

Note**OCCURRENCE AND BIOLOGICAL ASPECTS OF
THE CLITORIA TREE PSYLLID IN BRAZIL**

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ABSTRACT: *Clitoria fairchildiana* (Howard) is a tree largely distributed in Brazil, used for urban arborization. In April 2001, the psyllid *Euphalerus clitoriae* Burckhardt & Guajará was reported on this plant in the metropolitan areas of Recife, PE, Brazil. This report records the occurrence of *E. clitoriae* and studies some of its biological aspects in this area. With this purpose, *C. fairchildiana* leaves were sampled weekly, and *E. clitoriae* nymphs as well as *Aprostocetus* sp. larvae and nymphs were collected and counted. The *E. clitoriae* population ranged from 2 to 90 nymphs per leaflet. The *Aprostocetus* sp. percentage of parasitism ranged from 3 to 24%. The frequency curve for pygidium width ranged from 120 to 140; 200 to 240; 300 to 380; 460 to 580, and 720 to 820 µm for the first, second, third, fourth, and fifth instars, respectively. The incubation period for *E. clitoriae* eggs lasted 7.6 days. The nymphal stage lasted 5.7; 4.5; 4.8; 5.0, and 6.1 days for the first, second, third, fourth, and fifth instars, respectively. Development time from egg to adult was 33.7 days. Female longevity 8.6 days, with a daily fecundity of 118 eggs. The total viability of the immature stage was 74%, and the sex ratio was 0.5.

Key words: *Euphalerus clitoriae*, Psyllidae, biology, biological control, natural enemies

**OCORRÊNCIA E ASPECTOS BIOLÓGICOS DO
PSILÍDEO DO SOMBREIRO NO BRASIL**

RESUMO: O sombreiro *Clitoria fairchildiana* (Howard) é uma planta amplamente distribuída no Brasil sendo muito utilizada em arborizações. Em abril de 2001 foi constatada a ocorrência do psilídeo *Euphalerus clitoriae* Burckhardt & Guajará neste hospedeiro na Região Metropolitana do Recife, PE. Este trabalho teve como objetivo registrar a ocorrência de *E. clitoriae* e seus inimigos naturais, e estudar alguns aspectos da biologia deste psilídeo. Foram realizadas coletas semanais de folhas de *C. fairchildiana* visando à contagem de ninfas de *E. clitoriae* e formas imaturas e adultos dos inimigos naturais. A população de *E. clitoriae* variou de 2 a 90 ninfas por folíolo. A percentagem de parasitismo de *Aprostocetus* sp. variou de 3 a 24%. A curva de frequência da largura do pigídio dos insetos observados apresentou variação de 120 a 140; 200 a 240; 300 a 380; 460 a 580 e 720 a 820 µm para o primeiro, segundo, terceiro, quarto e quinto instares, respectivamente. Os ovos de *E. clitoriae* apresentaram 7,6 dias de incubação. A fase ninfal apresentou 5,7 dias para o primeiro instar, 4,5 dias para o segundo instar, 4,8 dias para o terceiro instar, 5,0 dias para o quarto instar e 6,1 dias para o quinto instar. O período de ovo-adulto foi 33,7 dias, a longevidade de fêmeas foi 8,6 dias e a fecundidade de 118 ovos/fêmea. A viabilidade total de formas imaturas foi de 74% e a razão sexual de 0,5.

Palavras-chave: *Euphalerus clitoriae*, Psyllidae, biologia, controle biológico, inimigos naturais

INTRODUCTION

The clitoria tree, *Clitoria fairchildiana* (Howard) (Fabaceae: Papilionoidea) is commonly used as an urban tree in several states in Brazil (Guajará et al., 2003). In the city of Recife-PE, this species is used either for urban arborization of streets, squares, and gardens, or in parking lots as a shade tree. In May 1999, this species was reported as a host for the psyllid *Euphalerus clitoriae* Burckhardt & Guajará, in the city of Seropédica-RJ (Burckhardt & Guajará, 2000).

Psyllids are small, soft-bodied insects, measuring 2 to 5 mm in length, resembling miniature cicadas. They have three ocelli, with well-developed and usually ten-segmented antennae, jumping hind legs in the adult, dimerous tarsal claws, and membranous wings (Borror & DeLong, 1988).

