J. Exp. Zool. India Vol. 19, No. 2, pp. 1003-1009, 2016 | www.connectjournals.com/jez | *ISSN 0972-0030*

INSECT PEST SCENARIO OF OKRA,*ABELMOSCHUS ESCULENTUS* (L) MOINCH AND THEIR NATURAL ENEMIES

Rajveer, Vijay Kumar Mishra and R. S. Bisht

Department of Entomology, G.B.Pant University of Agriculture and Technology, Pantnagar - 263 145, India.
Department of Entomology and Agricultural Zoology, Banaras Hindu University, Varanasi-221005, India
e-mail-premvijaybhu@gmail.com

(Accepted 25 May 2016)

ABSTRACT : The present investigation was carried out during *kharif*, 2014 at Vegetable Research Centre, G.B. Pant University of Agriculture and Technology, Pantnagar situated in Tarai region of Uttarakhand. A total of twenty one species of insect pests beloging to four orders and seven species of natural enemies on insect pests of okra have been reported. The order Hemiptera occupied the largest number of species contributing about 38.09% of the total pest fauna followed by Lepidoptera (33.33%,), Coleoptera (23.80%) and Orthoptera (4.76%). Among the various insect pests of okra, *Earias* spp., *Bemisia tabaci* and *Amrasca biguttula biguttula* have been reported to be major insect pests.

Key words : Insect pest of okra, natural enemies in kharif season.

INTRODUCTION

India has emerged out as the second largest producer of vegetables in the world. Vegetables constitute a substantial part of human diet supplying vitamins and minerals, in which other food materials are deficient.

Among the different kinds of vegetables, okra (bhendi) *Abelmoschus esculentus* (L.) Moench. is the second largest cultivated one, a potential export earner and accounting for 60 percent of export of fresh vegetables (Peirce, 1987). India ranks first in okra production and area in the world and occupies prime position among the vegetables excluding potato and tomato. In India the production was about 6350.27 thousand metric tones from 530.79 thousand hectares of area during 2012-2013 (72.9% of the total world production) of ladyfinger/okra (NHB, 2013).

In india major leading state in okra production is West Bengal, Andhra Pradesh, Odisha, Gujarat and Bihar with a production of 74.60, 74.25, 67.04, 65.66 and 59.24 thousand metric tones, respectively (NHB, 2013).

In Uttarakhand Dehradun, Udham singh nagar, Pithoragarh, Tehri, Nainital, Haridwar and Chamoli are the major okra producuing district.

Okra belongs to the family Malvaceae and grown all over the country during spring –summer and rainy season for its immature fruits. It is closely relative to cotton crop and thought to be native to tropical Africa extending from Ethiopia and Sudan (Agarwal and Bhanot, 2000; Peirce, 1987). The edible portion of the okra crop is immature seed pod, which quickly losses its desirable characteristics as it matures. These tender okra pods/fruits are used as vegetable, a good source of vitamins (A, B and C), proteins, minerals and excellent source of iodine.

Linoleic acid, an essential fatty acid, has also been reported to be present, abundantly in okra seed oil (Chin and Nushirwan, 1990). Okra mucilage is also used in clarificationtechnique for producing quality jaggery (Mungare *et al*, 2000). In some places, the plants are soaked in water and the resulting solution is used as clarifier in the manufacture of jaggery. Its ripe seeds are roasted, ground and used as a substitute for coffee in Turkey.

Important limiting factors in the successful cultivation of okra is the damage due to insect pest, mainly fruit borers and sucking insects. The important species of fruit borers are *Earias vittella* (Fabricius) (Krishnaiah *et al*, 1978; Rawat and Sahu, 1973), *E. insulana* (Bioduval) (Tripathi and Singh, 1990) and *Helicoverpa armigera* (Hubner) (Rawat and Sahu, 1973). However, according to Hiremath (1984) *Earias* spp. damage may reach as high as 60.68%. Besides fruits, it also damages growing shoots which adversely affects the overall health of plants and yield. Sucking insects *viz.*, cotton jassids, *Amrasca biguttula biguttula* (Ishida) (Lal *et al*, 1990) whitefly, *Bemisia tabaci* (Gennadius) and *Aphis gossypii* (Glover) (Rawat and Sahu, 1973) and red spider mite, *Tetranychus telascius* (Linn.) (Khaire and Naik, 1986). The okra

infesting pests are also pests on cotton (Dhawan, 1998). The leaf hopper and *E. vittella* together are reported to cause about 69% loss in okra (Rawat and Sahu, 1973).

