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Authors: Hoddle, Mark S., and Brown, John W.

Source: Florida Entomologist, 93(4) : 649-650

Published By: Florida Entomological Society

URL: https://doi.org/10.1653/024.093.0428

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LEPIDOPTERA ASSOCIATED WITH AVOCADO FRUIT IN GUATEMALA

MARK S. HODDLE[1,2] AND JOHN W. BROWN[3]
[1]Department of Entomology, University of California, Riverside, CA 92521

[2]Center for Invasive Species Research, University of California, Riverside, CA 92521

[3]Systematic Entomology Laboratory, PSI, Agricultural Research Service, U.S. Department of Agriculture, c/o National Museum of Natural History, Smithsonian Institution, Washington, DC 20013, U.S.A

Avocados (*Persea americana* Miller) (Lauraceae) evolved in the eastern and central highlands of Mexico, Guatemala, and the Pacific Coast of Central America (Knight 2002). Humans moved avocados into northern South America by 4000 BC where plants became naturalized (Knight 2002). In 2007, 4 of the top 10 producing nations were located in the native and naturalized range of avocados, with countries ranked as follows: Mexico (1), Colombia (6), Peru (8), and Guatemala (10) (FAOSTAT 2009). California, the fourth largest producer of avocados in the world (FAOSTAT 2009), with a 2007-2008 season crop worth $327 million (US) (CAC 2008), is experiencing increasing imports of fresh avocado fruit from areas where this plant is native. The estimated amount of fruit entering California from Mexico in 2008-2009 was 36.3 million kilograms (Morse et al. 2009).

Co-evolved herbivores of avocados are poorly documented. Three avocado foliage-feeding pests in California, *Tetraleurodes perseae* Nakahara (Hemiptera: Aleyrodidae), *Oligonychus perseae* Tuttle, Baker, and Abbatiello (Acari: Tetranychidae), and *Scirtothrips perseae* Nakahara (Thysanoptera: Thripidae), were new to science at the time of discovery in the U.S.A. (Hoddle 2004). Morse et al. (2009) recorded 8 species of armored scales on imported avocado fruit entering California from Mexico of which 3 were new species. Globally, 99 species of Lepidoptera from 20 families have a documented association with avocados (HOSTS 2009). The pest status and invasion potential of Lepidoptera in areas where avocados are native are not well understood. To better understand Lepidoptera associated with avocado, we undertook fruit survey work in Guatemala and results are presented here.

Fruit collection and rearing studies were conducted in Guatemala from 1 Nov 2006 to 1 Apr 2007 (n = 23 sites), 13 Nov to 21 Dec 2007 (n = 3 sites), 13 Mar to 1 May 2008 (n = 1 site), and 14 Nov 2008 to 14 Jan 2009 (n = 5 sites). Small immature Hass fruit (5-25 mm in length, n = 1,078), and large mature Hass and non-Hass fruit (≥100 mm in length, n = 7,742) were harvested over these 4 different survey periods. Small fruit were held either individually in ventilated plastic vials or commingled and held in ventilated plastic cups labeled by collection site and date. All large fruit were held by collection site and date in collapsible, ventilated insect rearing cages (BugDorm-2120, 60 cm × 60 cm × 60 cm, MegaView Science Education Services, Taiwan). All rearing studies was conducted in laboratories at 17-22°C and 41-75% RH under natural daylight of ≈12:12 (L:D). As larvae emerged from fruit to pupate they were collected and held individually in labeled ventilated plastic vials until emergence of adult moths. Selected examples of adult moths were killed by freezing, and then pin-mounted with wings spread. Pupal cases were kept and pinned with the adult moth which emerged from it.

A total of 1,098 specimens representing 10 moth species from 4 families were reared from harvested avocado fruit in Guatemala. Two tortricid species, *Argyrotaenia urbana* (Busck) (n = 2) and *Polyortha* n. sp. (n = 1), were reared from small immature avocados and grown to maturity on unopened avocado flower clusters after small fruit desiccated. The numbers of each of these 2 species reared from small fruit was underestimated due to larval mortality resulting from fruit desiccation. From large fruit, 8 different moth species were reared: *Amorbia santamaria* Phillips and Powell (Tortricidae) (n = 5), *Cryptaspasma* sp. nr. *lugubris* (Meyrick) (Tortricidae) (n = 50), *Euxoa sorella* Schaus (Noctuidae) (n = 1), *Histura perseavora* Brown (Tortricidae) (n = 35), *Holcocera plagatola* Adamski (Coleophoridae) (n = 2), *Micrathetis triplex* Walker (Noctuidae) (n = 1), *Netechma pyrrhodelta* (Meyrick) (Tortricidae) (n = 1), and *Stenoma catenifer* Walsingham (Elachistidae) (n ≈ 1000 specimens).

Stenoma catenifer, a well known avocado pest, accounted for 91% of collected material. Tortricidae had the most representatives with 6 species. At least 2 new moth species were discovered and described from this project, *H. perseavora* (Brown & Hoddle 2009) and *H. plagatola* (Adamski & Hoddle 2009), with possibly a third undescribed species, *Polyortha* n. sp. being found also. *Polyortha* is a very poorly studied genus, and this rearing record from Guatemala is the first host plant data for this undescribed species. *Argyrotaenis urbana* is known primarily from Mexico. This is the first record of this species from Guatemala, and the first host rearing record for this moth. Prior to this study, *N. pyrrhodelta* was known only from Costa Rica where it was reared

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from *Inga* sp. (Fabaceae). *Cryptaspasma* spp. have been reared previously from avocados in Michoacán Mexico, and Puerto Rico (Brown & Brown 2004). Species of *Amorbia* are known pests of avocados (Dreistadt 2008). *Amorbia santamaria* was originally described from specimens collected in Guatemala (Phillips-Rodríguez & Powell 2007). The single specimens of *E. sorella* and *M. triplex*, together with *N. pyrrhodelta* and *H. plagatola*, appear to be opportunistic exploiters of large avocado fruit.

The results of this survey work over a ~2.5-year period encompassing ~25 different sites in Guatemala revealed that a varied moth fauna was associated with avocados, and 2 new species were discovered feeding on large fruit, of which *H. perseavora* has the potential to be an economic pest (Brown & Hoddle 2009). Additionally, the first host associations for 4 species were documented. Given the current situation, the preparation of risk assessment reports by regulatory agencies for countries with indigenous avocados that are petitioning to export avocado fruit are probably not robust because surveys similar to those conducted here have not been executed.

Support for this work was provided in part by the California Avocado Commission. We are indebted to all our cooperators in Guatemala who assisted with the location of field sites and fruit for these studies. We thank Michael Pogue, USDA-ARS, for identifying the noctuid moths. Comments from an anonymous reviewer greatly improved this article.

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