

LASIODERMA SERRICORNE F. - PEST OF TOBACCO AND TOBACCO PRODUCTS

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ABSTRACT

Cigarette beetle *Lasioderma serricorne* F. is a well known pest of dried tobacco and tobacco products (cigarettes and cigars).

It can be found in warehouses for tobacco manipulation and fermentation and also in some purchase checkpoints where dried tobacco is stored.

Investigations carried out in 2011-2013 in laboratory conditions included tobacco types Prilep and Yaka from 2010 crop.

Standard methodology was applied during investigation.

Adults of this pest are reddish brown and their body is covered with fine and tiny ash grey hairs. The adults have an elongated oval body, approximately 2.5 mm long.

The egg is oval, milky white, less than 1 mm, and because of its small size it is hard to be determined in tobacco bales, especially in cut tobacco.

In our investigation, larvae are 4 mm long, dirty white in color and with numerous yellow brown hairs, densely distributed throughout their bodies. Insect droppings, tobacco dust and other debris adhere to their surface.

In laboratory conditions larval development lasts 20 to 40 days and in that time, feeding on tobacco, it makes serious economic damage.

The pupa is about 3 mm long. It is whitish in the beginning, but immediately after pupation its color is like that of the adult insect (reddish brown). Pupal stage lasts 7 to 9 days.

L. serricorne attacks dried tobacco and cut tobacco in warehouses, causing damage and contamination with its feces and remains of molting and metamorphosis. Initially it damages tobacco making small holes in it. In later development larvae bite larger parts of dried leaves and pile them one upon another.

If tobacco raw material attacked by cigarette beetle is stored for a longer period without any protection, only dust and debris will be seen when it is opened.

Larvae eat the wrapping paper of cigarettes, cigars and cigarillos, making round openings. It feeds on their content and contaminates it with feces, cast skin and remains of metamorphosis, making it unpleasant in smoking.

Keywords: tobacco, cigarette beetle, *Lasioderma serricorne* F., harmfulness.

LASIODERMA SERRICORNE F. ШТЕТНИК НА ТУТУНОТ И ТУТУНСКИТЕ ПРЕРАБОТКИ

Тутунската буба *Lasioderma serricorne* F. е познат штетник на исушениот тутун и производите од тутун (цигарите, цигаретите и пурите).

Се среќава во тутунските магацини за манипулација, ферментација и цигари, а се среќава и размножува и во пунктовите за откуп каде се чува сувиот тутун.

Прочувувањата беа изведени во текот на 2011-2013 година во лабораториски услови. За материјал беа користени тутуни од тип Прилеп и тип Јака од реколта 2010 година.

За истражување на *L. serricorne* во лабораториски услови, за биолошки и други испитувања, беше применета стандардна методологија.

Имагот по боја е црвенкасто кафено, а телото е покриено со фини ситни влакненца со пепелавосива боја. Според нашите истражувања, имагата се со издолжено овална форма на телото и просечно се долги 2,5 mm.

Јајцето е овално, помало од 1 mm, со млечно бела боја, и заради неговата мала големина тешко се утврдува во тутунските бали, а посебно во режаниот тутун.

При нашите истражувања ларвите се со големина од 4 mm, имаат валканобела боја на телото и многубројни густы жолто кафени влакненца, распоредени по целото тело на ларвата. На нив се лепат изметот на инсектите, тутунска прашина и други остатоци.

Развојот на ларвите во лабораториски услови трае од 20 до 40 дена, при што исхранувајќи се со тутунот таа предизвикува економски значајни штети.

Куклата е долга околу 3 mm. Таа е во почетокот беличеста, меѓутоа веднаш по куклењето постепено се менува, така да подоцна добива боја на возрасен инсект (црвенокафена). Стадиумот кукла трае 7-9 дена.

L. serricorne го напаѓа сувиот тутун и режаниот тутун во магацините, го оштетува и загадува со измет, остатоците од преслекувањето и метаморфозата. Во почеток го оштетува тутунот правејќи мали дупчиња. Со текот на развитокот ларвите нагрзуваат големи делови од сувите лисја наредени еден врз друг.

Кога суровината нападната од тутунската буба подолго време се чува, без да се заштитува, при отворањето останува само прашина и отпадоци.

