

First Report of *Eriosoma lanigerum* (Hausmann, 1802) (Hemiptera: Aphididae) on the Apple tree Crop in Espirito Santo State, Brazil

Fernando Zanotti Madalon¹, Alixelhe Pacheco Damascena², Rodrigo Zanotti Madalon³, Luis Moreira Araujo Junior², José Romário de Carvalho², Dirceu Pratisoli²

¹ Department of Entomology and Acarology, University of São Paulo, Luiz de Queiroz Higher School of Agriculture (USP-ESALQ), Avenida Pádua Dias, 11, 13418-900, Piracicaba - SP, Brazil.

² Department of Agronomy, Center of Agrarian Sciences and Engineering, Espírito Santo Federal University, Alto Universitário, s/n, Guararema, 29.500-000, Alegre, Espírito Santo, Brazil.

³ Espírito Santo Institute of Agricultural and Forestry Defense (IDAF), Zip Code 29650-000, Santa Teresa - ES, Brazil.

Abstract— The apple tree is affected by a large variety of phytophagous plants. Woolly apple aphid in apple trees, *Eriosoma lanigerum* (Hausmann) (Hemiptera: Aphididae) are from North America. The main host of this insect is the plant *Ulmus americana* L. and the secondary host is the apple tree, where it develops throughout the year. Collects were carried out in pioneer municipalities in the planting of apple trees in the state of Espírito Santo, being cultivated Eva, Gala and Fuji varieties. The collections took place in the municipality of Santa Teresa, Santa Maria de Jetiba and Mantenópolis. Samples were taken at the stages of vegetative development and apple production. In this study, the occurrence of this insect was recorded in apple orchards in the state of Espírito Santo, where the presence of *E. lanigerum* was observed in all the samples, attacking the trunk, new shoots, roots, shoots and fruits between the planting lines.

Keywords— Insect-pest; Introduced species; Aphid; *Ulmus americana* L.

I. INTRODUCTION

The apple (*Malus domestica* Borkh) is the second most produced fruit in the world (Pasa et al., 2012; Ganopoulos et al., 2018). In Brazil, thanks to the favorable climate found in the main fruit producing regions, the crop 2016/17 produced excellent quality fruits, with a production of 1.2 million tons (Kist, 2016).

The apple trees are attacked by various types of arthropod pests (Shoonhoven et al., 2005). The aphids are considered key pests in apple orchards around the world (Beers et al., 2003). Among these pests, stands out the *Eriosoma lanigerum* (Hausmann) (Hemiptera: Aphididae), native to north america and one of the major pests of culture worldwide (Khan et al., 2015; Singh, et al., 2018). The outbreaks of this insect are related to the drop in biological control use to the detriment indiscriminate use of insecticides (Gontijo et al., 2012).

The *E. lanigerum* infestations in apple plants may occur in the root system or in trunks and branches through

lesions, what damages the sprouts and reduces tree growth (Brown et al., 1995; Pringle; Heunis, 2001; Beers et al., 2010). It is an indirect pest when it only weakens the host by feeding on bark and roots, which reduces tree health and prevents the wounds from healing. It is also a direct pest when it infests the central fruit part of some cultivars and can also be a pest during harvest, when the waxy cover of the insect focuses on the clothes of the pickers (Khan et al., 2015).

The studies published so far do not mention the presence of *E. lanigerum* in apple orchards in the Espírito Santo state. Thus, the objective of this paper was to report the occurrence of *E. lanigerum* in apple orchards in the Espírito Santo state.

II. MATERIAL AND METHODS

The survey of the occurrence of outbreaks of populations of *Eriosoma lanigerum* in apple tree culture was carried out from December 2018 to September 2019.

The collections were carried out in pioneer municipalities in the apple tree plantation in the Espírito Santo state, where the varieties Eva, Gala and Fuji were grown. The collections took place in the following localities: municipality of Santa Teresa, (Alto Caldeirão, 19°56'48.50"S, 40°46'18.18" W); municipality of Santa Maria de Jetibá (19°59'25.33" S, 40°42'16.73" W); and municipality of Mantenedópolis (18°51'10.85"S, 41° 3'50.42" W) (Figure 1). Monthly Samples, in the stages of vegetative development and apple production, were realized.

