Kansas State University Agricultural Experiment Station and Cooperative Extension Service

KANSAS CROP PESTS

K-STATE Research and Extension

Dectes Stem Borer

The dectes stem borer, *Dectes texanus* LeConte, is a long-horned beetle native to the High Plains and southeastern United States. Its wild host plants are mostly annual weeds such as ragweed, *Ambrosia* spp., and cocklebur, *Xanthium strumarium* L., although other plants also may be attacked. Cultivated sunflowers have always been a preferred host plant, and it emerged as a pest of soybeans shortly after the expansion of soybean cultivation in the 1960s. It now infests commercial soybeans in at least 12 states and cultivated sunflowers throughout the High Plains, except for the most northern regions.

Identification

Figure 1. Adult Dectes texanus

Figure 2. Adult feeding scar and ovipuncture on sunflower petiole

Adult beetles are gray to bluish-gray and ⅜ to ¾ inches (1.0 to 2.0 cm) long (Figure 1). Antennae have dark, transverse bands and are longer than the body. Adult beetles are active during the day but secretive, spending much of the time hiding under leaves within the plant canopy. Sometimes they may be seen flying and running around on plant surfaces. When approached, beetles either take flight or fall to the ground, feigning death.

In sunflowers, careful inspection of the undersides of leaf stems (petioles) can reveal ovipunctures (Figure 2). A sweep net can be used to sample adults in soybeans. Wilted or dying leaves mid-canopy are an early indication of soybean infestation. The eggs are curved like small bananas with rounded ends and are always laid in a hollow cavity in the pith core of a petiole or tender stalk (Figure 3).

Once eggs hatch, larvae bore down the petiole and into the core of the main stalk. The legless larvae are creamy white and deeply segmented, with segments tapering toward the rear (Figure 4). Larvae from soybeans are smaller and darker yellow than those in sunflowers. While feeding, larvae move up and down within stalks and may be found at any height within the plant. Bored soybean stems exhibit reddish discoloration when split (Figure 5). Girdled plants appear to have been neatly sawed off close to the ground (Figures 6 and 7).

Life History and Behavior

Dectes produce only one generation per year. Adults emerge over an extended period in midsummer. They are relatively long-lived and may attack plants in various stages of growth. Adults mate and feed on host plants, leaving longitudinal feeding scars on stems and leaf petioles. They are not strong fliers and disperse only far enough to find a suitable host plant. Females mate within a week of emergence and require another week or so to mature the first eggs. Oviposition is a meticulous process that may take 5 to 10 minutes. Only a fraction of ovipunctures result in eggs laid. First, the female chews a hole, typically in the underside of a leaf petiole, and then turns around and probes the hole with her ovipositor until she encounters the central pith cavity where the egg is laid. The eggs

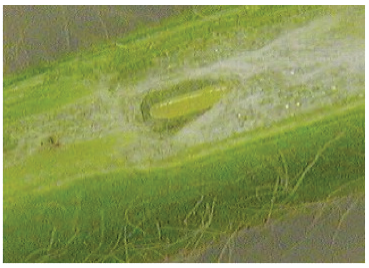

Figure 3. Egg in sunflower petiole

Figure 4. Mature larva from sunflower

Figure 5. Larva in soybean petiole

Figure 6. Girdled sunflower stalk

Figure 7. Girdled soybean stem

are highly sensitive to desiccation and will not hatch successfully outside this protected microhabitat.

Competition for Overwintering Sites
Newly hatched larvae spend the first larval stage (instar) in the leaf petiole and then tunnel down into the main stalk where they feed selectively on the pith in the central core. In soybeans, infested leaves die, and entrance holes into the main stalk are visible when they are removed (Figure 8). A single female may lay a number of eggs in the same leaf petiole. Females do not avoid laying eggs in previously attacked plants. The larvae are highly aggressive and fight to the death upon encounters with others of the same species. The objective of this combat is to capture the prime location for overwintering at the base of the stalk. Although typically only one larva remains in a plant by season's end, occasionally two overwintering chambers are formed, one above the other.

