

A Guide for Scouting Insects of Field Corn in the Mid-Southern U.S.



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Table of Contents

Introduction	1
Relative Efficacy of Bt Corn Products . . .	4
Crop Stages: Planting, Emergence and Seedling	6
Crop Stage: Whorl	20
Crop Stage: Pre-Tassel to Black Layer . .	28
Index	36



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Introduction

Overview

Field corn is among the most important cereal crops grown in the world today. Already the dominant crop grown in the United States, it has recently undergone a further increase in acreage. This is particularly true in the Mid-South, where corn has “cannibalized” acreage of other crops such as cotton. Although corn may not require as many inputs as cotton (e.g., PGRs, defoliation, etc.), proper and timely scouting for insect pests can still be an important component of obtaining favorable corn yields. The primary goal of scouting any crop, including corn, should be to minimize input costs and crop damage while maximizing profit for the grower.

Integrated Pest Management (IPM)

Successful and economical control of corn insect pests requires the use of multiple control measures – planting during recommended windows, using resistant crop varieties and using insecticides judiciously. Successful in-season components of IPM consist of, but are not limited to, 1) scouting the crop in a systematic manner and on a set schedule to identify pests and/or associated injury, 2) implementing control measures when a pest population reaches the economic threshold and 3) utilizing an effective control measure to manage pests.

Scouting

Field corn should be scouted weekly from emergence through black layer. During the first few weeks, fields should be scouted similarly to other crops where a random walking pattern (e.g., “zigzag”) is used to ensure adequate coverage of the field. Signs of early-season

insect injury to look for include nonemergence caused by seed-feeding pests, poor vigor (i.e., yellowing, stunted growth, deformed plants) or plants that have been cut off near the soil line. Insect damage may exhibit a pattern in the field such as near field edges (e.g., stink bugs) or in previously weedy areas (e.g., cutworms). Perhaps even a certain row of each planter pass may sustain soil insect injury as a result of a clogged in-furrow insecticide applicator. Regardless of cause, affected plants should be dug up to identify any pests that may be present and to document feeding injury to the seed, growing point or roots. Even if rescue treatments do not exist for the particular pest at hand, knowledge of pest history in a given field can be helpful with future management decisions.

As corn plants are well into vegetative growth stages, it will be less feasible to follow a true “zigzag” pattern in any given field, due to the size of the plants. However, covering adequate portions of the field is still imperative. Generally, four to eight representative areas of the field, depending on field size, should be scouted during each visit. Additionally, it is important to continue to observe field borders for “edge pests” (e.g., stink bugs, grasshoppers).

Bt Corn in the Mid-South

The term *Bt corn* has been used generically since the late 1990s. However, there are Bt traits that exhibit activity against lepidopteran pests (i.e., caterpillars) and those that do so against corn rootworms. Bt traits with activity on European corn borers, southwestern corn borers and sugarcane borers have been heavily adopted in the Midwest as well as the South and play a significant role in corn IPM at the time of this writing.

In the “Corn Belt” (i.e., the midwestern United States), transgenic corn hybrids that contain Bt genes expressing “rootworm proteins” (e.g., Cry3Bb) are used extensively for control of both northern and western corn rootworms. That said, these pests rarely occur in the Mid-South, with

the exception of the southern corn rootworm. Bt corn hybrids containing the rootworm-active traits have little value in the Mid-South because current proteins that are effective in controlling western and northern corn rootworm have little activity against southern corn rootworm. Therefore, Bt corn hybrids with the greatest value in the Mid-South are generally those with activity against lepidopteran pests only.

For resistance management strategy, a refuge area of non-Bt corn must be planted when using Bt corn hybrids. This guide will not go into specifics with respect to refuge requirements, because these requirements may vary considerably, depending on geographical location and which Bt traits are being used, and may change over time. It is recommended that you consult the licensing agreement that comes with the Bt hybrids selected for planting for a given season.



**Insect injury on Bt corn (left)
and non-Bt corn (right)**

Relative Efficacy of

Traits/brands	Primary target pests	Corn borer complex (stalk)	Black cutworm (seedling)*	Corn earworm (ear)*
Agrisure CB/LL	Corn borers	Excellent	Poor	Fair
Herculex I	Corn borers, FAW, cutworm	Excellent	Good	Poor
YieldGard VT Triple (VT3)	Corn borers, rootworm	Excellent	Poor	Fair
Herculex XTRA (HXX)	Corn borers, FAW, cutworm, rootworm	Excellent	Good	Poor
Genuity VT Triple Pro (GENVT3P)	Corn borers, CEW, FAW, rootworm	Excellent	Poor	Good-Very Good
Genuity or Dow AgroSciences SmartStax (GENSS or SSX)	Corn borers, CEW, FAW, cutworm, rootworm	Excellent	Good	Very Good
Agrisure Viptera 3110	Corn borers, CEW, FAW, cutworm	Excellent	Good	Excellent
Agrisure Viptera 3111	Corn borers, CEW, FAW, cutworm, rootworm	Excellent	Good	Excellent
Genuity VT Double Pro (GENVT2P)	Corn borers, CEW, FAW	Excellent	Poor	Good-Very Good
Agrisure CB/LL/RW	Corn borers, rootworm	Excellent	Poor	Fair
Optimum Intrasect	Corn borers, FAW, cutworms, LCSB	Excellent	Good	Fair-Good
Agrisure 3000GT	Corn borers, rootworm	Excellent	Poor	Fair