E. clitoriae preferentially colonizes the abaxial surface of leaflets, laying its egg masses along the veins (Santos et al., 2000a). Upon hatching, the first instar nymphs are mobile and devoid of coating; the production of a whitish waxy mass begins toward the end of the

first instar, under which the nymphs are protected (Guajará et al., 2002). This insect causes severe damage to the clitoria tree, continuously sucking young branches and leaves, which become yellow and then fall (Docile et al., 2000).

At present, several studies were conducted in order to clarify behavioral and biological aspects of this insect on *C. fairchildiana* in the State of Rio de Janeiro (Docile et al., 2000; Santos et al., 2000a; Guajará et al., 2002; 2003). In April 2001, the occurrence of *E. clitoriae* was verified in clitoria tree plants from several localities in the cities of Recife, Olinda, Jaboatão dos Guararapes, and Cabo de Santo Agostinho, in the State of Pernambuco. This study was carried out to record the occurrence of *E. clitoriae* and its natural enemies in the city of Recife on *C. fairchildiana*, and to study some aspects of its biology, such as duration of the immature stages, longevity, fecundity, and total viability.

MATERIAL AND METHODS

The research was performed in a laboratory under the following conditions: $26 \pm 0.5^\circ\text{C}$, $65 \pm 10\%$ R.H., and 12h photophase. *C. fairchildiana* leaves were collected between the months of July 2001 and May 2002, in the city of Recife, PE, Brazil ($08^\circ 01' 02''$ S and $34^\circ 56' 43''$ W). To accomplish this, ten trifoliolate leaves from the middle part of the branches of four adult plants were collected weekly. The leaves were taken to the laboratory and the numbers of *E. clitoriae* nymphs and natural enemies were tallied.

To obtain seedlings, *C. fairchildiana* seeds were planted in 250 mL capacity plastic cups, using a clay loam soil and earthworm humus at a 4:1 ratio as substrate. The cups were watered daily, and 15 days after planting the seedlings showed only the first pair of leaves; plants at this stage were used to rear *E. clitoriae*. Adults were collected in the field, brought to the laboratory, and confined for eight hours in cages containing 15-day old plantlets. The cages consisted of plastic tubes 10 cm in length and four centimeters in diameter. The lid was cut out and drilled in the middle to allow the plantlet stem to be inserted through it. The base of the tube was cut out and a fine screen was glued in place to allow aeration.

Plantlets containing eggs between zero and eight hours of age were observed every 12 hours to determine the incubation period. After hatching and at every ecdysis, 20 nymphs had their pygidia measured with an ocular micrometer attached to a stereoscopic microscope to determine the number of instars. After hatching, the nymphs continued to be observed at 12 hours intervals to determine the duration of each instar. Viability of the development stage was also determined.

After emergence, the adults were sexed in order to determine the sex ratio. Males were confined individu-

ally in cages for longevity determination. Females were confined in cages with males obtained in the field, which were replaced in case of death, and were observed daily for fecundity and longevity determination.

RESULTS AND DISCUSSION

Occurrence of *E. clitoriae* and its natural enemies

Nymphal ectoparasite, belonging to the family Eulophidae, subfamily Tetrastichinae, and genus *Aprostocetus* were found in all sampled plants. The hymenopterans that belong to species in this genus frequently parasitize spiders and insects belonging to order Orthoptera, Lepidoptera, Coleoptera, Diptera, Hymenoptera, and Hemiptera (Gaines & Kok, 1999; Hall et al., 2001; Mirchev et al., 2001). Among hemipterans, the species of this genus parasitize aphids, coccids, pseudococcids, and psyllids (LaSalle, 1993; Ulgenturk, 2001). This *Aprostocetus* species was found in the Recife metropolitan area, ectoparasitizing third-, fourth-, and fifth-instar *E. clitoriae* nymphs.

Mites of the families Cheyletidae and Stigmaeidae were found in laboratory, under the wax layer secreted by the nymphs. Such places are probably used as shelter by the mites, which probably also feed on sugary secretions (honeydew) produced by the psyllids. However, it was observed in the laboratory that these mites are predators on first-instar *E. clitoriae* nymphs, which still do not present a waxy scale. Mites of the families Cheyletidae and Stigmaeidae are predators frequently found on plants, feeding mainly on mites and occasionally on other small arthropods (Flechtmann, 1975). *Cheletogenes ornatus* (Canestrini & Fanzago) is a natural enemy of citrus scale insects and is an important component in combination with other agents for the biological control of scale insects (Avidov, 1970).

