

## Survey and Abundance of Common Parasitoid and Predatory Species of the Cigarette Beetle, *Lasioderma serricorne* (F.) (Coleoptera: Anobiidae) in Tobacco Storage Warehouses in Syria

Bilal<sup>\*</sup>, H.; A. M. Basheer<sup>\*</sup> and A. T. Saleh<sup>\*\*</sup>

<sup>\*</sup>Dept. of Plant Protection, Faculty of Agriculture, Damascus University, Damascus; Syria.

<sup>\*\*</sup>Biological Control Studies and Research Center, Fac. of Agric.,  
Damascus University, Damascus, Syria.

(Received: July 12, 2011 and Accepted: August 28, 2011)

### ABSTRACT

A survey of common parasitoid and predatory species associated with the cigarette beetle, *Lasioderma serricorne* (F.) (Coleoptera: Anobiidae) and their relative abundances was carried out. Sampling was conducted in warehouses dried tobacco leaves in several regions of Syria (Dir Ali in Damascus rural, Lattakia seaport and Kafaryahmool in Idleb) from 30 May 2010 to 30 July 2011. Larvae of *L. serricorne* were collected at random from infested dried tobacco leaves. A total of 350 alive *L. serricorne* larvae were placed individually in cells, and isolated from each other with a special perforated tape. Emerged parasitoid and predatory species were weekly collected and classified. Four species of parasitoids; three pteromalids; *Anisopteromalus calandrae* (Howard), *Lariophagus distinguendus* (Forster) and *Pteromalus cereallahae* (Ashmead) and one encyrtid; *Ericydnus sipylus* (Walker) were recorded associated with the pest throughout the study period. *A. calandrae* was the most abundant one. As well, the predacious mite, *Tyrophagus putrescentiae* (Schrank) (Acaridae) was also recorded once at Dir Ali warehouse. Collected specimens were identified by the authors.

**Key words:** Survey, cigarette beetle, *Lasioderma serricorne*, warehouses, parasitoids, predators, Syria.

### INTRODUCTION

The cigarette beetle, *Lasioderma serricorne* (F.) (Coleoptera: Anobiidae) is the most important stored-tobacco pest in Syria (Alhariri, 1976). It is the most destructive insect pest ever found on stored tobacco (Papadopoulou and Buchelos, 2002 and 2003). Cigarette beetle infestations were estimated to be 0.7% of the total warehoused tobacco commodity (USDA, 1971). Damage occurs due to larval tunneling, feeding, excreting waste (frass) and pupating.

Adult cigarette beetles do not consume significant quantities of tobacco (Reed and Vinzant, 1942); however, they cause damage by chewing entrance/escape holes through the product as well as tunneling during their search for mating and ovipositional sites (Baur, 1991). The cigarette beetle, *L. serricorne* is a major insect pest damaging both raw and manufactured products in warehouses in Syria (Alhariri, 1976). Control of *L. serricorne* populations around the world is primarily dependent upon continued applications of phosphine (White and Leesch, 1995). Although, its repeated use for decades has disrupted biological control by natural enemies and led to outbreaks of insect species, development of resistance to the chemical, undesirable effects on non-target organisms and environmental and human health concerns (Rajendran and Narasimhan, 1994; Subramanyam and Hagstrum, 1995 and White and Leesch, 1995).

Survey of natural enemies fauna associated with the cigarette beetle in warehouses is the first step for successful establishment of biological control and IPM programs of the pest. Therefore, this study targeted the fauna of parasitoid and predatory species of *L. serricorne* in warehouses at some regions in Syria.

### MATERIALS AND METHODS

Sampling of the cigarette beetle *L. serricorne* was conducted in warehouses dried tobacco leaves at several regions of Syria (Dir Ali in Damascus rural, Lattakia seaport and Kafaryahmool in Idleb) from 30 May 2010 to 30 July 2011. Larvae of *L. serricorne* were collected at random from infested dried tobacco leaves in the warehouses dried tobacco leaves. *L. serricorne* larvae were placed individually in cells, isolated from each other with a special perforated tape. The plastic cases containing the larvae were placed in chambers, under controlled conditions; at 28±0°C, 65±5 % R.H. in darkness. The pest larvae were left until pupation and subsequently adults' emergence of either *L. serricorne* or its natural enemies. Emerged parasitoid and/or predatory species were weekly collected, classified by the aid of a stereomicroscope and counted. Emerged parasitoid and/or predatory species were identified at the Biological Control Studies and Research Center (BCSRC), Faculty of Agriculture, Damascus University, Syria.