На цигарите, цигаретите и пурите ларвите ја нагрзуваат хартијата, омотниот лист, правејќи тркалезни отвори. Таа се храни со нивната содржина, а воедно ги загадува со изметот, остатоците од преслекувањето и метаморфозата, заради што тие стануваат непогодни за пушење.

Клучни зборови: тутун, тутунска буба, *Lasioderma serricorne* F., штетност.

INTRODUCTION

Lasioderma serricorne, commonly known as cigarette beetle, cigar beetle or tobacco beetle, originates from tropical and subtropical regions of America, but it can be found in all parts of the world. According to other literature data, this pest comes from Africa.

Areal distribution of cigarette beetle is very wide and it can be said that it is a cosmopolitan species. It is found much more in areas with warm and moderate climate than in countries with sharp and cold winters.

L. serricorne was described as a harmful insect since long ago. According to

Radovanovic (1961), the species was found 3000 years ago in Egypt, in an old tomb of Tutankamon, in a vase containing a substance similar to a resin. In Europe it was described for the first time in France, in 1972, according to some samples from the United States (21).

The oldest data which define it as tobacco pest originate from the U.S.A, 1886 (20).

Cigarette beetle is a polifagous pest that attacks various other products kept in the home.

In the Republic of Macedonia it is a permanent resident in the warmer southern

parts of the country. It is often found in tobacco factories and warehouses, but its presence is still less than that of tobacco moth.

The larvae of cigarette beetle are poliphagous and beside tobacco products, bales and seeds they attack other stored products and food including rice, nuts, peanuts, beans, cocoa, coffee, chocolate, flours, dried fruits (dates, figs), dried fish,

Chinese tea, cashews, black pepper, red pepper and many other spices and seeds, dry dog food, etc. It also attacks many products that are stored in containers in kitchens and other places in the home.

It is also harmful to non-food products such as dried plants and herbarium specimens, dry floral arrangements, potpourri, decorative vine garlands, drugs and pills, insectariums, etc.

MATERIAL AND METHODS

Two year investigations (2011-2013) were carried out in laboratory conditions with tobacco types Prilep and Yaka from the 2010 crop.

Standard methodology was applied for investigations on their biological characteristics and other analysis.

A part of tobacco samples was placed in cages to monitor the development cycle of cigarette beetle.

Also, larvae of *L. serricorne* were placed with tobacco leaves in Petri dishes until eclosion of adults.

Other samples were left as a whole into bags to monitor the damage caused by the pest.

The material was analysed on binocular in the laboratories of Scientific Tobacco Institute - Prilep.

RESULTS AND DISCUSSION

Lasioderma serricorne Fabricius, 1792, belongs to the order Coleoptera- beetles, suborder Polyphaga, family Anobiidae.

Synonyms of this species (according to Targioni Tozzetti, cit. Tirelli, 1953) are: *Ptinus serricornis* F., *P. flavescens* Dahl, *P. ligniperda* Waltl., *Ptilinus testaceus* Duft, *Xyletinus testaceus* Sturm, *X. serricornis* Guer.

The species development undergoes complete metamorphosis (holometabolism).

Adults are reddish brown in color and their body is covered with fine ash grey hairs. The color may vary from dark red-brown to reddish yellow. The insect looks like in armour, because its head, chest, especially the pronotum and front wings are heavily chitinized (Fig. 1, 2, 3, 4).

The adults of cigarette beetles are quite small, measuring about 2 to 4 mm (12, 13, 14, 15). They have an elongated oval body, approximately 2.5 mm long.

The head is completely concealed under the first thoracic segment and can not be seen from above, which gives the insect a hunchback appearance. The neck shield is wide in its base, like the elytrae, rounded on its margins and quite narrowed in the front side, with a small depression for the head. The head and mouthparts are bent downward at right angle to the body. The oral apparatus is adapted to biting, with very strong serrated mandibles. It has compound large black and oval eyes, in anterior lateral position. The antennae are long, with 11 saw-like segments.



Figure 1 Imago- dorzal view



Figure 2 Imago- lateral view



Figure 3 Imago- ventral view



Figure 4 Adults of tobacco beetle

The elytrae are arched and spread along the middle of the back, embossed, with many spots through the whole surface. The second pair of wings is membraneous, bent under the elytrae.

