Dectes Stem Borer in South Dakota Sunflowers

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Introduction

In South Dakota, the Dectes stem borer, *Dectes texanus* LeConte (Coleoptera: Cerambycidae), is a common insect pest of sunflowers. During recent years, infestations of this pest have been increasing (Prasifka 2024). Data from the National Sunflower Association surveys indicate that Dectes stem borer infestations have increased by approximately 30% from 2019 to 2023 (Prasifka 2024). Dectes stem borers are native to North America but were not reported as a frequent pest of sunflowers prior to the 1970's (LeConte 1862, Rogers 1985). Although the feeding activity of Dectes stem borer larvae in the sunflower stems causes negligible yield loss, their preharvest girdling activity causes lodging and subsequent yield losses due to harvest difficulties (Michaud et al. 2007).

Description

Adult Dectes stem borers are approximately 6-11 mm in length and 1.69 to 3.4 mm in width (Hatchett et al. 1975). The adults are dark brown to black in color, with their body covered in a dense light gray pubescence (Hatchett et al. 1975) (Fig. 1). The antennae are longer than the body and are black in color with a pattern of light gray pubescence on the ventral side of each segment. The average antennal length for both sexes is 9.1-9.3 mm (Crook et al. 2003). The female beetles tend to be larger than the male beetles (Hatchett et al. 1975).

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

The eggs of the Dectes stem borer are rarely observed since they are laid into the petioles of the upper sunflower canopy (Michaud and Grant 2005, Michaud and Grant 2009). The eggs are approximately 1.9 mm long and 0.43 mm wide. Immediately after oviposition, the eggs are a yellow white color but become a dark yellow color closer to hatching (Hatchett et al. 1975). All stages of the eggs have a smooth, shiny surface without any 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). Late-stage larvae are cream colored with a dark brown head capsule (Hatchett et al. 1975) (Fig 2). To date, a study providing a morphological description of the larvae present in sunflowers has not been conducted.

Research has determined that the larvae have six instars or larval stages in sunflowers and that they weigh approximately 2.5x more and are 1.3x longer when found in sunflowers compared to soybeans (Patrick 1973, Niide et al. 2006, Michaud 2013). Larval morphological characteristics will not be summarized as those data do not exist for larvae feeding in sunflower stems. During the early instars, the larvae are typically found in the upper canopy leaf petioles, but during later instars, the larvae are found in the main stem (Hatchett et al. 1975). As the larvae grow, they tunnel up and down in the pith of the main stem (Patrick 1973, Hatchett et al. 1975). During the initial infestation it is possible to observe multiple larvae in a single sunflower stem (Michaud et al. 2007). However, due to their cannibalistic behavior, only a single larva will be observed in a stem at the end of the season (Michaud et al. 2007).

Figure 2. Dectes stem borer larva. Photo courtesy of Patrick Wagner.

Lifecycle

The Dectes stem borer is a univoltine insect, meaning it has a single generation per year (Campbell 1980). The diet of the larvae and adults affects the Dectes stem borer lifespan (Hatchett et al. 1975). The adults live approximately 56-59 days (Hatchett et al. 1975, Michaud and Grant 2005). The new generation begins when adults emerge from overwintering sites (soybean, sunflower, or weedy hosts) from late May to late August (Hatchett et al. 1975, Michaud et al. 2005). There is some year-to-year variation associated with the adult emergence that is attributed to spring weather conditions (Hatchett et al. 1973, Michaud et al. 2005). Peak adult emergence generally occurs during mid-July (Rystrom 2015).Before mating, the adult Dectes stem borers feed on sunflower foliage, but cause negligible defoliation (Rogers 1977). Following mating, the female Dectes stem borers lay eggs in the sunflower petiole pith (Rogers 1977) (Fig. 3). Upon hatching, the larvae 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 upward and downward in the pith (Hatchett et al. 1975) (Fig. 3).