## RESULTS AND DISCUSSION

### Survey of common parasitoid species of the cigarette beetle:

Out of 350 alive larvae of *L. serricorne*, collected from the three locations, four species of parasitoids; three pteromalids; *Anisopteromalus calanrae* (Howard), *Lariophagus distinguendus* (Forster) and *Pteromalus cereallae* (Ashmead) and one encyrtid; *Ericydnus sipylus* (Walker) were recorded associated with the pest throughout the study period. *A. calanrae* was the most abundant one (Table 1).

### Abundance of common parasitoid species

Numbers and seasonal abundances of the collected parasitic species/ location during the period of study were summarized in table (2). As shown in the table, number of the parasitoid species recorded at Dir Ali warehouse was higher than that at Latakia and Kafaryahmool. *A. calanrae* dominated the other species, particularly at Latakia. The three parasitoid species; *A. calanrae*, *L. distinguendus* and *E. sipylus* were recorded at Dir Ali, while the species *A. calanrae* and *P. cereallae* were recorded singly at Lattakia and Kafarmehoal, respectively. The four parasitoid species; *A. calanrae*, *P. cereallae*, *L. distinguendus* and *E. sipylus* represented 64.5, 34.6, 0.7 and 0.2% of the total number of parasitoids collected.

### Abundance of predators

The predacious mite, *Tyrophagus putrescentiae* (Schrank) (Acarina: Acaridae) was the only species recorded. It was recorded once at Dir Ali warehouse throughout the study period. Both sexes and nymphs of the mite species tended to aggregate into colony

in the feeding medium (Sánchez -Ramos and Castañera, 2001).

Kheradmand *et al.*, (2007) stated that *T. putrescentiae* is a cosmopolitan species capable of infesting many types of food and stored products and is commonly found in house dust. Ngamo *et al.*, 2007, Timokhov and Gokhman, 2003 and Onagbola and Fadamiro, 2011 reported that the pteromalid parasitoid species have a powerful role in pest control of several warehouses insect pests.

Obtained results agree with that of Peck, (1963), Bouček and Rasplus (1991) and Quicke (1997) who pointed that *A. calandrae* is an effective cosmopolitan parasitoid species of various stored-product pests mostly that belong to the order Coleoptera. Onagbola and Fadamiro (2011) stated that *P. cerealellae* is a generalist parasitoid of the larvae of many stored-product insects, including the beetle, *L. serricorne*. Papadopoulou and Athanassiou (2004) indicated that the ecto-parasitoid *L. distinguendus* is a parasitoid of various beetle species including *L. serricorne* in Europe.

Conservation of natural enemies is necessary and could be efficient method for suppressing pest populations in warehouses is decreasing pesticides applications (Brower *et al.*, 1991).

## ACKNOWLEDGMENT

The authors are grateful to all specialists in Center of Research and Study of Biological Control, Faculty of Agriculture, Damascus University, Damascus, Syria, for their valuable helps in progress of the project.

Table (1): Common parasitoid species of *L. serricorne*, collected from the tobacco warehouses in Syria, 2010/11

Family	Subfamily	Species	Collection site
Pteromalidae	Pteromalinae	<i>Anisopteromalus calanrae</i> (Howard)	Dir Ali and Latakia
	Pteromalinae	<i>Lariophagus distinguendus</i> (Forster)	Dir Ali
	Pteromalinae	<i>Pteromalus cereallae</i> (Ashmead)	Kafaryahmool
Encyrtidae	Tetracneminae	<i>Ericydnus sipylus</i> (Walker)	Dir Ali

Table (2): Total numbers of different recorded parasitoid species of *L. serricorne* at three locations in Syria

Species	Dir Ali		latakia		Kafarmehoal		Total	
	Total no.	%	Total no.	%	Total no.	%	Total no.	%
<i>A. calanrae</i>	56	93.3	207	100	0	0	263	64.5
<i>L. distinguendus</i>	3	5.0	0	0	0	0	3	0.7
<i>E. sipylus</i>	1	1.7	0	0	0	0	1	0.2
<i>P. cereallae</i>	0	0	0	0	141	100	141	34.6
Total	60		207		141		408	

