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WIREWORMS

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Wireworms, a common cotton pest in the Texas High Plains, feed on germinating cotton seeds and emerging seedlings, destroying the plants and reducing the crop stand and yield. Two types of wireworms feed on cotton: true wireworms and false wireworms. True wireworms, commonly called click beetles, are members of the Elateridae family, while false wireworms, or darkling beetles, are from the Tenebrionidae family (Table 1).

TABLE 1. TYPES OF WIREWORMS.

TRUE WIREWORMS (CLICK BEETLES)	FALSE WIREWORMS (DARKLING BEETLES)
Family: Elateridae	Family: Tenebrionidae
Species: *Aeolus* spp., *Conoderus* spp., *Limonius* spp., *Hemicrepidus* spp., *Agriotes* spp., *Melanotus* spp.	Species: *Eleodes* spp., *Blapstinus* spp.

True wireworm adults vary in size but are usually about ½ inch long. They are hard-bodied, elongated beetles, somewhat rounded toward the head, with a tapered abdomen (Fig. 1). A true wireworm, when placed on its back, will right itself by performing a rapid-flexing motion that propels it vertically, while making a clicking sound. The adults are usually brownish, grayish, or nearly black.

Figure 1. Click beetle (*Agriotes* spp.) *(Source: Mike Quinn, www.TexasEnto.net by BugGuide.net [CC BY-ND-NC 1.0])*

False wireworm adults also vary in size and shape and are hard-bodied. The *Eleodes* spp. is about 1½ inches long, black, with grooves along its elytra (hardened forewings). When disturbed, this beetle raises its abdomen and appears to stand on its head. Because they can squirt a foul-smelling substance to deter predators, they are called stink beetles.

The *Blapstinus* spp. is the most common of the wireworm pests that infest Texas cotton (Fig. 2). This insect is about ¼ inch long and about half as wide, and dull black to reddish-brown. The adults are long-lived, able to survive as long as 3 years.

Figure 2. Adult darkling beetle (*Blapstinus* spp.) *(Source: Mike Quinn, www.TexasEnto.net by BugGuide.net [CC BY-NDNC 1.0])*

In early spring, the adults become active and lay their eggs in the soil in clusters of 10 to 60 eggs. Egg-laying continues throughout the summer and into the fall. The adults, as well as the larvae produced from the late summer and fall egg-lays, overwinter in the soil in leaf litter, stubble, or other suitable habitats. True wireworm adults prefer to lay their eggs in moist soil; false wireworms favor drier soils with some plant cover. Wireworm attacks on cotton tend to be most severe when the cotton is planted following grain crops (especially sorghum), fallow or weedy ground, or in reduced-tillage systems.

The larvae of these two species look alike and are difficult to distinguish. They are smoothskinned, elongated, cylindrical, and up to 1¼ inches long. They are creamy white to yellow or light brown. Their heads are typically darker, and they have small true legs clustered near the head (Fig. 3).

Figure 3. False wireworm larva. *(Source: David Kerns)*

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They move by slowly pulling themselves with their legs, dragging their bodies. Wireworm larvae are strictly soil-dwellers and not seen unless removed from the soil. They feed on decaying roots, seeds, vegetation, and other subsurface plant parts. Larval development takes 100 to 140 days, and pupation (when the larva becomes a pupa) another 10 to 25 days.

DAMAGE

Overwintering larvae inflict the most damage as they become active in the spring, although adult *Blapstinus* spp. have been known to girdle or clip seedling cotton off at the soil surface much like a cutworm. The larvae damage cotton by feeding on the root, hypocotyl (stem of the germinating seedling), and cotyledon (seed leaves) of plants before emerging from the soil. Root feeding can kill plants but usually results in stunting. The most severe damage occurs when the hypocotyl is severed, killing the plant and reducing the stand. Larvae also feed on the growing point of the plant, slowing the growth of the main stem. These plants often take on a "Christmas tree" appearance after they emerge (Fig. 4).

Figure 4. Stand loss due to wireworms (top), wireworm stem girdling (middle), and "Christmas treeing" from subsurface terminal feeding (bottom). *(Source: David Kerns)*

MANAGEMENT AND DECISION MAKING

Cultural management. Minimize wireworm infestations through clean cultivation and fallowing. Infestations are most severe in no-tillage or reduced-tillage situations, particularly following rain crops. Planting shallow and under warm conditions allows cotton seeds to germinate rapidly and plants to outgrow wireworms.

Biological control. Biological organisms such as birds, parasitic nematodes, and fungal pathogens prey on wireworms. The impact of these organisms is not entirely understood but undoubtedly important in suppressing the overall wireworm population. Attempts to use commercially available parasitic nematodes for wireworm control in other crops have had inconsistent success.

Scouting. In the spring, from planting to four-to five-leaf cotton, watch for darkling beetle adults that invade cotton from pastures, weedy areas, and corn and sorghum stubble. These beetles are a threat only if they cut off the seedling plants and reduce the stand. Scouting for larvae is more challenging and involves bait trapping.

Chemical control and action thresholds (Table 2). Treat for adult *Blapstinus* spp. only when they reach large numbers, plant clipping is evident, and unacceptable stand reduction is probable. Treat wireworm larvae preventively. Seed treatments are the most effective means of preventing wireworm damage.

TABLE 2. SUGGESTED INSECTICIDES FOR MANAGING WIREWORMS IN COTTON.

INSECTICIDE (TRADE NAME)	APPLICATION RATE	MODE OF ACTION GROUP (IRAC[1])
Foliar sprays for adults		
Pyrethroids	See individual labels for information.	3A
Seed treatments for wireworm larvae		
Clothianidin/Bacillus firmus I-1582 (PONCHO/VOTiVO, Acceleron)	0.424 mg AI[2]/seed	4A, NA
Imidacloprid (Gaucho 600, generics)	0.375 mg AI/seed	4A
Imidacloprid, thiodicarb (Aeris)	each at 0.75 mg AI/ seed	4A, 1A
Thiamethoxam (Cruiser 5 FS)	0.375 mg AI/seed	4A
Thiamethoxam, abamectin (Avicta Complete Cotton, Avicta Duo Cotton)	0.49 mg AI/seed	4A, 6
Thiamethoxam, abamectin, Imidacloprid (Avicta Elite Cotton Plus with Vibrance)	0.865 mg AI/seed	4A, 6

[1]IRAC = Insecticide Resistance Action Committee (1A = Carbamates, 3A = Pyrethroids, 4A = Neonicotinoids, 6 = Avermectins)
[2]AI = Active ingredient