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

When the sunflower plant begins senescing, the larva tunnels out the remaining pith at the base of the stem and creates an overwintering chamber (Hatchett et al. 1975, Rystrom 2015). The larva then chews around the stem approximately 5 cm above the soil surface, effectively girdling the stem (Hatchett et al. 1975, Rogers 1977). Once the larva finishes girdling the stem, it plugs the top of the overwintering chamber with frass (Hatchett et al. 1975) (Fig. 5). The larva remains in the overwintering chamber until the following season (Hatchett et al. 1975). When environmental conditions trigger activity, the larva will chew through the frass plug to create an exit hole for the adult (Hatchett et al. 1975). The larva undergoes pupation, which typically lasts 10-15 days (Patrick 1973, Hatchett et al. 1975, Campbell 1980). Once pupation is complete, the adults will emerge from the stem and begin searching for host plants.

Alternative hosts

In addition to cultivated sunflowers, Dectes stem borer have been documented in soybeans as well as weedy hosts within the family Asteraceae (Hatchett et al. 1975). The 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). Wild sunflower, *Helianthus annuus L.*, can be used as a host for the Dectes stem borer, but they prefer other hosts likely due to plant resistance traits present in wild sunflowers that reduce the success of the larvae (Michaud and Grant 2010). Dectes stem borer prefer cultivated sunflower (Michaud and Grant 2005, Michaud and Grant 2009).

Injury to Sunflower

Although Dectes stem borer adults feed on sunflowers prior to mating, this defoliation injury is minimal (Hatchett et al. 1975, Rogers 1977). Some injury occurs when the females oviposit into the petioles, which results in scarring (Fig. 4). The combination of the oviposition activity and the larva feeding within 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 leaving behind a scarred tunnel (Hatchett et al. 1975) (Fig. 5). In sunflowers, this activity does not result in yield loss (Michaud et al. 2007). The girdling behavior by the larva results in stem weakening and eventual lodging that typically is observed 5 cm above the soil surface (Rogers 1985) (Fig. 6). Recent research from SDSU revealed that lodging in sunflowers can vary from 10-50%, with earlier planted sunflowers lodging approximately 20-40% more than later planted sunflowers (Bhusal et al. In Review).

Figure 4. Dectes stem borer larva in sunflower stem. Photo courtesy of Adam Varenhorst.

Figure 5. Dectes stem borer larva at the base of a sunflower stem. Photo courtesy of Adam Varenhorst.

Figure 6. Lodged sunflowers following Dectes stem borer infestation and girdling. Photo courtesy of Patrick Wagner.

Scouting

Observation of Dectes stem borer adults in sunflower fields is most effectively done by visual sampling. The adults will potentially be present in sunflowers in late May and remain active in fields through August. Once flowering, Dectes stem borer adults are often observed on sunflower heads. Scouting for wilting, dying leaves can also indicate potentially infested sunflowers (Hatchett et al. 1975). During the season, most sunflowers will exhibit no indication of infestation. Scouting prior to harvest for lodging can be used to determine harvest priority and document infestations.

Management

Previous research determined that insecticide applications did not provide an economic benefit for Dectes stem borer management in sunflower (Michaud et al. 2007). Similar to soybeans, one of the explanations for the lack of economic benefit is the prolonged emergence window of Dectes stem borer adults (May to August) (Hatchett et al. 1975). In addition, only Mustang Maxx (MoA Group 3A; Pyrethroid Class; Active Ingredient: Zeta-cypermethrin) insecticide is labeled for Dectes stem borer management in South Dakota sunflower. Treatment of the larvae is difficult if not impossible as they are protected within the stem (Hatchett et al. 1975, Michaud et al. 2007). Dectes stem borer cultural management options include prompt harvest, reduced seeding rates, tillage (where applicable), crop rotation, and management of weedy hosts (Michaud et al. 2007). Reduced seeding rates result in sunflower stems with increased diameters (Michaud et al. 2007). Smaller diameter sunflower stems (i.e., less than 2.5 cm) lodge 34-40% more than

sunflower stems that are greater than 2.5 cm in diameter (Michaud et al. 2007). As mentioned, later planting dates can also decrease lodging associated with Dectes stem borer infestations (Bhusal et al. In Review). The most important management technique is to routinely scout the field to assess the need of early harvest based on stem infestation to avoid lodging. This scouting will also provide information for needed changes in future Dectes stem borer management plans.

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