

Detection of *Argyrotaenia sphaleropa* Meyrick (Lepidoptera: Tortricidae) in cultivations of *Persea americana* Mill.

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Abstract

The Germplasm Bank of 22 varieties of avocado is located at the Olericultural Fruit Research Center of the Faculty of Agricultural Sciences of the Hermilio Valdizán National University. During the period March-August 2019, the presence of the species *Argyrotaenia sphaleropa* Meyrick was detected attacking the avocado cultivation. Fruits were sampled describing the characteristics of the damage. Likewise, the larvae and pupae found were transferred to the laboratory for breeding and their morphological description based on the dichotomous key of the order. It was observed that the larvae began their feeding with irregular scrapes of the epicarp and could affect up to the mesocarp of the fruit and, as they passed, they left white droppings, joined the leaves and fruits together with silk threads, serving as shelter for the larvae for the pupal process and subsequent development of the adult.

Keywords: *Argyrotaenia sphaleropa*, avocado pest, silk threads.

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In Peru, the species *Argyrotaenia spheropa* Meyrick (1909) (Lepidoptera: Tortricidae) was detected causing damage to the cultivations of tara *Caesalpinia spinosa* (Molina), tree of Peruvian origin of industrial importance (Murga *et al.*, 2015) and citrus (Salazar, 1999; Aliaga, 2014). In Brazil, during the 2000 and 2001 harvest, the species is recorded in peach cultivations (Botton *et al.*, 2003) and in the 1994-1995 season, it was detected in citrus plantations (*Citrus sinensis*) and recently in soybean cultivation (Neves and da Silva, 2021).

In other countries of South America, the occurrence of this pest is recorded in Argentina (Gonsebatt *et al.*, 2018) Bolivia and Uruguay, with attack on fruiting (Pinto *et al.*, 2005; Filho *et al.*, 2007), ornamental and aromatic plants (Bentancourt, 1986), in Mexico in the avocado cultivation (Rosas-García and Villegas-Mendoza, 2008).

It is a polyphagous pest, frequently with damage to fruit trees (Rocca and Brown, 2013; Meneguim and Hohmann, 2007), so its presence in the cultivation of avocado in Peru is not ruled out. However, there is still no report of the occurrence at the country level. Therefore, the objective of this study is to report the detection of the species with damage at the fruit level in the observed varieties.

Between the months from March to August of 2019, frequent monitoring and evaluations of pests were carried out in the cultivation of the avocado (*Persea americana* Mill.) belonging to the germplasm bank of 22 varieties, owned by the Olericultural Fruit Research Center of the Faculty of Agricultural Sciences of the Hermilio Valdizán National University (CIFO, for its acronym in Spanish), Huánuco-Peru, located at 1 930 masl, where it has housed 22 varieties for approximately 22 years.

Monitoring and observations were carried out in all varieties, selecting 5 trees of each variety, in which visual reviews around the middle and upper third of the plant were made and leaves or fruits damaged by the pest were collected. When the pupae were detected in the fruits, up to 8 tulle-based cages with trapping function were placed to allow the adults to hatch in the natural environmental conditions (Figure 1).



Figure 1. Tulle-based cages with damaged fruits containing pupae.

Forty-seven damaged fruits, 23 larvae of different stages and 18 pupae Meyrick (1909) were collected. Divided into 16 larvae and 13 pupae of the Hass variety, 5 larvae and 3 pupae of the Naval Verde variety and 2 larvae, 2 pupae of the Verónica variety.

This material was transferred to the entomological breeding area of the laboratory of the University to allow the development of adults, with the food supplies for the larvae being the healthy fruits and for the shelter of the pupae, the leaves of the avocado were used. The damages were described through observations on fruits, leaves and other plant structures.

Among the 22 varieties of avocado evaluated, the highest number of damaged fruits was registered (32) in the Hass variety, representing 68% of the total of the fruits evaluated, followed by the Naval Verde variety with 9 damaged fruits (19%) and the Verónica variety with 6 damaged fruits (13%).

There are significant statistical differences between the number of damaged fruits per variety ($p \leq 0.05$ and $p \leq 0.01$), with Hass being the most affected with an average of 6.40 damaged fruits/plant, followed by the Naval Verde variety with 1.80 damaged fruits/plant and the Verónica variety with 1.20 damaged fruits/plant (Table 1).

Table 1. Attack of *A. sphaleropa* Meyrick in different varieties of avocado.

Varieties	Fruits with damage	SE	0.05	0.01
Hass	6.4**	0.28	a	a
Naval Verde	1.8	0.28	b	b
Verónica	1.2	0.28	b	b
CV (%)	19.76			
<i>p</i> -value	<0.0001			

Values in the same column followed by the same letter are not statistically different (Duncan, $p \leq 0.05$); ** = significant values; CV= coefficient of variation; *p*-value= significant difference; SE= standard error.

The larvae of yellowish green color at the beginning and green in the last stages are very active making silk threads to join the leaves or fruits together, the joint is usually used as a hiding place and at the same time to feed on the parenchymal plant tissue (Figure 3a and 3b). This behavior is similar to the report of Juárez (2013), when identifying the species in the blackberry cultivation.

Each larva builds an exclusive shelter between the leaves or fruits, they begin their feeding with irregular scrapes of the epicarp, being able to affect up to the mesocarp of the fruit and as they pass, they leave white droppings, in the same damaged fruit and inside the woven fabric or in the joint of leaves, they manage to pupate easily (Figures 2a, 2b and 2c). Similar behavior is reported by Murga (2015) in the affected pods of *Caesalpinia spinosa*. With perforations that vary between 5 to 20 mm in diameter, also affecting the seeds.

