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Screening of okra varities against okra jassid (*Amrasca biguttula biguttula* Ishida)

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ABSTRACT

In the present study the screening of okra was planned against okra jassid caused by *Amrasca biguttula biguttula* (Ishida) in consecutively for the two seasons viz; summer and Rainy season in Indian Institute of Vegetables Sciences, Varanasi. Eight varieties of okra namely Arka Anamika, GS - 43 Arka, Abhay, VR –5, HRB–55, IIVR–10, VRO–6 and Pusa Sawani were included for the present study. Evaluation and screening of varieties in two environments led to the categorizriation into different groups. It helped in identification of two resistant (Arka Anamika and GS - 43), four moderately resistant (Arka Abhay, VRO–5, HRB – 55 and IIVR - 10), one susceptible (VRO-6) and one highly susceptible (Pusa Sawani) varieties. The study also revealed that none of the variety was rated as highly resistant indicating about severity of this insect.

Keywords: *Amrasca biguttula* (Ishida), Okra Jassid, Resistant varieties, Susceptible varieties

Introduction

Vegetables are one of the most important components of Indian Horticulture and constitute the most important foods of mankind. They have high protective food value and are more economical than milk, meat, fish or eggs. Among the various vegetables grown in India, *Abelmoschus esculentus* L., family Malvaceae is an important vegetable crop which is grown during kharif season in India. The environmental condition necessary for okra plant is sunny light, well drained soil, pH 6 to 7.5, warm temperature and average moisture. It is tall-growing warm season annual plant that is well adapted to a wide range of soil types. Physiologically, it is considered as a day neutral plant and crops remains in-bearing almost entire year except in winter from mid November to mid January in plains. Most destructive insect pest of okra are jassids, whitefly, aphids, spotted bollworms. *Amrasca biguttula biguttula* (Ishida) (Homopterous: Cicadellidae) which is important in the tropics and sub tropics. Amongst the most important sucking insect that attack okra plant (Singh *et al.*, 1993; Kakar and Dobra, 1988; Dhandapani *et al.*, 2003) where it lays maximum numbers of eggs and thus becomes suitable place for survival and feeding (Hussain *et al.*, 1979; Bernado and Taylo, 1990; Sharma and Singh, 2002). Both the nymph and adult suck the plant sap and introduce salivary toxins that impair photosynthesis in proportion to the amount of feeding.

The affected leaves curl downwards; turn yellowish then brownish before drying and shedding. Severe incidence lead to stunting of young plants and results in hopper burn injury. The fruiting capacity of the infested plants is significantly affected and in many cases heavy infestation on young plants cause death of the plant. Severe incidence during the late season leads to reduced yields. Cotton leafhopper or cotton jassid (*Amrasca biguttula biguttula* Ishida), (Homoptera: Cicadellidae), has a broad host range including cotton, okra, brinjal, eggplant, jute and aubergine (Kittiboonya *et al.*, 2004).

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Both nymph and adult stages can destroy the plants by not only sucking into the leave tissues but also by transmitting different viruses, resulting in symptom and yield loss. The extent of jassid damage to number and weight of okra fruits could approach 54% (Rawat and Sahu, 1973).

The insect pest management program still relies heavily on the chemical insecticides, which lead to a destabilization of ecosystem and enhanced resistance to insect pests (Kranthi *et al*., 2001; Mohan and Gujar, 2003). Chemicals and pesticides are less effective to control jassid problem, ecologically harmful and financially not viable, which also adds to environmental pollution. Therefore there is a need to develop alternates for handling such economically important pest approach with the environmental friendly pest management approach; host plant resistance (HPR) is one of most effective and safe methods. Plant contains a large number of substances which have their primary use as a means of defense against naturally enemies. A resistance variety can provide a base on which to construct an integrated control system (Maxwell *et al.,* 1972; Gallun *et al.,* 1975) and may be most fruitful when used in connection with other methods of control. HPR is seen to be sustainable approach to pest management and varietals traits of different okra plants to jassid are essential. This was an attempt to identify the response by different available genotypes of okra to jassid in order to determine resistance/ susceptibility. The best logical approach to overcome the jassid problem is to develop jassid resistance varieties. Host plant resistance provides an efficient, economical and safe means of plant protection against jassid. Resistance to jassid is controlled by major genes. Few characterized and numerous uncharacterized resistance genes are being now used in various crops improvement programs.