Importance of white fly lies in its being vector of yellow vein mosaic virus (YVMV) disease in okra. YVMV is one of the most destructive disease of the crop and causes considerable reduction in yield which could be as higher as 92 to 94 per cent. Besides quantity, fruit quality is also adversely affected due to this disease.

The *Earias* spp. and *A. biguttula biguttula* are the major and regular pests of okra in Tarai region of Uttarakhand. Of late, *H. armigera* has been observed to damage fruits and stem by weevil, *Alcidodes* spp.

At the same time the shifting ecological imbalances of pests and other species led to level of infestation, which varied, widely from year to year in space and time. Hence, a continuous monitoring of all important pests under field condition is essential for timely prevention of sudden outbreaks of epidemics and for devising the suitable pest management strategies.

These pests are managed by various methods like as cultural, mechanical, physical, biological and chemical. Coleopteran predators are important bio-control agents among the entomophagous group of insects. *Coccinella septumpunctata* and *Menochilus sexmaculata* etc. has received much attention as biological control agent due to its potential to control outbreaks of homopteran and heteropteran insects (Singh *et al*, 2013).These predators are recognized as one of the important regulating factors in managing the aphid population**.**They also feed on mites, whiteflies, small soft bodied insects and eggs of insects etc. In order to prevent the losses caused by insects and to produce quality crop, it is essential to manage the pest population at appropriate time with suitable measures. The multiplication of these pests has been found to be favoured by environmental factors.

MATERIALS AND METHODS

Field experiments on okra during *kharif*, 2014 at Vegetable Research Centre (VRC), Haldi, of Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Uttarakhand were conducted to study the biodiversity and their natural enemies Under present investigation, commonly grown okra variety 'parbhani Kranti'was raised in field with a plot size of 5x3. Row to row and plant to plant distance were kept 60x 45 cm. This experiment was laid under RBD design with three replication. Each replication was divided into seven treatment.

Observations procedure

The qualitative and quantitative study of insect pest of okra was carried out by regular monitoring to explore the biodiversity and abundance of the insect pests. The abundance/incidence of various insect pests was recorded right from seedling stage to harvesting of the crop. On the basis of pest population, the relative abundance of each pest was worked out according to rating system as given below:

Abbreviations: ++++ = Abundant; +++ = Common; ++ = Fairly common; + = Rare.

Statistical analysis

The data thus obtained was transformed to square root values and subjected to analysis of variance. After determination of significance of difference between the treatment means at (0.05) percent probability, critical difference was calculated in order to compare the treatment means.

RESULTS AND DISCUSSION

Biodiversity of okra pests and their natural enemies (Tables 4.1; 4.2, Fig 4.1)

Results of extensive field survey carried out from August to October, 2011, in okra crop field at Vegetable Research Centre (VRC), Pantnagar revealed the occurrence of 21 species of insect pests belonging to 4 orders and 14 families attacking okra crop indicating appreciable biodiversity under conditions prevailing in this part of the state (Plate 2-3). However, the number of okra pests reported by various workers in India has been found to vary with respect to different geographical and ecological conditions of a locality. Butani and Verma (1976) reported that okra plants in Rajasthan are attacked by 20 insect pests whereas Patel *et al* (1970) reported more than 30 species of insect pests attacking okra crop in India out of which only 11 species are reported from Gujarat.

