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

Diabrotica speciosa

Diabrotica speciosa Germar, 1824

Synonyms:
Galeruca speciosa Germar, 1824
Diabrotica vigens Erichson, 1847
Diabrotica simulans Baly, 1886
Diabrotica simoni Jacoby, 1889
Diabrotica hexaspilota Baly, 1886
Diabrotica amabilis Baly, 1886

Common Name

Cucurbit beetle, chrysanthemum beetle, San Antonio beetle, and South American corn rootworm

Type of Pest

Beetle

Taxonomic Position

Class: Insecta, **Order:** Coleoptera,
Family: Chrysomelidae

Figure 1. Adults of *Diabrotica speciosa* (Photos courtesy of Stanislav Krejcik, www.meloidae.com)

Notes on taxonomy: *Diabrotica speciosa* was first described as *Galeruca speciosa* by Germar in 1824. Two subspecies have been described as *D. speciosa vigens* (Bolivia, Peru, and Ecuador) and *D. speciosa amabilis* (Bolivia, Colombia, Venezuela, and Panama). These two subspecies differ mainly in the coloring of the head and forewings (Araujo Marques, 1941; Bechyne, 1962).

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

Adults: Adults are small, 5.5 to 7.3 mm (approx. $^{3}/_{16}$ to $^{5}/_{16}$ in) in length, but brightly colored (Fig. 1, 2). Six wide, yellow ovals stretch across the abdomen (three spots on

Figure 2. Dorsal (top) and lateral view (side) of *Diabrotica speciosa* adult. Preserved specimens are not as brightly colored as living beetles (Source: Identification Technology Program; imageID, IDtools.org)

each forewing). *Diabrotica speciosa* has black eyes and thread-like antennae that are nearly equal to the body length. Male antennae are proportionally longer than the female antennae when compared to body size. The head ranges in color from red to black (Derunkov et al., 2013).

Signs: Larvae feed on roots while adults feed above-ground (Cabrera Walsh, 2003). The damage from root feeding can kill the host when it is small; in larger host plants, the larvae can cause stunted growth (Cabrera Walsh, 2003).

Corn: Larval feeding on young plants produces a condition known as 'goose neck'. The first few internodes of the plant grow

Figure 3. Top left, typical damage to corn roots from larvae. Top right, dislodging of crop (photo courtesy of Cabrera Walsh et al., 2020). Bottom, 'Gooseneck' growth form of corn (Ohio State University)

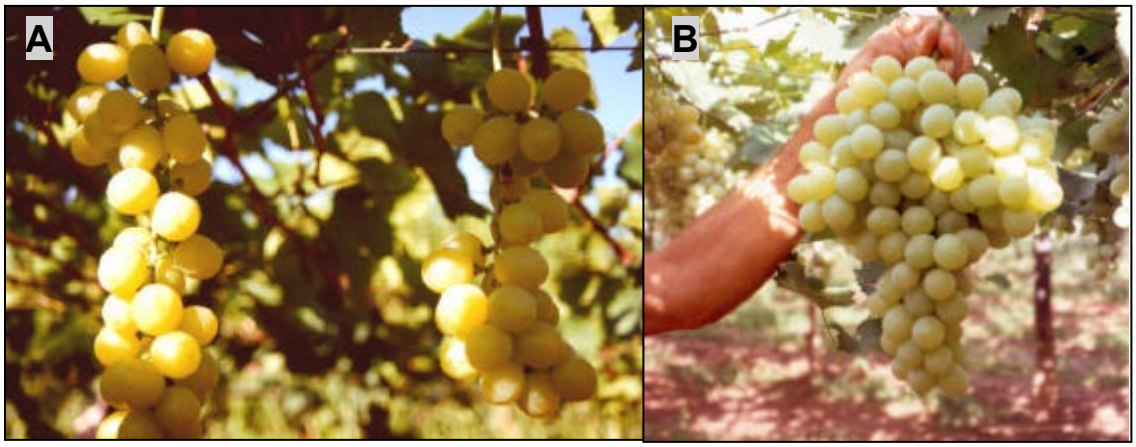

Figure 4. (A) Grape cluster after a severe outbreak of *D. speciosa* during the bloom period and (B) a normal cluster (Roberto et al., 2001)

bent, sometimes to such an extent that the plant lies on the ground (Fig. 3) (Cabrera Walsh, 2003).

