every 7 days interval started at 50 days after sowing (DAS) and continued to 78 DAS. Percent shoot and fruit infestations were calculated using following formulae;

$$\%\ \text{Shoot infestation} = \frac{\text{Number of infested shoot}}{\text{Total number of shoot}} \times 100$$

$$\%\ \text{Fruit infestation} = \frac{\text{Number of infested fruit}}{\text{Total number of fruit}} \times 100$$

All the data were analyzed statistically by the computer package MSTAT-C program. The mean differences among the infestations were separated with Duncan's Multiple Range Test (DMRT) at 5% level of probability.

RESULTS AND DISCUSSION

Shoot infestation by OSFB at different days after sowing

The mean percentage shoot infestation among seven varieties differed significantly (Table 1). Among the seven varieties, maximum shoot infestation was found in Taj Vendhi in all the observations. Sporadic and negligible shoot infestations were detected after plant emergence but infestation level increased rapidly from the flowering stage at 45 Days after sowing (DAS). At 50 DAS, the highest percentage of infested shoot was found on Taj Vendhi (19.37%), followed by OK-285 (18.46%) while no infestation was observed on Arka Anamika (0.0%). At 57 DAS, Arka Anamika exhibited outstanding performance by receiving significantly the lowest percentage shoot infestation (4.46%), which was significantly different from all other varieties. On the contrary, the highest percentage of infested shoot was exhibited by Taj Vendhi (24.04%) followed by OK-285 (20.63%) and Green Finger (19.61%).

At 64 DAS, the highest percentage of infested shoot was noticed in Taj Vendhi (28.76%), which was statistically similar to Green Soft (26.97%) and OK-285 (26.01%) but significantly different from rest of the varieties. Similarly, the lowest percentage of infested shoot was observed in Arka Anamika (9.54%) followed by Nabik (13.23%).At 71 DAS, Taj Vendhi (30.59%) showed comparatively maximum percentage of shoot infestation which was statistically similar to OK-285 (30.1 %) and Green Soft (27.59%) but significantly different from rest of the varieties. The lowest percentage of infested shoot was observed in Arka Anamika (18.76%), which was statistically similar to Nabik (19.11%) but significantly different from all other varieties. At 78 DAS, the highest

Table1. Mean percent shoot infestation caused by Okra Shoot and Fruit Borer on different okra varieties in the field

Variety	Percent shoot infestation at different days after sowing					Overall Mean (%)
	50 DAS	57 DAS	64 DAS	71 DAS	78 DAS	
TajVendhi	19.37a	24.04a	28.76a	30.59a	27.83a	26.12a
BARI Dharos1	9.54c	14.41cd	19.97c	25.01b	24.66a	18.72d
ArkaAnamika	0.00d	4.46e	9.54d	18.76c	17.52b	10.06f
Nabik	8.33c	11.51d	13.23d	19.11c	18.20b	14.08e
OK-285	18.46a	20.63ab	26.01ab	30.10a	28.75a	24.79ab
Green Soft	15.47b	18.33bc	26.97a	27.59ab	28.89a	23.45bc
Green Finger	14.35b	19.61b	22.54bc	26.54b	28.72a	22.36c
CV (%)	7.50	10.32	7.84	5.63	7.26	9.07
$LSD_{0.05}$	2.25	4.09	4.04	3.50	4.44	2.35

Means followed by the same letter in a column are not significantly different by DMRT (0.05)
DAS: Days after sowing

percentage of infested shoot was found in Green Soft (28.89 %), which was statistically similar to OK-285 (28.75%) and Green Finger (28.72%). The lowest percentage of infested shoot was found in Arka Anamika (17.52%), which was statistically similar to Nabik (18.20%) but significantly different from rest of the tested varieties.

In case of overall mean%, significantly the highest percent shoot infestation was recorded in Taj Vendhi (26.12%) followed by OK-285 (24.79%) but significantly different from other varieties. The average of all five observations revealed Arka Anamika exhibited outstanding performance by receiving significantly lowest percentage of shoot infestation (10.06%) followed by Nabik (14.08%), which was significantly different from all other varieties. Comparatively higher rate of shoot infestation was observed in OK-285 (24.79%), Green Soft (23.45%) and Green Finger (22.36%) varieties. So, the overall preference rank for OSFB among seven okra varieties was Taj Vendhi> OK-285 > Green Soft > Green Finger >BARI Dharos-1 >Nabik>Arka Anamika.

The present study is in full agreement with the findings of Mandal et al. (2006),Sharma and Jat (2009), Rahman et al. (2012). They reported Arka Anamika as less preferable variety among the varieties they used in their experiments.

