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Incidence and Population Dynamics of Leaf Hopper, *Amrasca bigutulla bigutulla* (Cicadellidae:Homoptera) on Four Varieties of Okra (*Abelmoschus esculentus*) Crop in Multan, Pakistan

Atta ur Rehman[1], Muhammad Razaq[1] and Wali Muhammad[2]

[1]*Department of Entomology, Faculty of Agricultural Sciences and Technology, Bahauddin Zakariya University, Multan, Pakistan*

[2]*Pest Warning and Quality Control of Pesticides, Agriculture Department, Government of Punjab, Pakistan*

Abstract.- The leaf hopper, *Amarasca bigutulla bigutulla* Ishida is an important sucking pest of okra causing huge losses. The present study was aimed to study the incidence and population dynamics of *Amarasca bigutulla bigutulla* on four okra (*Abelmoschus esculentus* L.) varieties in Southern Punjab Pakistan. The results revealed non significant difference in the mean population of *A. bigutulla bigutulla* on different okra varieties. However, maximum population was observed on Green star and minimum population on Pusa sawani. The leaf hopper population varies in different dates throughout the season with maximum population observed in the first week of July, 2012. Host Plant Susceptibility Indices (HPSI,s) of various genotypes were also observed. HPSI,s of Sabz pari (32%) was maximum toward leaf hopper followed by Green star and arka anamika (25% each) and minimum in Pusa sawani (18%). Correlation with different environmental variables showed negative correlation with maximum temperature and positive significant correlation with relative humidity at morning 8 AM. The study will be helpful in the management of jassid on okra under agro-climatic conditions of Southern Punjab.

Keywords: *Amarasca bigutulla bigutulla*, varietal susceptibility, environmental factors, pest management

INTRODUCTION

Okra, *Abelmoschus esculentus* L. is an annual summer vegetable crop grown commercially throughout the tropical and sub tropical regions of the world for immature fruit (Martin and Ruberte, 1978). It has a great nutritional value and is said to be "a perfect villager's vegetable" (Adamou *et al.*, 2010; Holser and Bost, 2004). It is an important source of carbohydrates, minerals, amino acids which play a vital role in human diet (Gopalan *et al.*, 2007; Farinde *et al*., 2007; Dilruba *et al.*, 2009; Saifullah and Rabbani, 2009). Its average production in the world is estimated to six million tons per year (Burkil, 1997). In Pakistan, it is grown on an area of 15,081 hectares with 114,657 million tons of production (Varmudy, 2011).

Okra crop is attacked by a numbers of insect pests and diseases (N'Guessan *et al.*, 1992; Ghanem, 2003) which results in poor production (Ek-amnuay, 2007; Fasunwon and Banjo, 2010; Fajinmi and Fajinmi, 2010). About 72 species of insects are known to attack the Okra plants. Among the reported insect pests of Okra, leaf hopper (*Amrasca bigutulla bigutulla* Ishida) is one of the most important sucking pests (Srinivasa and Rajendran, 2003). Leaf hopper is a pestiferous insect that sucks the cell sap and injects toxic saliva into leaves resulting in yield loss (Singh *et al*., 2008).

Insecticides are the only options for the vegetable growers to manage insect pests in the developing countries. Indiscriminate use of pesticides leads to an undesirable load of pesticide residues in saleable vegetables (Kumari *et al*., 2002). It is necessary to explore alternative methods to reduce the use of pesticides and their adverse effects on the environment and human health. Host plant resistance is an economical, effective and environment friendly tactic to manage insect pests. This not only led to the reduction of pesticide use and slows down the development of insecticide resistance in insects, but also increases the activity of beneficial organism (Sharma and Ortiz, 2002). Each variety has some distinguishing characteristics which make them less vulnerable to insect pests and

* Corresponding author: walientomologist@gmail.com; atta_rehman28@yahoo.com

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diseases. Density of hairs or trichomes on the leaves play an important role in plant defense mechanism against insect pests. Uthamasamy (1985) reported that hairy varieties are more resistant as compared to others. Tyalo and Bernardo (1995) determined that density of trichomes had significant and negative correlation with the emergence of leaf hopper. A resistant variety can provide a foundation for integrated control system against insect pests. Therefore, the present study was conducted to explore the population dynamics of leaf hopper, *Amrasca bigutulla bigutulla* and its incidence on different okra varities. The main purpose was to find out such a variety that can be regarded as a resistant variety to leaf hopper.

