

Dectes Stem Borer in South Dakota Soybeans



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Introduction

The Dectes stem borer, *Dectes texanus* LeConte (Coleoptera: Cerambycidae), is native to North America. Prior to the late 1960's, Dectes stem borers were not reported in soybean (Falter 1969). Prior to its host transition to soybean, Dectes stem borers were primarily a pest of cultivated sunflower. After it was first observed in soybean, Dectes stem borer rapidly became a serious pest of soybean in the eastern, southern, and central United States (Patrick 1973, Hatchett et al. 1975, Campbell and Van Duyn 1977). Until recently, Dectes stem borer has been considered a minor pest of soybean in South Dakota due to limited soybean infestations. In 2017, SDSU entomologists received reports of Dectes stem borer infesting soybeans in southeastern South Dakota. During 2021, numerous reports to SDSU Extension regarding Dectes stem borer in soybean originated from Yankton and Bon Homme Counties. These reports from farmers indicated that field infestations ranged from an approximate 25-75% of the scouted plants. During 2022 and 2023, SDSU entomologists sampled soybean fields with a high percentage of Dectes stem borer infestation (90-100% of scouted plants) as well as the presence of considerable lodging prior to harvest. Since then, the number of infested field reports that SDSU Extension receives has continued to increase. Factors that are responsible for the increased Dectes stem borer pressure in South Dakota have not been confirmed.

Biology

Description

Adult Dectes stem borers are approximately 9.5 mm in length (Hatchett et al. 1975). The antennae have a

black and gray pattern and are longer than the body. One side of the antennae is black, and the opposite side is gray, with a full black band present at the tip of each segment farthest from the body. Female beetles are larger in body size but have shorter antennae when compared to the male beetles. The adults are typically gray in color (Fig. 1). However, some adults may be reddish brown, dark brown, to black in color due to cuticle damage that has removed the gray hairs.



Figure 1. Dectes stem borer adult. Photo courtesy of Adam Varenhorst.

The eggs of the Dectes stem borer are typically not observed as they are laid into the petioles of the upper soybean canopy (Campbell 1980). Each egg is approximately 1.9 mm long and 0.43 mm wide. The eggs vary in color based on time from oviposition. The eggs are yellowish white immediately after they are deposited and become dark yellow close to hatching (Hatchett et al. 1975). All stages of the eggs have a

have a smooth, shiny surface without ridges (Hatchett et al. 1975).

Dectes stem borer larvae vary in size and color based on which instar they are observed at (Hatchett et al. 1975). In soybean, Patrick (1973) documented only four instars as compared to six instars when other hosts are being used. The first instar larvae are approximately 2 mm in length, with this instar lasting approximately seven days (Patrick 1973). The second instar larvae are approximately 4 mm in length with this instar lasting between 12-14 days (Patrick 1973). The third instar larvae ranges in size from five to 10 mm, and this instar is approximately 18-21 days long (Patrick 1973). The fourth instar larvae are approximately 12-15 mm in length and is the overwintering stage (Patrick 1973) (Fig. 2). Each of the larval instars have an accordion shaped body due to their body segmentation. Early instars are typically found in the upper canopy leaf petioles while later instars are found in the main stem (Hatchett et al. 1975). As the larvae grow, they continue to tunnel in the pith of the main stem. Although multiple larvae may be present in a single soybean stem in fields with severe infestations, only a single larva will be present in the stem at the end of the season due to cannibalism (Michaud et al. 2007).



Figure 2. Dectes stem borer larva (in sunflower stalk). Photo courtesy of Adam Varenhorst.

Lifecycle

Dectes stem borers have a single generation per year (univoltine) (Campbell 1980). The lifespan of the adult beetles varies based on the diet of the larval and adult stages. On average, adults live approximately 56-59 days (Hatchett et al. 1975, Michaud and Grant 2005). The adults begin emerging from overwintering sites (soybean, sunflower, or weedy hosts) from late May to late August with some yearly variation based on spring conditions and location (Hatchett et al. 1973, Michaud et al. 2005). Peak emergence generally occurs during mid-July (Rystrom 2015).

Prior to mating, adult Dectes stem borers will feed on soybean foliage, but causing negligible defoliation (Hatchett et al. 1975). After mating, female Dectes stem borers lay eggs in soybean petiole pith (Hatchett et al.

1975). Once the larva hatches, it will begin tunneling in the pith of the petiole towards the main stem (Hatchett et al. 1975).

Once in the mainstem, the larva continues to feed downward in the pith (Hatchett et al. 1975). When the soybean plant begins senescing, the larva tunnel out the remaining pith at the base of the stem and create an overwintering chamber that is approximately 5 cm above the soil line (Hatchett et al. 1975, Rystrom 2015). The larva then chews around the stem during a process referred to as girdling, and once complete will plug the top of the overwintering chamber with frass (Hatchett et al. 1975). The overwintering larva remains in the chamber until mid-June of the following season, when it will begin chewing through the frass plug to create an exit hole for the adult stage (Hatchett et al. 1975). The larva then transforms into a prepupa and undergoes pupation that typically lasts 10-15 days (Patrick 1973, Hatchett et al. 1975, Campbell 1980). Adults then emerge from the stubble and begin searching for host plants.

