Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2015; 3(6): 88-90

Received: 10-09-2015
Accepted: 02-10-2015

Imtiaz Ali Khan
Department of Entomology, The University of Agriculture, Peshawar, Pakistan.

Sana Ashfaq
Department of Entomology, The University of Agriculture, Peshawar, Pakistan.

Rasheed Akbar
Department of Entomology, The University of Agriculture, Peshawar, Pakistan.

Sajjad Hussain
Department of Entomology, The University of Agriculture, Peshawar, Pakistan.

Komal Habib
Department of Entomology, The University of Agriculture, Peshawar, Pakistan.

Walija Fayaz
Department of Entomology, The University of Agriculture, Peshawar, Pakistan.

Muhammad Saeed
Department of Agricultural Sciences, University of Haripur, Pakistan.

Abid Farid
Department of Agricultural Sciences, University of Haripur, Pakistan.

Ijaz Ali
Dept. of Biosciences, COMSATS Institute of Information Technology, Islamabad.

Mukhtar Alam
Faculty of Science, University of Swabi, Pakistan.

Correspondence:
Imtiaz Ali Khan
Department of Entomology, The University of Agriculture, Peshawar, Pakistan.

Population dynamics of insect pests and their natural enemies on okra, *Hibiscus esculentus* L. (Malvales: Malvaceae), in Peshawar, Pakistan

Imtiaz Ali Khan, Sana Ashfaq, Rasheed Akbar, Sajjad Hussain, Komal Habib,Walija Fayaz, Muhammad Saeed, Abid Farid, Ijaz Ali, Mukhtar Alam, Ruidar Ali Shah

Abstract
Okra is attacked by many insect pests in Peshawar, Pakistan. For efficient control of insect pests of okra, population dynamics of insect pests and its associated natural enemies is utmost important. The present research project was carried out at the New Developmental Farm (NDF) of the University of Agriculture, Peshawar (UAP) during 2009. Whitefly *Bemisia tabaci* (Gennadius), aphids *Aphis gossypii* (Glover), leafhopper *Amrasca biguttula biguttula* (Ishida), leaf beetle *Cerotoma trifurcate* (Forster), red cotton bug *Dysdercus koenigii* (Fabricius) were the major insect pests while Ladybird beetle *Coccinella septempunctata* (Linnaeus), spider *Dictyna* sp. (Linnaeus) and ant *Solenopsis invicta* (Buren) were the natural enemies recorded on okra. Densities of insect pests as well as their natural enemies peaked in June-July. Highest density of the pests recorded were 0.81 *B. tabaci* per leaf on 30th June, 3.56 *A. gossypii* per leaf on 23rd June, 47.03 *A. biguttula biguttula* per leaf on 7th July, 0.14 *C. trifurcate* per leaf on 14th July and 1.03 *D. koenigii* per leaf on 21st July. Highest density of 0.58 *C. septempunctata* per leaf was on 21st July, 0.36 *Dictyna sp*. per leaf on 21st July and 2.25 *S. invicta* per leaf on 16th June. The present work might help in devising IPM against insect pests of okra especially using its natural enemies in Peshawar.

Keywords: Insect pests, Natural enemies, Okra, Population dynamics

1. Introduction
H. esculentus, also known as Lady's finger, is a popular home garden vegetable in Pakistan. It is a good source of vitamins, minerals, salts and has high caloric value. The edible portion contains 89.8, 0.8, 0.2, 7.4 and 1.8% water, protein, fat, carbohydrate and ash, respectively. It has 175 calories per pound [1].

In Pakistan, okra was grown on 15.081 thousand ha in 2009 that yielded 114.657 thousand tones while in Khyber Pakhtunkhwa province it was grown on 2.126 thousand ha with total production of 18.156 thousand tones [2].

Insect pests pose major threat from sowing to harvest to this important vegetable. The major pests are thrips *Thrips tabaci*, jassid *Amrasca biguttula biguttula*, aphid *Aphis gossypii*, cutworm *Agrotis ipsilon*, spotted boll worm *Earias insulana*, American boll worm *Helicoverpa armigera*, whiteflies *Bemisia tabaci* and fruit borer *Earias vittella* [1,3].

