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ABUNDANCE AND IMPACT OF SUCKING INSECTS ON DIFFERENT GENOTYPES OF OKRA

Md. Lablu Mia[1], Md. Shamim Hossain[1], Mansura Afroz[1], M. Moynul Haque[2] and Md Ruhul Amin[1*]

[1]Department of Entomology, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur, Bangladesh. [2]Department of Agronomy, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur, Bangladesh.

[*]**Corresponding e-mail:** mramin@bsmrau.edu.bd

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ABSTRACT

The study was undertaken during September 2020 to August 2021 in the experimental field and laboratory of the Department of Entomology, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur to know the abundance of sucking pests, particularly thrips and jassid on fifteen okra genotypes, and to assess their effects on fruit characteristics and yield of okra. The okra genotypes viz. BD 1851, BD 1854, BD 1860, BD 1861, BD 1863, BD 1892, BD 1897, BD 1900, BD 1904, BD 1907, BD 1911, BD 8615, BD 8617, BD 8618 and BD 8620 were used in experimental plots, and the abundance of the pests was observed from seedling to the harvesting stage of the fruits. The abundance of thrips and jassid varied among the genotypes. The lowest abundance of thrips and jassid were found on BD 1851 and BD 1892, respectively (11.0 ± 1.2 and 3.6 ± 0.4 adults/ 5 cm of top shoot). Genotype BD 8617 (2.8 ± 0.2 cm) showed the highest fruit diameter while BD 1892 had the longest fruit (15.6 ± 1.0 cm). BD 8617 and BD 8620 showed the highest fruit weight (31.6 ± 5.4 and 31.5 ± 3.5 g, respectively) which was statistically similar. Overall, BD 1892 showed better performance with the highest yield (3.2 t ha^{-1}) and low abundance of both thrips and jassid than other genotypes.

Keywords: *Abelmoschus esculentus, Amrasca biguttula biguttula, Thrips tabaci,* yield contributing characteristics

Introduction

Vegetables are one of the essential items of daily requirement of human consumption where okra (*Abelmoschus esculentus* L.) is a popular one grown mainly for its tender green fruits. The crop is also known as lady's finger and widely used as a food vegetable in Asia, Africa and South-America (Messing *et al.* 2014). It is an important traditional vegetable in Bangladesh, grown round the year. A total of 11.5 thousand hectares of land was under the cultivation of okra where the total production was 55.9 thousand MT in 2019-2020 (BBS 2020).

There are several barriers that limit the okra production. The infestation of different insect pests has been raised as major due to regular attacks which lead to economic yield loss. As many as 72 species of insects have been recorded on okra, of which the sucking pests comprising of aphids, jassid, whitefly, thrips and mite cause significant damage to the crop (Srinivasa and Rajendran 2003, Shabozoi *et al.* 2011).

Jassid *Amrasca biguttula biguttula,* a sucking pest, occurs throughout the growing season of okra crop. Both nymphs and adults suck the cell sap usually from the ventral surface of the leaves, and while feeding inject toxic saliva into plant tissues, resulting in curling, marginal discoloration, chlorosis as well as reddening of leaves (Singh *et al.* 2008). It can cause damage from young seedling to mature crops resulting in 50% yield loss (Halder *et al*. 2016).

Thrips *Thrips tabaci* is another limiting pest in reducing productivity of several crops and has been reported to cause significant economic losses of okra up to 30-50% (Nault and Shelton 2012). The damaging stages are nymphs and adults, which feed by rasping the leaves and other tissues of plants and sucking the sap, causing silver patches and streaks on the leaves.

Plants possess different specialized morphological structures or have different biochemical properties which are responsible for population fluctuation of the insect pests on different genotypes of crop. Genotypes of okra are also varied in sucking insect infestation during the growing season which is valuable in selection of the best genotypes for a variety development. Therefore, the study was undertaken to know the abundance of thrips and jassid on fifteen genotypes of okra and their subsequent effects on fruit morphological characteristics and yield.

Materials and Methods

Study site and duration: The study was conducted from September 2020 to August 2021 in experimental field and laboratory of the Department of Entomology, Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Gazipur, Bangladesh. The site is located in the middle of Bangladesh at 25°25′ North latitude and 89°5′ East longitude with 34 meters altitude above sea level. In general the annual mean maximum and minimum temperatures, relative humidity and rainfall are 36.0 °C, 12.7 °C, 65.8% and 237.6 cm, respectively (Amin *et al.* 2015).

