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Biology and systematics of gall-inducing triozids (Hemiptera: Psylloidea) associated with *Psidium* spp. (Myrtaceae)

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Abstract

Psidium myrtoides (Myrtaceae) shelters the gall inducer *Nothotrioza myrtoidis* **gen. et sp. n.** (Hemiptera: Psylloidea) which is described and illustrated here. *Nothotrioza* belongs to the family Triozidae and is probably most closely related to *Neolithus*, a monotypic Neotropical genus associated with *Sapium* (Euphorbiaceae). Three species are recognized within *Nothotrioza*: the type species *N. myrtoidis* **sp. n.** associated with *Psidium myrtoides*, *N. cattleiani* **sp. n.** (misidentified by Butignol & Pedrosa-Macedo as *Neotrioza tavaresi*) with *Psidium cattleianum*, and *N. tavaresi* (Crawford) **comb. n.** (from *Neotrioza*) with an unidentified species of Malpighiaceae, respectively. A lectotype is designated here for *Neotrioza tavaresi*. Also, the diversity of insect galls associated with *P. myrtoides* and the biology of *N. myrtoidis* were examined. *N. myrtoidis* presents five instars and an annual life cycle synchronised with the phenology of *P. myrtoides*. Gall size was proportional to the insect developmental stages, and rates of parasitism and mortality were 15.7 % and 29.8 %, respectively. The red colour is an important macroscopic diagnostic feature of the gall that could be associated with parasite-free condition of the galling insect. The biological features presented by the system *Psidium myrtoides – Nothotrioza myrtoidis* are in accordance with other systems involving sucking galling insects, however, it is exceptional by its univoltine life cycle associated with a perennial plant in the Neotropics. The galls induced by the three known *Nothotrioza* spp. are morphologically similar, i.e. closed, globoid and unilocular, as well as the opening mechanism for releasing the adults.

Key words: Brazil, Eulophidae, *Galeopsomyia,* multihost, *Neotrioza,* Neotropics, *Nothotrioza,* phenology

Introduction

Insect galls are the result of a species-specific relationship (Mani 1964), which determines the redifferentiation of plant tissues (*sensu* Lev-Yadun 2003) towards symmetrical and repetitive structures (Raman 2007). Although entirely made of plant tissues, the structure of the gall is finely regulated by the inducer (Redfern & Askew 1992), and therefore can be considered its extended phenotype (*sensu* Dawkins 1982).

Typically, the development of galls can be divided into four stages: induction, growth and development, maturation and senescence (Rohfritsch 1992). This development is dependent on the temporal co-occurrence of the infesting forms of the insects and the reactive sites of their host plants. Variations in the life cycles of the plants can cause changes in the quality and quantity of the resources available to the galling insect, which directly affects its population (Yukawa 2000). The time necessary for the complete process is variable, depending, among other factors, on the developmental rate, and the type of voltinism of the inducer (Hodkinson 2009). Generally, in the association between insects and deciduous plants, the life cycles must be highly synchronous tending to univoltinism (Gonçalves *et al*. 2005). For perennial plants, in turn, resource availability is not a limiting factor to the establishment of the galling insects, which determines a tendency to multivoltine life cycles.

A key factor for the full development of the gall is the constant stimulus of the insect during the entire period of its development (Rohfritsch 1992). This process can be affected by parasitoids, which modify or interrupt the stimuli of the inducer and, therefore, the developmental pattern of the gall. Thus, it is possible that the presence of

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