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Screening of different genotypes of okra [*Abelmoschus esculentus* (L.) Moench] against leafhopper, *Amrasca biguttula biguttula* Ishida

Ranjit V Kadu, Santosh R Kulkarni, Pankaj V Patil and Sanjay K Patil

Abstract
Studies on susceptibility of different genotypes of okra to leafhopper, *Amrasca biguttula biguttula* were undertaken at Research Field of Post Graduate Institute, Department of Agricultural Entomology, Mahatma Phule Krishi Vidyapeeth, Rahuri during *Kharif* 2016 and 2017. Twenty okra genotypes were screened against leafhopper. None of the genotypes was found completely free from the infestation of leafhopper, although they differed significantly in their degree of damage and pest number to harbour. The genotypes OK-7, OK-9 and Arka Anamika were categorized as resistant and recorded least population of the pest. The genotypes Narendra, IC-128889, GM-5, EC-133336, Arka Abhay, IC-43733 and IC-69242 were moderately resistant, genotypes IC-90168, VRO-22, IC-45805, IC-282229, IC-45800 and EC-169378 as moderately susceptible whereas the genotypes IC-282268, IC-282292, IC-282288 and IC-140906 showed maximum population and categorized as susceptible to leafhopper.

Keywords: Okra, genotypes, leafhopper, *Kharif*

Introduction
Okra (*Abelmoschus esculentus* (L.) Moench) known in many English-speaking countries as lady's finger, bhindi in India is a commercial vegetable crop belongs to family Malvaceae. It is one of the largely cultivated vegetables in the country due to its nutritional, industrial and medicinal values [1]. It originates from Ethopia and is widely spread all over tropical, sub tropical and warm temperate regions of the World [2]. It plays an important role in human diet and is a good source of vitamin A, B, and C and also rich in protein, minerals and iodine [3].
Among many factors responsible for low production in okra, incidence of insect pests is one of the prime factors. As high as 72 species of insects have been recorded on okra [4] of which, besides shoot and fruit borer, *Earias* spp., among the sucking pest complex, leafhopper *Amrasca biguttula biguttula* (Ishida) is a major concern and cause havoc damage. Leafhopper is a pestiferous insect that sucks the cell sap and inject toxic saliva into leaves resulting in yield loss [5]. The nymphs and adults suck the plant sap mainly from the lower surface of leaves and cause phytotoxic symptoms known as hopper burn which results in complete dessication and has become one of the limiting factors in economic productivity of the crop. Leafhopper alone had caused 59.79 per cent losses in okra fruit yield [6].
Insecticides are mostly used by the vegetable growers as it results in immediate relief to crop and apparently benefit the farmers. For the same reason the use of chemical is increasing rapidly and at the same time the indiscriminate use of insecticides created problems of insecticide resistance, pest resurgence, adversely affect the non target organisms, environmental pollution and also leads to an undesirable load of pesticide residues in saleable vegetables [7]. The use of chemicals will continue in days to come until some reliable alternative control measures are developed. Today's era is an era of IPM where integration of all the control measures is likely to be done, whereas insect resistant plant offer ideal prevention against insect damage, involve minimum cost of production and are ecofriendly. Thus in vegetable crops there is huge scope to evolve pest resistant variety. Host plant resistance is an economical, effective and environment friendly tactic to manage insect pests. So, looking to the economic importance of leafhopper, *A. biguttula biguttula* on okra crop, the present study was conducted to explore the reaction of different okra genotypes against leafhopper and it's incidence on different varieties to find out such a variety that can be regarded as a resistant variety to these pests.