## REFERENCES

- Alhariri, G. *The economic insects in Syria and neighboring countries book* (Aleppo University Press, 1976) p. 296.
- Baur, F. J. 1991. Chemical methods to control insect pests of processed foods. In: Gorham, J.R., (Ed.), *Ecology and Management of Food-Industry Pests*. FDA Technical Bulletin no. 04, pp. 1-2.
- Bruček Z. and J. Y. Rasplus 1991: *Illustrated Key to West-Palaearctic Genera of Pteromalidae* (Hymenoptera: Chalcidoidea). Paris: Inst. Nat. Rech. Agronom., 140 pp.
- Brower, J. H., R. Parker and R. Cogburn 1991. Biological: insect diseases, insect parasites and predators. In: Krischik, V., Cuperus, G., Galliard, D. (Eds.), *Management of Grain, Bulk Commodities and Bagged Products*. U. S. Dep. Agric. Coop. Ext. Serv. Circ. E-912, pp. 219-225.
- Kheradmand, K. Kamali, Y. Fathipour and E. Mohammadi Goltapeh 2007. Development, life table and thermal requirement of *Tyrophagus putrescentiae* (Astigmata: Acaridae) on mushrooms. *J. Stored Products Res.*, 43, 276-281.
- Ngamo, T. S. L., H. Kouninki, Y. D. Ladang, M. B. Ngassoum, P. M. Mapongmestsem and T. Hance 2007. Potential of *Anisopteromalus calandrae* (Hymenoptera: Pteromalidae) as biocontrol agent of *Callosobruchus maculatus* (F.) (Coleoptera: Bruchidae) African J. Agric. Res., 2 (4), 168-172.
- Onagbola, Ebenezer O; Y. Henry Fadamiro 2011. Electroantennogram and behavioral responses of *Pteromalus cerealellae* to odor stimuli associated with its host, *Callosobruchus maculatus*. *J. Stored Products Res.*, 47, 123-129.
- Papadopoulou S. C. and C. G. Athanassiou 2004. *Lariophagus distinguendus* (F.) (Hyme.: Chalcidoidea: Pteromalidae), an ectoparasitoid of *Lasioderma serricorne* (F.) (Col.: Anobiidae), found for the first time in tobacco stores in Greece. *J. Pest Sci.*, 77 (3), 183-184.
- Papadopoulou, Sm. Ch. and C. Th. Buchelos 2002. Comparison of trapping efficacy for *Lasioderma serricorne* (F.) adults between original electric, pheromone and food attractant adhesive traps. *J. Stored Products Res.*, 38, 375-383.
- Papadopoulou, Sm.Ch. and C. Th. Buchelos 2003. *Lasioderma serricorne* (Coleoptera: Anobiidae) number of generations and time they appear during the year, in tobacco stores of northern Greece (Macedonia). *Mitteilungen aus dem Museum fuer Naturkunde im Berlin. Deut. Entomol. Zeit.*, 50, 255-257.
- Peck, O. 1963: A Catalogue of the Nearctic Chalcidoidea. *Canad. Entomol., Suppl.* 30:1-1092.
- Quicke, D. 1997: *Parasitic Wasps*. London: Chapman and Hall, 288 pp.
- Rajendran, S. and K.S. Narasimhan 1994. Phosphine resistance in the cigarette beetle *Lasioderma serricorne* (Coleoptera: Anobiidae) and overcoming control failures during fumigation of stored tobacco. *Int/ J. Pest Manag.*, 40, 207-210.
- Reed, W. D. and J. P. Vinzant 1942. Control of Insects Attacking Stored Tobacco and Tobacco Products. United States Department of Agriculture, Division of Truck Crop and Garden Insect Investigations. Bureau of Entomology and Plant Quarantine. Circular no. 635, pp. 5-6.
- Sánchez-Ramos, Ismael and Pedro, Castañera 2001. Development and Survival of *Tyrophagus putrescentiae* (Acari: Acaridae) at Constant Temperatures. *Environ. Entomo.*, 30: (6), pp. 1082-1089(8).
- Subramanyam, B. and D. W. Hagstrum 1995. Resistance measurement and management. In: Subramanyam, B., Hagstrum, D.W. (Eds.), *Integrated Management of Insects in Stored Products*. Marcel Dekker, New York, pp. 331-397.
- Timokhov, Alexander V. and Gokhman, E. Vladimir 2003. Host preferences of parasitic wasps of the *Anisopteromalus calandrae* species complex (Hymenoptera: Pteromalidae). *Acta Soc. Zool. Bohem.* 67: 35-39
- USDA, 1971. *Stored Tobacco Insects, Biology and Control*. Stored-Product Insects Research Branch, Market Quality Research Division, Agricultural Research Service, USDA. Agricultural Handbook no. 233, pp. 1-12.
- White, N. D. G. and J. G. Leesch 1995. Chemical control. In: Subramanyam, B., Hagstrum, D.W. (Eds.), *Integrated Management of Insects in Stored Products*. Marcel Dekker, New York, pp. 287-330.