Originally published in the 2011 Alabama Pesticide Handbook (www.aces.edu/publications/), based on input from the Southern Corn Insect Working Group. Most of these products are marketed as stacks with herbicide resistance traits. Rankings are meant to be relative.

Selected Bt Corn Products

Primary target pests	Fall armyworm (whorl)*	Western corn rootworm (roots)	Lesser cornstalk borer
Corn borers	Good	None	Good
Corn borers, FAW, cutworm	Very Good	None	Very Good
Corn borers, rootworm	Good	Excellent	Good
Corn borers, FAW, cutworm, rootworm	Very Good	Excellent	Very Good
Corn borers, CEW, FAW, rootworm	Excellent	Excellent	Very Good
Corn borers, CEW, FAW, cutworm, rootworm	Excellent	Excellent	Very Good
Corn borers, CEW, FAW, cutworm	Excellent	None	Good
Corn borers, CEW, FAW, cutworm, rootworm	Excellent	Fair-Good	Good
Corn borers, CEW, FAW	Excellent	None	Very Good
Corn borers, rootworm	Good	Fair-Good	Good
Corn borers, FAW, cutworms, LCSB	Very Good	None	Very Good
Corn borers, rootworm	Good	Fair-Good	Good

*Control of target pests by Bt crops is often dependent on the size of the target pest larva when it first feeds on Bt toxins. Thus, a product rated as "Excellent" may sustain some damage if larvae are able to attain significant size by feeding on alternate hosts (i.e., weeds) before moving onto the plants.

Crop Stages: Planting, Emergence and Seedling

Insects attacking plants at or beneath the soil surface can cause significant damage to germinating seed and/or seedling plants. Although many of these insects can cause injury to older plants, seedling corn is significantly more vulnerable.

Two important factors to be considered when managing early season corn pests are (1) preserving targeted plant populations and (2) protecting overall plant health of surviving plants. Rescue treatments are rarely an option or may be only marginally effective against soil pests. As a result, in-season scouting is generally not recommended for many of these pests. However, finding these pests in your fields may help provide a history of what pests may cause problems in the future.

Preventative insecticides, such as seed treatments or soil-applied insecticides, are the most effective options for control in most cases and are especially justified when the probability of soil insect infestation is high. The adoption of reduced tillage systems and use of fields with a history of soil insect infestations are risk factors that generally justify the use of preventative insecticides. Delayed application or poor performance of preemergence herbicides may also increase the likelihood of soil/seedling insect pests.

Seedcorn Maggot

The seedcorn maggot can be found on many host crops as well as corn. The adults are flies that often are attracted to soil that has recently been disturbed by plowing or cultivation. The adult female deposits eggs, up to 100 over a three- to four-week period, in soils that are abundant in organic matter. These pests are commonly associated with cool, wet weather and early planting. Adults feed on nectar from flowering plants within or

around the field, but the immature stage causes the most damage to germinating seed and seedling corn plants. Larvae are generally small and yellowish-white in color with no legs.



Seedcorn maggots



Seedcorn maggot damage to seed

Damage: Maggots feed on germinating seed and seedling plants by tunneling or burrowing. Damaged seed may fail to germinate, or the plant may sustain poor vigor following emergence. Damaged plants that emerge will likely appear wilted, stunted or otherwise unhealthy. If seedcorn maggots are suspected, carefully dig up seed in areas of the field where plant stands have been reduced or failed to emerge. Look closely for small, yellowish-colored maggots feeding on the seed or seed contents.

Management: Many insecticide seed treatments are highly effective against seedcorn maggot. There is no rescue treatment for this pest.

White Grubs

The most common white grubs found infesting cornfields consist of May beetles, June beetles and southern masked chafer. Of these, the annual white grub (a.k.a. southern masked chafer) is not known to cause damage to seedling corn stands. The true white grubs, larvae of May and June beetles, can cause significant damage to developing corn plants if present in high numbers. The adult beetles rarely cause economic damage to corn,

but they do lay their eggs in grass or sod. The grubs are C-shaped and white or cream in color with visible legs. Grubs typically are found feeding on roots of wild grasses and other hosts.



White grub

Damage: White grubs damage corn by feeding on the developing root system. Pruned roots usually result in stunted plants and even stand loss in heavily infested fields. Extensive root damage may not kill the plant, but lodging and yield reduction are likely.

Management: Many of the insecticide seed treatments and in-furrow insecticides are effective in preventing injury from these pests.