The damage of different insect pests varies from year to year depending upon weather conditions and the intensity of insect pests attack. About 145 species of insect pests are recorded on cotton plant and almost all of these attack okra plant also in Pakistan [4]. In okra the insect pests infestation caused 8.92%, 15.69% and 49.30% reduction in plant height, number of effective branches and marketable fruit yield, respectively [5].

Among natural enemies *Encarsia* sp., *Chrysoperla* spp., ants and Coccinellids are some that contributed to the reduction of insect pest of okra [6].

Keeping in view the importance of the okra vegetable and losses caused by different insect pests to it, the present research aimed to study population dynamics of insect pests and its natural enemies on okra.

2. Materials and Methods
2.1 Experimental field
The experiments on insect pests and their natural enemies of okra were conducted at the NDF, UAP in 2009. For the experiment, okra, variety Roma Kirishan was sown on May 13 in a plot,

measuring 34 x 54 m^2. The recommended seed rate of 2/hole was applied at the depth of 1 inch. Standard agronomic practices were applied throughout the growing season. No pesticides were applied to the crop. Plant to plant and row to row distances in okra was kept at 45 cm and 90 cm, respectively.

2.2 Insect pests and natural enemies sampling

Density of insect pests and their natural enemies was recorded on weekly basis on three randomly selected leaves, one each from top, middle and bottom, of each of the ten randomly plants per row. For counting the insect pests and their natural enemies on okra, the leaf was gently held at the petiole by thumb and fore finger and turned until the entire underside of leaf was clearly visible. Data were recorded at morning hours (8-10 am) because at that time winged pests were sluggish and easily counted. The insects were recorded from 3rd week of May till last week of July. The data recorded was subjected to mean values of individuals per leaf per week. Okra was harvested daily from 3rd week of June till last week of July. The weather data was recorded at the Research Farm for correlation with the insect densities.

2.4 Statistical analysis

The data recorded for each parameter was analyzed statically by using Statistix 8.1 software and means were separated by using Fisher Protected Least Significance Difference Test at 5% level of significance [7].

3. Results and Discussion

The results of the experiment on insect pests and their natural enemies of okra are reported as under:

3.1 Population dynamics of insect pests

Density of *B. tabaci* on okra on 16th June was 0.11 individuals per leaf (Table 1). The pest's population inclined afterwards to the highest point of 0.81 individuals per leaf on 30th June and then decreased abruptly afterwards. Density of *A. gossypii* increased from 2.47 on 16th June to 3.56 aphids per leaf on 23rd June. The pest density decreased abruptly to 0.06 on 30th June and diminished afterwards. *A. biguttula biguttula* appeared on 16th June with 0.44 individuals per leaf. Density of the leafhopper increased abruptly from 23rd June (0.56 individuals per leaf) to 07th July (47.03 individuals per leaf). The pest density gradually decreased in the coming weeks. *C. trifurcate* appeared on okra on 14th July with 0.14 individuals per leaf but soon disappeared on 21st July. *D. koenigii* appeared with 1.03 individuals per leaf on 21st July on okra and disappeared soon afterwards.

Table 1: Mean density of insect pests per leaf on okra during 2009.

Insect pest species	Mean no. of insect pests per leaf						LSD
	16th June	23rd June	30th June	7th July	14th July	21st July	
B. tabaci	0.11c	0.67b	0.81a	0.03d	0.00e	0.00e	0.10
A. gossypii	2.47b	3.56a	0.06c	0.00d	0.00d	0.00d	0.04
A. biguttula biguttula	0.44d	0.56d	13.58c	47.03a	45.53a	32.47b	9.87
C. trifurcate	0.00b	0.00b	0.00b	0.00b	0.14a	0.00b	0.04
D. koenigii	0.00b	0.00b	0.00b	0.00b	0.00b	1.03a	0.06

Means in rows followed by different letters are significantly different at 5% level of significance (LSD-test).

