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Biological aspects of the leafminer *Liriomyza sativae* (Diptera: Agromyzidae) on melon (*Cucumis melo* L.)

Aspectos biológicos da mosca minadora *Liriomyza sativae* (Diptera: Agromyzidae) em melão (*Cucumis melo* L.)

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- NOTE -

ABSTRACT

The leafminer *Liriomyza sativae* Blanchard is an important insect pest on melon crops in Brazil. However, the information about its biology on melon (*Cucumis melo* L.) is scarce. Therefore, the aim of this research was to know some biological aspects of this pest, reared on melon plants, under laboratory conditions at 25°C. Our results showed that the biological cycle of *L. sativae* lasts 15.9±0.04 days (egg-adult), namely: egg (2.7±0.01 days), larva (4.1±0.03 days) and pupa (9.1±0.03 days). The sex ratio is 0.51 and the females live (19.3±1.09 days) longer than males (16.2±0.96 days). These results can help in the integrated management of *L. sativae* on melon crops and improve the systems for rearing this leafminer in laboratory.

Key words: insect pest, *Cucurbitaceae*, biology, semiarid.

RESUMO

A mosca-minadora *Liriomyza sativae* Blanchard é uma praga importante em cultivos de meloeiro (*Cucumis melo* L.) no Brasil. No entanto, as suas informações sobre biologia, em meloeiro, são escassas. Portanto, o objetivo deste trabalho foi conhecer alguns aspectos biológicos dessa praga, criada em plantas de meloeiro, em condições de laboratório a 25°C. As informações obtidas mostram que o ciclo biológico de *L. sativae* é de 15,9±0,04 dias (ovo-adulto), sendo: ovo (2,7±0,01 dias), larva (4,1±0,03 dias) e pupa (9,1±0,03 dias). A razão sexual é de 0,51 e as fêmeas vivem mais tempo (19,3±1,09 dias) que os machos (16,2±0,96 dias). Essas informações podem auxiliar na adoção de medidas de manejo integrado de *L. sativae* em cultivos de meloeiro e melhorar os sistemas de criação da mosca minadora em laboratório.

Palavras-chave: inseto praga, *Cucurbitaceae*, biologia, semiárido.

Leafminers (Diptera: *Agromyzidae*) belonging to the species *Liriomyza sativae* Blanchard, *Liriomyza trifolii* (Burgess) and *Liriomyza huidobrensis* (Blanchard) are the most aggressive, causing the major losses in different cultures from New World (MURPHY & LaSALLE, 1999; BUENO et al., 2007). In the past years, *L. sativae* has occasioned serious problems in melon crops (*Cucumis melo* L.) (*Cucurbitaceae*) in the semiarid of Rio Grande do Norte and Ceará States (ARAUJO et al., 2007a; COSTA-LIMA et al., 2010), main melon producers from Brazil (IBGE, 2012). Leafminer females oviposit inside the leaf mesophyll of melon plants, from where the larvae hatch and feed, consuming the photosynthetic area of the leaf, originating fruits with low total soluble solids (Brix) (ARAUJO et al., 2007a). After completing their development, the larvae turn to pupae and after few days, the adults emerge, restarting the cycle (PARRELLA, 1987).

The leafminer is a holometabolic insect, being the egg and larva stages inside the leaf, the pupa stage into the soil, and the adult is free (PARRELLA, 1987). Many are the studies about the biology of *Liriomyza* species around the world, under different hosts (PARRELLA, 1984; LEIBEE, 1984; MILLER & ISGER, 1985; SCHUSTER & PATEL, 1985; PRANDO & CRUZ, 1986). However, information about the biological aspects of *L. sativae* in melon

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plants is scarce, and like for any pest, this knowledge is important for the correct adoption of integrated management actions.

Therefore, the present study has the aim of knowing the duration of the life stages of *L. sativae* in melon plants, as well to observe the survival of larvae and pupae, the sex ratio and adult longevity, under 25°C.

The research was carried out at the Laboratory of Applied Entomology from the Universidade Federal Rural do Semi-Árido (UFERSA), Mossoró, Brazil. The insects used in the experiments came from the maintenance rearing of this laboratory (whose initial population was collected in melon farms from Mossoró), reared on melon plants inside acrylic cages (50x50x50cm). The methodology adopted for rearing the insects was the same described by ARAUJO et al. (2007b). The identification of *L. sativae* was done at ESALQ/USP, where morphologic and molecular aspects were considered (COSTA-LIMA, 2009).

The melon plants ('Goldex' cultivar) were produced in polyethylene pots (10cm diameter x 10cm height), and when they had two leaves well formed, were individualized inside plastic cages (10cm diameter x 30cm height, with lateral openings covered with a nylon mesh for air circulation) and infested for three hours by ten pairs of *L. sativae*. Immediately after infestation, plants were put individually in white trays, inside Tecnal® climatic chambers, model Te-401, at 25.0±1.0°C, 12 hours photophase and 70.0±5.0% RH.