The abdomen consists of 5 visible soft segments, protected by elytra. The antenna is telescopic. Legs are short, capable to walk, the formula of the foot is 5-5-5.

Imagos are active at night. They fly in the cages, whereas at daytime they hide in various places, between cage edges, among dry tobacco leaves etc. The life cycle of adults usually takes 3-4 weeks.

Cigarette beetles “play dead” for a few seconds when they are disturbed.

The type is oviparous. Imagos copulate and the females lay the eggs on the

substrate in which the tobacco beetle lives and feeds.

Eggs are laid without any order, individually or in a group. In tobacco samples and tobacco packs, the females attach the eggs on tobacco leaves along the leave nerves or along their edges.

In case of tobacco processed products, the female lays the eggs on open edges or on covering leaves of cigarettes, packaging boxes for tobacco products etc.

According to literature data, one female can lay 20-100 eggs (1, 5, 12, 13, 14, 17, 18).

The egg has an oval shape, smaller than 1 mm, with milky white color, and prior the hatching, it turns dull yellow.

Due to its small size, it is difficult to identify it in tobacco packs, especially in cut tobacco.

Larva is fat, crimped, with soft body, curled in the middle as "c", which is typical for this type of insects.

It is eucephalous, its head is chitinized, with brown color. Its jaws are darker, almost black, with triangular shape, with a slightly convex boundary externally, whereas the internal edge is serrated.

According to literature data, an adult larva can be 4 to 5 mm long (12, 13, 14, 15).

In our researches, larvae are 4 mm long, their body has opaque white color and numerous thick yellowish to brown hairs, distributed all over their body. The fecal material from insects, tobacco dust and other remains (figures 5, 6, 7, 8) are stuck on them.

The larva is oligopod, with three pairs of short legs with light brown color.



Figure 5 Larva after hatching



Figure 6 Larva

According to Vukasovic (1962), larvae hatch after 6-7 days in optimum conditions, whereas at temperature at 12 °C even after 8-12 days.

They immediately feed from the material where they hatched.



Figure 7 Larvae



Figure 8 Larvae and damage

The development of larvae is affected not only by the temperature and humidity, but also by the type of food.

The development of larvae in laboratory conditions lasts from 20 to 40 days, and during this time period, if reared on tobacco they cause significant economic damages.

According to Ilic (1961), if the larva is reared on cigars, the development lasts 42 days, if it is reared on cigarettes, the development lasts 36 days, and if it is reared on cut tobacco, only 30 days.

Radovanovic (1961), registered development of larva from 47-70 days, whereas according to Vukasovic (1962), the development of larva can take from 30 days to 70 days in winter conditions.

When the larva is fully grown, it is transformed into a cocoon, located into a semi-closed chamber. The larva builds the cocoon from secretion products, small food particles, tobacco or tobacco dust and fecal material in the substrate it rears on and it spends there the cocoon stadium (figure 9).

According to Krsteska et al. (2011), larvae sometimes make a pathway through card boxes and other packaging in search of spot for building a cocoon.

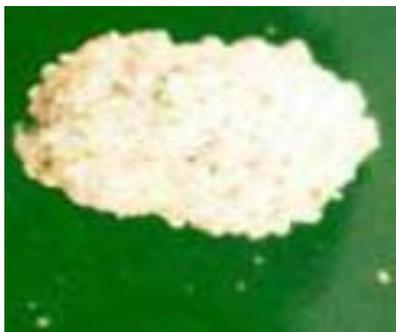


Figure 9 Cocoon

The cocoon is free cocoon type (pupa libera). The body parts are free and close to the body, whereas the jaws are immovable.

At first, the cocoon is white; later on the color gradually changes and assumes reddish brown color, similar to an adult insect. The cocoon is 3 mm long.

According to Ilic (1961), the length of cocoons is 3,5 mm, according to Radovanovic (1961), it is 2-3 mm, and according to Tirelli (1953), the length ranges from 2,5 to 3,75 mm.

The cocoon stadium lasts 4-10 days, sometimes up to 13 days (12, 15).

In laboratory conditions, this stadium lasted 7-9 days.

The life cycle of this harmful insect is variable. The length of life cycle is affected by climate conditions and the substrate it is reared on.