Materials and methods

The experiment on "Screening of okra varieties against okra jassid (*Amrasca biguttula biguttula* Ishida)" was carried out at the Indian Institute of Vegetable Research. The observations on various weather parameters such as temperature (^{0}C) (maximum and minimum), relative humidity (%) (maximum and minimum), total rainfall (mm) and sunshine hours were recorded at weekly interval in both rainy and summer seasons by the Meteorological Observatory situated at the Research Farm, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh.

Analysis of data

The population data of jassid recorded in different treatments were transformed as square root transformation ($\sqrt{x+1.0}$) as suggested by Heinrichs *et al.* (1981). The transformed data were statistically analyzed for their test of significance by following Factorial Randomized Block Design (Gomez and Gomez, 1976). The analysis of variance (ANOVA) was made and the calculated 'F' was compared with tabulated 'F' to record the significance of difference. The ANOVA table is given hereunder:

Sources of Variation	DF	SS	MSS	F values Cal	F values Tab
Replication	R - 1 = r				
Treatment	T - 1 = t				
Weekly Population (WP)	P - 1				
Treatment x WP	(T - 1) x(P - 1) = tp				
Error	(tp - 1) x (R - 1)				

$C.D. = \sqrt{\frac{2 \times error\ MSS}{n}} \times 't'$ 5% level of significance. The calculated 'F' value was compared with the tabulated value of 'F' given by Fisher and Yates (1949) at 5 % level of significance and error degree of freedom.

Results

Eight varieties were screened against jassid (*A. b. biguttula*) under natural infestation condition (field condition). The data on jassid infestation are presented in Table 1. The significant differences among the varieties in recording jassid infestation were observed. The highest mean jassid population was recorded in varieties Pusa Sawani (15.24 leaf $^{-3}$) followed by VRO-6 (13.08 leaf $^{-3}$). The lowest jassid population was recorded in Arka Anamika (3.93leaf $^{-3}$) followed by GS-43 (5.53 leaf $^{-3}$). The jassid infestation recorded at weekly interval differed significantly from each other.

Treatments	Okra Varieties
T1	Arka Anamika
T2	GS -43
T3	Arka Abhay
T4	VRO -5
T5	HRB -55
T6	IIVR-10
T7	VRO -6
T8	Pusa Sawani

Highest mean jassid population was recorded on 23rd September (12.04 leaf $^{-3}$) and lowest was recorded on 26th August (2.85 leaf $^{-3}$) (Table 1).

Table 1 Screening of varieties of okra against jassid during rainy season, 2008.