The duration of egg stage was obtained by observing, four times a day, the hatching larvae inside the leaves. The viability (hatchability) of egg stage wasn't estimated due to the fact that for visualizing the oviposition puncture it's necessary to remove the leaves from the plant and observe it using a stereoscope, what would interfere in the insect's development. The observations for the end of the larval stage were made every two hours, from 8:00 a.m. to 6 p.m. until all larvae leave the leaves or die. After leaving the leaves, the larvae were individualized inside glass tubes (2.5cm diameter x 8.5cm height) sealed with PVC packing film, remaining there throughout pupa stage until adult emergence. The adult insects were provided daily with honey solution (10% in distilled water) and pure distilled water. The observations for adult emergence were made the same way we did for larval stage. The survival rate for larvae and pupae were calculated as follows: Larval survival = (n° pupated larvae x 100) / n° total larvae; and Pupal survival = (n° emerged adults x 100) / n° total pupae. The sex ratio calculation followed the formula: Sex

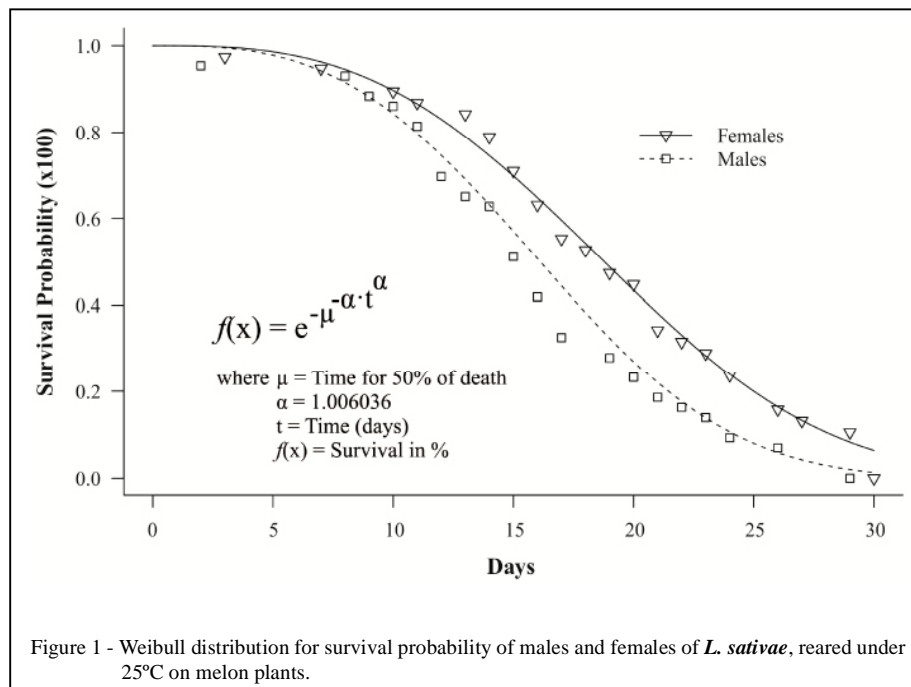
ratio = n° females / (n° emerged adults). Longevity for adults was calculated by observing the daily mortality, and the data were further submitted to a survival analysis (Weibull model), using the package *Survival* in the R® software (2011).

The average duration for the immature life stages of *L. sativae* on melon plants at 25°C was: egg (2.7±0.01 days), larva (4.1±0.03 days) and pupa (9.1±0.03 days). This gives a total egg-adult period of 15.9±0.04 days. These development times are similar to the intervals described by PARRELLA (1987), for species from the genus *Liriomyza*. They are also similar to the duration verified by COSTA-LIMA et al. (2009) for *L. sativae* on *Vigna unguiculata* (*Fabaceae*) at 25°C, with development times of 2.5 days for egg, 4.9 days for larva, 8.0 days for pupa and 16.5 days for egg-adult.

The results obtained by LANZONI et al. (2002) for *L. trifolii*, on *V. unguiculata* at 25°C - egg (2.1 days), larva (4.6 days), pupa (9.2 days) and egg-adult (15.9 days) - were also similar to the results presented here. These durations differ slightly from the work of the same authors above, for *L. huidobrensis* also in cowpea, with 2.2 days for egg, 5.8 days for larva, 8.2 days for pupa and 16.2 days for egg-adult. The most different results from the present research were found in the work of LEIBEE (1984), in the larva stage of *L. trifolii* on *Apium graveolens* (*Apiaceae*), with durations of 2.3 days for egg, 8.0 days for larva, 8.4 days for pupa, and 18.7 days for egg-adult.

The larval and pupal survival of *L. sativae* on melon was 95.0% and 78.2%, respectively. This larval survival was higher than the observed by COSTA-LIMA et al. (2009) for *L. sativae* on *V. unguiculata* (84.8%) and the pupal survival was similar (78.8%). Literature presents a large variation on survival of larvae and pupae of *Liriomyza* (LEIBEE, 1984; LANZONI et al., 2002). However, worth pointing out that many biotic and abiotic factors can influence the survival rates of larvae and pupae (PARRELLA, 1987), like for example, the host plant. The observed sex ratio (0.51) is in accordance with the pattern of the genus *Liriomyza*, to which PARRELLA (1987) related to be 1:1 in most cases, sometimes having a bias in favor of females.

Regarding to adult longevity, we verified that females live longer than males. While females live in average 19.3±1.09 days, males live 16.2±0.96 days and have a lower survival probability (Figure 1). According PARRELLA (1987), in general, females live approximately 15 to 20 days in average, and males live 10 to 15 days. However, the author highlights that the food source and the interval in which larva turns to pupa, may influence adult longevity.



The information presented herein (duration of immature stages, adult longevity, survival) for *L. sativae* in melon, constitute important tools for the adoption of control procedures, aiming at a better integrated management of this pest on melon crop.

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