Figure 8. Detached petiole where stem borer entered stem

Stalk Damage
Girdling occurs when a larva terminates feeding and prepares for overwintering. With mandibles oriented horizontally, the larva cuts a disk-shaped incision of about ½-inch radius from the center of the stalk. The larvae then plugs the tunnel below the girdle with chewed plant fibers and seals itself in the chamber below. Larvae pass through an average of six instars and may begin overwintering in any stage from the third to the sixth. Earlier stage larvae undergo additional molts during winter months. Pupae form in late spring, and adult emergence in Kansas typically peaks mid-June, but often extends well into July.

Girdling by dectes larvae varies within and among fields, both in the extent of the behavior and its timing. The behavior is influenced by various environmental factors, including stalk desiccation, soil moisture, and temperature. Larvae feed only on moist pith and will not consume dry plant material. Stalk desiccation signals the end of larval feeding in the plant and can trigger early girdling behavior. It may also explain the repeated observation that early maturing soybeans tend to sustain greater losses than later ones. Larvae that feed late into autumn are eventually slowed by cold temperatures and forced to curtail girdling prematurely or forgo it entirely.

Management in Soybeans

Some field studies suggest that dectes larval boring in soybean can reduce seed yield by up to 10 or 12 percent in addition to losses from lodging; others have been unable to measure an impact. Complicating such estimates is the fact that the larvae tend to prefer the largest plants with the highest yield potential. At present, chemical control of dectes is not feasible. Adults are active over an extended period and cannot be adequately controlled with a single application of a foliar insecticide, despite their apparent susceptibility to many materials. Larvae feed within the plant, protected from contact insecticides. Trials that employed fipronil as a seed treatment yielded promising results, but registration was never sought for this use.

Because this pest attacks both soybeans and sunflowers, crop rotations should account for the ability of this pest to move between the two crops. Wild host plants, particularly cocklebur and ragweed, can serve as significant reservoirs of this pest and should be controlled when they are abundant adjacent to fields destined for soybean cultivation. Wild sunflowers are resistant to infestation and need not be controlled.

Mitigation of damage in soybeans is more difficult than in sunflowers. Growers should avoid planting soybeans into, or adjacent to, infested sunflower or soybean stubble. Because adult females strongly prefer cultivated sunflowers over soybeans, several rows of sunflowers planted around the perimeter of a soybean field will serve as an effective trap crop to intercept ovipositing females and substantially reduce infestation of the soybeans. Otherwise, prompt harvesting is the best strategy for avoiding lodging losses in infested fields. If significant girdling has already occurred, careful harvesting at low speed will be required to salvage yield.

Management in Sunflowers

Stalk boring by dectes in sunflowers has no measurable impact on seed yield or oil content, although it may affect the plant's ability to resist other boring insects such as stem weevils. Significant yield losses can arise from the lodging of girdled sunflower plants, especially during particularly dry summers that accelerate plant maturity or when harvest is delayed. Oil seed sunflowers grown under rain-fed conditions are most at risk, especially when they are planted at high density and experience drought conditions. Early-planted, short-season sunflowers are more susceptible than longer season varieties and those planted later. Prompt harvesting is again key to minimizing losses in infested fields.

Plant Spacing
Even repeated applications of systemic insecticides have failed to provide adequate control of dectes in sunflowers, possibly because larvae feed on pith and avoid conductive tissues. With appropriate cultural management, sunflower producers can tolerate dectes infestation without sustaining yield losses. Dectes larvae cannot physically girdle a radius greater than about 1/2 inch (1.0 cm). Although this can completely sever a slender stalk, it will only slightly weaken a stout one. In confection sunflowers, growers target lower plant populations to increase seed size, and girdled plants rarely lodge because larvae are unable to completely girdle stalks of such large girth (Figure 9). As a result, manipulation of stalk diameter by careful control of plant

spacing is a primary tactic for mitigating sunflower losses to dectes.

Figure 9. Mature dectes larva in confection sunflower showing limit of girdling radius

Another advantage of large plants is slower stalk desiccation postmaturity, which may extend the period of larval feeding and delay girdling. In oil sunflowers, yield per acre remains relatively constant across a wide range of plant populations. Growers should employ relatively low plant populations in dryland plantings where dectes infestation is expected. For example, studies in Nebraska have shown that seed yield did not vary significantly between 11,000 and 20,000 plants per acre.

