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

Crocidosema aporema

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

Scientific Name
Crocidosema aporema (Walsingham, 1914)

Synonym(s):
Epinotia aporema (Walsingham, 1914)
Epinotia opposita Heinrich, 1931
Eucosma aporema Walsingham, 1914

Common Name(s)
Bud borer, bean shoot moth, soybean bud borer

Type of Pest
Moth, borer

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

Reason for Inclusion in Manual:
CAPS Soybean Commodity Survey list 2015-present

Pest Recognition

This section describes characteristics of the pest and symptoms that may help surveyors recognize possible infestations in the field and select survey sites. For morphological descriptions, see Identification Resources on the AMPS pest page on the CAPS Resource and Collaboration website.

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

Crocidosema aporema produce multiple, overlapping generations each year. Adults appear first but larvae and adults may be active at the same time throughout the growing season (Ferreira, 1980; Altesor et al., 2010).

Adult moths are small and brown. The adult wingspan is 14 to 17mm (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 3. Late instar larva of *Crocidosema aporema*. Photo: T. M. Gilligan & S. C. Passoa, LepIntercept (www.lepintercept.org)

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).

Larvae join young leaflets together with silk creating leaf-rolls around the terminal and lateral buds of the plant (Liljesthröm et al., 2001) (Fig. 4). Larvae feed within the leaf-rolls. Later instars may move from leaf-rolls to feed on axils and stems, and bore into the stems and, occasionally, pods (Sánchez and Pereyra, 2008).

In addition to the leaf-rolls, **infested plants** exhibit stunted growth (Fig. 5), increased secondary branching, and premature flower bud and pod drop (Bentancourt and Scatoni, 2006)

Figure 4. Leaf-rolls created by *Crocidosema aporema* larvae. Photos: Laboratório de Controle Integrado de Insetos (http://www.bio.ufpr.br/portal/insectbiocontrol/).

Biology and Ecology

Crocidosema aporema produces four to six generations a year (Ferreira, 1980; Altesor et al., 2010). In temperate regions of South America (latitude 31-34°S), *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 correspond 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).

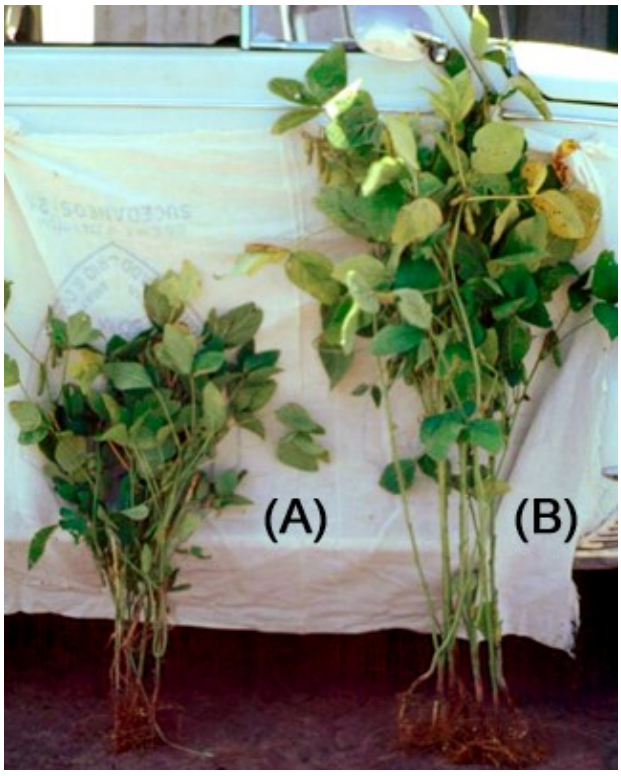

Figure 5. *Crocidosema aporema* damage stunts plant growth. Comparison of (A) damaged and (B) undamaged soybean plants. Photo: Laboratório de Controle Integrado de Insetos (http://www.bio.ufpr.br/portal/insectbiocontrol/).

The timeframe from egg to adult is 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).

The average development time to complete the five instars was 13-18 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 between 11-12 days (Ferreira, 1980; Iede and Foerster, 1982).

Known Hosts

Crocidosema aporema feeds on native 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). Although soybeans are not this pest's optimal host, a minimum of two generations are often observed in soybeans (Sánchez and Pereyra, 2008). This could be because soybean is readily available due to the sowing season, the long development time, and its late maturation cycle (Corrêa and Smith, 1976; Siqueira and Siqueira, 2012).

