



Research Article

Parasitism level by *Servillia transversa* Tothill on *Helicoverpa armigera* (Hubner) larvae on tomato crop in Meghalaya

D. PAUL and M. CHOUDHURY

Department of Environmental Studies

North Eastern Hill University, Corresponding author email: pauld97@rediffmail.com

ABSTRACT: Parasitism on *Helicoverpa armigera* larvae collected from the tomato fields situated in the village of Mawionsun in East Khasi Hills District of Meghalaya, was recorded during the fruiting stage. The total incidence of parasitism (%) for the entire study period in all the plots was estimated to be 14.47%. and 91% of parasitism of host larvae was due to a tachinid fly, *Servillia transversa*, Tothill.

KEY WORDS: *Helicoverpa armigera*, parasitoid, tachinid fly, *Servillia transversa*, Meghalaya

(Article chronicle: Received: 04-11-2013; Revised:18-01-2014; Accepted: 14-02-2014)

INTRODUCTION

Helicoverpa armigera (Hübner) (Lepidoptera: Noctuidae) is a polyphagous pest on hundreds of economically important agricultural and horticultural crops worldwide. Given its wide damage potential and prevalence, many control measures have been employed, 50% of all insecticides used in India and China are to control this pest (Lammers and MacLeod, 2007) and the pest has developed resistance to many insecticides. The use of biocontrol agents that can maintain *H. armigera* population at sub-economic levels is advocated.

The predators and parasitoid of *H. armigera* found in India have been recorded and enlisted by several authors (Manjunath *et al.*, 1989; Nikam and Gaikwad, 1989; Romeis and Shanowar, 1996). The largest group of *H. armigera* natural enemies reported from India is the larval and larval – pupal parasitoid with more than 60 identified species. *Campoletis chlorideae* Uchida (Hymenoptera: Ichneumonidae), a larval parasitoid, is the most common and widely distributed (Romeis and Shanowar, 1996). According to Singh *et al.* (2002), the worldwide records suggest that the maximum number of parasitoid of *H. armigera* larvae belong to the family Tachinidae (Order:Diptera), in contrast to India, where out of the 77 species of parasitoid recorded, 50 belong to parasitic Hymenoptera. The information on parasitism of *H. armigera* from the north eastern region as a whole and from the state of Meghalaya in particular, is scanty and not well documented.

The present study was undertaken to record the incidence of parasitism of *H. armigera* larvae collected from tomato fields in East Khasi Hills District of Meghalaya.

MATERIALS AND METHODS

Sampling of host insect/parasitoid

The larvae of *H. armigera* were collected from four randomly selected agricultural plots in the village of Mawionsun under the administrative division (tehsil) Mawryngkneng (25°33'49.729"N 92°1'16.108"E) in the East Khasi Hills District of Meghalaya. The average temperature and humidity recorded during sampling period was 29.3°C and 92.5% respectively. Most villages under Mawryngkneng almost exclusively grow tomato crops on commercial scale starting from the month of February/March each year. Different instars of *Helicoverpa armigera* larvae were collected from 10 randomly selected tomato plants in each agricultural plot. The field sampling for this study was undertaken only during the fruiting season which in this case was the entire month of July, so the sampling was performed on a weekly basis for the month of July, 2011. Total number of larvae collected from all the four plots during the period of study was 76. The larval samples were brought to the laboratory and reared in plastic containers and fed on natural diet comprising of leaves and fruits from organically grown tomato crops. The larvae were maintained at room temperature (23±1°C) and relative humidity of 68±5%. All the larvae were regularly monitored and any anomaly in their development as well as cases of their parasitism was recorded.

The percentage parasitism was estimated according to the formula (Romeis and Shanowar, 1996),

$$\text{Parasitism (\%)} = L_p/L_t \times 100$$

Where: L_p = Larvae parasitized

L_t = Total number of larvae

RESULTS AND DISCUSSION

The percent parasitism and the host stage at which the emergence of parasitoid occurred was noted. The level of parasitism was found to be highest (20.0%) in the samples collected during the fourth week of sampling, and the total incidence of parasitism in all the plots during study period was 14.47% (Table 1). Out of the total number of host specimens collected during the four week sampling period, 36.8% belonged to the early instar larval stages (L1-L3) at the time of the sampling and 63.2 % belonged to the late instar stages (L4-L6). The level of parasitism of late instar larvae was found to be 20.8% and the level of parasitism in the early instar stage was 10.7%. Of the total cases of parasitism during the period of study, 91% of parasitism of host larvae was due to the parasitoid *Servillia transversa*, Tothill (Diptera; Tachinidae). Therefore, the predominant natural enemy of *H. armigera* population on tomato crops of Mawiongsun village is a parasitoid belonging to the Tachinidae family (Fig 1).

