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Mini Review

Review of cigarette beetle *Lasioderma serricorne* (F.)(Coleoptera: Anobiidae)

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ABSTRACT:

The number of insect species that attack agricultural crops after harvest is estimated to be 1,660 insect species. During the various stages of transport, marketing and storage, the losses from these insect pests reaches about 30%. Insects as a result of direct feeding on stored products caused damage by loss in quality of stored products or had an effect on seed germination ratio. Thus, stored grain or food items loose their marketing, consumer or agricultural value. Among these insect pests are the Coleoptera insects belonging to Anobiidae family. Some of these insects feed on dry plant materials and timber, and some of them feed on fungi, of which about 1000 species are known. Most of them are Woodlouse except the two cigarette beetle *Lasioderma serricorne* (F.) and *Stegobium paniceum* (L.). *Stegobium paniceum* (L.), are from storage pests that cause serious damage and economic losses to stored grains. This review highlighted the importance of cigarette beetle *L. serricorne*.

Keywords:
Cigarette beetle, Lasioderma, Life cycle, Insect pest.

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INTRODUCTION

Life cycle

The life of cigarette beetle *Lasioderma serricorne* (Coleoptera: Anobiidae) is affected by low temperatures and humidity, which reduces the time needed for the insect to complete it's life cycle, because it is usually found in warm places areas (Arbogast *et al*., 2003). It also lives on plant and animal materials and infect homes and stores (Ashworth, 1993; Arbogast *et al*., 2000 and 2002). The type of food affects the life cycle and the length of the generation period. The larvae reared on rice, cowpea, peanuts, corn and wheat at a temperature of 28-32°C and humidity of 72-80 % lived for 27-33 days, 23-27 days, 24-32 days, 26-31 days and 24-28 days respectively. The life cycle is completed in 50 days when fed on low-nicotine tobacco feed with high sugars content such as (FCV) Flue-Cured Virginia, whereas when fed on high-nicotine species and small amounts of sugars and starch, her its development is very slow and the insect completed it's life cycle by about 65-80 days (Edde, 2019). Tobacco also affects the oviposition, as the females lay more eggs when fed on FCV than other tobacco species (Joshi, 1968). The insect completes its life cycle by about 43-55 days when fed on baker's yeast *Saccharomyces cerevisiae* (Shahrabani and AL-Obaidy, 2020) (unpublished data).

Description

The adult has a reddish-brown color of about 2-3 mm in length and has the ability to fly, with long antenna which move randomly when the insect is walking. The female is larger and more heavier than the male, and lay eggs at a rate of 15 eggs per day and approximately 185 eggs during her life cycle depending on the type of food and covers the eggs with adhesive to keep it moist. The egg has a white colour covered with a smooth wax shell and hatch after 6-10 days in a warm environment and the egg shell is eaten by the newly hatched larvae (Ashworth, 1993; Shahrabani and AL-Obaidy, 2020) (unpublished data). The larva has a yellowish white color and a brown head covered with thin hair and has three pairs of legs. The insect has 6 larval stages depending on the temperature and type of food. The full-grown larvae are 4 mm, long curved and are surrounded by soft hair. The larval stage takes 43-55 days. The larvae at the last larval stage stop feeding and begin to build the pupa room with the food and feed inside it. The pupation period is between 7-13 days. The pupa is white and the females are distinguished from males by the end of the pupa. The female contains a pair of side lobes with sharpened ending, which are not found in males (Rayner, 1951). Mating occurs 2-3 days after the adult emergence of the pupa. The mated adult female starts laying eggs after 1-2 days of mating (Howe, 1957; Shahrabani and AL-Obaidy, 2020). (Unpublished data)

