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Technical Bulletin- Oxycarenus hyalinipennis (Costa) (Hemiptera: Oxycarenidae) Cotton seed bug

Cotton seed bug, *O. hyalinipennis* (image courtesy of Julieta Brambila, USDA–APHIS–PPQ)

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Figure 1. Adult and five nymphal stages of *Oxycarenus hyalinipennis* (image courtesy of Natasha Wright, FDACS-DPI).

Introduction: Cotton seed bug (CSB), *Oxycarenus hyalinipennis*, is an important global pest of cotton (Smith and Brambila, 2008). Native to Africa, CSB is now widespread with distribution in Asia, Europe, Middle East, South America and the Caribbean (Bolu et al., 2020; Halbert and Dobbs, 2010). Cotton seed bug infestations can cause weight loss in cottonseed, decrease seed germination, and reduce oil seed (Henry, 1983). Additionally, when CSB is present in sufficient numbers, cotton fibers become stained during processing (Smith and Brambila, 2008) which results in decreased value.

Description: Final identification of CSB is based on the morphology of adult male internal structures (Brambila, 2020).

Adults: Newly emerged individuals are pale pink but rapidly turn brown, dark brown, or black (**Fig. 1**). Adults are 4-5 mm long, with females larger than males (Samy, 1969). Male abdomens terminate in a round lobe, while female abdomens are truncated. Other distinguishing characteristics include: three tarsal joints, a pair of red simple eyes situated above and behind the compound eyes, and the second antennal segment is usually partially yellow or pale yellow. The forewings are glassy/translucent and usually whitish. The clavus, base of corium, and costal vein are opaque (**Fig. 1**) (Henry, 1983; Kirkpatrick, 1923; Smith and Brambila, 2008).

Nymphs: The nymphs are orange-red on hatching and later develop a dark red abdomen that has a greenish tint (**Fig. 1**). Kirkpatrick (1923) measured the average instar lengths as first, 1.20 mm (0.05 in); second, 1.58 mm (0.06 in); third, 2.25 mm (0.09 in); fourth, 2.86 mm (0.11 in); and fifth, 3.7 mm (0.15 in) (**Fig. 1**) (Kirkpatrick, 1923). The fifth instar has distinct wingpads that extend to the third abdominal segment (Henry, 1983).

Eggs: Egg are 0.29 mm (0.01 in) wide by 0.97 mm (0.04 in) long and slender with 25 longitudinal ribs or corrugations. During development, the eggs change from straw yellow to orange or pink (**Fig. 2**) (Henry, 1983; Sweet, 2000).

Figure 2. *Oxycarenus hyalinipennis* eggs (image courtesy of Dr. Halil Bolu, Dicle University, Faculty of Agriculture, Diyarbakir, Turkey)

Biology: Cotton seed bug must feed on Malvales seeds to complete nymphal development, but the species may feed on other plants and plant parts, usually to acquire moisture (Halbert and Dobbs, 2010). A complete generation occurs in about a month. Depending on host availability and temperature, four to seven generations can occur per year (Adu-Mensah and Kumar, 1977; Halbert and Dobbs, 2010).

The eggs are laid in cotton boll lint close to the seed, or in seed pods of other Malvales hosts, including *Abelmoschus* spp. (okra), *Abutilon* spp. (Indian mallow), *Hibiscus* spp., *Lagunaria patersonia* (cow-itch-tree), *Malva* spp. (mallow), *Sida* spp. (fanpetals), *Sphaeralcea* spp. (globemallow) and *Urena* spp. (bur

mallow). Early in the season, eggs may be found in green bolls near (or at) the base or in holes made by bollworm moth larvae (*Helicoverpa* spp.). Females lay up to 110 eggs, either singly or in groups. The incubation period generally lasts from 4 to 8 days (Kirkpatrick, 1923).

Figure 3. *Oxycarenus hyalinipennis* will suck fluids from leaves, stems, and flowers for moisture, but it feeds on seeds (image courtesy of Dr. Halil Bolu, Dicle University, Faculty of Agriculture, Diyarbakir, Turkey)

There are five nymphal stages that last 14–22 days, depending on temperature (Kirkpatrick, 1923). To complete their development, the insects must pierce seeds with their needle-like mouth parts, inject saliva to liquify the contents, and suck the juices out. When dew is present on the cotton plant, nymphs can be found drinking it from nearby bolls or leaves. When dew is unavailable, they may seek moisture by piercing leaves (Kirkpatrick, 1923). Nymphs aggregate on hosts in a feeding swarm, during which they are very conspicuous.

Adults congregate in bolls and begin feeding on seeds as soon as the bolls open. Mating occurs soon afterwards. Adults are known to enter diapause during the winter, when host plant seeds may not be available. During this period, CSB generally prefer cryptic locations such as tree trunks, the undersides of living or dead leaves, pods of leguminous plants, or human-made structures (Adu-Mensah and Kumar, 1977; Kirkpatrick, 1923; Smith and Brambila, 2008).

