CAPS Datasheets provide pest-specific information to support planning and completing early detection surveys.

Crocidosema aporema species complex

Figure 1. Adult (a) male and (b) female *Crocidosema aporema*. Photos: Christi Jaeger, MEM.

Scientific Name
Crocidosema aporema

Synonym(s):
Epinotia aporema
Epinotia opposita
Eucosma aporema

Common Name
Bud borer, bean shoot moth, soybean bud borer

Type of Pest
Moth, borer

Taxonomic Position
Class: Insecta, **Order:** Lepidoptera, **Family:** Tortricidae

Note: *Crocidosema aporema* is not a discrete taxon and all the information provided in this datasheet refers to a complex of different species. References to and images of *C. aporema* genitalia are only useable for identification to the complex level, not for a particular species.

Pest Recognition

This section describes characteristics of the organism and symptoms that will help surveyors recognize possible infestations/infections in the field, select survey sites, and collect symptomatic material. For morphological descriptions, see the Identification/Diagnostic resources on the AMPS pest page on the CAPS Resource and Collaboration website.

Pest Description

Adult moths are small and brown. The adult wingspan is 14 to 17 mm (approx. 0.55 to 0.67 in) wide (Morey, 1972; Ferreira, 1980) (Figs. 1a and b). Adults are nocturnal (Liljesthröm et al., 2001). During the day, adults rest within the vegetation, but flush and fly in short bursts if disturbed (Cano Ortiz, 1998; Wille, 1952). Daytime observations of adults are unlikely.

Figure 2. First (bottom) and third (top) instar *Crocidosema aporema*. Photo: Laboratório de Controle Integrado de Insetos (http://www.bio.ufpr.br/portal/insectbiocontrol/).

Larvae complete five instars. The body color is variable green to yellowish green. The head capsule is shiny and black in early instars (1–3) (Fig. 2). In later instars (4–5), the head is reddish brown with a lateral black dash on each side (Fig. 3). Fully grown larvae are approximately 10 mm (0.39 in) long (Morey, 1972).

Figure 3. Late instar larva of *Crocidosema aporema*. Photo: T. M. Gilligan & S. C. Passoa, LepIntercept (www.lepintercept.org)

Figure 5. Leaf-rolls created by *Crocidosema aporema* larvae. Photos: Laboratório de Controle Integrado de Insetos (http://www.bio.ufpr.br/portal/insectbiocontrol/).

Signs and Symptoms

Larvae join young leaflets together with silk, creating easily recognizable leaf-rolls around the terminal and lateral buds of the plant (Liljesthröm et al., 2001) (Fig. 4). Larvae feed within the leaf-rolls on vegetative and floral buds and bore into stems and seedpods (Altesor et al., 2010; Ferreira, 1980; Pereyra and Sánchez, 1998; Sánchez et al., 1997) until pupation.

Feeding on buds and boring into stems causes major symptoms including stunted growth (Fig. 5), deformed leaves, increased secondary branching, and reduced pod production and seed quality. Boring into seedpods damages the seeds and causes premature pod drop (Bentancourt and Scatoni, 2006).

Soybeans: Larval feeding on the pods of soybeans damages the seeds (Ferreira, 1980), and feeding on new growth during the vegetative stage reduces the plant size and increases the number of secondary branches (Foerster et al., 1983). During the reproductive stage of soybeans, larval attacks can lead to flower bud and pod drops (Cano Ortiz, 1998; Wille, 1952).

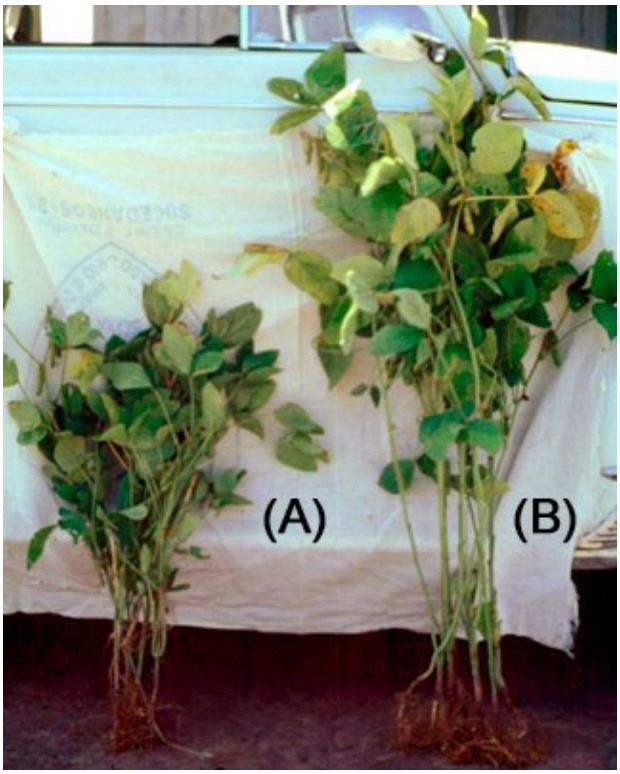

Figure 4. *Crocidosema aporema* damage stunts plant growth. Comparison of (A) damaged and (B) undamaged soybean plants. Photo: Laboratório de Controle Integrado de Insetos (http://www.bio.ufpr.br/portal/insectbiocontrol/).