Among the predators that belong to Insecta, two coccinellid species were found preying on nymphs of all instars, as well as one species of Neuroptera. These predators were observed attacking *E. clitoriae* when the infestation was high, but did not remain on the plants when the population was low. Marques et al. (2002) reported the occurrence of the fungus *Cladosporium cladosporioides* (Fres.) De Vries on *E. clitoriae* in the city of Recife, PE. These authors verified that this pathogen infects nymphs, producing a parasitism rate of up to 12.5%.

The *E. clitoriae* population ranged from approximately 2 to 90 nymphs per leaflet, with an average of 26.6, between the months of July/01 to May/02. The population peak occurred between the months of December/01 and January/02 (Figure 1). Other authors observed means of 19 and 60 nymphs per leaflet, for the same psyllid on clitoria tree (Docile et al., 2000; Santos et al., 2000b). The parasitism percentage by *Aprostocetus* sp.

ranged from 3 to 24%, and the highest parasitism occurred at the beginning of the evaluation, between the months of July and September/01, decreasing to lower values when the highest host population density was verified around the months of December/01 and January/02. As time went by, the *E. clitoriae* population increased considerably, as well as the population of *Aprostocetus* sp., despite the fact that the parasitism percentage decreased. This, in addition to the fact that *Aprostocetus* is not a genus frequently associated with insects in the family Psyllidae, suggests that *E. clitoriae* probably is not a preferential host for this parasitoid.

The *E. clitoriae* population increased considerably from August to November 2001, when lower precipitation and relative humidity prevailed, with higher temperatures, and was considerably reduced from March to July, when greater precipitation and relative humidity prevailed, with lower temperatures. Sahu & Mandal (1999) studied the seasonality of *Euphalerus vittatus* on *Cassia fistula* in the western part of Bengala and verified a greater occurrence of the psyllid during the months with milder temperatures and higher relative humidity.

During the period of higher *E. clitoriae* population density, *C. fairchildiana* plants presented a large number of yellow leaves and marked leaf shedding. Faeth et al. (1981); Stiling & Simberloff (1989); and Stromgren & Lanciani (2001) also verified leaf shedding in plants

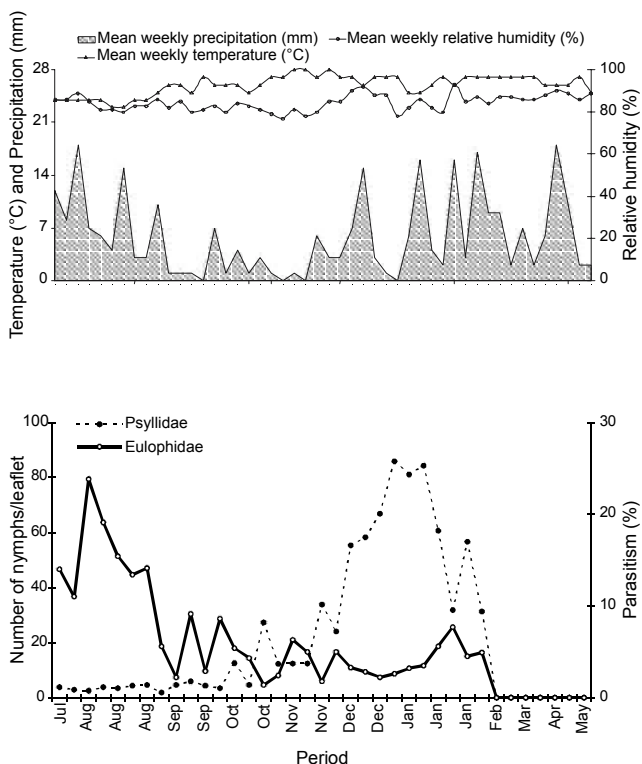


Figure 1 - Population fluctuation of *Euphalerus clitoriae* and *Aprostocetus* sp. clitoria tree (*Clitoria fairchildiana*), between July 2001 and January 2002.

infested with psyllids. Although leaf shedding for this species is an intrinsic trait, apparently *E. clitoriae* has highlighted this fact, since this is a deciduous species; this aspect has been verified by other authors as well, such as Santos et al. (2000a) and Docile et al. (2000).

E. clitoriae Biology

The psyllid adults oviposited individual eggs or laid them in clusters. The eggs were elongated, stalked, and laid preferentially on younger parts of the plant, such as shoots and young leaves, having a yellowish-green color, becoming black after a period of 24 to 48 hours. Conceição et al. (2000a) also observed the same color changing aspect in *E. clitoriae* eggs. The first-instar nymphs became fixed near the egg and started feeding on the leaves, secreting a small amount of wax. In the second instar, they started secreting a larger amount of wax, forming a whitish scale that entirely covered the body. This wax layer was observed in subsequent instars. Leaves with high psyllid infestations showed their abaxial surfaces completely covered with a large amount of white waxy material, secreted by the nymphs. These aspects have been reported by Guajara et al. (2002).