Material and methods

Field experiment with twenty genotypes was laid out in a Randomized Block Design and replicated thrice with plot size of 3.0 x 2.7 m each at All India Coordinated Research Project on Vegetable Crops, Department of Horticulture, MPKV, Rahuri during *Kharif*, 2016 and at Research Field of Post Graduate Institute, Department of Agricultural Entomology, MPKV, Rahuri during *Kharif*, 2017. Seeds of twenty different genotypes of okra *viz.*, OK-9, Narendra, IC-90168, IC-282268, IC-128889, GM-5, IC-282292, Arka Anamika, EC-133336, Arka Abhay, IC-43733, OK-7, VRO-22, IC-69242, IC-45805, IC282229, IC-282288, IC-45800, IC-140906 and EC-169378 were sown at 30 cm x 15 cm spacing in both the seasons. All the recommended package of practices were adopted for raising the crop. The plots were kept unsprayed through the experimental period. Observations on nymphs and adults of leafhopper, *A. biguttula biguttula* were recorded at weekly interval during morning hours on five plants. The plants were selected randomly and tagged in each plot to record the population of leafhopper (both nymph and adult) from three leaves, each one from top, middle and bottom canopies with the help of 10X hand lens and mean population per three leaves was worked out. The observations on insect pests were recorded at weekly interval right from their appearance to last picking of fruits of the crop. Mean leafhopper population per three leaves was calculated and subjected to suitable statistical analysis and categorized under the grades based on the scale adopted by Nagar *et al*., (2017) [8]. For the purpose, mean value of individual genotypes (Xi) was compared with mean value of infestation of all genotypes (X) and standard deviation (sd) following the modified scale [Resistant : Xi < X – sd for resistant; Xi > X – sd < X for moderately resistant; Xi > X < (X + sd) for moderately susceptible; and Xi > (X + sd) < (X + 2 sd) for susceptible]. The retransformed data were used for computation of X, Xi and sd for each parameter.

Results and discussion

The present study was designed to screen twenty different okra genotypes against leafhopper, *A. biguttula biguttula* under field conditions of Rahuri. Data regarding per three

Table 1: Average population of leafhopper on different genotypes of okra during *Kharif*, 2016 and *Kharif*, 2017 (Pooled)

Sr. No.	Genotypes	Average mean population of leafhopper/3 leaves		Pooled Mean	Grades
		Kharif, 2016	*Kharif*, 2017		
1	OK-9	4.13 *(2.15)	4.07 *(2.13)	4.10 *(2.14)	R
2	Narendra	7.20 (2.78)	6.80 (2.70)	7.00 (2.74)	MR
3	IC-90168	10.00 (3.24)	10.07 (3.25)	10.04 (3.25)	MS
4	IC-282268	13.00 (3.68)	13.07 (3.68)	13.03 (3.68)	S
5	IC-128889	7.27 (2.79)	7.13 (2.76)	7.20 (2.78)	MR
6	GM-5	7.33 (2.79)	7.67 (2.85)	7.50 (2.82)	MR
7	IC-282292	13.47 (3.73)	13.67 (3.76)	13.57 (3.74)	S
8	Arka Anamika	5.07 (2.36)	4.63 (2.26)	4.85 (2.31)	R
9	EC-133336	8.07 (2.93)	7.93 (2.90)	8.00 (2.92)	MR
10	Arka Abhay	8.80 (3.04)	8.53 (3.00)	8.66 (3.02)	MR
11	IC-43733	8.87 (3.06)	9.20 (3.11)	9.03 (3.09)	MR
12	OK-7	3.93 (2.11)	3.67 (2.04)	3.80 (2.07)	R
13	VRO-22	10.40 (3.30)	10.27 (3.28)	10.33 (3.29)	MS
14	IC-69242	9.47 (3.15)	9.73 (3.19)	9.60 (3.17)	MR
15	IC-45805	10.73 (3.35)	11.00 (3.39)	10.87 (3.37)	MS
16	IC-282229	11.80 (3.51)	11.47 (3.46)	11.63 (3.48)	MS
17	IC-282288	13.80 (3.79)	14.00 (3.81)	13.90 (3.80)	S
18	IC-45800	12.13 (3.56)	12.47 (3.60)	12.30 (3.58)	MS
19	IC-140906	13.93 (3.79)	14.13 (3.82)	14.03 (3.81)	S
20	EC-169378	12.80 (3.65)	12.80 (3.64)	12.80 (3.65)	MS
	SE	0.08	0.10	0.09	-
	CD @ 5%	0.22	0.28	0.24	-