Economic importance and damage

L. serricorne (F.) is an important and major pest infesting tobacco and its stored products, especially in poor storage conditions, the damage induces larvae to feed on tobacco leaves, while adult insects does not fed but their damage is represented by making holes to enter and exit from tobacco or cigarettes, which makes it unusable. The presence of insects or moulting scale or feces leads to user denial and thus leaving the product losing its economic value. The estimations in 1950 and 1968 indicate that 0.7-1.0 % of untreated stored tobacco was destroyed by cigarette beetles and losses are estimated annually at $ 300 million of tobacco product stored in US storages (USDA, 1972; Ashworth, 1993; Basheer *et al*., 2013). The percentage of damage caused by the insect varies according to the type of tobacco, and the insect prefers Turkish tobacco (Eastern) because it contains high sugar and low percentage of nicotine to avoid the nicotine toxicity and its subsequent effects on the life and fertility of the insect. In addition to tobacco, the insect feeds on many stored food products including flour, rice, coffee beans, cocoa, herbs, spices, nuts, dried fruits such as dates and raisins and infects dried plants

and flowers, herbs, medicinal products, canned food products, books and folders. In addition to polluting the stored products by feces, moulting scale, and the remains of dead insect bodies, sometimes the larvae dig the cardboard boxes used for packaging to find a place to pupate causing indirect damage to the products (Howe, 1957; Gopalachari, 1984; Ryan, 1995; Arbogast *et al*., 2002).

Diffusion and geographical distribution

Cigarette beetle is a widespread insect that can be found all over the world. It is found in tropical, subtropical and temperate regions and found wherever dried tobacco is present. The original home of the insect is South America and was first observed on tobacco in the United States in 1886. The remains of its bodies were found in the tomb of Egyptian King Tutankhamun, so it's believed that it grew up in Egypt. The insect has spread widely during transport in packaged tobacco or other packaged products. It was known in many countries of the world, including Asia, Africa, North and South America, Europe and others. It is also a major pest on dried tobacco in storages, which are found especially in the Syrian coast and also in northern and southern regions of Syria (AL-Hariry, 1976; Ashworth, 1993; Arbogast *et al*., 2002; Blanc *et al*., 2006).

Control

Cigarette beetle is an important pest in many regions of the world. Although phosphine fumigation has been used to control this pest, it has become less effective due to the development of insect resistance to this pesticide, which has led to increased interest in natural herbs such as aromatic plants (pesticides of plant origin), which are among the most efficient pesticides and as a safe alternative to the use of chemical pesticides (Copping and Menn, 2000; Isman, 2006). The application of repellents can be considered a new way of controlling and alleviating insect problems in storage. Aromatic oils were used as repellents Jemâa *et al*.