Significantly, the sucking pests belonging to order Hemiptera occupied largest number of 8 species *viz*. *Bemisia tabaci* Gennadius (whitefly), *Amrasca biguttula biguttula* Ishida (jassid), *Aphis gossypii* (Glov.) (aphid), *Dysdercus cingulatus* koenigii (red cotton bug), *Leptoglossus phyllopus* (Linnaeus) (leaf footed bug), *Scutellera* spp (jewel bug), *Nezara viridula* (L.) (green stink bug), *Oxycarenus hyalipennis* (Cost) (dusky cotton bug) constituting about 38.09% of the total insect pests followed by 7 species of Lepidoptera *viz*. *Earias vitella* Fab. and *Earias insulana* Boisduval (shoot and fruit borer), *Helicoverpa armigera* (Hubner) (fruit borer), *Lamprosema* sp. (leaf folder), *Sylepta*

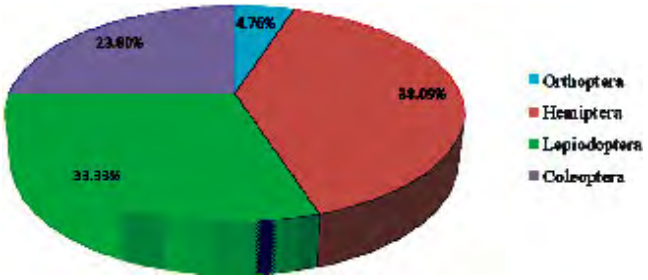

Fig. 4.1 : Percent composition of different orders of insect pests of okra at Pantnagar during *Kharif*, 2014.

(*Haritalodes*) *derogata* (Fabricius) (leaf roller), *Trichoplusiani* (semilooper), *Spodoptera litura* (Fabricius) (tobacco caterpillar) comprising of 33.33%; 5 species of Coleoptera *viz. Chalaenosoma matallicum* (flea beetle), *Aulacophora foveicollis* (Lucas) (red pumpkin beetle), *Myllocerus subfasciatus (discolor)* (Ash weevil), *Oxycetonia versicolor* (flower beetle), *Mylabris pustulata* Thumb (Blister beetle) constituting 23.80%. The order Orthoptera on the contrary was represented by only one species *viz. Hieroglyphus banian.*