Adults feed on corn tassels, which prevents pollination and kernel formation. They also cause defoliation and damage to leaves, flowers, and fruit as a result of feeding (Ávila and Santana, 2013; Cabrera Walsh et al., 2020; EPPO, 2005).

Figure 5. *Diabrotica speciosa* larva on potato with typical pinprick damage (photo courtesy of Cabrera Walsh et al., 2020)

Grape: Beetles eat young leaf edges during budding, which usually does not seriously damage the host (Roberto et al., 2001). Beetles may eat the flowers, however, which can lead to a reduction in fruits (Fig. 4). Nearby weedy hosts can act as reservoirs for beetle populations that end up in vineyards (Cabrera Walsh, 2003; Roberto et al., 2001).

Peanut/Potato: Larvae cause external damage resembling pin pricks (Fig. 5) (Cabrera Walsh et al., 2020; EPPO, 2005).

Easily Mistaken Species

Diabrotica speciosa resembles several U.S. native beetles that feed on the same hosts. For a detailed image gallery of *Diabrotica* species from North and Central America, please see Derunkov et al. (2013). Species and subspecies of *Diabrotica* that surveyors could mistake for *D. speciosa* include the following:

- Banded cucumber beetle (*D. balteata*) (Fig. 6), found throughout the southern United States from North Carolina to Southern California (Capinera, 2017). Surveyors can differentiate *D. balteata*, which has four bands on its forewings, from *D. speciosa*, which has three bands (Derunkov et al., 2013).
- Northern corn rootworm (*D. barberi*), found throughout the United States. *Diabrotica barberi* lacks bands on its forewings and is nearly uniformly green (Derunkov et al., 2013).

- Spotted cucumber beetle/ southern corn rootworm (*D. undecimpunctata*), found throughout the United States. It has an overall sulfur yellow color with 12 black spots (Derunkov et al., 2013).

Figure 6. Adult banded cucumber beetle, *Diabrotica balteata* (John L. Capinera, University of Florida)

Biology and Ecology

This species has multiple generations per year with more generations occurring in tropical regions (Cabrera Walsh et al., 2020). Adults are typically active during the day and feed on foliage, pollen, flowers, and fruits of host plants (USDA, 1957). Eggs are laid on the soil near a host and hatch in a week when temperatures average 80.6°F (Ávila and Santana, 2013). *Diabrotica speciosa* undergoes three larval instars, which are differentiated by the size of the head capsule. The larval stage lasts around three weeks (~18 days in laboratory conditions at 77°F) (Ávila and Santana, 2013). At 77°F, the pupal stage lasts six days and is followed by a three to five day inactive period (CABI, 2021).

Young beetles have a yellowish or pale brown color that turns green with bright yellow spots after consuming host plants (Cabrera Walsh, 2003). Under laboratory conditions, mating has been observed four to six days after adult emergence, and some females were observed mating again at day 35 (Cabrera Walsh, 2003). In one laboratory study, females laid an average of 1,164 eggs during their lifetime (Cabrera Walsh, 2003).

Overwintering occurs in the adult stage in cooler climates (USDA, 1957). Overwintering adults can be found concealed in the rosette and crown of winter-growing plants (EPPO, 2005). A study in Argentina suggests that the most important factor for the emergence of overwintering adults was weekly average temperatures above 55 F° (Cabrera Walsh et al., 2020).

Known Hosts

Diabrotica speciosa has been reported feeding on more than 132 plant species in 24 different families (Cabrera Walsh, 2003; Cabrera Walsh et al., 2020; Christensen, 1943; Heineck-Leonel and Salles, 1997). The known larval host range includes corn, peanut, potato, Johnsongrass, and wheat (Cabrera Walsh, 2003). Larvae also developed on soybean, pumpkin, and bean roots in laboratory tests (Cabrera Walsh, 2003).

The host list, below, includes cultivated and wild plants that, 1) are infected or 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. Plants are highlighted in ***bold*** *if they are commercially produced and the pest causes economically significant damage.*

Preferred hosts
***Arachis* spp. (peanut)**[*], ***Cucurbita spp.* (squashes)**[*], ***Glycine max* (soybean)**[*], *Sorghum halepense* (Johnsongrass)[*], ***Phaseolus vulgaris* (Bean)**[*], ***Solanum tuberosum* (potato)**[*], ***Triticum* spp. (wheat)**[*], and ***Zea* spp. (corn)**[*] (Cabrera Walsh, 2003; Cabrera Walsh et al., 2020; Pereira et al., 1997).