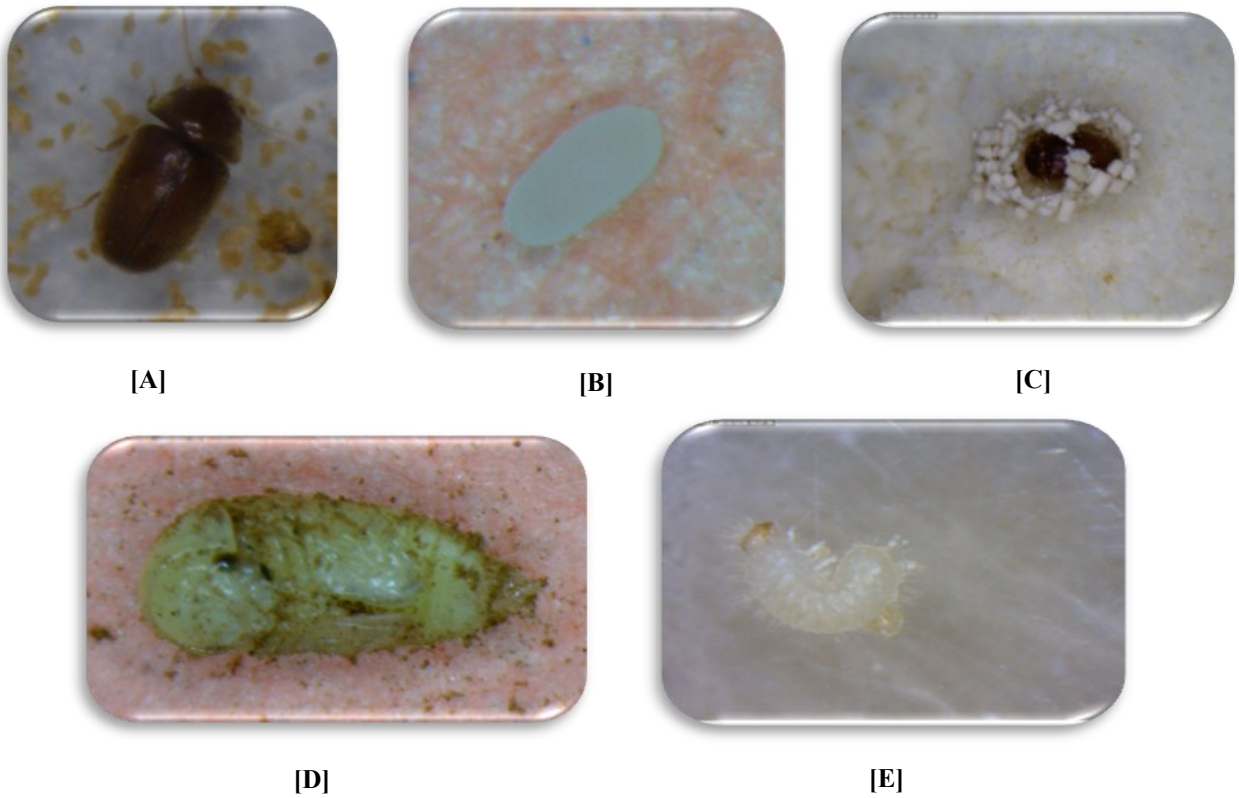

Figure 1. Life cycle of *Lasioderma serricore* A. Adult; B. Egg; C. Population room; D. Pupa; E. Larva

(2011) used the aromatic oils of laurel leaf and observed that it has a repellent efficacy at high doses with a short exposures period. Methanol extracted from fennel plant was used to control adults. Olive oil (Kellouche *et al*., 2004) was also used as a repellent. *Mentha longifolia* extract and *Momordica charantia* extract were used in three concentrations 25, 50 and 75%, and their repellent effect to cigarette beetle adult *L. serricorne* was studied, where the adults were exposed to the extracts for ten days and the experiment confirmed that whenever the exposure time and the concentrations increased the repellent activity to the insect was increased (Kamal *et al*., 2019). Extracts of black pepper, garlic, mustard oil hot pepper oil, cinnamon oil and *Zingiber zerumbet* extract (Al-Khazraji *et al*., 2016; Jahromi *et al*., 2012) have proven the effectiveness against this pest and does not harm natural enemies. Growth regulators such as 20-hydroxyecdysone which is one of the main enzymes used in the decomposition of chitin (Chen, 2018) was also analyzed. In the fields use of *Bacillus thuringiensis* showed high efficacy as a pesticide in controlling this insect with flour beetles in storages (Blanc *et al*., 2006); while, the natural enemies, the *Anisopteromalus calandrae* parasitism on beetle larvae have been recorded in Iraq (AL-Obaidy *et al*., 2019). The parasitism level of *A. calandrae* was 96.34 % at a density of 50 larvae of beetle (Zilch *et al*., 2017), while *Anisopteromalus apiovorus* was recorded on the pest larvae (Cheong and Yoon, 2016). Also Arbogast *et al*. (2002) recorded four types of parasites such as *Anisopteromalus calanrae* (Howard), *Lariophagus distinguendus* (Forster), *Pteromalus cereallae* (Ashmead), *Ericydnus sipylus* (Walker) and the predator *Tyrophagus putrescentiae* (Schrank) (Acaridae) in Syria. It is reported that the predator is located in the middle of the feeding colony and the predator mite *Amblyseius Swirskii* Athias-Henriot preys on the insect eggs. Preserving the natural enemies of the pest is essential and can be an effective way to eliminate pests during storage.

CONCLUSION

The economic losses caused by *L. serricorne* could be reduced by eliminating this pest biologically and in an eco-friendly way. In this way, the ecosystem of the hosts is not altered. Moreover, the life cycle of the pest must be clearly known before adopting any kind of pest control measures.

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