Signs and Symptoms: Visual cues can help detect the presence and infestation level of CSB in an area. A surveyor may be able to find a CSB population more easily when fruits, seeds, and seed pods from plants in Malvales are available, or after a recent rain (Adu-Mensah and Kumar, 1977; Ismail, 2018). Symptoms and signs to look for include the following:

- Feeding damage is not a reliable indicator of CSB presence, but it can help narrow down an area to begin a delimitation survey. Look for brown leaves and stipple marks from feeding (**Fig. 3**) (Bolu et al., 2020; Kirkpatrick, 1923).
- The cotton plant and cotton seed show no external signs of damage from CSB (Kirkpatrick, 1923; Sweet, 2000). Internally, seeds are shriveled and discolored (Kirkpatrick, 1923).
- Adult and nymph-stage CSBs commonly congregate in tight clusters, especially in seed pods (**Fig. 4**) (Adu-Mensah and Kumar, 1977; Chin et al., 2009; Smith and Brambila, 2008).

Figure 4. Aggregates of adult and nymph *O. hyalinipennis* clustered on, and inside dried seed pods (image courtesy of Dr. HalilBolu, Dicle University, Faculty of Agriculture, Diyarbakir, Turkey)

- Populations of CSB do not damage seeds until the bolls open; but, if another pest damages the boll, CSB will enter and feed on the internal seeds (Adu-Mensah and Kumar, 1977; Ismail, 2018; Sharma et al., 2010).
  Symptoms in cotton will be most apparent between July and September when the bolls are open (Ritchie et al., 2004).
- Cotton seed bugs resemble fleas in infested bolls. Look for small black or brown bugs running through the cotton (**Fig. 5**) (USDA-APHIS-PPQ-S&T, 2016).

Figure 5. Infested cotton bolls (image courtesy of Julieta Brambila, USDA-APHIS-PPQ)

- Aggregated groups produce a pungent odor (Adu-Mensah and Kumar, 1977; Sharma et al., 2010; Smith and Brambila, 2008).

Control: Destruction or removal of crop residues after harvest reduces CSB population size (Atwal, 1976). Burning old cotton stalks with bolls will limit future CSB damage (Odhiambo, 1957). Before burning any material, check the local ordinance for guidelines and required documentation. Cotton seed bugs are not adept at flying; therefore, it is possible to compost, mulch, or till the infested crop into the soil if burning is not an option. Contact your local extension expert to determine the best way to remove/destroy hosts in your area. In addition, it is recommended to remove all weeds and alternative host plants near cotton fields (Adu-Mensah and Kumar, 1977; Kirkpatrick, 1923). There are currently no chemicals registered for use against CSB in cotton in the United States; however, there are chemicals listed for use in cotton and these have been effective against CSB in other parts of the world (**Table 1**). Some populations of CSB have been found to develop resistance to insecticides (Ijaz and Shad, 2020; Sweet, 2000). To avoid inherited resistance, use a combination of insecticides with different modes of action (Insecticide Resistance Action Committee, 2020). Check local and State regulations to determine what chemicals are available for this purpose.

Table 1. Chemicals approved for use in cotton in the United States (CDMS, 2020) and effective against CSB in other countries

Chemical Name	Life Stage[2]	Reference
Avermectin[1]	Adult	Ullah et al., 2016; Ullah and Shad, 2017
Bifenthrin[1]	Adult, nymph	Ibrahim et al., 1993; Irshad et al., 2019
Chlorpyrifos	Adult, nymph	Abbas et al., 2014; Irshad et al., 2019
Clothianidin	Adult, nymph	Irshad et al., 2019
Deltamethrin	Adult, nymph	Ijaz and Shad, 2020; Irshad et al., 2019
Dimethoate[1]	Adult	Banazeer et al., 2020
Imidacloprid[1]	Adult, nymph	Khan and Naveed, 2017
Lambda-cyhalothrin[1]	Adult, nymph	Irshad et al., 2019
Malathion[1]	Not specified	dos Santos et al., 1977; Sweet, 2000
Methomyl/ diflubenzuron[1]	Adult, nymph	Ibrahim et al., 1993
Neem/Neem Oil[1]	Adult	Khan and Ahmed, 2000
Spinosad	Adult	Ijaz and Shad, 2020
Thiamethoxam[1]	Not specified	Used on seed prior to planting (Kedar et al., 2014)

[1] Products with active registration in California
[2] Life stage(s) reported in the literature cited

Post-harvest/Storage control: Fumigation of harvested cotton with common fumigants such as phosphine or methyl-bromide would likely kill all CSB present. However, this would not prevent the staining of the cotton lint during the post-harvest process.

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