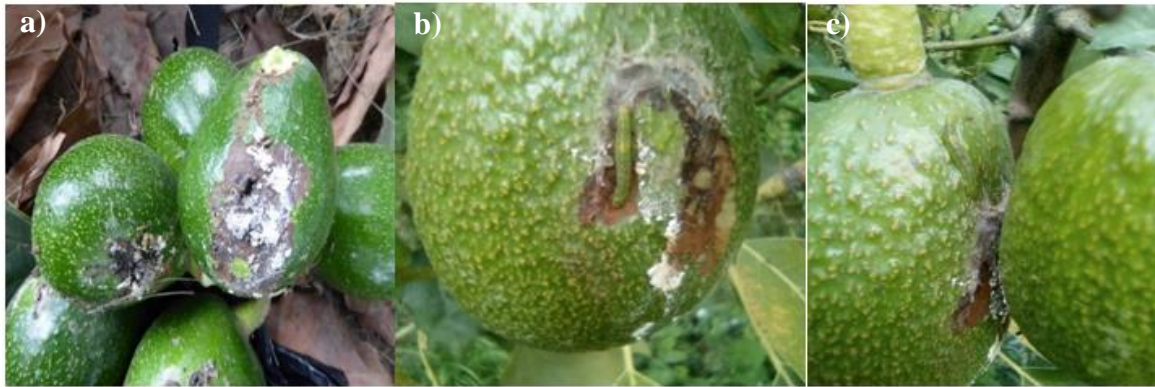


Figure 2. a) damage to the epicarp of the fruit; b) droppings and silks threads; and c) joined fruits.

The larvae when disturbed tend to fall quickly supported by a silk thread that facilitates the free jump. The inactive pupae of green color at the beginning and brown at the end complete their development cycle between the fruits or leaves stuck together (Figure 3c). Larvae and pupae located between the insertions of the peduncles in the Naval Verde variety have been observed (Figure 3d). Botton *et al.* (2003) mention that the larvae scrape the epidermis of the fruits and usually shelter in the insertion of the peduncle or in the folded leaves or with fruits.

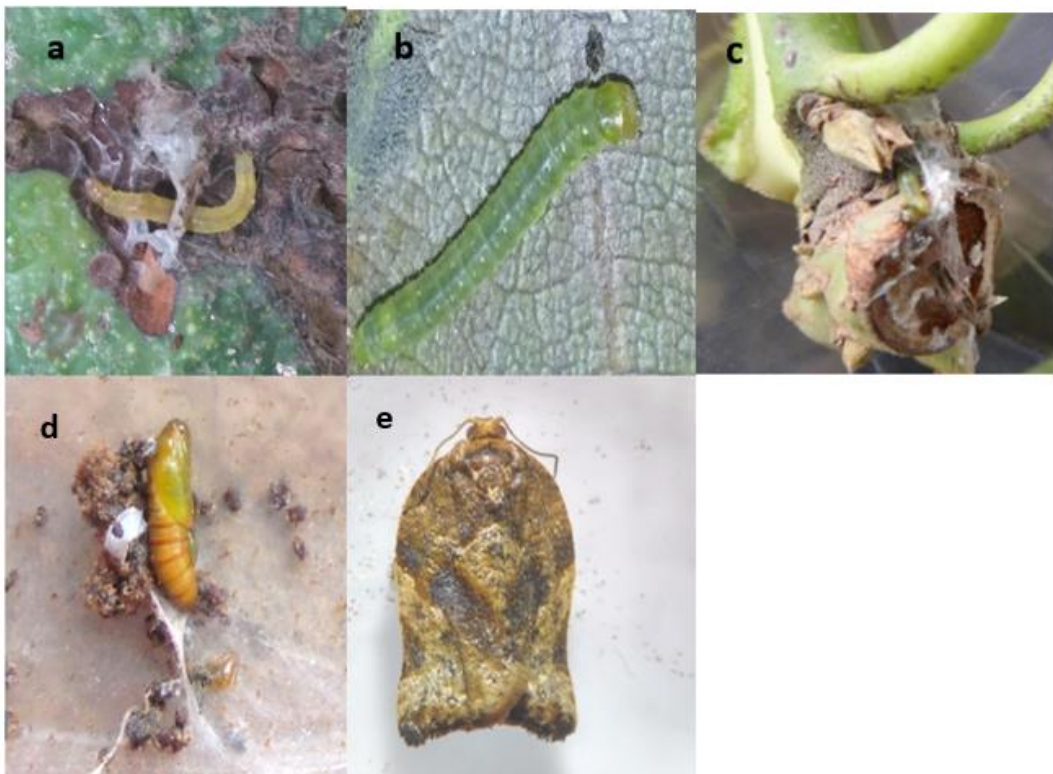


Figure 3. a) larva of yellowish green at the beginning; b) green larva in the last stages; c) pupa; d) larva located at the insertion of the peduncle; e) adult.

Adults of nocturnal habit with sizes between 15 mm, with filiform-type antennae, provided with a proboscis, thorax and abdomen of ashen brown color, legs of brown color similar to that described by Bavaresco *et al.* (2005), they are easy to recognize.

The male, on the dorsal part between the two forewings, forms a black 'V'-shaped figure on which another figure resembling a 'rhombus', light in color, lies. The distant areas of the wing are beige with dark brown spots on the costal-inner margin and light brown between sides of the apical-anal angle, outer margin, the hindwings are light brown. A similar characteristic is described by Neves and da Silva (2021) when making the first record of *A. sphaleropa* in soybean cultivation. The adult female is light brown with irregular black spots on the forewings (Figure 3e) and is larger than the male.

Conclusions

The occurrence of *A. sphaleropa* Meyrick (1909) is confirmed, with damage to the cultivation of the avocado, preferably in the Hass variety.

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