Minor hosts
Allium spp. (onion, leek)[*], *Amaranthus* spp. (pigweeds)[*], *Avena* spp. (oats)[*], *Beta vulgaris* (beet)[*], *Brassica* spp. (mustards)[*], *Capsicum annuum* (pepper)[*], *Capsicum frutescens* (pepper)[*], *Carica papaya* (papaya)[*], *Cayaponia* spp.[*], ***Chrysanthemum* spp.**[*], *Cichorium* spp. (chicory, endive)[*], ***Citrullus lanatus* (watermelon)**[*], *Citrus* spp.[*], ***Cucumis* spp. (melons, cucumbers, gerkins)**[*], *Cucurbitella asperata, Daucus carota* (carrot)[*], *Gossypium* spp. (cotton)[*], *Helianthus annuus* (sunflower)[*], *Ipomoea* spp. (sweet potato, morning glory)[*], *Ipomoea purpurea* (common morning glory)[*], *Lactuca sativa* (lettuce)[*], *Lagenaria siceraria* (bottle gourd), *Linum usitatissimum* (flax)[*], *Luffa* spp. (loofah)[*], *Malus* spp. (apple)[*], *Matricaria chamomilla* (chamomile), *Medicago sativa* (alfalfa)[*], *Mentha* spp. (mint)[*], *Musa* spp. (banana), *Nicotiana tabacum* (tobacco)[*], *Orginanum vulgare* (oregano), *Passiflora coerulea* (passion flower)[*], , *Prunus* spp. (stone fruit)[*], *Raphanus sativus* (radish)[*], *Sida rhombifolia* (Cuban Jute)[*], *Solanum* spp.[*], *Solanum diflorum, Solanum sisymbriifolium* (sticky nightshade)[*], *Sorghum* spp.[*], *Spinacia oleracea* (spinach)[*], *Taraxicum officinale* (dandelion)[*], *Trifolium* spp. (clover)[*], *Tropaeolum majus* (nasturtium), *Vaccinium virgatum* (smallflower blueberry)[*], *Vaccinium corymbosum* (highbush blueberry)[*], and ***Vitis vinifera* (grape)**[*], (Ávila and Santana, 2013; Cabrera Walsh, 2003; Cabrera Walsh et al., 2020; EPPO, 2005; Roberto et al., 2001).

Pest Importance
Diabrotica speciosa is an important pest throughout much of South America (CABI, 2021). Historically, it has caused considerable damage to crops in Brazil, Argentina, and Paraguay (USDA, 1957). It is considered an important pest of corn, cucurbits, solanaceous hosts, and orchard crops throughout its distribution (CABI, 2021). *Diabrotica speciosa* may also damage flowers of various ornamentals such as dahlias and chrysanthemums (CABI, 2021).

Severe infestations can cause loss of marketable fruits or ornamental plants, defoliation, and host death (Ávila and Santana, 2013). While *D. speciosa* is not present in the United States, Ávila (2013) estimated $1 billion is spent annually to control other chrysomelids in U.S corn fields. In Brazil, a significant quantity and wide variety of insecticides are applied annually to control the pest in corn and potatoes (Ávila and Santana, 2013).

There may be trade implications if *D. speciosa* becomes present in the United States. The USDA's Phytosanitary Export Database (PExD) lists *D. speciosa* as a harmful

[*] Hosts with U.S. distribution

organism to Guatemala, Morocco, South Korea, Taiwan, Turkey, and Vietnam. In addition, PExD lists *Diabrotica* as a harmful organism at the genus level to China and Egypt (PExD, 2021).

Pathogens or Associated Organisms Vectored

There is evidence that *D. speciosa* is a viral vector for tomato brown rugose fruit virus (Tobamovirus, ToBRFV), comoviruses, southern bean mosaic virus, mimosa mosaic virus, tymoviruses (such as passionfruit yellow mosaic virus), carmoviruses, and purple granadilla mosaic virus (Cabrera Walsh et al., 2020; Germain, 2000; Ribeiro et al., 1996; Lin et al., 1984).