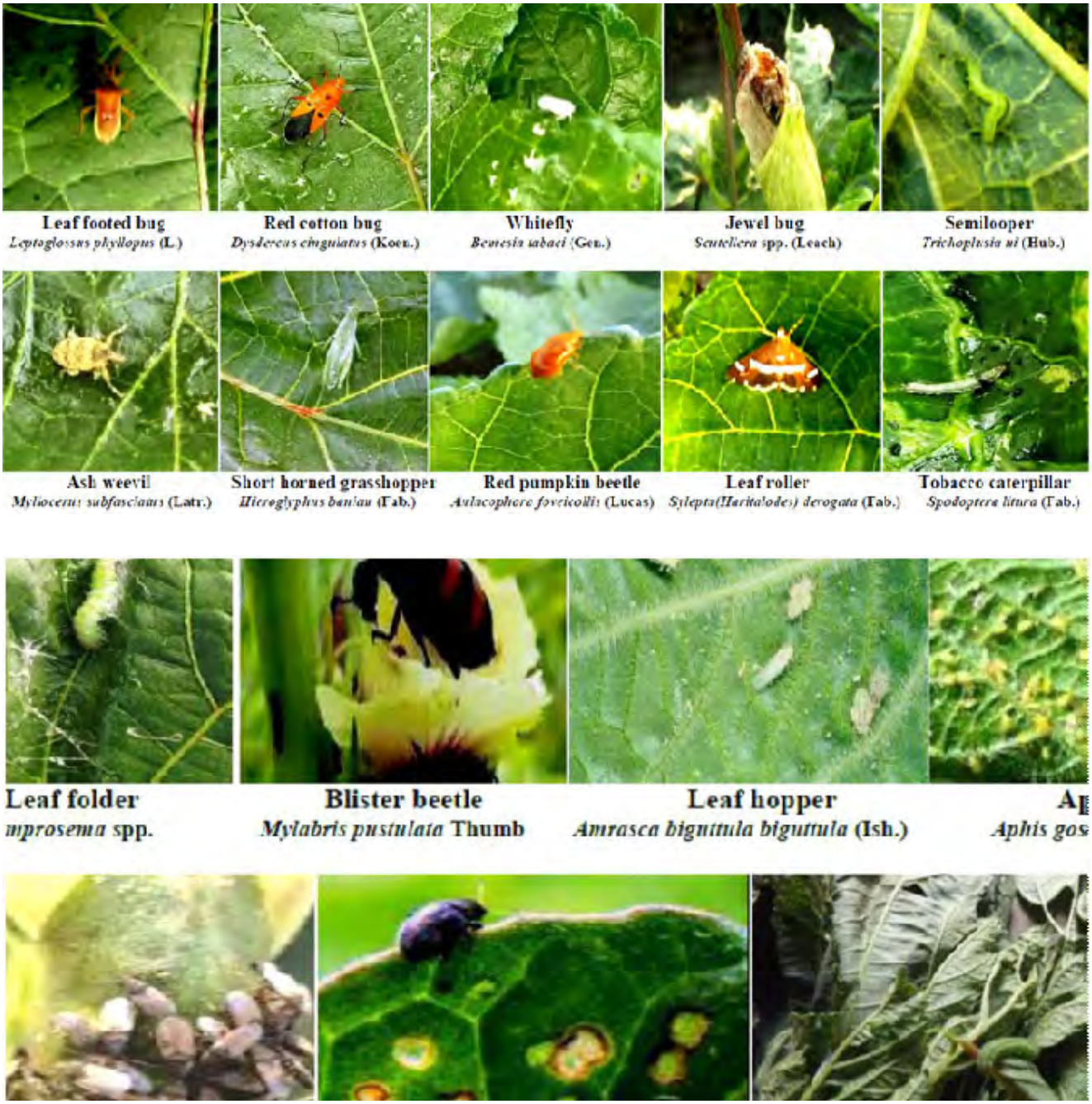

Plate 2 : Insect fauna associated with okra crop.

F. (short horned grasshopper) constituting only 4.76% of the total insect pests of okra (Fig. 4.1).

The relative abundance of these insect pests (Table 4.1.1) indicated that out of 21 insect pests attacking okra crop, the shoot and fruit borer *(Earias vittella* Fab. and *Earias insulana* Boisd.), leaf hopper *(Amrasca biguttula biguttula* Ishida) and white fly *(Bemisia tabaci* Gennadius) exhibited marked higher abundance as compared to other insect pests and therefore, appeared to be the pests of major importance. Out of two species of spotted bollworm, *Earias insulana* Boisduval and *E. vittella* occuring under Indian conditions, the latter species has been found more destructive to okra (Butani and Jotwani, 1983). The status of okra shoot and fruit borer, *Earias* spp. as the major pest of okra in various parts of India has also been described by several other workers (Rawat and Sahu, 1973; Sharma *et al*, 2010). Likewise, *Amrasca biguttula biguttula* has been also considered as the most destructive pest of okra by many workers. (Dhandapani *et al*, 2003; Pathan *et al*, 2010; Sinha *et al*, 2010). The role of whitefly in transmitting yellow vein mosaic virus and as the major pest of okra is well understood (Kabade *et al*, 2010; Sinha *et al*, 2010).

Helicoverpa armigera, Trichoplusia ni, Sylepta derogata, Aphis gossypii, Spodoptera litura and *Lamprosema* spp., were the next in position that were observed as common pests in the present study. *Heteroglyphus banian* F., *Leptoglossus phyllopus* (Linnaeus), *Oxycetonia versicolor*, *Scutellera* spp., *Nezara viridula* (L.), *Oxycarenus hyalipennis* (Cost) *and Dysdercus cingulatus* were noticed to be fairly common, whereas *Chalaenosoma matallicum*, *Aulacophora foveicollis* (Lucas), *Myllocerus subfasciatus* (discolor), *Mylabris pustulata* Thumb showed their rare abundance and therefore, considered as the pests of minor importance in okra crop.