Other Hosts:

- In alfalfa, larval feeding reduces the amount of green tissue and damages seeds. Larvae can also feed on flowers (Altesor et al., 2010; Pereyra and Sánchez, 1998; Wille, 1952).
- In broad beans, larval feeding damages terminal and lateral shoots, stems, and pods, ultimately stunting plant growth and affecting the quality of the seeds (Cano Ortiz, 1998).

Easily Mistaken Species

Other species of *Crocidosema* occur in the United States, especially in the southeast. *Crocidosema plebejana* is present across much of the southern United States and looks similar but primarily infests mallow (Malvaceae) (Gilligan and Epstein, 2014b). Female or male genitalia dissection is required to distinguish *Crocidosema aporema* from other *Crocidosema* species (Gilligan and Epstein, 2014b).

The leaf-rolling behavior of *C. aporema* can be mistaken for that of *Ecdytolopha fabivora*. However, *C. aporema* attacks young leaflets, while *E. fabivora* is commonly found on fully developed leaves (Ferreira, 1980; Gilligan and Epstein, 2014a). *Ecdytolopha fabivora* is a legume pest found throughout Central and South America.

Commonly Encountered Non-targets

The approved survey method for C. aporema is large plastic delta traps loaded with *Crocidosema aporema* lure. Non-target species of tortricid moths that also look similar to *C. aporema* may be captured in these traps in the United States, including *Bactra verutana*, *Olethreutes* spp., *Pelochrista fiskeana*, *Proteoteras* spp., *Pseudexentera faracana*, *Gretchena* spp., *Epinotia* spp., and *Catastega* spp.

Biology and Ecology

Crocidosema aporema produces four to six generations a year (Ferreira, 1980; Altesor et al., 2010). In temperate regions of South America, *C. aporema* adults are active between September and April, coinciding with the start of spring to mid-autumn (Ferreira, 1980; Altesor et al., 2010). The number of adults observed closely corresponds to the host phenology (Altesor et al., 2010). In soybean fields in southern Brazil, adult numbers increase as the plants reach the last vegetative stage and remain high throughout the flowering stage of the plant (Ferreira, 1980). Adult numbers begin to dwindle as pods develop; however, high infestations during pod development have been recorded in central Brazil (Ferreira, 1980). The same trend is observed in bean (*Phaseolus vulgaris*) fields in Colombia, with adult numbers peaking 76–87 days after planting (Cano Ortiz, 1998). In Uruguay, populations persist all year as long as there is appropriate host material (Cano Ortiz, 1998; Ferreira, 1980).

Development from egg to adult takes 33 to 46 days at 21–23°C (70-73°F) (Altesor et al., 2010). The maximum adult lifespan is 23 days for males and 21 days for females (Sánchez et al., 1997). Adult females start to lay eggs (a maximum of 119 eggs) 2 to

4 days after emergence (Pereyra et al., 1991; Sánchez and Pereyra, 2008; Sánchez et al., 1997). Eggs are laid individually mainly on the internodes and nodes of host plants (Pereyra et al., 1991) and take approximately 7 days to develop (Sánchez et al., 1997).

Larval development time (1st to 5th instar) takes 13 to 18 days at 25°C (77°F) (Iede and Foerster, 1982; Sánchez et al., 1997). Newly hatched larvae travel to the nearest leaf or flower buds (Liljesthröm et al., 2001; Sánchez et al., 1991). Larvae can also bore into stems and pods (Sánchez and Pereyra, 2008). Once at the buds, larvae join the leaflets or floral parts together with silk and feed within the enclosed areas until they pupate in place or drop to the soil for pupation (Liljesthröm et al., 2001; Sánchez and Pereyra, 2008). Pupation lasts 11 to 12 days (Ferreira, 1980; Iede and Foerster, 1982).

Known Hosts

Crocidosema aporema feeds on wild and cultivated legumes such as peanut, clover, alfalfa, lotus, pea, melilotus, lupine, broad bean, and common bean (Biezanko et al., 1974; Sánchez and Pereyra, 2008). This pest is active year-round in South America due to the availability of legume hosts (González et al., 2012) and is an important pest in soybeans (Sánchez and Pereyra, 2008). Soybeans are not an optimal host for *C. aporema*, but multiple generations are often observed in this crop (Sánchez and Pereyra, 2008). This could be because soybean is readily available throughout the active season, with a long development time and a late maturation cycle (Corrêa and Smith, 1976; Siqueira and Siqueira, 2012).