Larger plants obtained in lower populations not only have much higher per-plant yield, they benefit from improved resistance to lodging. Studies in Kansas suggest that seed oil content is not negatively affected by flower size unless the heads exceed 9 or 10 inches in diameter, and even then the oil penalty is minor. Reduced planting density is further enabled by seed treatments that improve seedling emergence and help to ensure good stand establishment. Growers of oil sunflowers without irrigation should target established plant populations between 12,000 to 15,000 plants per acre to prevent losses due to dectes-induced lodging. While the higher range may be acceptable for eastern Kansas where rainfall tends to be greater, the lower range is more appropriate further west.

Stalk Dessication

Studies in sunflowers suggest that stalk desiccation is an important cue, triggering the girdling behavior of dectes larvae. In one data set, variation in plant spacing within rows (and hence variation in plant size) explained about 60 percent of the variation in dectes larval girdling on each of two dates. A majority of small, closely spaced plants were girdled and lodging, while girdling was delayed in larger, more widely spaced plants (Figure 10). Fortunately, stalk and seed desiccation appear to proceed independently in mature sunflowers. Accelerated stalk desiccation brought about by hot, dry winds can lead to significant larval girdling before seeds are dry enough to harvest. Conversely, delayed stalk desiccation can result in seed being harvestable before any girdling occurs. This is because soil moisture can rehydrate stalks without slowing seed desiccation.

Dead stalks wick moisture from the soil, keeping tissues moist enough that larvae continue to feed, but this moisture does not reach seeds in the flower receptacle. This is a key insight because seed moisture must be below 10 percent for delivery to market, and yet dectes larvae begin girdling plants when stalk moisture falls below 70 percent. When soil moisture is high as harvest approaches, stalks remain damp, and larvae continue feeding until lower temperatures eventually limit their activity. Under these conditions, few larvae complete girdles, many girdle only partially, and some do not girdle at all. Growers can assess their risk of loss by monitoring soil moisture in the field postmaturity. If dry soil conditions threaten to elicit early girdling, it may be advisable to harvest earlier at higher seed moisture and accept the cost of drying seed before delivery.

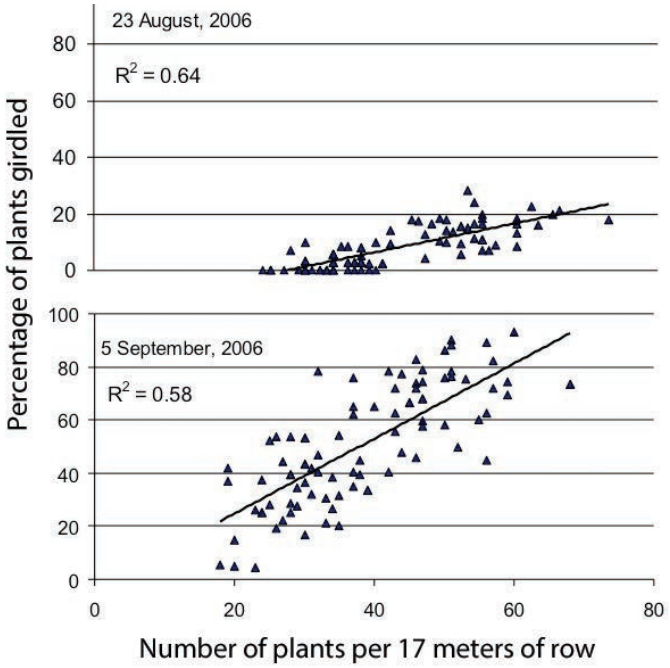

Figure 10. Percentage of sunflower plants girdled as a function of plant size (number per 17 meters of row) on two successive dates.

Author

J.P. Michaud, Associate Professor of Entomology

Photo Credits

Angela Grant, former technician, K-State Department of Entomology, Figures 2, 3,
University of Tennessee Figures 5 and 7
Larry Charlet, USDA-ARS, Figure 8
J.P. Michaud, Figures 1, 4, 6

Publications from Kansas State University are available at *www.ksre.ksu.edu*

Kansas State University Agricultural Experiment Station and Cooperative Extension Service

MF2581 **October 2013**