



## How to Manage Seed and Seedling Insect Pest in Corn

Responsive insect pest management strategies to control seed and seedling insect pests of corn have proven to be elusive and difficult to develop for several reasons. Many of the pests are sporadic and spend a portion of their life cycle in the soil making sampling difficult. Economic injury levels for situations with injury from multiple seed or seedling pests have not been developed, complicating decisions. To overcome these challenges, growers have relied on insecticide seed treatments that provide protection during the early growth period. In a study conducted in the Mid-South, (Arkansas, Louisiana, Mississippi, and Tennessee) a neonicotinoid (insecticide) seed treatment provided an average yield increase in 8 out of 14 years when compared to seed treated only with a fungicide. The study concluded that depending on location and year, neonicotinoid seed treatments applied to corn in the Mid-South can provide significant yield and economic benefits.<sup>1</sup> Cultural practices like planting date, tillage system, weed management, and crop sequence can help reduce the risk of injury depending on the pest. See Table 1 for more information.

### Common Corn Seed Pests

#### Seedcorn beetles

There are two-major species collectively referred to as seed corn beetles-- the slender seedcorn beetle and the seedcorn beetle. Injury to corn is a result of adult feeding on the endosperm or mesocotyl prior to emergence. Both species feed on a wide variety of plant material and other soil inhabiting insects and, in some contexts, can be considered beneficial. The injury by seedcorn beetles is usually sporadic and patchy in a field, but injury can be economic at times and widespread throughout the field. Unfortunately, economic thresholds have not been developed for this pest complex and rescue treatments are not effective. A seed treatment is recommended if damage and subsequent stand loss dictate replanting.

#### Seedcorn maggot

The determining factor for an infestation of seedcorn maggot is if the field is attractive to egg laying females. The females are attracted to decaying organic matter, such as manure or green plant material incorporated into the soil with tillage. Decaying legumes are more attractive than decaying grasses, which may have implications for spring management of legume cover crops or terminating alfalfa with tillage prior to corn planting. Cover crops eliminated with herbicide and no-till fields are at lower risk to injury. Delaying planting for two to three weeks after terminating weeds or cover crops can lower the risk of injury but is often not practical as delaying planting past the optimum date for an area can result in a yield penalty.



Figure 1. Seedcorn maggot.

#### Wireworms

Wireworms are the soil-inhabiting larvae of click beetles. Depending on geography, different species of wireworms can injure corn as well as many other crops. While there are different species of wireworm, their biology is relatively similar. Damage occurs during the larval stage, which can last two to six years. Wireworms feed on the seed and can tunnel into the mesocotyl resulting in stand reduction. Plants that survive injury

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are stunted and will not contribute to the final yield. While injury is usually sporadic and patchy across the field, crop rotation plays a large role in the risk of wireworm injury. The corn and soybean rotation has minimal risk of wireworm injury; however, corn following sod or grass crop mixtures are at higher risk, especially those that have been undisturbed for several years. As wireworms are most active in cooler soils, early planting followed by cool and wet conditions can increase the level of injury.



**Figure 2. Wireworms.**

Image courtesy of Frank Peairs, Colorado State University, Bugwood.org.

## Imported fire ant

The red imported fire ant can attack the seed and cause extensive injury when populations are high within the field. In some areas of Texas, the injury can be widespread and may be related to moisture and temperature. Injury is more common in fields that have been undisturbed or in no-till production systems. Germinating seeds are more at risk, and poor planting conditions with incompletely closed furrows can allow access to the seed. Conditions that cause slow emergence are particularly vulnerable to imported fire ant damage.

## Below Ground Seedling Pests

### White grubs

As with wireworms, white grubs are a consortium of many species. There are white grubs with a one-year life cycle, also called annual grubs, of which Japanese beetles are an example. There are grubs which are referred to as true white grubs with a two to three-year life cycle, like June beetles. Annual grubs tend to be more sporadic and rarely result in economic injury to corn; however, the true white grub is usually a more widespread and common pest of corn.

The true white grub is damaging in the second instar growth stage when larvae feed primarily on the root hairs of seedling corn. The injury can result in stand loss and plant stunting. Injury is usually more severe when corn follows sod or pasture. Additionally, fields surrounded by trees (poplar, cottonwood, willow and ash) are attractive to adults that feeding on the leaves, and lay eggs in the soil near the trees. Therefore, two years after high numbers of adults are noticed feeding on leaves, the risk of injury by second instar larvae is the highest.



**Figure 3. True white grub.**

Image courtesy of Alton N. Sparks, Jr., University of Georgia, Bugwood.org.

### Southern corn rootworm

The southern corn rootworm is widely distributed, and unlike the western and northern corn rootworm, it feeds on a wide variety of crops as both an adult and larvae and can have several generations per year. The adults can survive the winter in southern states and move northward during the growing season. The adult deposits eggs in the soil at the base of host plants. In corn, only the first generation is economically damaging. The larvae may attack the seed and be confused with wireworm injury or tunnel into the mesocotyl killing the plant or severely stunting it. Interestingly, the Bt trait that controls the western and northern corn rootworm does not provide control for this species. Injury can be more severe when a legume cover crop is used. Termination of the cover crop less than four weeks prior to planting increases the risk. No-till cropping systems that utilize a cover crop are more at risk.