Population of *B. tabaci*, *A. gossypii* and *A. biguttula biguttula* started from mid-June while *C. trifurcate* appeared in July. Population of whitefly started from mid-June and reached to highest number in last week of June [5, 6]. In the present study aphids population also peaked in June which was different than findings of earlier some researchers [8, 9]. They recorded higher populations of aphids in May and September. Leafhopper was the major pest of okra throughout the growth period of the crop. The mean population of leafhopper recorded was 7.78/plant during Kharif season (May to September, 2005) [6]. The population density of leafhopper was higher (0.57-4.16 nymphs/adults per leaf) during summer 2005 as compared to summer 2006 (0.19-1.60 nymphs/adults per leaf) [10]. Some earlier researchers had also reported leaf beetle and red cotton bug as major pests of okra [11, 12]. Our results are comparable to the findings of the previous researchers regarding the insect pests and their population dynamics on okra. The differences in pest density and species of insect pests might be due to the variations in climatic conditions, crop variety and soil, etc.

3.2 Population dynamics of natural enemies on okra

The density of *C. septempunctata* on okra recorded on 16th June was 0.22 individuals per leaf (Table 2). The beetle density gradually decreased till 30th June (0.03 individuals per leaf) but increased again and reached to a highest no. of 0.58 individuals per leaf on 21st July and disappeared later on. *Dictyna* sp. appeared in okra on 7th July with 0.31 individuals per leaf. Its density decreased to 0.25 individuals per leaf in the next week but increased again to 0.36 individuals per plant in the subsequent week. Density of *S. invicta* was 2.25 individuals per leaf on 16th June. The density continuously decreased till 30th June, but fluctuated afterwards. The ants disappeared on 21st July.

Table 2: Mean density of natural enemies per leaf on okra during 2009.

Natural enemy species	16th June	23rd June	30th June	7th July	14th July	21st July	LSD
C. septempunctata	0.22b	0.14c	0.03d	0.28b	0.50a	0.58a	0.07
Dictyna sp.	0.00b	0.00b	0.00b	0.31a	0.25a	0.36a	0.06
S. invicta	2.25a	1.00b	0.14d	0.42c	0.31c	0.00e	0.09

Means in rows followed by different letters are significantly different at 5% level of significance (LSD-test).

The population of *C. septempunctata* and *S. invicta* started from mid June while *Dictyna* sp. appeared in July. Our results are comparable to that of some earlier researchers [6]. They also found high population of Lady beetle and ants in July. The present results of spider are different than that of some earlier researchers [6, 8], who recorded higher population of spider during June to October and May to September, while it appeared and peaked once in the season (July) in the present experiment.

3.3 Effect of weather on insect pests and their natural enemies of okra

Temperature (ºC) (both minimum and maximum) and RH (%) gradually increased during the three months (Fig. 1). But there was found no effect of weather on population fluctuation of insect pests and their natural enemies except that population of *A. biguttula biguttula* increased with the increase in temperature (ºC) and RH (%).

Temperature had a marked effect on natality and mortality schedules and on life table statistics of three cohorts of potato leafhopper. When computed on a day scale, intrinsic and finite rates of increase were largest, and mean generation time shortest, at the regime with highest temperature [13]. Lower (7.6 and 8.8 ºC) and upper (29 ºC) thresholds for egg and nymphal development of *E. fabae* were determined, where nymphal mortality was high at 13 ºC, decreased at 18 ºC, and gradually increased to 81% at 35 ºC [14].