Varieties	Population of Jassid (Leaf $^{-3}$) at Weekly Interval						Average
	26th Aug.	2nd Sept.	9th Sept.	16th Sept.	23rd Sept.	30th Sept.	
Arka Anamika	2.60 (1.89)	3.47 (2.11)	3.73 (2.17)	3.47 (2.11)	6.53 (2.73)	3.80 (2.19)	3.93 (2.20)
GS-43	3.00 (2.00)	4.07 (2.25)	5.93 (2.63)	5.87 (2.61)	10.20 (3.35)	4.13 (2.26)	5.53 (2.51)
Arka Abhay	2.80 (1.95)	4.27 (2.29)	8.33 (3.05)	10.80 (3.42)	6.20 (2.67)	3.60 (2.14)	6.00 (2.59)
VRO – 5	2.07 (1.75)	5.67 (2.58)	8.87 (3.14)	12.33 (3.64)	8.33 (3.05)	10.27 (3.35)	7.92 (2.92)
HRB - 55	3.33 (2.07)	5.13 (2.47)	12.27 (3.64)	18.27 (4.39)	10.33 (3.36)	6.47 (2.71)	9.30 (3.11)
IIVR-10	1.60 (1.61)	3.13 (2.02)	6.27 (2.69)	9.33 (3.21)	11.27 (3.50)	14.40 (3.92)	7.67 (2.83)
VRO – 6	3.80 (2.15)	9.13 (3.18)	12.27 (3.64)	15.00 (4.00)	18.07 (4.36)	20.20 (4.60)	13.08 (3.66)
Pusa Sawani	3.40 (2.08)	9.07 (3.17)	15.90 (4.11)	20.47 (4.63)	25.43 (5.14)	17.20 (4.26)	15.24 (4.06)
Average	2.85 (1.94)	5.476 (2.50)	9.19 (3.128)	11.94 (3.5)	12.04 (3.51)	10.00 (3.17)	
Difference between the treatments			C.D.(P = 0.05) = 0.14				
Difference between the periods of observations			C.D.(P = 0.05) = 0.04				
Difference between the treatments x periods of observations			C.D.(P = 0.05) = 0.34				

Figures in the parenthesis are $\sqrt{x+1}$ transformed values.

Screening of okra varieties on the basis of jassid population during rainy season 2009

All the varieties screened against jassid infestation showed significant variation (Table 2). The highest mean jassid infestation was recorded in the Pusa sawani (16.19 leaf $^{-3}$) and lowest jassid population (3.65 leaf $^{-3}$) was in Arka Anamika followed by GS - 43. The jassid infestation recorded at weekly interval differed significantly from each other. Highest mean jassid population was recorded on 23rd September (12.52 leaf $^{-3}$) and lowest was recorded on 26th August (2.83 leaf $^{-3}$) (Table 2).

Screening on the basis of jassid population during rainy season 2008 and 2009 (pooled)

The pooled data on jassid infestation for the two years are presented in Table 3. There were significant differences among the varieties for jassid infestation. The highest mean jassid population was recorded in

varieties Pusa sawani (15.51 leaf $^{-3}$) and lowest jassid population was recorded in Arka Anamika (3.79 leaf $^{-3}$) followed by GS – 43 and Arka Abhay (6.40 leaf $^{-3}$). The jassid infestation at various periods varied significantly from each other. The highest jassid infestation was recorded on 23rd September (12.21 leaf $^{-3}$) and lowest on 26th August (2.77 leaf $^{-3}$) (Table 3).

Conclusions

Among the various vegetables, okra is one of the cultivated crops relished for tender pods. From the time of sowing till harvest, okra is attacked by a number of insect pests. Among these, jassid (*Amrasca biguttula biguttula* Ishida) is one of the major insect pest. In country like ours where the production of vegetables is already much below the requirement, the damage due to the jassid is undesirable. Application of chemical pesticides for controlling the insect pests infesting vegetable crops is not appreciated because of their side effects and environmental pollution.

Table 2 Screening of varieties of okra against jassid during 2009.