Preferred hosts

Arachis hypogaea[*] (peanut), *Cicer arietinum*[*] (chickpea), ***Glycine max***[*] (soybean), *Lens culinaris*[*] (lentil), *Linum usitatissimum*[*] (flax), *Lotus* sp.[*] (trefoils), *Lupinus* sp.[*] (lupine), ***Medicago sativa***[*] (alfalfa), *Melilotus* sp.[*] (melilots), ***Phaseolus vulgaris***[*] (common bean), *Pisum sativum*[*] (pea), *Trifolium* sp.[*] (clover), *Vicia faba*[*] (broad bean), and *Vigna unguiculata*[*] (cowpea) (Biezanko et al., 1974; Sánchez and Pereyra, 2008)

Pest Importance

Crocidosema aporema is a major pest of soybeans in South America (Sánchez and Pereyra, 2008). However, its impact on soybeans varies depending on the timing and development of the soybean crop. Foerster et al. (1983) observed that, during the flowering stage, when greater than 50% of plants were damaged, yield losses were significant. On the other hand, up to 80% of plants could be attacked during the vegetative stage or pod set without adversely affecting yield. Despite recorded damage, soybean is not an optimal host for larval development; larvae fed common bean and broad bean leaf buds develop faster than larvae fed soybean leaf buds (Pereyra and Sánchez, 1998). Cano Ortiz (1998) found that uncontrolled and large infestations in bean (*P. vulgaris*) could cause 52% yield loss.

[*] Hosts with known U.S. distribution

In the United States, soybean is one of the largest commodities producing more than $40 billion from 4 billion bushels grown on 90 million acres in 2017 (NASS, 2019). Peanut production in 2017 yielded 7 billion pounds grown on over 1 million acres, while other bean production comprised of $4 billion from 1.5 million acres in 2017. This includes totals from other grains, oilseeds, dry beans, and dry peas (NASS, 2019).

Pathogens or Associated Organisms Vectored

Crocidosema aporema is not known to be associated with pathogens or other organisms.

Known Distribution

Central America: Costa Rica, Guatemala; **North America:** Mexico; **South America:** Argentina, Brazil, Chile, Colombia, Ecuador, Peru, Uruguay (Biezanko et al., 1974; Clarke, 1954; Ferreira, 1980; Peralta et al., 2014).

Status in Texas

Clarke (1954) reported *C. aporema* as present in Texas. However, there are no recent records of *C. aporema* being captured in the United States besides five specimens collected in South Texas in 1941 (Gilligan and Epstein, 2014a).

Pathway

Crocidosema aporema has moved through international trade on host material. It has been intercepted at U.S. ports of entry, mainly in permit-cargo, baggage, and general cargo on *P. vulgaris*, *Phaseolus* sp., and *Pisum sativum* from Ecuador, Guatemala, Peru, and Mexico (AQAS, 2019). *Crocidosema aporema* is thought to have spread to new areas through human transport after the introduction and expansion of cultivated soybeans in the new world (Pereyra and Sánchez, 1998; Sánchez and Pereyra, 2008).

Use the PPQ Commodity Import and Export manuals listed below to determine 1) if host plants or material are allowed to enter the United States from countries where the organism is present and 2) what phytosanitary measures (e.g., inspections, phytosanitary certificates, post entry quarantines, mandatory treatments) are in use. These manuals are updated regularly.

Agricultural Commodity Import Requirements(ACIR) manual: ACIR provides a single source to search for and retrieve entry requirements for imported commodities. https://acir.aphis.usda.gov/s/

Plants for Planting Manual: This manual is a resource for regulating imported plants or plant parts for propagation, including buds, bulbs, corms, cuttings, layers, pollen, scions, seeds, tissue, tubers, and like structures. https://www.aphis.usda.gov/import_export/plants/manuals/ports/downloads/plants_for_planting.pdf

Treatment Manual: This manual provides information about treatments applied to imported and domestic commodities to limit the movement of agricultural pests into or within the United States.
https://www.aphis.usda.gov/import_export/plants/manuals/ports/downloads/treatment.pdf

Potential Distribution within the United States

Crocidosema aporema is native to the neotropics. It is reported across Plant Hardiness Zones 6 through 13, but is most likely present in zones 8 through 12 (Takeuchi et al., 2018). In the United States, zones 8 through 12 include Hawaii, Puerto Rico, most of the southern states, and parts of New Mexico, Arizona, California, and the Pacific Northwest (Takeuchi et al., 2018).

Survey and Key Diagnostics

Approved Methods for Pest Surveillance*:

For the current approved methods and guidance for survey and identification, see Approved Methods for Pest Surveillance (AMPS) pest page on the CAPS Resource and Collaboration website, at https://caps.ceris.purdue.edu/approved-methods.

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Versions

May 2015 (Version 1): Datasheet completed and published as part of the 2007 Soybean Survey Manual

April 2020 (Version 2): Updated datasheet

December 2020 (Version 2.1): Reorganized datasheet and added guidance for approved methods section

December 2022 (Version 2.2): Updated datasheet, transferred to new template, and added taxonomic disclaimers

Reviewer(s)

Todd Gilligan, USDA APHIS PPQ, Fort Collins, CO