The pygidium in *E. clitoriae* was covered by a chitinous plate, which did not vary in size along each instar. The frequency curve built from the insect pygidium width measurements showed variations from 120 to 140 (μm) (first instar), 200 to 240 (second instar), 300 to 380 (third instar), 460 to 580 (fourth instar), and 720 to 820 μm (fifth instar) (Figure 2). The growth ratios between instars (Table 1), varied from 1.48 to 1.54. These values agree with Dyar's rule and can therefore be applied to insects of the family Psyllidae, using the pygidium width as a parameter.

The incubation of *E. clitoriae* eggs lasted 7.6 days on average; this value was close to that reported by Guajara et al. (2003) for the same host. The nymphal stages had the following durations: 5.7 days for the first instar; 4.5 days for the second instar; 4.8 days for the third instar; 5.0 days for the fourth instar; and 6.1 days for the fifth instar. The egg-adult period lasted 33.7 days, female

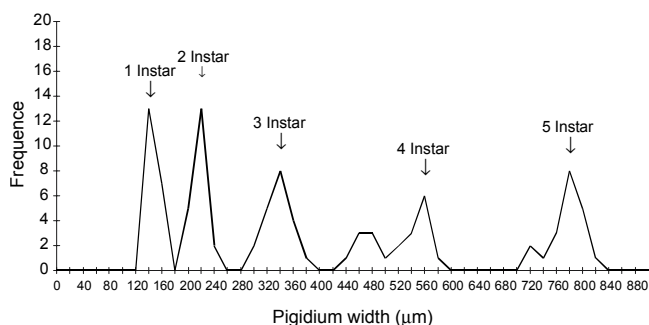


Figure 2 - *Euphalerus clitoriae* pygidium width frequency curve on clitoria tree (*Clitoria fairchildiana*), expressed in micrometers.

Table 1 - Mean pygidium width in *Euphalerus clitoriae* nymphs, expressed in micrometers, and growth ratio.

Instar	Pygidium Width (µm)	Growth Ratio
	Mean ± s(m)	
I	147 ± 2	1.48
II	217 ± 3	1.55
III	337 ± 5	1.54
IV	518 ± 10	1.50
V	776 ± 6	---

Table 2 - *Euphalerus clitoriae* development time and longevity (days), and fecundity (number of eggs per female) on butterfly pea (*Clitoria fairchildiana*) at 26 ± 0.5 °C, 65 ± 10% RH and 12h photophase.

Stage/Parameter	No. ¹	Min. ²	Max. ³	Mean ± s(m) ⁴
Egg	97	7	9	7.6 ± 0.07
Nymph I	74	4.5	7	5.7 ± 0.09
Nymph II	52	3.5	6.5	4.5 ± 0.08
Nymph III	50	4	6	4.8 ± 0.09
Nymph IV	37	4	6.5	5.0 ± 0.12
Nymph V	32	5	7.5	6.1 ± 0.12
Egg-Adult	32	29	39	33.7 ± 0.47
Longevity	22	5	14	8.6 ± 0.60
Fecundity	22	47	268	117.6 ± 4.2

¹Number of observations, ²Minimum observed value, ³Maximum observed value, ⁴Mean and standard deviation.

longevity was 8.6 days, and the females showed a mean fecundity of 118 eggs (Table 2). *E. clitoriae* has been mentioned by other authors as having an egg-adult period of 34 days, longevity of 9.17 days, and total fecundity of 225.29 eggs per female (Conceição et al., 2000b; Guajará et al., 2003).

Total viability of the immature forms was 74%, with a sex ratio of 0.5. Similar values were observed by Tsai & Liu (2000), who studied the biology of *Diaphorina citri* under similar conditions as those verified here, and observed a total viability ranging from 68.6 to 84.6%.

E. clitoriae is a recent pest in the Recife Metropolitan Area and occurs at high infestations, causing serious damage to clitoria tree plants. This pest is partially controlled by some ectoparasitoid and predator species, and possibly by pathogens as well, and suffers the influence of climatic factors. Apparently, some of these agents are nonspecific; however, with time it is likely that these natural enemies will become adapted; this, in addition to environmental factors, may keep the pest equilibrium level at lower values than at present.

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