The host list below includes cultivated and wild plants that 1) are infested by the pest under natural conditions, 2) are frequently described as major, primary, or preferred hosts, and 3) have primary evidence for feeding and damage documented in the literature. Economically important plants are highlighted in bold.

Preferred hosts

***Arachis hypogaea** (peanut)**, ***Cicer arietinum** (chickpea)**, ***Glycine max** (soybean)**, ***Lens culinaris** (lentil)**, *Linum usitatissimum** (flax), *Lotus* sp.* (trefoils), *Lupinus* sp.* (lupins), ***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)

Damage

Crocidosema aporema larvae feed 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). Feeding on buds and boring into stems causes stunted growth, deformed leaves, and reduced pod production and seed quality. Boring into seedpods causes direct damage to seeds and premature pod drop (Bentancourt and Scatoni, 2006).

* Hosts with known U.S. distribution

Soybeans: Newly hatched larvae feed on the buds and leaflets. As they grow, the larvae may also feed on secondary buds, axils, and stems. Older larvae create tunnels 5 cm (1.97 in) in length within the stem, obstructing sap movement and development of the plant (Cano Ortiz, 1998; Wille, 1952). Feeding on the pods of soybeans damages the seeds (Ferreira, 1980). 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).

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).

Pest Importance

Crocidosema aporema is a major pest of soybeans in South America (Sánchez and Pereyra, 2008). Foerster et al. (1983) observed that, during the flowering stage, damages greater than 50% results in significant crop reductions. On the other hand, damage during the vegetative state or pod set (up to 80%) does not adversely affect 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 (*Phaseolus vulgaris*) could cause 52.45% yield loss.

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).

Crocidosema aporema is currently listed as a harmful organism in South Korea (PExD, 2019). There may be trade implications with South Korea if this pest becomes established in the United States.

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, 2014b).

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 *Phaseolus vulgaris*, *Phaseolus* sp., and *Pisum sativum* from Ecuador, Guatemala, Peru, and Mexico (AQAS, 2019). *Crocidosema aporema* is thought to have spread to new areas after the introduction and expansion of cultivated soybeans into the new world through human transport (Pereyra and Sánchez, 1998; Sánchez and Pereyra, 2008).

Use the USDA 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.

Fruits and Vegetables Import Requirements (FAVIR) Online Database: The FAVIR database lists all import requirements for fruits and vegetables. To search by commodity, select 'Approved Name' at the top left of the page. Select the commodity from the drop down menu and then click 'Search'. Click on the 'Commodity Summary' tab for details.
https://epermits.aphis.usda.gov/manual/index.cfm?action=pubHome

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 similar 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 in regions encompassing 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 Identification
Approved Methods for Pest Surveillance*:

For the current approved methods and guidance for survey and identification, see

Approved Methods for Pest Surveillance on the CAPS Resource and Collaboration Site, at https://caps.ceris.purdue.edu/approved-methods.

Easily Mistaken Pests

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, 2014b). *Ecdytolopha fabivora* is a legume pest found throughout Central and South America.

Other species of *Crocidosema* occur in the United States, especially in the southeast. *Crocidosema plebejana* looks similar but primarily infests mallow (Malvaceae) (Gilligan and Epstein, 2014c). It is distributed throughout the world and in the United States; it is present across much of the southern United States. *Crocidosema aporema* is distinguished from other species of *Crocidosema*, like *C. plebejana*, by dissecting its female or male genitalia (Gilligan and Epstein, 2014c).

In the United States, species that may be found in traps that are most likely to be confused with *C. aporema* include *Bactra verutana*, *Olethreutes* spp., *Pelochrista fiskeana*, *Proteoteras* spp., *Pseudexentera faracana*, *Gretchena* spp., *Epinotia* spp., and *Catastega* spp.

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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):

1. Transferred to new template.

2. Updated or expanded information in Pest Description, Biology and Ecology, Known Hosts, Damage, Pest importance, Known Distribution, Pathway, Potential Distribution in the United States, and Easily Mistaken Pests.
3. Removed Survey and Key Identification sections. This information is available on the AMPS pest page on the CAPS Resource and Collaboration website.
4. Added photos of adult male and female, late instar larva, leaf-roll damage, and stunted growth.

Reviewer(s)

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