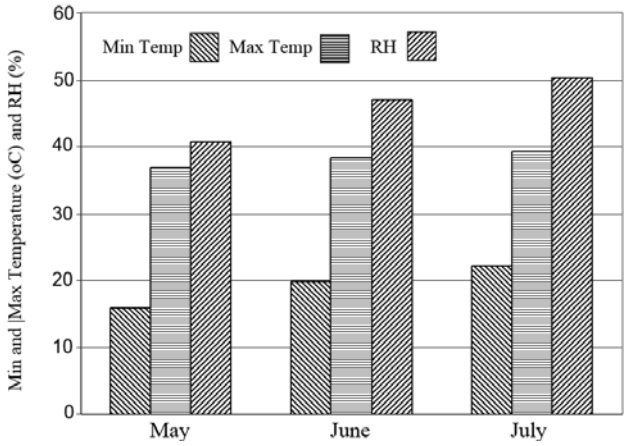

Fig 1: Minimum and maximum temperature (ºC) and RH (%) recorded during 2009.

4. Conclusion and Recommendations

In the present research work, infestation of *B. tabaci*, *A. gossypii*, *A. biguttula biguttula*, *C. trifurcate* and *D. koenigii* as well as their natural enemies *C. septempunctata*, *Dictyna* and *S. invicta* peaked in June-July. Minimum temperature was recorded in May, while maximum temperature and RH was recorded in June and July of 2009. The peak densities of the insect pests as well as their natural enemies were positively correlated with the maximum temperature and RH. The findings of the present research might help in better control of the insect pests of okra, mainly using their natural enemies in Peshawar.

5. References

1. Lanjar AG, Sahito HA. Impact of weeding on whitefly, *Bemisia tabaci* (Genn.). Pakistan Journal of Weed Science Research. 2007; 13(3-4):209-217.
2. MINFAL. Agriculture Statistics of Pakistan. Fruits and Vegetables. Government of Pakistan, Ministry of Food, Agriculture and Livestock (Economic Wing) Islamabad, 2008, 11-18.
3. Rakesh M, Dhawan P, Vinod B. Evaluation of okra varieties against viral diseases. Indian Journal of Virology. 2006; 17(2):61-65.
4. Kanwar N, Ameta OP. Assessment of losses caused by insect pests of okra (*Abelmoschus esculentus* L). Pestology 2007; 31(6):45-47.
5. Leite GLD, Picanço M, Jham GN, Moreira MD. Whitefly population dynamics in okra plantations. Pesquisa Agropecuária Brasileira 2005; 40(1):19-25.
6. Solangi BK, Lohar MK. Effect of some insecticides on the population of insect pests and predator on okra. Asian Journal of Plant Science. 2007; 6(6):920-926.
7. Steel RGD, Torrie JH. Principals and procedures of statistics: A biological approach. 2nd Ed. McGraw Hill Book Co. New York, 1980, 481.
8. Leite GLD, Picanço M, Zanuncio JC, Gusmao MR. Factors affecting colonization and abundance of *Aphis gossypii* Glover (Hemiptera: Aphididae) on okra plantations. Ciência e Agrotecnologia 2007; 31(2):337-343.
9. Kim YH, Kim HY, Kim JH. Occurrence of cotton aphids (*Aphis gossypii*) and lady beetles (*Harmonia axyridis*) on *Hibiscus syriacus* L. Entomology Research 2008; 38(3):211-215.
10. Wajid H, Ansari MS. Distribution pattern of cotton leafhopper, *Amrasca biguttula biguttula* (Ishida), on okra varieties. Indian Journal of Entomology. 2008; 70(3):276-288.
11. Delate K, McKern A, Burcham B. Evaluation of organic pest management treatments for Bean Leaf Beetle and Soybean Aphid-Neely-Kinyon trial. http://www.ipm.iastate.edu/ipm/icm, 2004, 3.
12. Raju SVS, Kumar S. Dynamics and development of field resistance to red cotton bug (*Dysdercus koenigii* F.). International Journal of Tropical Agriculture. 2008; 26:1-2.
13. Hogg DB. Potato Leafhopper (Homoptera: Cicadellidae) immature development, life tables and population dynamics under fluctuating temperature regimes. Environmental Entomology 1985; 14(3):349-355.
14. Simonet DE, Pienkowski RL. Temperature effect on development and morphometrics of the potato leafhopper. Environmental Entomology 1980; 9(6):798-802.