Fruit infestation by OSFB at different days after sowing

Fruit infestation by okra shoot and fruit borer (OSFB) was similar to shoot infestation. Significantly higher percentage of fruit infestation was recorded on Taj Vendhi in most of the cases (Table 2). Flowering started at 45 DAS and early fruit infestation was observed at 52 DAS although the infestation level was very negligible. At 57 DAS, the highest percentage of infested fruit was noticed on Taj Vendhi (16.02%) followed by OK-285 (15.47%)but significantly different from all other tested varieties. However, Arka Anamika (0.00%) and Nabik (0.00%) varieties exhibited significantly least percentage of OSFB infestation. They were statistically similar to each other, but significantly different to the other varieties.

At 64 DAS, 17.71% fruit infestation was observed on OK-285, followed by Taj Vendhi (17.27 %). On the contrary, the lowest percentage of infested fruit was observed on Arka Anamika (5.32%), which was significantly different from all other varieties.

At 71 DAS, the highest percentage of infested fruit was observed on Taj Vendhi (32.05%), which was statistically different from rest of the varieties. The lowest percentage of infested fruit was observed on Arka Anamika (12.45%), which was statistically similar to Nabik (16.02%) but significantly different from rest of the varieties.

At 78 DAS, the highest percentage of infested fruits was found on Taj Vendhi (27.52%), which was statistically similar to OK-285 (24.57%) but significantly different from other varieties. The lowest percentage of infested fruit was observed on Arka Anamika (18.73%) which was statistically similar to Nabik (19.38%) and BARI Dharos-1 (21.69%) but significantly different from the rest of the varieties.

At 85 DAS, Taj Vendhi (29.13%) received significantly the highest percentage of fruit infestation over other varieties. The lowest percent of infested fruit was observed on Nabik (17.28%) followed by Arka Anamika (18.19%) and BARI Dharos-1 (20.17%) but significantly

Table 2. Mean percent fruit infestation caused by Okra Shoot and Fruit Boreron different okra varieties in the field

Variety	Percent fruit infestation at different days after sowing (DAS)					Overall Mean (%)
	57 DAS	64 DAS	71 DAS	78 DAS	85 DAS	
TajVendhi	16.025a	17.270ab	32.050a	27.520a	29.135a	24.400a
BARI Dharos 1	6.700d	8.710d	20.605bc	21.690bc	20.175cd	15.576de
ArkaAnamika	0.000e	5.325e	12.450e	18.735c	18.190d	10.940f
Nabik	0.000e	12.915c	16.025de	19.385c	17.285d	13.122ef
OK-285	15.475a	17.710a	23.905b	24.570ab	23.590b	21.050b
Green Soft	13.390b	13.805c	23.830b	24.165b	22.950bc	19.628bc
Green Finger	10.555c	14.355bc	19.455cd	22.930b	22.060bc	17.871cd
CV (%)	9.153	9.798	8.354	5.825	6.233	13.598
$LSD_{0.05}$	1.986	3.083	4.331	3.238	3.344	3.103

Means followed by the same letter in a column are not significantly different by DMRT (0.05)
DAS: Days after sowing

different from the rest of the varieties.

In case of mean, the highest percent fruit infestation was recorded on Taj Vendhi (24.40%) and this was significantly different from other varieties. The lowest percent shoot infestation was found in Arka Anamika (10.94%) followed by Nabik (13.12%) but significantly different from all other varieties. Comparatively higher rate of fruit infestation was observed on OK-285 (21.05%) and Green Soft (19.63%) varieties, which were statistically similar. So, the overall preference rank for OSFB among seven okra varieties was Taj Vendhi> OK-285 > Green Soft > Green Finger > BARI Dharos-1 >Nabik>Arka Anamika.

The present result was contradictory with Mazed (2009), where he reported Arka Anamika as highly preferable with giving low yield among the varieties because he experimented with different cultivars except (Arka Anamika, BARI-1 and OK285) and in different season (May to September). But the present result is full agreement with the findings of Sharma and Jat (2009), Rahman et al. (2012) as they found Arka Anamika as the least preferable variety to okra shoot and fruit borer.

The present findings are also in conformity with those of Memon et al. (2004) and Aziz (2010)who reported that Green polo and Arka Anamika as the least susceptible varietiesand the Desi variety was the most preferable variety by okra shoot and fruit borer.

Considering both shoot and fruit infestation it could be concluded that, among the seven tested varieties TajVendhi was highly susceptible to okra shoot and fruit borer and Arka Anamika was resistant against OSFB infestation.

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