MATERIALS AND METHODS

Field site

The experiment was conducted at the research farm of Department of Agricultural Entomology, Bahauddin Zakariya University, Multan, Pakistan. Four commercially grown okra varieties *viz.*, sabzpari, green star, pusa sawani and arka anamika were selected for varietal resistance against leaf hopper (*Amrasca biguttula biguttula* Ishiida). Experiment was conducted in a randomized complete block design (RCBD) with three replications. Plant to plant and row to row distance was maintained at 15×15 cm and 75×75 cm, respectively. No plant protection measures were applied and studies were conducted under natural insect pressure. Standard agronomic practices were used for all plots uniformly.

Incidence and population dynamics of A. biguttula biguttula

The population of *A. biguttula biguttula* on each okra variety was recorded from May-July, 2012 by following the methodology of Iqbal *et al.* (2008). Briefly, a total of 30 plants (10 plants in one replication) of each variety were selected and tagged for population sampling at each inspection date. Numbers of nymphs and adults were counted from the top, middle and bottom leaves of the selected plants early in the morning when adults and nymphs are not active (Iqbal *et al.*, 2008). The mean numbers of both adults and nymph recorded from all okra varieties were correlated with temperature, relative humidity, rainfall and sunshine hours during the studied period. The susceptibility indices of okra varieties were calculated by following the methodology of Iqbal *et al.* (2008).

Data analysis

Data of the numbers of *A. biguttula biguttula* on each variety was subjected to analysis of variance (ANOVA) by using the linear model procedure of Statistix version 8.1 and means were compared by LSD test at P=0.05.

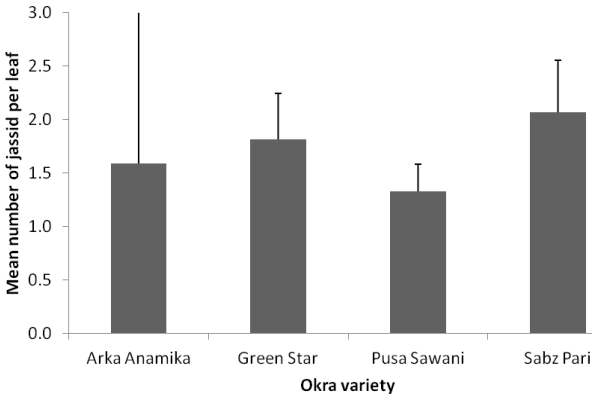

Fig. 1. Mean population of leaf hopper on four okra varieties during 2012.

RESULTS AND DISCUSION

The results revealed that the maximum leaf hopper population was recorded in genotype sabz pari followed by green star and arka anamika with 2.06, 1.81 and 1.59 per leaf, respectively. The minimum population was observed (1.32 per leaf) in pusa sawani (Fig. 1). In the current study, genotypes were non-significantly different, however, sabzpari was most susceptible to leaf hopper followed by green star and arka anamika. Pusa sawani was comparatively resistance to leaf hopper. These findings are in accordance with those of Dabhi *et al.* (2012) and Kumar and Singh (2002) who reported pusa sawani and arka anamika as moderately resistant to leaf hopper.

The overall population dynamics of *A. biguttula biguttula* on all varieties during the study period is shown in Figure 2. The results revealed less numbers of leaf hoppers at the start of season