Varieties	Population of Jassid (Leaf $^{-3}$) at Weekly Interval						Average
	26th Aug.	2nd Sept.	9th Sept.	16th Sept.	23rd Sept.	30th Sept.	
Arka Anamika	2.87 (1.96)	3.20 (2.04)	3.57 (2.13)	3.20 (2.04)	5.73 (2.59)	3.33 (2.07)	3.65 (2.14)
GS-43	2.73 (1.92)	4.93 (2.43)	5.40 (2.52)	6.07 (2.65)	9.20 (3.19)	4.60 (2.36)	5.49 (2.51)
Arka Abhay	3.27 (2.06)	5.17 (2.48)	8.73 (3.12)	12.07 (3.60)	7.33 (2.87)	4.20 (2.26)	6.79 (2.73)
VRO – 5	2.80 (1.95)	6.90 (2.81)	8.40 (3.06)	11.00 (3.46)	10.13 (3.33)	8.13 (3.01)	7.89 (2.94)
HRB - 55	2.40 (1.83)	5.87 (2.61)	11.23 (3.49)	16.33 (4.14)	10.97 (3.45)	5.20 (2.48)	8.67 (3.09)
IIVR-10	1.67 (1.63)	3.27 (2.06)	7.00 (2.82)	8.40 (3.06)	12.47 (3.67)	17.03 (4.24)	8.31 (3.02)
VRO – 6	3.60 (2.14)	8.17 (3.02)	10.13 (3.33)	14.47 (3.92)	16.87 (4.22)	21.20 (4.71)	12.41 (3.56)
Pusa Sawani	3.33 (2.08)	10.30 (3.36)	15.90 (4.09)	24.80 (5.07)	27.50 (5.35)	17.27 (4.03)	16.19 (4.03)
Average	2.83 (1.95)	5.98 (2.60)	8.80 (3.06)	12.04 (3.49)	12.52 (3.58)	10.12 (3.14)	
Difference between the treatments	C.D.(P = 0.05) = 0.18						
Difference between the periods of observations	C.D.(P = 0.05) = 0.06						
Difference between the treatments x periods of observations	C.D.(P = 0.05) = 0.44						

Figures in the parenthesis are $\sqrt{x+1}$ transformed values.

Table 3 Screening of germplasms / varieties of okra against jassid (pooled data of 2008and 2009).

Varieties	Population of Jassid (Leaf $^{-3}$) at Weekly Interval						Average
	26th Aug.	2nd Sept.	9th Sept.	16th Sept.	23rd Sept.	30th Sept.	
Arka Anamika	2.73 (1.93)	3.33 (2.08)	3.65 (2.15)	3.33 (2.08)	6.13 (2.66)	3.57 (2.13)	3.79 (2.17)
HRB – 55	2.87 (1.95)	5.50 (2.54)	11.75 (3.57)	17.30 (4.26)	10.65 (3.41)	5.83 (2.60)	8.98 (3.05)
GS-43	2.87 (1.96)	4.50 (2.34)	5.67 (2.58)	5.97 (2.63)	9.70 (3.27)	4.37 (2.31)	5.51 (2.51)
Arka Abhay	3.03 (2.01)	4.72 (2.39)	8.53 (3.08)	11.43 (3.51)	6.77 (2.77)	3.90 (2.20)	6.40 (2.66)
VRO – 5	2.43 (1.85)	6.28 (2.69)	8.63 (3.10)	11.67 (3.55)	9.23 (3.19)	9.20 (3.18)	7.91 (2.93)
IIVR-10	1.63 (1.62)	3.20 (2.04)	6.63 (2.76)	8.87 (3.14)	11.87 (3.58)	15.72 (4.08)	7.99 (2.87)
VRO – 6	3.70 (2.17)	8.65 (3.10)	11.20 (3.49)	14.73 (3.96)	17.47 (4.29)	20.70 (4.66)	12.74 (3.61)
Pusa Sawani	3.37 (2.09)	9.68 (3.26)	13.73 (4.10)	22.24 (4.85)	25.90 (5.25)	17.23 (4.14)	15.51 (4.06)
Average	2.82 (2.03)	5.73 (2.56)	8.72 (3.10)	12.00 (3.50)	12.21 (3.55)	10.06 (3.16)	
Difference between the treatments	C.D.(P = 0.05) = 0.14						
Difference between the periods of observations	C.D.(P = 0.05) = 0.07						
Difference between the treatments x periods of observations	C.D.(P = 0.05) = 0.36						

Figures in the parenthesis are $\sqrt{x+1}$ transformed values.

Therefore, development of eco-friendly measures is very much essential. Eight varieties were screened against jassid. The varieties categorized into different groups on the basis of jassid population exhibited a total of 2 as resistant (Arka Anamika and GS - 43), 4 as moderately resistant (Arka Abhay, VRO – 5, HRB – 55 and IIVR - 10), 1 susceptible (VRO - 6) and 1 as highly susceptible (Pusa Sawani) while none of the variety was rated as highly resistant.

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