Japanese Beetle



Japanese beetle grub

Grubs of Japanese beetles are similar to white grubs, in that they are white with a brown head capsule, have chewing mouthparts and may also curl into a “C” shape when disturbed. Japanese beetle grubs, however, can be identified by the V-shaped

pattern on the underside of the last abdominal segment. Japanese beetles undergo one generation per year and overwinter as third instar larvae in the soil below the frost line. As soil temperatures warm in the spring, the larvae move closer to the soil surface to pupate and finally emerge as adults to find hosts and to mate.

Damage: As grubs, Japanese beetles feed on roots, reducing the uptake of water and nutrients. As with other soil insects, this will often go unnoticed until reduced plant growth and development are observed. Heavily infested fields may undergo a reduction in plant stand to where replanting is often required.

Management: While Bt hybrids provide no control of Japanese beetles, lower rates of most labeled seed treatments generally provide adequate control of grubs. In-furrow insecticides may also provide acceptable control. As with other soil pests, there is no rescue treatment for the grub of the Japanese beetle.

Southern Corn Rootworm

Although adults of southern corn rootworm cause little damage to seedling corn, larvae can cause damage to plants when they feed on the germinating seeds or the developing root systems. Rootworm larvae are small and cream-colored with a black head on one end of the body and a dark spot on the other end, sometimes appearing to have two heads.

Damage: Plants that have been damaged may appear wilted, with the emerging whorl leaf of plants wilting first. If plants are severely injured, death of the plant may occur. Carefully inspect wilted plants for the presence of rootworm larvae. Carefully remove plants from the soil and closely inspect the crown of the seedling plants just below



Southern corn rootworm



Southern corn rootworm damage



“Goosenecking” of corn

the soil surface. Rootworm larvae will also tunnel within the roots. Damaged plants surviving rootworm infestations will often lodge later in the growing season due to underdeveloped root systems. This sometimes results in what is referred to as “goosenecking” of corn.

Management: Many of the insecticide seed treatments are effective in preventing injury from this pest.

Wireworms

Several species of wireworms can infest field corn in the Mid-South. Infestations are typically observed when fields have recently been planted to a grass crop (e.g., pasture) or have been out of production for a period of time. Fields following soybean have also been reported as having wireworm infestations (Akin and Stewart, personal observations). However, sandy soils



Wireworm

are also prone to infestations, regardless of the previous crop. Wireworm larvae are unique, compared to other insect pests, in that they mature in two to five years, depending on species. Thus, infested fields may sustain wireworm injury for several consecutive years. Wireworms can also be found in no-till fields. Bait stations are sometimes used prior to planting to determine whether the use of a soil insecticide (e.g., in-furrow) is necessary during planting. Wireworm larvae are elongated, slender and yellowish-brown to brown in color. They have a slightly sclerotized (hard and shiny) exterior with prominent body segments.

Damage: Plant damage is very similar to that of the southern corn rootworm, where damaged seedlings will appear wilted and/or severely stunted. Under heavy pressure, extensive feeding may cause “deadheart,” a condition where the plant is severely stunted and often leads to death.



Wireworm damage



“Deadheart”

Management: Many of the insecticide seed treatments (depending on rate) and several in-furrow insecticides can be effective in preventing injury from this pest.

Lesser Cornstalk Borer

This lepidopteran pest is more likely to occur in sandy soils and under dry conditions. Larvae are slender and greenish-purple in color and wiggle around violently when disturbed. They also rarely develop to a size over 2/3 inch in their final instar.



Lesser cornstalk borer larva

Damage: Larvae cause damage to the corn plant by boring into the base of the stem, which can cause dead-heart and ultimately stand reduction if numbers are high. Lesser cornstalk borer often makes silken tubes from the soil level attached to the plants. Wilting is one of the first signs of attack in affected plants, but withering of buds, stunting and plant deformities are common. Plant death is not uncommon, and infested areas of fields often have a thin stand.



Lesser cornstalk borer

Management: Insecticides applied for suppression of lesser cornstalk borer are usually applied in a granular formulation in the seed furrow or in a band over the seedbed. Liquid formulations can also be applied, but it is important that they be directed to the root zone. Insecticides may be applied when significant stand loss is imminent.

Aphids

Although other species of aphid may occur in corn, the corn leaf aphid is often the most common aphid observed. As in other crops, aphids are typically found feeding in clusters on the leaves or in the whorl. Beneficial insects usually prevent aphid outbreaks, and treatment is seldom warranted in corn.



Aphids

Damage: On seedling corn plants, aphids may be found feeding in the whorl. Feeding may cause plants to turn yellow or reddish in color. Seedling corn plants under drought stress are more susceptible to damage. Plants that are not under stress and are growing vigorously are typically not affected.