The shoot and fruit borer, *E.vittella* in the present study was found to be the major pest on okra causing damage to shoots and fruits. The appearance of this pest started from the first week of August (32nd SMW) and continued till September end (39th SMW).

the findings are in confirmation with Devasthali and Saran (1997), who reported *Earias vittella* as the most serious and destructive pest at Indore region of M.P. They reported that *Earias vittella* cause damage to fruits from August 17 (33rd SMW) to September 21 (38th SMW), for 35 days.

Bajad and Patil (2014) reported at Allahabad (U.P.), the incidence of *Earias vittella* on okra plants from fourth week of August (34th SMW) to fourth week of October (41st SMW).

The young larvae of semilooper were found feeding on leaves by making holes. The incidence of this pest was recorded as minor during August and September. These finding in confirmation with Devasthali and Saran (1997), they reported that semilooper larvae infest the okra crop from August 10 (32nd SMW) to September 7 (36th SMW), for 28 days at Indore (M.P.).

Fruit borer, *H. armigera* which is an important pest of pulses and cotton in India was also found feeding on the okra. The larvae feed on developing fruit by boring them. The infestation was recorded from beginning of August (32nd SMW) to end of September (39th SMW). The damage was also reported by Kumar *et al* (2014) on okra at Central Potato Research Institute, Meerut and they revealed that the incidence of this pest occur from August beginning (32nd SMW) to October end (43rd SMW).

The nymphs and adults of aphid, *A.gossypii* was recorded from first week of August (32nd SMW) to last week of September (39th SMW). These finding in close agreement with Devasthali and Saran (1997), they reported that the infestation of aphid on okra from July 27 (30th SMW) to September 14 (37th SMW), for a period of 49 days at Indore (M.P.).

The red cotton bug, *D. cingulatus* on okra was recorded in the month of September with a minor incidence in 3rd and 4th week (38th SMW to 39th SMW). These finding in close agreement with Devasthali and Saran (1997), who reported that the infestation of this pest on okra at Indore occurred from September 14 to 21 (37th to 38th SMW), for a period of one week.

Blister beetle, *M. pustulata* on okra appeared from second week September (37th SMW) to last week of September (39th SMW) as a minor pest. reported its incidence on okra at Central Potato Research Institute, Meerut, from August (32nd SMW) to September (39th SMW) as a low economic status pest. This pest is also reported on okra by Kakar and Dogra (1988) in Himachal Pradesh.

Other pests of okra like as *Chalaenosoma matallicum* (flea beetle) and *Oxycetonia versicolor* (flower beetle) made their appearence in August, *Lamprosema* sp. (leaf folder), *Trichoplusia ni* (semilooper) and *Heteroglyphus banian* F. (short horned grasshopper) from August to September, *Leptoglossus phyllopus* (L.) (leaf footed bug), *Scutellera* spp (jewel bug) and *Aulacophora foveicollis* (Lucas) (red pumpkin beetle) appeared in September, as also reported by Lohumi (2012) at Vegetable Research Centre, Pantnagar

Table 4.1 : Pest complex of okra, their incidence and relative abundance at Vegetable Research Centre, Pantnagar, *Kharif* 2014.