Alternative hosts

In addition to soybean, Dectes stem borer have been documented in cultivated sunflower as well as weedy hosts within the family Asteraceae (Hatchett et al. 1975). Preferred weedy hosts include common ragweed (*Ambrosia artemisiifolia* L.), giant ragweed (*Ambrosia trifida* L.) and common cocklebur (*Xanthium strumarium* L.) (Hatchett et al. 1975, Rogers 1977). Although common sunflower (*Helianthus annuus* L.) can be used as a host, the Dectes stem borer appear to prefer other host plants (Michaud and Grant 2010). In a similar manner, Dectes stem borer prefer cultivated sunflower to weedy hosts and soybeans (Michaud and Grant 2005, Michaud and Grant 2009). For Dectes stem borer, soybean is not as nutritious as sunflower and adults that feed on sunflower live substantially longer than those that feed on soybean (Michaud and Grant 2010).

Injury to Soybean

Although Dectes stem borer adults feed on soybean prior to mating, this injury is minimal (Hatchett et al. 1975, Campbell 1980). Some injury occurs when the females oviposit into the petioles, which results in scarring (Fig. 3). The combination of oviposition activity and larva feeding with the leaf petiole results in wilting/ dying of the leaves and drooping of the petiole (Hatchett et al. 1975). Upon reaching the main stem, the larva will tunnel upwards and downwards feeding on the pith and leaving behind a scarred tunnel (Hatchett et al. 1975) (Fig. 4). This feeding activity reduces nutrient and water flow and results in yield losses that range from 10-15% (Richardson 1975, Campbell 1980). The girdling behavior by the larva results in stem weakening

and eventual lodging that is typically observed 5-10 cm above the soil surface (Hatchett et al. 1975). This injury first appears as sawdust at the soil surface next to infested plants (Fig. 5). Under natural conditions, it is estimated that 17% of infested plants will lodge (Daugherty and Jackson 1969). Strong winds can increase the amount of lodging prior to harvest.



Figure 3. Sunflower stem with scarring caused by *Dectes* stem borer oviposition. Photo courtesy of Whitney Cranshaw, Colorado State University, Bugwood.org.



Figure 4. *Dectes* stem borer larva with boring injury to the soybean stem pith visible. Photo courtesy of Philip Rozeboom.



Figure 5. Soybean stem with stem dust on the soil indicating stem girdling activity. Photo courtesy of Adam Varenhorst.

Scouting

Observation of *Dectes* stem borer adults in soybean fields is most effectively done by implementing sweep net sampling. The adults will potentially be present in soybean in June and will remain active in fields through August. Another indicator of an infestation is the presence of scarring on petioles in the upper

canopy or the presence of wilting leaves or dropped petioles (Hatchett et al. 1975). Throughout the season, it is possible that infested plants may appear healthy with no obvious symptoms of infestation. Scouting prior to harvest for signs of girdling (Fig. 6) or lodging can be used to determine harvest priority and document infestations (Fig. 7).



Figure 6. Girdled or cut soybean stem following *Dectes* stem borer activity. Photo courtesy of Adam Varenhorst.



Figure 7. Lodged soybean caused by a confirmed *Dectes* stem borer infestation. Photo courtesy of Adam Varenhorst.

Management

Although adult *Dectes* stem borers are susceptible to insecticides, historical management recommendations have not included the use of foliar insecticides due to their extended emergence window (June to August) (Hatchett et al. 1975). However, there is evidence from recent research at SDSU that well-timed insecticide applications during July can reduce infestations and improve yield. Treatment of the larvae is not possible as they are protected within the stem (Hatchett et al. 1975). Cultural management options include early harvest, tillage, crop rotation, trap cropping using sunflower, and management of weedy hosts (Michaud et al. 2007). There is some evidence of both antibiosis and antixenosis host plant resistance towards *Dectes* stem borer (Niide et al. 2012). However, to date research has only been conducted on soybean plant introductions and no commercial varieties have been developed (Niide et al. 2012, Aguirre-Rojas et al. 2021). Aguirre-

Rojas et al. (2021) determined that the antibiosis resistance in one plant introduction was a polygenic trait and could be overcome by the *Dectes* stem borer larvae. This research suggests that the current polygenic trait that Aguirre-Rojas et al. (2021) identified would require additional support from other sources of resistance. In addition, the hypothetical routine exposure to a single source of resistance would likely result in the rapid development of *Dectes* stem borer populations that are able to fully overcome the trait. Of the tillage options that Campbell and Van Duyn (1977) tested, they determined that discing and burying stems at a depth of 2 inches provided the best overwintering mortality (i.e., approximately 55% mortality averaged across three years) and prevented adult emergence (i.e., less than 15% of the adults emerged). However, their research also demonstrated that the presence of soil moisture and cold soil temperatures are necessary for tillage to provide increased mortality (Campbell and Van Duyn 1977). The most important management technique is to routinely scout the field.

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