Scouting and Management: It is rare for aphid infestations to justify treatment. Therefore, there is little need to scout specifically for this pest alone. Most seed treatments will provide adequate control of aphids on seedling plants. Foliar insecticide applications, although seldom needed, are also effective. Extension recommendations developed in Midwestern states suggest that if 50 percent of the plants have more than 100 aphids per plant and plants are under drought stress, treatment may be justified. If occurring late in the season, control is warranted if 3 percent or more of the plants have heavily infested tassels and upper leaves, plants are under moisture stress and the population is increasing.

Slugs

Slugs, although not insects, cause damage to corn primarily by feeding on leaf or stem tissue, particularly to seedling plants. Due to their affinity for plant residue, slugs tend to be more problematic in fields that



Slug

have undergone little or no tillage. Unwanted vegetation that emerges in the spring can provide a suitable food source for slugs to thrive before crops emerge. Also, if planting occurs too soon following herbicide burndown in the spring, slugs may move from dying weeds onto the corn stand. Having a sufficient vegetation-free period prior to crop emergence is imperative for corn seedlings, with regards to slugs as well as other pests. Saturated soils or other conditions that favor slow plant growth increase the likelihood of economic damage from slugs.

Damage: Because they are nocturnal in nature, slugs can be difficult to detect during the day. However, slugs produce excessive levels of slime, so trails may be visible on leaf tissue. Symptoms of feeding by slugs can vary depending on the stage of the crop. If feeding occurs on small corn, the plant will likely put on new leaves due to the growing point being below ground. Currently, no treatment threshold exists for slugs; therefore, fields should be treated on a field-by-field basis.

Management: Because slugs and snails are not classified as insects, traditional insecticides are generally not effective. Certain baits that contain the active ingredient metaldehyde are labeled for control of slugs. If baits are used, labeled use rates as well as adequate coverage are necessary to attain control. The best method for control of slugs is prevention. Prior to planting, vegetation removal (e.g., tillage) can reduce habitat for slugs, subsequently reducing future slug populations. However, these practices may not be in line with desired grower practices, and it may be difficult to make management decisions to prevent sporadic pests such as these. Contact your county agent or state extension entomologist for assistance with potential management options.

Billbugs



Billbug

Several species of billbug can be found in corn. Billbugs are weevils, and the adults range anywhere from 1/3 to 1/2 inch in length. These insects may be gray or brown in color and are usually covered with soil or dust, often

making the insect difficult to see. Several species of nutsedge (i.e., *Cyperus* spp.) serve as alternative hosts for this pest. Therefore, controlling this weed is often recommended when trying to manage billbugs.

Damage: Plants showing symptoms may appear wilted or stunted. These plants are more susceptible to drought stress and other environmental stresses that affect plant growth. Damaged plants will often have smaller ears, depending on the time of the infestation. Leaf feeding by adults appears as a transverse row of oblong holes. When the growing point of the seedling is injured, excessive tillering or death of the plant may occur. The potential for damage is much reduced as plants begin to grow rapidly.

Scouting: When a billbug infestation is suspected, examine seedling plants carefully. Billbug feeding generally occurs on the lower portion of the stem, near the base of the plant. In fields where billbug populations may be present, special attention should be given to field edges bordering fields that were in corn the previous year.

Management: The use of soil insecticides or seed treatments offers some control/suppression of infestations. Foliar insecticides may be warranted depending on the number of insects present and the amount of damage to the crop. Rotation to a non-grass crop can also be effective in managing year-to-year billbug populations. North Carolina State University recommends a treatment threshold of 5 percent seedling loss in infested areas with a full plant stand. This threshold may be reduced in fields with marginal plant stands.

Chinch Bugs

Chinch bugs overwinter on wild grass hosts. In the spring, populations migrate to new grass vegetation, including seedling corn. Because chinch bugs are susceptible to rainfall, this pest typically causes more damage during dry years. The adult chinch bug is approximately 1/5 inch long with black and white patches on the wings. Small nymphs are reddish-orange with a white band across the back. Later-instar nymphs are brownish-black with a white band across the back.



Chinch bug adult (left) and nymphs

Damage: Both adults and nymphs damage plants with their piercing-sucking mouthparts. Extensive feeding will cause plants to wilt, and some may eventually die. Plants surviving heavy feeding damage by chinch bugs are stunted and develop slower than unaffected plants.

Control: Soil insecticides or seed treatments will often control or suppress this pest. Foliar insecticides can be used as a rescue treatment. When using foliar insecticides, ground equipment calibrated to deliver high pressure and high volume directed at the base of the plant will provide the best control.



Chinch bugs

Scouting: Look for stunted or wilted plants throughout the field. Plants damaged by chinch bugs can have a red or yellowish streaky appearance to the leaves. Chinch bugs are usually found at the base of the plant or behind the leaf collar. Populations can build to high levels in small grains such as winter wheat, so it is wise to monitor fields bordering or adjacent to small grains.

Management: Treat when plants are less than 6 inches tall and when at least 20 percent of plants sampled have five or more chinch bugs. Seed treatments can suppress populations, and foliar insecticides are often effective. However, sufficient spray volume is essential for good coverage.