Random collections were performed between the orchard planting lines. The presence of insects was notified by the striking characteristic of the colonies, which are coated with a downy wrap and white. The knots and swellings caused by insects feeding was also a feature used in notification. The collections were performed in all parts of the attacked plants as: trunk, new branches, roots, sprouts and fruits. All infested materials were placed in thermal boxes (44 cm x 25 cm x 37 cm) and sent to the Entomology department of the Núcleo de Desenvolvimento Científico e Tecnológico em Manejo de Pragas e Doenças (NUDEMAFI) of the Universidade Federal do Espírito Santo (UFES). In the laboratory, the materials were carefully placed in 70% alcohol for later identification.

III. RESULTS AND DISCUSSION

After analyzing the materials collected in the three municipalities, it was checked that all samples presented occurrence of *Eriosoma lanigerum*, which confirmed its presence in the Espírito Santo state (Figure 2).

The *E. lanigerum* is a hemimetable insect. Thus, it has the same eating habit for most of his life cycle. The feeding process of this insect induces gall formation along the root length. In the stem, the presence of galls and sap dripping creates attack opportunities of opportunistic fungi (Molinari, 1986; Brown et al., 1991; Heunis; Pringle, 2006). The *E. lanigerum*, for being a hemipter, has the potential to be a vector of some culture-damaging virus. However, it is noteworthy that so far none viruses that harm the apple tree are linked to *E. lanigerum* (Blackman; Eastop, 1994).

The *E. lanigerum* attacks various tree species in the Rosaceae family. It is observed that in the places where it was introduced this species plague, it has a preference for apple trees (Asante, 1994). However, attacks on some other plants in the family can be found.

One of the ways of management of *E. lanigerum*, is the biological control with *Aphelinus mali* (Hald.) (Hymenoptera: Encyrtidae), that parasitizes all development stages of the pest, with preference for third instar nymphs (Muller et al., 1992). The parasitism rate of *A. mali* in the host under study show results above 80%, even at low population density, which demonstrates the harm reduction caused by the plague with the use of the parasitoid (Thakur; Dorga, 1980; Tejada; Rumayor, 1986; Shaw et al., 1996).

In the Espírito Santo state, the introduction of exotic species as: *Duponchelia fovealis* Zeller, 1847 (Lepidoptera: Crambidae); *Helicoverpa armigera* Hübner (Lepidoptera: Noctuidae) and *Daktulosphaira vitifoliae* (Fitch, 1856) (Hemiptera: Phylloxeridae) - was reported by other works, who claimed that these pests have caused great damage to state of the Espírito Santo agriculture (Fornazier et al., 2011; Pratissoli et al., 2015; Madalon et al., 2018). Faced with such fact, the report of the finding of the *E. lanigerum* in capixaba territory is of paramount importance, since the farmers are aware of the negative impacts of the infestation on apple tree productivity by this species, just as farmers adopt management practices to minimize future losses.

IV. FIGURES AND TABLES



Fig. 1: Municipalities from the Espírito Santo state in which the survey of the occurrence of *Eriosoma lanigerum* was performed.

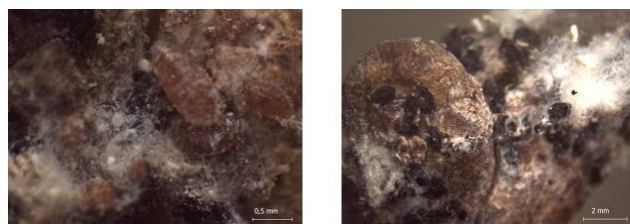


Fig.2. *Eriosoma lanigerum* in apple (left). Swelling caused by *Eriosoma lanigerum* (right).

V. CONCLUSION

All samples showed the occurrence of *Eriosoma lanigerum*, which confirmed its presence in Espírito Santo.

ACKNOWLEDGEMENTS

This work was supported by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) and Fundação de Amparo à Pesquisa e Inovação do Espírito Santo (FAPES).

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