S. No.	Pest		Order	Family	Period of incidence	Relative Abundance
	Scientific name	Common name				
1	*Bemesia tabaci* (Gennadius)	Whitefly	Hemiptera	Aleyrodidae	August - September	++++
2	*Amrasca biguttula biguttula* (Ishida)	Jassids	Hemiptera	Cicadellidae	August - September	++++
3	*Aphis gossypii* (Glover)	Aphid	Hemiptera	Aphididae	August - September	+++
4	*Dysdercus cingulatus* (Koenigii)	Red cotton bug	Hemiptera	Pyrrhocoridae	September	+
5	*Leptoglossus phyllopus* (Linnaeus)	Leaf footed bug	Hemiptera	Coreidae	September	++
6	*Scutellera* spp. (Leach)	Jewel bug	Hemiptera	Scutelleridae	September	++
7	*Nezara viridula* (Linnaeus)	Green stink bug	Hemiptera	Pentatomidae	August - September	++
8	*Oxycarenus hyalipennis* (Cost)	Dusky cotton bug	Hemiptera	Lygaeidae	September	++
9	*Earias vittella* (Fabricius)	Okra shoot and fruit borer	Lepidoptera	Noctuidae	August - September	++++
10	*Earias insulana* Boisduval	Okra shoot and fruit borer	Lepidoptera	Noctuidae	August - September	+
11	*Helicoverpa armigera* (Hubner)	Fruit borer	Lepidoptera	Noctuidae	August - September	+++
12	*Sylepta* (Haritalodes) *derogata* (Fabricius)	Leaf roller	Lepidoptera	Crambidae	August - September	+++
13	*Lamprosema* spp.	Leaf folder	Lepidoptera	Pyralidae	August - September	+++
14	*Trichoplusia ni* (Hubner)	Semilooper	Lepidoptera	Noctuidae	August - September	+++
15	*Spodoptera litura* (Fabricius)	Tobacco caterpillar	Lepidoptera	Noctuidae	August - September	+++
16	*Chalaenosoma matallicum* (Spinola)	Flea beetle	Coleoptera	Chrysomelidae	August	+
17	*Aulacophora foveicollis* (Lucas)	Red pumpkin beetle	Coleoptera	Chrysomelidae	September	+
18	*Myllocerus subfasciatus* (Latreille)	Ash weevil	Coleoptera	Curculionidae	September	+
19	*Oxycetonia versicolor* (Fabricius)	Flower beetle	Coleoptera	Curculionidae	August	++
20	*Mylabris pustulata* Thumb	Blister beetle	Coleoptera	Meloidae	September	+
21	*Hieroglyphus banian* (Fabricius)	Short horned grasshoppers	Orthoptera	Acrididae	August - September	++

Abbreviations:- ++++ = Abundant; +++ = Common; ++ = Fairly common; + = Rare.

(Uttarakhand).

The incidence of tobacco caterpillar, *Spodoptera litura* (Fab.) and dusky cotton bug, *Oxycarenus hyalipennis* (Cost) were also recorded from August to September and in September, respectively.

CONCLUSION

Field experiments on okra was conducted during *kharif*, 2014 at Vegetable Research Centre (VRC), G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, to study the pest complex of okra, During the course of study, as many as 7 species of natural enemies (predators, parasitoids and spider) of various pests were encountered on okra crop (Plate 4). A list of these natural enemies along with their prey/host, period of incidence and relative abundance is presented in Table 4.2.

Among the aphidophagous insects, 2 species of Lady bird beetle *viz*. *Coccinella septempunctata* and *C. transversalis* and 2 species of syrphid larvae *viz. Syrphus* sp. and *Ischiodon* sp. were noticed as the most common

Table 4.2 : Natural enemies of various insect pests of okra, their incidence and relative abundance at VRC, Pantnagar.

S. No.	Natural enemy		Order	Family	Prey/host	Period of incidence	Relative abundance
	Scientific name	Common name					
1.	*Coccinella septempunctata C. transversalis*	Lady bird beetle	Coleoptera	Coccinellidae	Aphids, jassids	August - September	+++
2.	*Eocanthecona furcellata*	Predaceous stink bug	Hemiptera	Pentatomidae	Lepidopteran larvae	September	+++
3.	*Dysmachus trigonus*	Robber fly	Diptera	Asilidae	Moths, spiders	September	+
4.	*Syrphus* sp. and *Isciodon* sp.	Syrphid fly	Diptera	Syrphidae	Aphids	August - September	+++
5.	*Aphidius* spp.	Aphid parasitoid	Hymenoptera	Braconidae	Aphids	August - September	+
6.	*Mantis religiosa*	Praying mantid	Dictyoptera	Mantidae	Aphids	September	+
7.	Spiders	Spiders	Arachnida	-	Aphiod, Jassid and Lepidopetran larva	July - September	++++