Cutworms

While several species of cutworms are known to attack seedling corn plants, the black cutworm is the most common across the Mid-South. The female moth usually deposits her eggs in low-lying/weedy areas of fields. This pest is also associated with cool weather in the spring, when it is known to attack plants up to 10 inches tall.



Black cutworm

Damage: When temperatures are cool, larvae will be at or near the soil surface and will cut plants off at the soil line. In warmer weather, larvae can be found lower in the soil boring into small plants. This feeding often results in wilting or death of the plant.

Scouting: Due to their nocturnal nature, cutworms are not likely to be seen during the light of day. Look for areas that sustain some level of stand loss. This will often be in low areas of the field or previously flooded areas. Fields with vegetation are likely to be infested with cutworms. Damaged plants will be cut off near the soil line. Older seedlings may be cut, or individual leaves may be cut from the plant.

Management: Cutworms are rarely a problem in fields kept free of weeds and vegetation prior to planting. Early seedbed preparation will often help prevent cutworms from occurring in these fields. Vegetation should be removed with herbicides or tillage at least two to three weeks prior to planting, which allows time for any

cutworms in the field to starve due to lack of food. If vegetation is still present at planting, a pyrethroid can be banded behind the planter. For populations detected after emergence, foliar applications are typically effective, assuming infestations are detected early and before significant stand loss occurs. Pyrethroid insecticides are effective and are typically recommended for control of cutworms.

Sugarcane Beetles

The sugarcane beetle adult is black and about 1/2 inch long. This pest can be sporadic and unpredictable in occurrence. Historically, some fields are more prone to infestation than others.



Sugarcane beetle

Damage: The adult stage causes significant damage. They bore into the soil at the base of the plant and use their chewing mouthparts to feed on the stalks just below the soil surface, sometimes chewing all the way through the stalk. Sugarcane beetle can damage plants up to 3 feet tall, and serious infestations can decimate stands. Whorl leaves of damaged plants will begin to wilt, and death of the plant may occur. Older plants that are damaged may lean or appear lodged in the field.

Scouting: Look for a small, round hole (1/2 inch diameter) at the base of the plant, where the beetles burrowed beneath the soil. Carefully remove the soil and the base of wilted plants. Look for feeding damage and adult beetles.

Management: Treatment for sugarcane beetles is sometimes difficult, as rescue treatments with foliar insecticides will often not provide adequate control. Use of in-furrow insecticides and seed treatments can help reduce the chances of damage. However, some insecticide seed treatments may not be as effective as others with regards to control of this pest.

Stink Bugs

Stink bugs can, in some cases, cause considerable damage to seedling corn. These pests have piercing-sucking mouthparts and move about the plant searching for feeding sites.

Damage: Plants damaged by stink bugs in the whorl stage may be stunted, produce excessive tillers or turn yellow. If damage occurs to the growing point, death of the plant may occur. Often, affected plants tend to survive but will not contribute significantly to yield.

Scouting: Stink bugs can be found in the whorl probing the plant, but they can also be found moving up and down the stalk or at the base of the plant near the soil. Brown stink bugs are easily overlooked at the base of the plant because they blend in well with the soil and debris. Thoroughly check the base of young plants, the area around the base of the plants and under crop residue.

Management: Many insecticides are effective against stink bugs found in corn. However, differences in control are often noted between brown and green stink bugs, with green stink bugs being typically easier to control with labeled pyrethroids than brown stink bugs.



Southern green stink bug

Crop Stage: Whorl

Injury to field corn in the whorl stage can be fairly conspicuous, particularly when the injury results in loss of leaf tissue. This injury can be identified either by ragged and irregular holes or “windowpaning” of corn leaves by various pests or small “shot holes” caused by corn borers. Previous research suggests that corn is relatively tolerant to defoliation once in the whorl stage, and treatment with a foliar insecticide at this stage rarely results in increased yield. However, feeding by heavy, sustained infestations of defoliating pests may lead to deadheart and subsequent reduced yield. If this is the case, it is very important to identify the pests causing whorl damage because of the differences in insecticide susceptibility among them. Most often, early planting is the most effective method for management of pests that feed in the whorl.



Checking whorl for injury

Corn Earworms

Corn earworm is highly polyphagous in nature and thus may be found in many other crops (e.g., cotton, soybean, sorghum). This pest has various color phases and tends to have more rigid hairs than armyworms.

Damage: Early larval stages typically feed on the leaf surface before moving down into the whorl. As is normally the case with lepidopteran pests, as the larvae develop, the amount of feeding increases with each instar. Damaged whorls appear very tattered and torn.



Corn earworms



Corn earworm

Fall Armyworms



Fall armyworm

Fall armyworm larvae are smoother than corn earworm and can range from grey or brown to greenish in color. Fall armyworm typically has fewer and shorter hairs than the corn earworm and often has black “domino dots” on the top of the last abdominal segments. Fall armyworm may also have a more prominent, light-colored inverted “Y” on the head capsule.