Lin et al. (1984) showed that *D. speciosa* transmitted the cowpea severe mosaic virus (CPSMV – comovirus) to bean. Ribeiro et al. (1996) showed that eggplant mosaic virus (EMV – tymovirus) was transmitted to tobacco by *D. speciosa*. Carbrera Walsh (2003) mentioned that *D. speciosa* may also transmit bacterial wilt, caused by *Erwinia tracheiphila*, in cucurbits; however, this was never confirmed.

Known Distribution

Central America: Costa Rica and Panama. **South America:** Argentina, Bolivia, Brazil, Colombia, Ecuador, French Guiana, Paraguay, Peru, Uruguay, and Venezuela (Ávila and Santana, 2013; CABI, 2021; Cabrera Walsh, 2003; Cabrera Walsh et al., 2020; EPPO, 2005).

There are also reports of *D. speciosa* in Mexico, but they have not been verified. Krysan (1986) states that previous reports from Mexico are likely an error. A reference from 2016 reports that *D. speciosa* was found on chia (*Salvia hispanica*) planted in Toliman, Jalisco, Mexico (Sosa-Baldivia and Ruiz-Ibarra, 2016). However, this record is also disputed (Cabrera Walsh, 2021).

Pathway

Diabrotica speciosa could potentially move through international trade; however, the adults are mobile, external feeders and are unlikely to stay with most commodities. Soil contaminated with eggs or pupae that is moved by farm machinery is also a concern.

Agricultural inspectors have intercepted this species nine times at U.S. ports of entry. One interception was on *Solanum lycopersicum* (tomato) that originated from Argentina, and another was on *Lactuca* spp., originating from Peru. Two of the nine interceptions were on *Zingiber officinale* (ginger) originally from Brazil, and another one occurred on *Musa paradisiaca* (plantain) originally from Ecuador. This beetle has also been intercepted four times from *Zea mays* (corn), all originating from Mexico, but interceptions do not necessarily equate to establishment in the originating country (ARM and AQAS, 2021).

PPQ Commodity Import and Export Manuals

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) phytosanitary measures (e.g., inspections, phytosanitary certificates, post entry quarantines, mandatory treatments) that are in use. These manuals are updated regularly.

Fruits and Vegetables Import Requirements (FAVIR) Online Database: The FAVIR database lists all importation requirements for fruits and vegetables. To search by commodity, select 'Approved Name' at the top left of the page. Then, select the specific commodity from the drop-down menu and click 'Search'. Finally, 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 like structures. The link is provided, below:
https://www.aphis.usda.gov/import_export/plants/manuals/ports/downloads/plants_for_planting.pdf

Cut Flowers and Greenery Import Manual: This manual is a resource for regulating imported fresh, cut plants used for decoration and for protecting plants from extinction as a result of trade.
https://www.aphis.usda.gov/import_export/plants/manuals/ports/downloads/cut_flower_imports.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

Using SAFARIS (Takeuchi, 2018), we compared *D. speciosa* distribution in South America (Krysan, 1986) to corresponding PHZs in the United States. The localities where *D. speciosa* is present encompass PHZs 6 through 13. These zones correspond to Hawaii, the Pacific northwest, south through nearly all of California and the southwestern states, and east through most of the Midwest and southeastern states. Only the great plains and northern states lack the climate that would enable survival of *D. speciosa*. Due to its polyphagous nature, *D. speciosa* is unlikely to be constrained by a lack of host presence in the United States.

Survey and Key Diagnostics

Approved Methods for Pest Surveillance*:

*For the most up-to-date methods for survey and identification, see Approved Methods on the CAPS Resource and Collaboration Site, at http://caps.ceris.purdue.edu/.

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This datasheet was developed by USDA-APHIS-PPQ-CPHST staff. Cite this document as:

PPQ. 2021. Cooperative Agricultural Pest Survey (CAPS) Pest Datasheet for *Diabrotica speciosa* (Chrysomelidae): Cucurbit Beetle. United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine (PPQ), Raleigh, NC.

Versions

April 2007: Datasheet completed (Version 1)
April 2013: Datasheet fully revised (Version 2)
September 2021: Datasheet fully revised (Version 3)

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