### Grape colaspis

The grape colaspis is a sporadic pest mainly in the Central Corn Belt. Larvae overwinter in the soil and feed on the roots of small seedlings and several are usually found feeding on single plant. While injury is spotty



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across the Iowa, Indiana, and Illinois corn following a legume, such as red clover, sweetclover, and to some extent alfalfa is at higher risk. Injury can be more pronounced when seedling growth is slowed. There is not a recommend sampling program or economic threshold established for this pest, as well no rescue treatments in response to injury.

## Above Ground Seedling Pests

### Billbug

There are several species of billbugs that can injure corn. The two major species are the southern corn billbug in the South and the maize billbug in the Corn Belt. Adults usually walk from overwintering sites to host plants, so injury is usually localized to field borders. Nutsedge and corn are the predominant hosts for both species. Adults feed on the above portion of the plant and females oviposit in their feeding punctures and the developing larvae migrate down the stem. Occasionally females deposit eggs in the soil and larvae feed on the roots. When the growing point is injured, excessive tillering and plant stunting can occur and cause plant death. In the Atlantic Coastal Plain, billbugs are a serious annual pest. Outside of this region, injury is typically sporadic and minor. Crop rotation and control of yellow nutsedge can help limit the potential for injury. Fields in continuous corn production in no-till systems are at higher risk of injury by billbugs.



**Figure 4. Maize billbug.**

Image courtesy of Clemson University - USDA Cooperative Extension Slide Series. Bugwood.org

### Black cutworm

The black cutworm moth overwinters in northern Mexico and South Texas and migrates northward in the spring on storm fronts. The storm fronts dictate overall direction of the migrations, but local conditions--fields with winter annual weeds--determine where females deposit eggs. During early growth stages, the larvae can chew small holes in the leaves, but when larvae reach the middle growth stage, they can “cut” the plant and consume the upper portion of the plant. In some cases, particularly under very wet soil conditions, the larvae can bore into the stem and tunnel within it. The Cry1F-expressing Bt corn products may suppress black cutworm under low to moderate population levels; however, the Vip3Aa-expressing Bt corn products provide excellent control under high population levels. Fields without winter annual weeds have minimal risk of infestation as females will not deposit eggs in these fields. A rescue treatment with an insecticide is recommended when larvae are present and 5% or more of the plants have been cut. There are other species of cutworms that can injure seedling corn such as the dingy, sandhill, claybacked. However, the black cutworm is the most economically concerning over a wider area than these other species. For more information about cutworms and how to manage them, please read this Q&A, on [How to Manage Black Cutworms](#).



**Figure 5. Black cutworm.**

Image courtesy of Roger Schmidt, University of Wisconsin-Madison, Bugwood.org.

This insect can be an economic concern in southern states. Injury from immatures usually occurs on the borders of corn fields, the first 30 to 40 rows, when an adjacent small grain crop matures or is harvested. Early-planted corn sustains less economic injury but environmental factors that slow growth, such as drought, can increase the susceptibility. Fields that have grassy weeds and reduced tillage may be more at risk as the weeds act as alternative hosts.

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## Corn flea beetle

The corn flea beetle is mostly a concern in the Central and Eastern United States and causes little economic injury in the southern states. Adults overwinter in grassy areas and migrate to corn after emergence. A large beetle population can result in economic injury if the seedling stage is attacked. Harsh winter conditions can eliminate corn flea beetle adults and lower the risk of economic injury. This insect is a vector for Stewart's wilt, a bacterial pathogen, that can infect susceptible corn products resulting in economic loss. Early planting timed to emergence of the adults can increase the risk of infestation, particularly when plant growth is slowed. Weedy fields may be at more of a risk.

## Stink bugs

There are many species of stink bugs that injure corn, and the particular species depends on geography. Regardless of the species, the injury is similar. Adults make repeated feeding punctures at the base of the plant during a single day that can result in a yield reduction of 50 percent, depending on the size of the plant. A scouting program and treatment threshold have been developed, but since the injury can occur quickly after emergence, prevention with an insecticide application is difficult. Increased use of reduced tillage systems increases the risk of stink bug infestation. Fields adjacent to small grains or fields that use winter rye as a cover crop are also at higher risk. For more information about stinkbugs, read [Common Stinkbugs in Corn](#).

## Sugarcane beetle

This economically important insect in the Southeastern United States causes injury in the adult stage. The adults emerge from grassy field margins or pasture and migrate to corn fields to feed on newly emerged plants. They feed below the soil line and chew through the mesocotyl. The injury results in seedling death or stunting if feeding occurs on larger plants. A single adult can injure several plants and the resulting stand loss can lower yield potential. However, the injury is often sporadic, isolated and unpredictable. Fields at the highest risk border grassy areas.