*Figure in the parentheses are square root of x + 0.5 transformation

Leaves population of leafhopper on okra was recorded with weekly interval from randomly selected five plants per plot. The data presented in Table 1 indicates the average population of leafhopper per three leaves during *Kharif* 2016 and 2017 on twenty different genotypes of okra and data obtained is analyzed statistically and pooled data is described as under:

The overall pooled data of average population of leafhopper during *Kharif*, 2016 and 2017 is presented in Table 1 revealed that, average mean population of leafhopper during the crop growth ranged from 3.80 to 14.03 leafhoppers/3 leaves. The genotype OK-7 was the most promising and recorded average population of 3.80 leafhoppers/3 leaves and was significantly superior over remaining okra germplasm except OK-9 (4.10 leafhoppers/3 leaves) and Arka Anamika (4.85 leafhoppers/3 leaves) which were at par with OK-7. The maximum mean population of 14.03 leafhoppers/3 leaves was observed on the genotype IC-140906 followed by IC-282288 (13.90 leafhoppers/3 leaves), IC-282292 (13.57 leafhoppers/3 leaves) and IC-282268 (13.03 leafhoppers/3 leaves).

These present findings are in line with the earlier workers, Hooda *et al* (1999) [9] who identified two resistant and nine moderately resistant okra cultivars and stated that resistant genotypes had significantly few nymphs as compared to other varieties. Similarly, Ghosh *et al.* (1999) [10] found that okra variety Arka Anamika was moderately resistant against leafhopper. As per the reports of Srinivasa and Sugeetha (2001) [11] no okra cultivar was completely free from leafhopper infestation. According to Tripathy *et al*. (2008) [12] okra variety Arka Anamika was resistant against leafhopper and recorded mean population of 5.02 leafhoppers/3 leaves. Similar results have been quoted by Anita and Nandihalli

(2009) [13], Saif *et al*. (2012) [14], Vatsal Srivastava and Parasnath (2011) [15], Patel *et al.* (2012) [16], Nataraja *et al.* (2013) [17], Javed *et al*. (2016) [18], Sultana *et al*. (2017) [19], Nagar *et al*. (2017) [8].