Damage: Early larval stages of this pest will feed on the upper surface of leaf tissue of corn, resulting in “windowpaning” (i.e., a translucent lower layer remaining). Later instar larvae will completely remove portions of plant

tissue resulting in a tattered appearance on the leaves similar to injury caused by corn earworm.



Fall armyworms in whorl



Windowpaning caused by fall armyworm larval feeding



Tattered leaves due to fall armyworm feeding

Armyworms

Armyworms, sometimes referred to as “true armyworms,” have very little hair. They have four abdominal prolegs (as do all other armyworm species). Larvae often have black bands on the prolegs. True armyworms are often observed early in the growing season.



True armyworm

Damage: Damage by true armyworms is similar to that of fall armyworms – feeding by larger instars results in a tattered appearance of leaf tissue. These pests are more likely to migrate into a cornfield as larvae, in contrast to fall armyworms who migrate into fields as adults and subsequently lay eggs.

Corn Borers

Corn borers, including the European corn borer (ECB) and the southwestern corn borer (SWCB), can cause economic damage in field corn. SWCB, however, is more widespread across the Mid-South and can cause more significant late-season lodging than the ECB. Both corn borer species can easily be distinguished from corn earworm and fall armyworm, not only by their general appearance but because the borers can “back up” when prodded, an adaptation of many boring pests; whereas, the corn earworm and fall armyworm cannot. Although corn borers are a significant pest in much of the Mid-South, whorl stage corn is normally affected by first-generation borers across the region. Populations that occur during the first generation are generally more isolated. The second generation and perhaps even the



30

**Southwestern
corn borer**



31

SWCB egg mass



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European corn borer

third generation (the latter in late-planted corn) are more likely to cause economic damage. Sugarcane borer (SCB) is currently more problematic in the lower Mid-South (Louisiana and southern Mississippi) and is described in the following section.

Damage: Until resistance to Bt toxins develops, corn borers will be extremely rare in Bt corn hybrids as they contain proteins that are active against lepidopteran pests. To date, no resistance to Bt corn has been observed. In non-Bt corn, however, corn borers commonly cause shot-hole defoliation, but they can also tunnel stalks and even cause deadheart in whorl-stage corn.



33

Corn borer pupa

Scouting: For lepidopteran pests that cause defoliation in the whorl stage, it is relatively efficient to conduct destructive samples of a few random plants to identify the species causing the injury. These samples consist of pulling whorls and unrolling the leaves while looking for

larvae. Fall armyworm and corn earworm typically do more substantial leaf feeding in the whorl than corn borers as their entire larval development takes place in the whorl, whereas corn borer larvae move into the stalk once they reach sufficient size to do so.



Corn borer damage to leaves

Management: Insecticide applications are usually not warranted for corn earworms or fall armyworms feeding in whorls unless populations are high. Early planting is recommended to avoid heavy infestations of earworms and other caterpillar pests. Bt corns with activity on Lepidoptera provide excellent control of European and southwestern corn borers.

Grasshoppers

Grasshoppers of several species attack corn in the Mid-South and may be found in fields at any stage of corn development. Because grasshoppers overwinter as eggs underground in uncultivated areas, they are typically found causing economic damage near field edges. Many species of grasshoppers have only one generation per year, but that single generation



Grasshopper

can last several weeks, depending on species. Thus, “cycling out” will take a longer period of time compared to other insect pests. Grasshoppers also tend to be more of a problem following a dry spring.

Damage: All grasshoppers use their chewing mouthparts to remove foliage from the plant, resulting in a ragged appearance. Under conditions of heavy infestations, entire plants can be denuded.

Scouting: When scouting for grasshoppers, look closely around field edges and borders. Both adults and nymphs can cause damage. Nymphs are not as mobile as adults, thus damage may be more restricted to isolated areas of the field. Adults, on the other hand, are very mobile, and feeding damage may not be confined to field edges. Grasshopper feeding gives the plant a very ragged appearance. Damaged areas can be very large, and leaves sometimes appear stripped (only the midrib remains intact). However, damage is not limited to the leaves. Grasshoppers can also feed on the stem and reproductive tissues, sometimes even the ear.

Management: Grasshoppers are easily controlled with several insecticides. Treat when numbers are high and significant defoliation is occurring. Edge treatments may be sufficient to prevent spread to the remainder of the field.

Stink Bugs

Stink bugs sometimes cause considerable damage to corn less than 2 feet tall. These pests have piercing-sucking mouthparts and move about the plant searching for feeding sites. Stink bugs can be found feeding in the whorl of young plants or on developing ears prior to silking.

Damage: Plants damaged by stink bugs in the whorl stage may be stunted, produce excessive tillers or turn yellow. If damage occurs to the growing point, death of the plant may occur. Often, affected plants tend to survive but will not contribute significantly to yield.