In warehouses where there are warmer locations, as well as in warehouses which are heated throughout the whole year, one can find *L. serricornis* in all stadiums of development. In the course of the summer, the development of this pest is faster.

In our regions, the tobacco beetle spends the winter in larva stadium. In spring, the larva forms a chamber in which it transforms itself into a cocoon.

One week later, the imago appears. During the first three days, the new imago stays in the cocoon chamber until its wings become stronger.

Usually, the adult insects appear during May and June.

According to a large number of authors, adult insects do not feed, but use the reserves in their body, stored while being in the larva stadium. Actually, adults can cause direct damage only when they eclose, because they make holes through which they go outside.

According to Krsteska et. al. (2011) and Radovanovic (1961), when a cocoon was in a cigarillo, cigarette or cigar, the adult imago makes a hole in order to go out. They can cause similar damages in tobacco packs.

For full development in laboratory conditions, this pest needs 35-55 days.

In our country, it is considered that the tobacco beetle produces 2-3 generations per year.

According to Dimitrov (2003), in Bulgaria, in years with late spring and early autumn, there were two generations, whereas in

more favorable conditions there were 2 complete generations and the third generation developing during two calendar years.

Harmfulness

L. serricorne attacks the dry tobacco in warehouses, causes damages to it by rearing on it and polluting it with fecal material, remains from changing and metamorphosis.

The unprocessed tobacco, upon fermentation in a mass or pack, becomes a very favorable environment for reproduction of this pest.

At first, it causes damage to the tobacco by making small holes. As it grows, larvae bite larger parts of dry leaves placed in layers one over another (figure 10, 11).



Figure 10 Damaged tobacco leaves

When the raw material attacked by tobacco beetle is stored for a longer period without any protection, during the opening of samples only dust and waste appear.



Figure 11 Damaged tobacco leaves

The type can cause significant economic damages in tobacco warehouses.

Most often, it attacks the best tobacco classes, in tonga or yarma packs, i.e. tobacco leaves with larger percentage of soluble carbohydrates and more matured, that is, older tobacco leaves.

According to Krsteska et. al. (2011) and Ilic (1961), the attack of tobacco beetles is particularly strong on quality and aromatic varieties of tobacco and causes greater damages in higher classes.

It avoids and more rarely attacks the fresh, non-fermented and lower class tobacco.

The type is important not only as a pest in dry tobacco, but one could say it is even more important as a pest in tobacco products such as cigarettes, cigarillos, cigars, chewing tobacco, pipe tobacco and snuff.

By rearing on cut tobacco, they damage and infest it with fecal materials, dead larvae, remains from changing and metamorphosis.



Figure 12 Damaged cigarettes

Larvae bite the paper and covering leaves on cigars, cigarettes and cigarillos and

make round holes (figure 12, 13, 14). It rears on their contents, at the same time infesting them with its fecal materials, remains from changing and metamorphosis, which makes them inappropriate for smoking. When smoking such tobacco products, infested by tobacco beetle, one can sense a typical bad smell and taste.



Figure 13 Damaged cigarettes



Figure 14 Damaged cigarettes

According to Ilic (1961), this type was also identified as a pest in tobacco seeds. It rears on it, infests it and even attaches pieces of the seed on its body.

CONCLUSIONS

L. serricorne can cause significant economic damages when it reproduces in dry tobacco in warehouses, in tobacco manufacturing facilities and warehouses for manufactured tobacco products.

The development of larvae in laboratory conditions lasts from 20 to 40 days, and during this time period, if reared on tobacco they cause significant economic damages.

At first, it causes damage to the tobacco by making small holes. As it grows, larvae bite larger parts of dry leaves placed in layers one over another.

When the raw material attacked by tobacco beetle is stored for a longer period without any protection, during the opening of samples only dust and waste appear.

Besides the primary damages caused by dietary they done secondary damage by infest tobacco with fecal materials, dead larvae, remains from changing and metamorphosis.

Larvae bite the paper and covering leaves on cigars, cigarettes and cigarillos and make round holes. It rears on their contents, at the same time infesting them with its fecal materials, remains from changing and metamorphosis, which makes them inappropriate for smoking. When smoking such tobacco products, infested by tobacco beetle, one can sense a typical bad smell and taste.

Studies of the tobacco beetle will enable us timely and effective protection of tobacco and tobacco processing of this economically important pest.

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