In the present study all instars of *H. armigera* were collected but it was difficult to determine the exact stage at which the hosts were parasitized by the tachinids as they are koinobiont parasitoid, in which allows the host to continue feeding and grow while they develop inside it (Stireman *et al.* 2006). According to the findings of Bilapate, (1981a), Nikam & Gaikwald, (1989), tachinids parasitize older instars (L4-L6) and emerge from sixth instar larvae or pupae. The current observations showed that

S. transversa only emerge from sixth instar larvae or pupae of the hosts.

Although attempts to suppress *H. armigera* population by augmenting natural enemy populations have not shown consistent, feasible results so far (King *et al.*, 1982; King & Coleman, 1989) but it is pertinent to record and report the natural enemies of *H. armigera* particularly in the regions where these are less studied and explored for their utilization and also to understand the dynamics of host-parasitoid interaction with reference to local climatic conditions.

REFERENCES

- Bilapate GG. 1981. Investigations on *Heliothis armigera* (Hubner) in Marathwada .XXIII .Key mortality factors on cotton, pigeonpea and chickpea. *Proc Indian Nat Sci Acad. BL* 47:637-646.
- King EG., Powell JE. and Smith JW. 1982. Prospects for utilization of parasites and predators for management



Fig. 1. *Servillia transversa* Tothill parasitizing *Helicoverpa armigera* larvae collected from the study site.

Table 1. Parasitism level of *Helicoverpa armigera* during the entire study period

week plot	Parasitism level (%)				Weekly Parasitism level (%)	Host stage parasitized ^a	Host stage of emergence ^b
	I	II	III	IV			
1	14.28	0	14.28	25	13.63	L?, L?, L	L6,L6,L2
2	0	16.67	0	16.67	10.00	L?, L?	P, P
3	25	25	0	0	15.78	L?,L?,L?	L6,P,P
4	0	40	33.34	0	20.00	L?,L?,L?	L6,P,P
Total Parasitism level (%)	12	21.05	11.12	14.28	14.47		

^aL= larval stage; L?= larvae were attacked, host stage parasitized is unknown;

^bL6= sixth instar larva; L2= second instar larva; P= Pupal stage.

- of *Heliothis* spp., pp 103-122. *Proceedings of the International Workshop on Heliothis Management*. International Crops Research Institute for the Semi-arid Tropics, Patancheru, Andhra Pradesh.
- King EG, Coleman RJ. 1989. Potential for biological control of *Heliothis* species *Annual Rev Entomol.* **34**:53-75.
- Lammers JW, MacLeod A. 2007. Report of a Pest Risk Analysis *Helicoverpa armigera* (Hübner, 1808). Plant Protection Service (NL) and Central Science Laboratory (UK) join Pest Risk Analysis for *Helicoverpa armigera* (www.fera.defra.gov.uk/plants/plantHealth/pestsDiseases/.../helicoverp...) visited on 02.03.2012
- Manjunath TM., Bhatnagar VS., Pawar CS, Sithanatham S. 1989. Economic importance of *Heliothis* spp. in India and an assessment of their natural enemies and host plants, pp. 197–228. *Proceedings of the Workshop on Biological Control of Heliothis: increasing the effectiveness of natural enemies*. New Delhi, India.
- Nikam PK, Gaikwad AM. 1991. Effect of host larvae of *Helicoverpa armigera* (Hübner) on the parasitising ability of *Campoletis chlorideae* Uchida. *Entomon* **16** (4): 301 – 303.
- Pawar, CS., Bhatnagar, VS, Jadav, DR. 1986. *Heliothis* species and their natural enemies, with their potential for biological control. *Proc Indian Aca Sci (Animal Sciences)*. **95**: 695-703.
- Raheja AK. 1996. IPM Research and Development in India: Progress and Priorities, pp 115-126. In: Lal, O.P. (Ed.). *Recent Advances in Indian Entomology*. APC Publications Pvt. Ltd., New Delhi.
- Romeis J, Shanowar TG. 1996. Arthropod natural enemies of *Helicoverpa armigera* (Hübner) (Lepidoptera: Noctuidae) in India. *Biocontrol Sci Tech.* **6**: 481-506.
- Singh SP, Ballal CR, Poorani J. 2002. Old world bollworm: *Helicoverpa armigera* associated Heliothinae and their natural enemies. *Project Directorate of Biological Control, Bangalore, India, Technical Bulletin*, No. 31.
- Stireman JO, O'Hara JE. and Wood DM. 2006. Tachinidae: Evolution, Behavior, and Ecology. *Ann Rev Ent.* **51**:525-555.
- Thakur NSA, Shylesha AN, Rao R. 2006. Major insect pests of agri- horticultural crops and their management, pp. 4: 196-99. In: Dwivedi SC.(Eds). *North Eastern Hill Region in Integrated Pest Management and Biocontrol*. Pointer Publ. Pvt Ltd. New Delhi.