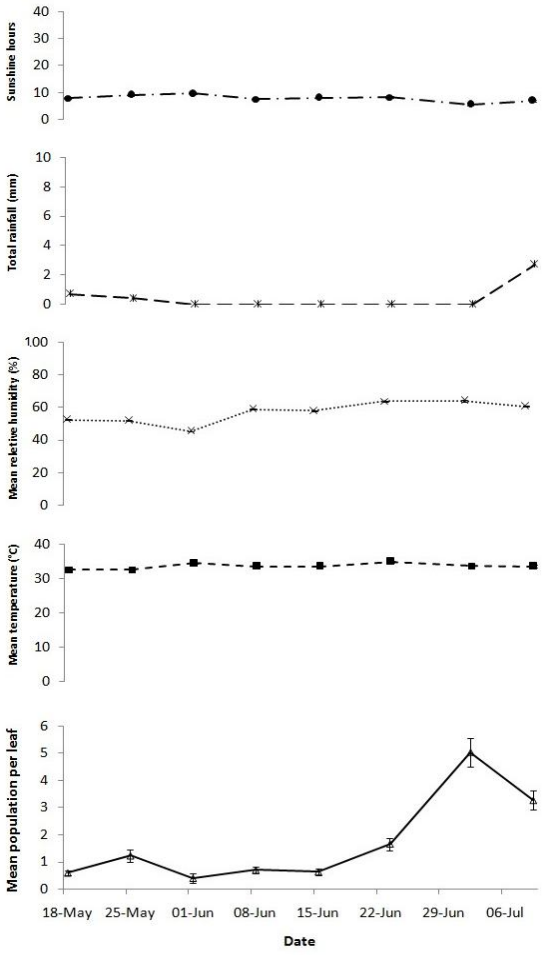

Fig. 2. Overall mean population of jassid on different sampling dates during 2012 along with climatic factors.

which then increased gradually after a small decline on 1st June 2012. Maximum numbers of leaf hoppers were captured on 2nd July 2012 after which sudden decline in population was observed (Fig. 2).

The host plant susceptibility indices (HPSIs) showed that genotype green star showed maximum HPSI's of 32% followed by the sabz pari and arka anamika each with 25% HPSI's during 2008. The minimum HPSI's of 18% was observed in pusa sawani and proved to be comparatively resistant than the other three genotypes (Fig. 3).

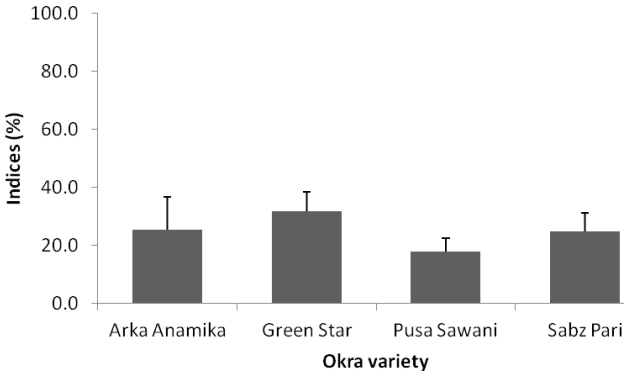

Fig. 3. Plant susceptibility indices (%) based on the population of *Amarasca biguttula biguttula* on four okra varieties during 2012.

Correlation analysis revealed that the leaf hopper population had non-significant and negative correlation with the three okra varieties except green star which had significant negative correlation at $p \leq 0.05$. While the leaf hopper population had positive and non-significant correlation with minimum air temperature on all okra varieties (Table I). These results are in conformity with that of Singh *et al.* (2013) who reported similar results as negative correlation between leaf hopper population on okra and maximum and minimum temperature. Iqbal *et al.* (2010) also reported the same results.

Table I.- Correlation of different environmental variables with *Amrasca bigutulla bigutulla* population on different varieties of okra.

Okra varieties	Temperature (ºC		Relative Humidity (%)		Sun shine	Rainfall	Population
	Maximum	Minimum	8 AM	5 PM	hours	(mm)	per leaf
Arka Anamika	-0.6753 ns	0.6033 ns	0.7694*	0.2730 ns	-0.7580*	0.3841 ns	1.5917
Green Star	-0.7553*	0.6943 ns	0.7091*	0.3292 ns	-0.8813**	0.9018 ns	1.8125
Pusa Sawani	-0.6407 ns	0.4839 ns	0.7097*	0.2511 ns	-0.6658 ns	0.9572 ns	1.3292
Sabz Pari	-0.6339 ns	0.7059 ns	0.7375*	0.2579 ns	-0.8054**	0.9380 ns	2.0667

**Correlation significant at 0.01 level, *Correlation significant at 0.05 level.

The relative humidity at 8 AM was significantly correlated with leaf hopper population at $p \leq 0.05$, whereas relative humidity at 5 PM had positive non-significant correlation with leaf hopper population. The results are in contrast with Singh *et al.* (2013) who reported negative correlation between leaf hopper population and relative humidity. This may be due to the difference in time during which studies were conducted. The sunshine hours had a strong negative correlation with leaf hopper population on sabz pari and green star okra varieties at $p \leq 0.01$. The rainfall also had positive but non-significant correlation with leaf hopper population on all okra varieties. Singh *et al.* (2013) reported a positive correlation with rainfall and leaf hopper population.

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