Experimental materials: There were fifteen genotypes of okra used as experimental materials in the current study, namely BD 1851, BD 1854, BD 1860, BD 1861, BD 1863, BD 1892, BD 1897, BD 1900, BD 1904, BD 1907, BD 1911, BD 8615, BD 8617, BD 8618 and BD 8620. The seeds were collected from Plant Genetic Resource Centre of Bangladesh Agricultural Research Institute, Gazipur.

Experimental design and cultivation of the crop: The experiment was set in randomized complete block design with three replications. There were forty-five plots in total where unit plot size was 3.0 m × 2.0 m. The spacing between block to block and plot to plot was 1.0 m in both cases. The okra genotypes were assigned randomly in the plots and then direct sowing of the seeds was done. Intercultural operations such as irrigation, weeding etc. were done whenever necessary. Manures and fertilizers were applied according to the fertilizer recommendation guide (FRG 2012). The crop was exposed to sucking insect infestation as no insect pest management was taken throughout the study period.

Abundance of thrips and jassid: Regular field monitoring was done at weekly intervals to observe the abundance of thrips and jassid. On every observation day, top 5.0 cm was observed from randomly selected five plants of each genotype and the number of thrips and jassid on each shoot was counted by using a hand lens.

Fruit characteristics: Five fruits from each selected plant were randomly collected and brought to the laboratory to measure their length, diameter and weight. The weights were taken using a digital balance (AG204, Mettler Toledo, Switzerland), and the widths and lengths were measured using a manual slide caliper.

Yield of okra: At fruit maturing stage, the matured fruits from each plot were harvested and brought to the laboratory, and genotype wise weights were recorded. A digital weighing balance was used to take the weight of fruits yield in every harvesting time (5 times) and was converted as yield in ton ha^{-1}.

Data analysis: One way analysis of variance (ANOVA) followed by Tukey HSD posthoc test (at 5% level of significance) was done for determining the variations of insect abundance, fruit characteristics and yield among the tested genotypes. All the analyses were performed using IBM SPSS 20.0.

Results and Discussion

The number of adult thrips on the tested genotypes of okra varied significantly ($F_{14, 120} = 5.8$, $p < 0.01$). The highest and statistically similar population was recorded on BD 1900 and BD 1911 (14.8 ± 2.0 and 14.6 ± 1.8 adults / 5 cm of top shoot). The lowest and statistically similar abundance of thrips was recorded on BD 1851, BD 1854, BD 8615, BD 8617 and BD 8619, respectively (11.0 ± 1.2, 11.9 ± 1.2, 11.1 ± 1.7, 11.1 ± 1.9 and 10.4 ± 1.8 adults/ 5 cm of top shoot, respectively) (Figure 1).

The number of adult jassid on 5 cm of top shoot of okra genotypes varied significantly ($F_{14, 120} = 1.4$, $p < 0.01$). The highest and statistically similar abundance of jassid was found on BD 1907, BD 8615, BD 8617 and BD 8620 (5.9 ± 0.7, 5.8 ± 1.0, 5.7 ± 0.9 and 5.2 ± 1.0 adults/ 5 cm of top shoot, respectively). The lowest and statistically similar abundance of jassid was found on BD 1892, BD 1904 and BD 8618 (3.6 ± 0.4, 3.5 ± 0.5 and 3.8 ± 0.6 adults/ 5 cm of top shoot, respectively) (Figure 2).

The fruit characteristics of okra among the genotypes varied significantly (fruit weight: $F_{14, 60} = 2.7$, $p < 0.01$; fruit length: $F_{14, 60} = 2.9$, $p < 0.01$; and fruit diameter: $F_{14, 60} =$