**Figure 7. Sugarcane beetle.**

Image courtesy of Clemson University - USDA Cooperative Extension Slide Series.

## Non-Insect Pests of Corn Seeds and Seedlings

### Slugs

Slugs can cause injury to corn seedlings by rasping the leaf tissue resulting in long vertical lines of dead tissue. In most cases, corn can out grow the injury. Seed treatments are not effective for control of slugs. Injury is more common in no-till or reduced tillage fields and in springs followed by mild winters. For more information, read [Slug Damage in Corn](#).

### Millipedes

Millipedes are not insects but are related to them. Millipedes feed on decaying plant matter, organic matter in the soil, and other smaller soil dwelling invertebrates. However, they can occasionally feed on corn seedlings. Injury more often occurs under no-till conditions and in wet springs. This is particularly true if they can access the seed because the seed furrow did not completely close during planting. Seed treatments are not effective against millipedes.



**Figure 8. Millipede.**

Image courtesy of Joseph Berger, Bugwood.org.

**Table 1. Common pests of corn seed and seedlings.**

Pest	Area of focus	Part attacked	Factors that increase risk	Management options
Billbugs	Corn Belt, South, Southwest Carolinas and Georgia Coastal Plain	Seedling	Continuous corn, yellow nutsedge, low-lying areas, poor drainage, no-till, crop rotation from sod, small grains, clover	Adult control spot treatments and possibly, seed treatments
Black cutworm	North America, most common in central US	Seedling	Winter annual and perennial weeds, flood plains, low-lying areas, soybean stubble, late planting in conjunction with winter annual weeds history of cutworm problems	Control weeds and delay planting for 2 weeks, Larval spot treatment recommended when 5% plants are cut, insecticide seed treatments and the trait Cry1F (provide some control at low pressure), the trait VIP3A
Chinch bug	Mid-South	Seedling	Rows bordering small grains, late planting, cool weather that delays corn growth, drought stress	Early planting and seed treatments
Corn flea beetle	Mid-Atlantic, South	Seedlings, young plants. Direct damage is insignificant, but can vector Stewart's wilt, but most field corn products are resistant	Mild winter, early planting, cool spring, weedy field, nearby grass or wheat, reduced tillage	Resistant corn products
Grape colaspis	North-Central	Seedlings	Corn planted after legume, especially red clover, increased recent reports of injury to corn planted after soybean, slow growth after early planting, history of infestations	Do not plant after red clover, seed treatments
Imported fire ant	Southern states	Seed	Prefers disturbed conditions, such as tilled fields, reduced tillage, planting into pastures, slow emergence conditions, history of seedling loss	Baits and seed treatments
Millipedes	North America	Seed and seedling	Cold and wet springs that slow germination and emergence, no-till fields with heavy trash loads	Tillage and reduction in trash loads
Seedcorn beetles	North America	Seed	Moist, heavy soils of high organic matter content, early planting with delayed germination and emergence, corn planted after pasture or fallow	Seed treatments
Seedcorn maggot	North America	Seed	Corn planted after legumes or sod, manured or freshly tilled fields with green plants, moist freshly tilled soil, early planting	Seed treatment, terminate weeds with herbicide, Delay planting for at least two weeks after tillage
Southern corn rootworm	Wide spread, but problematic on corn in Southern states	Seedling	Legume cover crop, especially hairy vetch, no-till, weedy field, poorly drained soil	Seed treatment
Stink bugs	Wide-spread, problematic in Corn Belt and Southeast	Seedling	Reduced tillage, field bordered by small grains, mild winter, late planting, weedy fields	Good closure of seed slot, avoid late planting, well timed insecticide application based on sampling, seed treatments at high rate.
Sugarcane beetle	Southeast	Seedling	Corn planted after pasture or in fields closely bordering pasture proximity, no-till, slow growth	Early planting, seed treatments may suppress
True white grubs	East of Rocky Mountains	Seedling	Corn planted after pasture, corn planted within 100 yards of tree-line after 2 years of a large adult population population	Seed treatment, occasionally Japanese beetle grubs can cause injury and rose chafer grubs can be a concern in sandy soils.
Wireworms	North America	Seed and seedling	Corn planted after pasture, uncultivated land, and small grains, well-drained soils, peat-muck soils (in North Carolina), Previous infestation, Early planting Cool, wet spring with delayed germination, grassy weed patches	Seed treatments, Multi-year life cycles, so infestations may persist two to four years.

Table adapted from Sappington, T., Hesler, L. Allen, C., Luttrell, R. and Papiernik, S. 2018. Prevalence of Sporadic Insect Pests of Seedling Corn and Factors Affecting Risk of Infestation. Journal of Integrated Pest Management. Volume 9. <https://academic.oup.com/jipm/article/9/1/16/5033787>



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## Sources

<sup>1</sup> North, J.H. et. al. 2018. Value of neonicotinoid insecticide seed treatments in mid-south corn (Zea mays) production systems. Journal of Economic Entomology. Volume 111. pp. 187–192.

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## Legal Statements

ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Performance may vary, from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields.

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