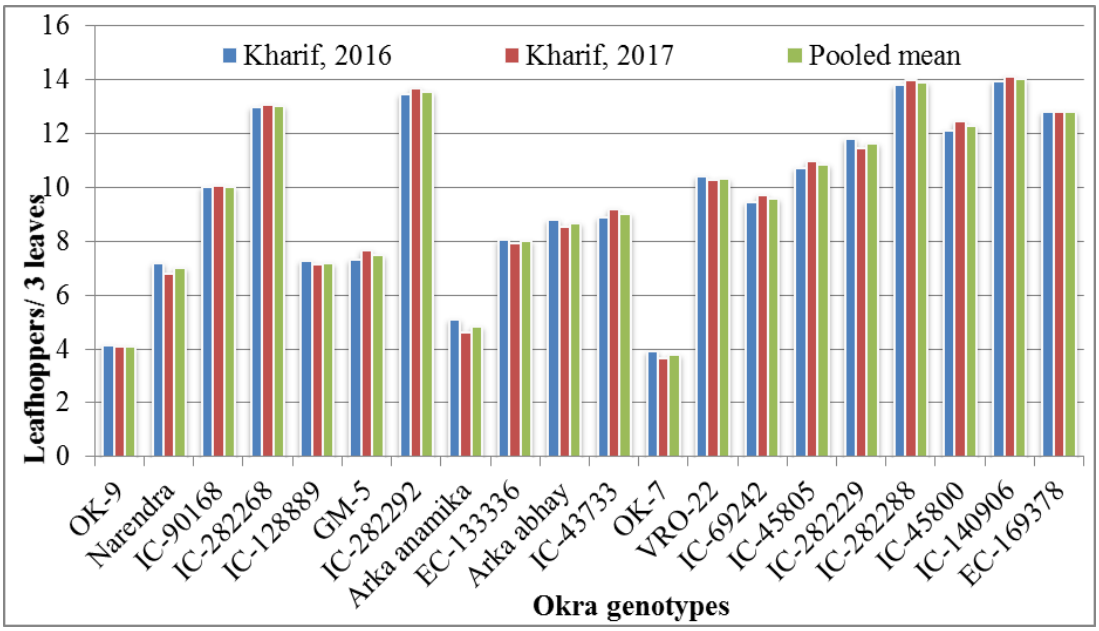

Fig 1: Average population of leafhopper on different okra genotypes during *Kharif* 2016 and 2017

Categorization of okra genotypes for their resistance or susceptibility to leafhopper, *A. biguttula biguttula*

To determine the relative susceptibility/resistance against leafhopper infestation, the okra germplasm were categorized based on the population count of leafhoppers/3 leaves on randomly selected five plants (Table 2). The genotypes *viz.*, OK-7, OK-9 and Arka Anamika had lowest leafhopper population below 6.39 leafhoppers/3 leaves and were graded under resistant category. The genotypes Narendra, IC-128889, GM-5, EC-133336, Arka Abhay, IC-43733 and IC-69242 had leafhopper population varying from 6.39 to 9.61 leafhoppers/3 leaves and were categorized as moderately resistant genotypes. The population of leafhopper on the genotypes IC-60168, VRO-22, IC-45805, IC-282229, IC-45800 and EC-169378 ranged from 9.61 to 12.83 and were categorized as moderately susceptible genotypes. IC-282268, IC-282292, IC-282288 and IC-140906 recorded the leafhopper population above 12.83 leafhoppers/3 leaves and were graded under the susceptible category.

These categorization is done as per the scale adopted by Nagar *et al*., (2017) in which mean value of individual genotypes (Xi) was compared with mean value of infestation of all genotypes (X) and standard deviation (sd) following the modified scale. The retransformed data were used for computation of X, Xi and sd for each parameter.

Table 2: Categorization of okra genotypes for resistance or susceptibility to leafhopper

Based on population of leafhopper/plant : X = 9.61 sd = 3.22			
Category of resistant	**Scale**	**Genotypes**	
Resistant	Xi < 6.39	OK-7	(3.80)
		OK-9	(4.10)
		Arka Anamika	(4.85)
Moderately resistant	Xi >6.39 < 9.61	Narendra	(7.00)
		IC-128889	(7.20)
		GM-5	(7.50)
		EC-133336	(8.00)
		Arka Abhay	(8.66)
		IC-43733	(9.03)
		IC-69242	(9.60)
Moderately susceptible	Xi > 9.61 <12.83	IC-90168	(10.04)
		VRO-22	(10.33)
		IC-45805	(10.87)
		IC-282229	(11.63)
		IC-45800	(12.30)
		EC-169378	(12.80)
Susceptible	Xi > 12.83	IC-282268	(13.03)
		IC-282292	(13.57)
		IC-282288	(13.90)
		IC-140906	(14.03)

Where, Xi = Mean value of individual genotype
X = Mean value of infestation of all genotypes
Sd = Standard deviation

Conclusion

From the present study, it may be concluded that the okra genotypes OK-7, OK-9 and Arka Anamika recorded the lowest population of leafhopper during the period of crop growth. This genotypes are identified as a source of resistance against leafhopper and could be used in breeding programme and development of IPM strategies.

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