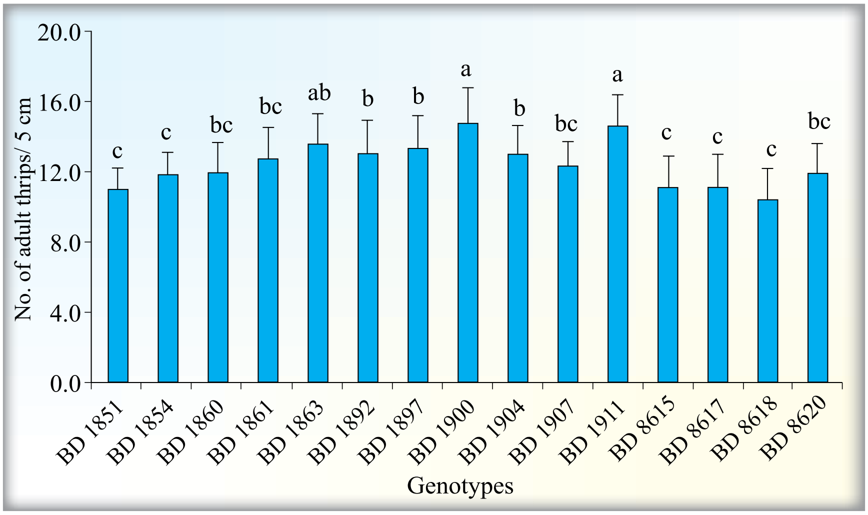

Figure 1. Abundance of adult thrips on fifteen okra genotypes during March to July 2021.

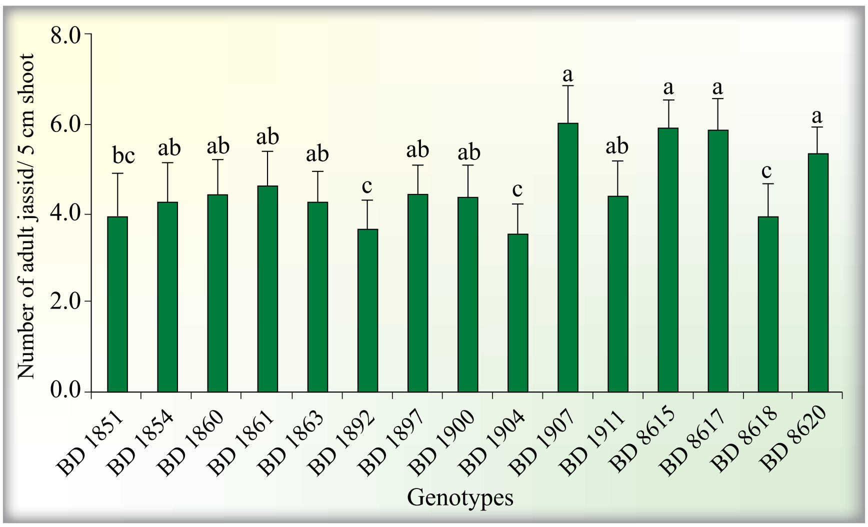

Figure 2. Abundance of adult jassid on fifteen okra genotypes during March to July 2021.

8.8, $p < 0.001$). Genotype BD 8617 (2.8 ± 0.2 cm) showed the highest fruit diameter, whereas genotype BD 1854 and BD 1911 (1.4 ± 0.0 and 1.5 ± 0.1 cm respectively) had the lowest and statistically similar fruit diameter. Fruit length was the maximum in BD 1892 (15.6 ± 1.0 cm) which was followed by BD 8620 (15.2 ± 0.8 cm). The lowest fruit length was recorded in BD 1851 (10.6 ± 0.7 cm). Fruit weight of okra was the highest and statistically similar in BD 8617 and BD 8620 (31.6 ± 5.4 and 31.5 ± 3.5 g, respectively) and the lowest was in BD 1854 with mean 11.1 ± 1.7 g (Table 1). Meher *et al.* (2016) studied the performance of okra cultivars under Red and Laterite Zone of West Bengal and found the average pod weight, pod length and pod diameter of okra ranged from 11.3-17.2 g, 12-16.2 cm, 1.5-1.6 cm among the tested varieties, respectively. Singh *et al.* (2018) reported the fruit weight and fruit length of okra cultivars ranged 11.7-14.1 g and 12.0-14.9 cm, respectively. Our results did not show conformity with Meher *et al.* (2016) and Singh *et al.* (2018) who conducted their experiments in another geographical locations with different genotypes of okra, and the sowing time was also different which may be the reasons of disconformity. Hasan *et al.* (2019) studied the morpho-physiological and yield characteristics of sixteen okra varieties and reported that the pod length and pod