Abbreviations: ++++ = Abundant; +++ = Common; ++ = Fairly common; + = Rare.

predators which prey upon *Aphis gossypii* on okra. The stink bug *viz*. *Eocanthecona furcellata* was found predating on the lepidopteran larvae *viz.* semiloopers, leaf folders, *Earias vittella* and *Helicoverpa armigera*. Moreover, the robber fly *Dysmachus trigonus* was observed to prey upon moths and spiders. Earlier, Shimoyakawa (2002) reported ladybird beetles and the predatory bug, *Orius* spp. feeding on aphids and some species of spiders feeding on cutworms attacking okra in Japan. Meanwhile Dhane (2007) found *Chelonus blackburni* predating on the shoot and fruit borer, *E. vittella*. Shivalingaswamy (2002) reported a staphylinid predator, *Paederus variicornis* on jassids attacking okra.

During the course of present study, a aphid parasitoid belonging to the genus *Aphidius* was encountered parasitizing the aphid, *Aphis gossypii* attacking okra. Recently, Rai *et al* (2011) reported *Trichogramma chilotraeae* (Trichogrammatidae: Hymenoptera) as an egg parasitoid of *E. vittella*.

During the course of present study twenty one species of insect pests were encountered to attack okra at different stages of crop growth in an overlapping manner, of these *Earias vitella* Fab, *Bemisia tabaci* Gennadius, *Amrasca biguttula biguttula* Ishida were found to be the pest of major significance whereas, seven species of predators were observed to be associated with various pests of okra, of these *Coccinella septempunctata, Coccinella transversalis, Eocanthecona furcellata* and spiders appeared to play major role to minimise the population of respective pest.

Among the various pests of okra, the order Hemiptera occupied the largest number of species constituting about 38.09%, followed by Lepidoptera 33.33%, Coleoptera 23.8% and Orthoptera 4.76%.

REFERENCES

Agarwal N and Bhanot J P (2002) Effect of seed treatment with different insecticies on the germination and vigour of okra seeds. *Pestology* **24**(10), 46-48.

Bajad V V and Patil S C (2014) Impact of weather parameters on incidence of *Earias vittella* infesting okra. *Indian J. Pl. Prot.* **42**(2),181-182.

Butani D K and Jotwani M G (1983) Insects as a limiting factor in vegetable production. *Pesticides* **17**, 6-13.

Butani D K and Verma S (1976) Insect pests of vegetables and their control, Lady s finger. *Pesticides* **10**, 31-37.

Chin A H G and Nurhirwan Z (1990) Properties of vegetable oils from unemployed source in Malaysia. *MARDI Res. J.* **18**(2), 261-265.

Devasthali S and Saran R (1997) Studies on pest complex of *Lady's finger* (bhindi) during *Kharif season* in Malwa region of Madhya Pradesh. *Crop Res.* **13**(2), 429-435

Dhamdhere S V, Bahadur J and Mishra U S (1984) Efficacy of some foliar insecticides against *E. vitella* F. infesting okra *A. esculentus. J. Ent. Res.* **8,** 128-131.

Dhandapani N, Shelkar U R and Murugan M (2003) Bio-intensive pest management in major vegetable crops: an Indian perspective. *Fd. Agric. Environ.* **2**, 333-339.

Dhane A S, Ghodaki B S and Babar M S (2007) Field evaluation of *C. blackburni* against shoot and fruit borer *E. vittella* infesting okra. *Indian J. Entomol.* **69**(1), 54-57

Dhawan A K (1998) Integrated pest management in cotton. *Pestology* **22**(4), 118-120.

Hiremath I G (1984) Host preference of spotted bollworm, *Earias* spp. *Entomology* **9**(3), 185-188.