Scouting: Stink bugs can be found in the whorl probing the plant, but they can also be found moving up and down the stalk or at the base of the plant near the soil. Brown stink bugs are easily overlooked at the base of the plant because they blend in well with the soil and debris. Thoroughly check the base of young plants, the area around the base of plants and under crop residue that may be present.

Management: Many insecticides are effective against stink bugs that can be found in corn. However, differences in control are often noted between brown and green stink bugs, with green stink bugs being typically easier to control with labeled pyrethroids than brown stink bugs. Adequate spray volume, however, is recommended in order for the insecticide to penetrate the canopy of taller corn.



Brown stink bug

Crop Stage: Pre-Tassel to Black Layer

Stink Bugs

Stink bugs can damage corn from prior to silking through kernel development.

Damage: Stink bugs probe plants with their beak-like mouthpart and inject enzymes into the plant tissue before removing plant juices. Significant ear damage is likely when ears are less than 3/4 inch long. Plants damaged during early ear development may result in what is referred to as “cow-horned” ears, resulting in total ear loss for that given plant.



Stink bug damage

Scouting: Scouting for stink bugs should begin before an ear is visible on the plant. At this stage, scout for stink bugs up and down the stalk, especially in the ear zone. These pests can usually be found, if present, probing the stalk searching for the developing ear. Stink bug infestation will normally begin on field borders. They also tend to hide and will move or fly when disturbed or threatened. Thus, when scouting for stink bugs, approach the area with care.

Management: Many insecticides are effective against stink bugs that are common in corn. However, differences in control are often noted between brown and

green stink bugs, with green stink bugs being typically easier to control with labeled pyrethroids than brown. Adequate spray volume, however, is recommended in order for the insecticide to penetrate the canopy of taller corn.



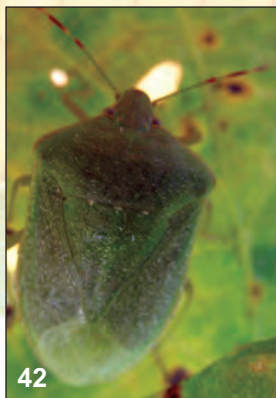
Brown stink bug nymph



Brown stink bug adult



Southern green stink bug nymph



Southern green stink bug adult

Corn Borers (Southwestern, European and Sugarcane)

The corn borer complex listed in this guide can be found throughout the Mid-South. However, the sugarcane borer (SCB) is generally confined to Louisiana and Southern Mississippi at the time of this writing. The larvae of all three species have similar feeding habits in that they will tunnel into the plant and feed on the pith in the stalk.



Southwestern corn borer larvae



Southwestern corn borer adult



European corn borer



Sugarcane borer

Pheromones are available for monitoring adult populations of southwestern corn borer (SWCB) and to some extent European corn borer (ECB), but not for the SCB. Both SWCB and SCB larvae can be observed in two forms, summer and winter. In SWCB, the summer form is white with black spots, while the winter form is creamy-white with barely-visible spots. The SCB is typically white with a brown head, and the summer form has brown spots on each body segment. The winter form of SCB lacks spots altogether.



Corn borer trap



Corn borer damage

Damage: Corn borers cause plant injury by leaf feeding, stalk tunneling and ear feeding. Tunneling reduces translocation of nutrients through the plant, and stalks that are significantly weakened may break over (lodge). Most yield loss, however, is related to lodging of plants, resulting in failure to pick up those plants with a combine at harvest. Additionally, larvae of

second or third generation SWCB will girdle the base of the plant in preparation for overwintering. This damage can also cause plants to lodge.

Scouting: In fields planted to non-Bt hybrids only, scout for egg masses or small larvae. When scouting for corn borer eggs in tasseling corn, look from eye level to below the ear for eggs on both the top and bottom of the leaves. Egg masses are relatively small, but will typically be at or near the midrib of the leaf. SWCB eggs more than a day old will be white with three red “candy-stripes”

across each egg, while ECB eggs will not. If eggs are less than one to two days old, SWCB eggs will not have the candy-stripes. The main characteristic of SWCB eggs compared to ECB, however, is that SWCB eggs will usually be laid in clusters of 2 to 5 while ECB typically lays eggs in clusters of 15 or more.



SWCB eggs



Corn borers caught in trap

Pheromone traps can be effective for monitoring populations of SWCB. A sharp increase or “spike” in moth captures should not be a cue for an automatic insecticide application but intensified scouting. Additionally, there is often

a 7- to 10-day delay in finding eggs following a spike in moth numbers, as mating, oviposition and egg hatch need to occur for larvae to be present. Once eggs hatch (4 to 6 days after oviposition), they will feed on foliage for 7 to 10 days, after which time they will tunnel into the stalk.

Foliar insecticides must be applied before larvae reach sufficient size to bore into the stalk. Treatment decisions in non-Bt corn can sometimes be made based on the number of SWCB moths in traps surrounding a given field. However, this number and how it relates to treatment decisions is generation dependent and dependent upon the time of the season as well as the maturity of the crop. For example, 50 moths captured in a given week is not a high number for the second generation, but it is high for the first generation of SWCB. For early-planted corn (recommended for non-Bt hybrids), the third generation typically emerges too late to be of economic significance.