Table 1. Comparison of fruit characteristics among the tested genotypes of okra

Genotypes	Fruit Diameter (cm)	Fruit Length (cm)	Average fruit Weight (g)
BD 1851	2.2 ± 0.1 ad	10.6 ± 0.7 c	26.8 ± 5.0 ab
BD 1854	1.4 ± 0.0 e	14.5 ± 0.7 ac	11.1 ± 1.7 b
BD 1860	1.6 ± 0.0 de	13.0 ± 1.1 ac	14.1 ± 0.6 ab
BD 1861	1.9 ± 0.1 ce	11.1 ± 0.5 bc	21.7 ± 3.7 ab
BD 1863	1.7 ± 0.0 de	13.5 ± 0.3 ac	19.6 ± 2.7 ab
BD 1892	2.0 ± 0.1 be	15.6 ± 1.0 a	29.6 ± 5.0 ab
BD 1897	1.8 ± 0.1 ce	14.6 ± 0.5 ac	24.4 ± 2.8 ab
BD 1900	2.1 ± 0.1 ad	14.9 ± 0.4 ac	22.6 ± 3.6 ab
BD 1904	1.9 ± 0.1 be	14.6 ± 1.0 ac	25.6 ± 3.4 ab
BD 1907	2.1 ± 0.2 be	12.4 ± 1.1 ac	28.1 ± 5.8 ab
BD 1911	1.5 ± 0.1 e	13.9 ± 0.6 ac	15.8 ± 1.5 ab
BD 8615	2.4 ± 0.2 ac	14.7 ± 1.4 ac	26.4 ± 4.0 ab
BD 8617	2.8 ± 0.2 a	14.8 ± 1.0 ac	31.6 ± 5.4 a
BD 8618	2.3 ± 0.2 ad	12.9 ± 0.9 ac	21.3 ± 3.4 ab
BD 8620	2.6 ± 0.2 ab	15.2 ± 0.8 ab	31.5 ± 3.5 a

Means within a column followed by same letter(s) are not significantly different by Tukey HSD posthoc statistics at < 0.05.

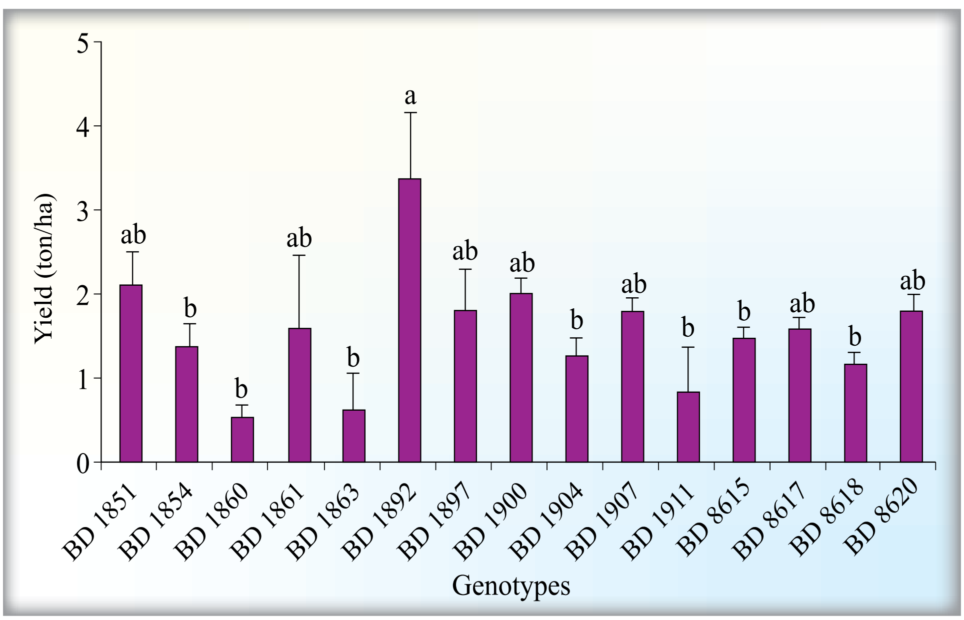

Figure 3. Comparison of fruit yield among the tested genotypes of okra.

breadth ranged from 6.7 cm to 13.1 cm and 1.2 cm to 1.7 cm respectively.

Among the fifteen genotypes of okra, BD 1892 showed the highest yield (3.2 tons/ha). The genotypes BD 1854, BD 1860, BD 1863, BD 1904, BD 1911, BD 8615, BD 8618 (1.3, 0.5, 0.6, 1.2, 0.8, 1.4 and 1.1 tons/ha, respectively) showed lower and statistically similar yield. BD 1851, BD 1861, BD 1897, BD 1900, BD 1907, BD 8617 and BD 8620 (2, 1.5, 1.7, 1.9, 1.7, 1.5 and 1.7 tons/ha) produced higher and statistically similar yield (Figure 3). Singh *et al.* (2018) reported the average fruit yield ranging from 8.2 tons/ha to 13.7 tons/ha. Hasan *et al.* (2019) studied the yield attributes of the difference okra varieties and found the pod yield ranging from 5.23 tons/ha to 14.27 tons/ha. The results of current study were not in accordance with the findings of Singh *et al.* (2018) and Hasan *et al.* (2019).