Kabade K H, Bharodia R K, Jethva D M and Joshi M D (2010) Susceptibility of genotypes of okra to *Bemisia tabaci*. *Annals of Plant Prot. Sci.* **18**(1), 240-241.

Kakar K L and Dogra G S (1988) Insect pests of okra, *Abelmoschus esculentus* (Linn.)Moench, and their control under mid hill conditions. *J. Insect Sci.* **1,** 195-198.

Khaire V A and Naik K (1986) Screening of promissing germplasm of okra aginst Shoot and Fruit borer. *Curr. Res. Rep. MPAU*, 112-115.

Krishnaiah K, Jagan Mohan N and Ramchander P R (1978) Economic Injury level and sequential sampling plan for okra fruit borer, *E. vittella* (Fab.). *Bull. Ent*. **19**, 114-118

Kumar U, Singh D V, Sachan S K, Bhatnagar A and Singh R (2014) Insect pest complex of okra and biology of shoot and fruit borer, *Earias vittella* (f.). *Indian J. Entomol*. **76**, 29-31

Lal H, Mahal M S, Singh R and Singh B (1990) Influence of rainfall on population build up of *A. biguttula biguttula* (Ishida) on okra. *J. Insect Sci.* **3**, 169-171.

Lohumi B (2012) Evaluation of okra germplasm for resistence against its major insect pests and biology of okra shoot and fruit borer, *Earias vittela* (Fabricius). *M. Sc. (Ag.) Thesis*, GBPUAT, Pantnagar.

Mungare T S, Jadhav H D, Patil J P, Hasure R R, Jadhav B S, Singh J and Singh J (2000) Clarification Technique for producing quality Jaggary. *Cooperative Sugar* **32**, 283-285.

NHB (2013) www.hortibiziindia.org

Patel H K, Patel V C and Patel J R (1970) Catalogue of crop pests of Gujarat. **33**, 30-35.

Pathan N M, Nalwandikar P K and Shinde S T (2010) Evaluation of components of Integrated Pest Management (IPM) against aphids and jassids infesting okra. *J. Ent. Res.* **34**, 317-323.

Peirce L C (1987) *Vegetables: characteristics, Production and Marketing.* John Wiley and Sons, Canada pp. 399-401.

Rai A B, Gracy Gandhi R, Shivalingaswamy T M and Satpathy S (2011) Okra shoot and fruit borer, *Earias vittella* (F.), a new host record for the egg parasitoid, *Trichogramma chilotraeae*

Rawat R R and Sahu H R (1973) Estimation of losses in growth and yield of okra due to *Empoasca devastans* (Dist.) and *Earias* spp. *Indian J. Ent*. **35**, 252-254.

Sharma R P, Swaminathan R and Bhati K K (2010) Seasonal incidence of fruit and shoot borer of okra along with climatic factors in Udaipur region of India. *Asian J. Agricult. Res.* **4**, 232-236

Shimoyakawa H (2002) Control of insect pests on okra (*Abelmoschus esculentus*) using indigenous natural enemies in an open field. *Bull. Kochi Agricultural Res. Center (Japan)* **11**, 27-35.

Shivalingaswamy T M, Satpathy S, Singh B and Akhilesh Kumar (2002) Predator-prey interaction between jassid (*Amrasca biguttula biguttula*, Ishida) and a staphylinid in okra. *Vegetable Sci.* **29**, 167-169.

Singh,Y, Jha A, Verma S, Mishra V K and Singh S S (2013) Population dynamics of sucking insect pests and its natural enemies on okra agro-ecosystem in Chitrakoot region. *African J. Agricult. Res.* **8**, 3814-3819.

Sinha S R and Nath V (2010) Comparative efficacy of Neonicotinoids and insecticide mixtures against sucking pests of okra. *Ann. Pl. Protec. Sci.* **18**(2), 489-556.

Tripathi S R and Singh A K (1990) Effects of food plants on development, growth and reproduction of *E. vittella* (Fab.). *Indian J. Ecol*. **17**, 83-85.