Management: Transgenic hybrids with Bt traits active against caterpillar pests provide very effective control for all corn borer species. The use of Bt corn hybrids on at least some acreage is recommended, especially in areas with a history of corn borer problems. For non-Bt corn, planting earlier in the season will help avoid late-season pressure from corn borers. Tillage prior to spring moth emergence can reduce the overall overwintering populations, but even well-tilled fields can still be heavily infested by neighboring fields. For SWCB, apply insecticides when larvae or egg masses are present on 25 percent or more of the plants. For ECB, apply insecticides when larvae or egg masses are present on 50 percent or more of the plants. For SCB, 10 to 20 percent infested plants is the recommended threshold in Louisiana.

Ear-Feeding Pests (Corn Earworm/Fall Armyworm)

Ear-feeding caterpillars, such as fall armyworm and corn earworm, are commonly found feeding on developing kernels in the ear, especially in later-planted corn. Control of these pests in field corn is generally not recommended due to the extremely high number of insecticide applications that would be required to attain control. This is due to the prolonged period of silking coupled with the fact that larvae are better controlled prior to entering the ear. The original Bt corn hybrids are not very effective for controlling corn earworm or fall armyworm in the ear. Newer Bt corn hybrids that contain novel and/or multiple Lepidoptera-active Bt proteins may result in enhanced control of



Corn earworm



Corn earworm damage

these pests (see chart on pages 4 and 5). In general, these traits have considerably more activity on corn earworm and fall armyworm.

Scouting: As it is not economically viable to treat caterpillar pests in the ear, scouting specifically for these pests is generally not recommended.

Japanese Beetle

Adults of Japanese beetle are approximately 1/2 inch in length and are metallic green with bronze/copper-colored wing covers. Adults also typically have five tufts of white hair that protrude from under the wing covers on each side of the abdomen and two tufts on the rear of the abdomen.



Japanese beetle

Damage: Although Japanese beetles are of little economic significance, adults can cause some defoliation. They can also feed on corn silks, which can impact the pollination process. This, in turn, may result in reduced kernel number on the ear.

Scouting: In areas where Japanese beetles have been problematic, traps can be useful for detecting adult beetle emergence and for indicating when scouting for adults should be increased. Checking entire fields is necessary to determine accurate infestation levels, although infestations are often worse along field edges. Thresholds vary by state, so seek guidance from state extension personnel when addressing treatment decisions.

Management: Adult Japanese beetles are highly mobile, and controlling the immature stage of this pest (with preventative, at-plant insecticides) does not guarantee prevention of adult numbers later in the season. Although

several foliar insecticides are labeled for controlling adult Japanese beetles in corn, injury level, population density, yield potential and insecticide cost should all be factors in deciding whether to treat.

Moodna bisinuella

Moodna bisinuella is a relatively new pest of corn in the United States. This pest is native to Central America and arrived in North Carolina on gamagrass from Mexico. First reported in the U.S. in 1985, this pest has been documented more recently in south Texas, Louisiana, Mississippi and Georgia.

Damage: Larvae can be found late in the season, usually beyond dent stage, feeding on kernels. Larval feeding from this pest is unique in that a frass (excrement) trail is created between the rows of kernels where feeding takes place. Pupae of this pest are about 1/4 inch long and can sometimes be found on the husk.



Moodna bisinuella

Scouting: As it is not economically viable to treat caterpillar pests in the ear, scouting is generally not recommended.

Management: Little is known about this invasive pest at the time of this writing. Currently, available Bt corns used in the Mid-South have little activity against *M. bisinuella*.

Index

- A**
Aphids, 12-13
Armyworms, 23
- B**
Billbugs, 14-15
Brown stink bug, 19, 26-27
- C**
Chinch bugs, 15-17
Corn borers, 2, 9, 21,
23-25, 30-33
Corn earworms, 4, 20-21,
33
Corn leaf aphid, 12
Corn rootworms, 2
Cutworms, 2, 4, 17-18
- E**
Ear-feeding pests, 33
European corn borer, 2, 23
- F**
Fall armyworms, 3, 5,
21-22, 33
- G**
Grasshoppers, 2, 25-26
- J**
Japanese beetle, 8-9,
34-35
- L**
Lesser cornstalk borer,
11-12
- M**
Moodna bisinuella, 35
- S**
Seedcorn maggot, 6-7
Slugs, 13-14
Southwestern corn borer,
2, 23, 25
Southern corn rootworm,
3, 9-10
Southern green stinkbug
19
Stink bugs, 2, 19, 26-27,
28-29, 30-31
Sugarcane beetles, 18
Sugarcane corn borer, 2,
30
- T**
True armyworm, 23
- W**
White grubs, 7-8
Wireworms, 10-11
Western corn rootworm,
2, 5

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