In the current study the okra genotypes showed comparatively lower yield. As we did not adopt any pest control strategy, there was heavy infestation of insect pests which may lead to the lower yield. The infestation levels of the insects on the genotypes also varied significantly which suggested that the genotypes were different in some of their characteristics which could alter insect infestation. Moreover, the different genotypes also varied in their pod length and diameter. Although genotype BD 8617 showed the highest diameter and weight of individual fruit and genotype BD 1892 showed the highest yield which may be associated with its highest fruit length. However, yield contributing characteristics had a great effect on the yield of the genotypes. The fruit characteristics which were responsible for higher yield were not found in a single genotype. Some of the genotypes showed higher fruit weight but lower other yield attributes. Therefore, insect infestation as well as the yield contributing characteristics of plants was responsible to make variable amount of fruit yield of the tested okra genotypes.

References

Amin MR, Namni S, Miah MRU, Miah MG, Zakaria M, Suh SJ and Kwon YJ. 2015. Insect inventories in a mango-based agroforestry area in Bangladesh: foraging behavior and performance of pollinators on fruit set. Entomological Research, *45*: 217-224.

Amin MR, Azad HMS, Hossain SMA and Tithi DA. 2013. Pest, predator and pollinator abundance in the cotton field of Bangladesh: A climate change country. In Sundaresan, J, Sreekesh S, Ramanathan A. L, Sonnenschein L and Boojh R (eds.), Climate Change and Environment. Scientific Publishers, India, Pp. 100-106.

BBS. 2020. Yearbook of Agricultural Statistics. Bangladesh Bureau of Statistics. Statistics and Informatics Division (SID), Ministry of Planning, Government of the People's Republic of Bangladesh, Pp. 279-280.

FRG. 2012. Fertilizer Recommendation Guide. Bangladesh Agricultural Research Council (BARC), Farm gate, Dhaka-1215, Pp. 1-284.

Halder J, Sanwal SK, Deb D, Rai AB and Singh B. 2016. Mechanisms of physical and biochemical basis of resistance against leaf-hopper (*Amrasca biguttula biguttula*) in different okra (*Abelmoschus esculentus*) genotypes. Indian Journal of Agricultural Sciences, *86*: 481-484.

Hasan MK, Rahul SK, Rakibuzzaman M, Mahato AK and Jamal Uddin AFM. 2019. Study on morpho-physiological and yield characteristics of sixteen okra varieties. International Journal of Business, Social and Scientific Research, *7*: 1-5.

Jindal J and Barar DS. 2005. Population dynamics of sucking pests on *Hirsutum* cotton hybrids in relation to weather factors. Indian Journal of Ecology, *32*: 58-60.

Meher R, Mandal J and Mohanta S. 2016. Performance of okra (*Abelmoschus esculentus* (L.) Moench) cultivars under red and laterite zone of West Bengal. Journal of Crop and Weed, *12*: 142-144.

Messing J, Thöle C, Niehues M, Shevtsova A, Glocker E, Borén T and Hensel A. 2014. Antiadhesive properties of *Abelmoschus esculentus* (okra) immature fruit extract against *Helicobacter pylori* adhesion. PLoS One, *9*: e84836.

Nault BA and Shelton AM. 2012. Guidelines for managing onion thrips on onion. Veg Edge. Cornell University, Cooperative Extension, Regional Vegetable Programs, *8*: 14-17.

Pedigo LP. 2004. Entomology and pest management. Prentice-Hall of India Private Limited, New Delhi, India.

Shabozoi NUK, Abro GH, Syed TS and Awan MS. 2011. Economic appraisal of pest management options in okra. Pakistan Journal of Zoology, *43*: 869-878.

Singh HK, Singh KM and Meraj M. 2018. Growth and yield performance of okra (*Abelmoschus esculentus* (L.) Moench) varieties on farmer's field. International Journal of Current Microbiology and Applied Sciences. (Special Issue) *7*: 1411-1417.

Singh S, Choudhary DP, Sharma HC, Mahla RS, Mathur YS and Ahuja DB. 2008. Effect of insecticidal modules against jassid and shoot and fruit borer in okra. Indian Journal of Entomology, *70*: 197-199.

Srinivasa R and Rajendran R. 2003. Joint action potential of neem with other plant extracts against the leaf hopper *Amrasca devastance* (Distant) on okra. Pest Management and Economic Zoology, *10*: 131-136.