

INSECT PEST MANAGEMENT

David Buntin

This chapter discusses the major insect pests of wheat. Insect pests can reduce both grain yield and quality of small grain crops in Georgia. Historically, the Hessian fly, aphids, and cereal leaf beetle are the pests of significant economic importance. Aphids can directly damage wheat, but are of concern mostly because they transmit a viral disease called barley yellow dwarf (BYD). True armyworm and other insects also occasionally damage cereal grain crops.

Major Insect Pests

Aphids: Aphids are small, soft-bodied insects that can be found in wheat anytime during the growing season. The most common aphids found on wheat are the bird cherry-oat aphid, rice root aphid, greenbug, corn leaf aphid, and English grain aphid. The first four occur mostly in the fall and winter. Only the greenbug causes direct feeding damage that appears speckled brown and discolored with some leaf curling. The other aphids usually do not cause obvious feeding damage. The English grain aphid is mainly present in the spring and can reach large numbers on flag leaves and developing grain heads. Damage from this pest can reduce kernel size and lower grain test weight. Aphids are a serious pest of wheat because they also transmit a viral disease named barley yellow dwarf (BYD) and a related disease called cereal yellow dwarf. Wheat and barley can be severely damaged, but oats are most susceptible to this disease. A new aphid, *Sipha maydis*, has been found in the Southeast on wheat which also can transmit BYD but its impact on wheat production in Georgia is not yet known.

BYD is present in most fields in most years throughout Georgia. Yield losses are sporadic but losses of 5-15% are common and can exceed 30% during severe epidemics. Infection can occur from seedling emergence through heading, but yield loss is greatest when plants are infected as seedlings in the fall. Although all aphids can potentially transmit certain strains of the virus, infections in the Southeast are mostly associated with infestations of bird cherry-oat aphid and rice root aphid. Planting date is the single most important management practice, with early plantings having greater aphid numbers and greater BYD incidence than late plantings. For the most part, beneficial insects such as lady beetles are helpful in reducing aphid numbers in the fall before frost and in the spring, but they are not active during the winter when aphids can quickly increase to large numbers during warm periods.

Systemic seed treatments are available for controlling aphids in the fall and winter and may reduce infection rates of BYD. These seed treatments are more effective in the northern half of the state, but are only recommended when (1) grain yield potential is high (>60 bu/acre), (2) a field has a history of BYD infection, and/or (3) early plantings will be made. In the coastal plain region, seed treatments have been inconsistent in control and are not recommended for routine aphid control. A single, well-timed insecticide application of the insecticide lambda cyhalothrin (Warrior II, Silencer, and similar products) or gamma cyhalothrin (Declare) also can control aphids, reduce the incidence of BYD, and increase yields. The best time for treatment in northern Georgia usually is about 25 - 35 days after planting, although an application in the winter until full tiller also may be beneficial. In southern Georgia, the best treatment time usually is at full-tiller stage in late January to mid-February. But, scout fields for aphids at 25 - 35 days

after planting and during warm periods in January to determine if an insecticide application is needed. A lambda cyhalothrin or gamma cyhalothrin treatment at full tiller can be applied with top-dress nitrogen. Two new insecticides, Sivanto Prime and Transform WG, also will provide useful control but its effect on BYD infection has not determined. OP insecticides, such as dimethoate, also will control aphids but are not effective in preventing barley yellow dwarf infection.

To sample aphids, inspect plants in 12 inches of row in fall and 6 inches of row in winter. In spring, inspect 10 grain heads (+ flag leaf) per sample. Count all aphids on both the flag leaf and head for making control decisions. Sample plants at 5 to 10 locations per field. Treat when populations reach or exceed the following thresholds:

Seedlings: 1 bird cherry-oat aphids per row foot, or 10 greenbugs per row foot.

2 or more tillers per plant: 6 aphids per row foot.

Stem elongation to just before flag leaf emergence: 2 aphids per stem.

Flag leaf emergence: 5 aphids per flag leaf.

Heading emergence to early dough stage: 10 aphids per head.

Do not treat for aphids after mid-dough stage.

Hessian Fly: The Hessian fly, *Mayetiola destructor*, can cause severe damage to wheat production throughout the southern United States. Wheat is the primary host of the Hessian fly, but the insect also will damage triticale. Barley and rye also may be infested but damage normally is very limited. Hessian fly does not attack oats. Little barley is the only important non-crop host in Georgia.

Adult Hessian flies are small black flies about the size of a mosquito. Adults live about two days and females lay about 200 eggs in the grooves of the upper side of the wheat leaves. Eggs are orange-red, 1/32 inch long and hatch in 3 to 5 days. Young reddish larvae move along a leaf groove to the leaf sheath and then move between the leaf sheath and stem where they feed on the stem above the leaf base. Maggots become white after molting and appear greenish white when full grown. Once larvae move to the stem base, they are protected from weather extremes and foliar-applied insecticides. Maggots suck sap and stunt tillers presumably by injecting a toxin into the plant. Infested jointed stems are shortened and weakened at the joint where feeding occurs. Grain filling of infested stems is reduced and damaged stems may lodge before harvest. Generally, three generations occur in the Piedmont region and four generations occur in the Coastal Plain region of Georgia. The fall and winter generations stunt and kill seedling plants and vegetative tillers. The spring generation infests jointed stems during head emergence and grain filling. Yield losses usually occur when fall tiller infestations exceed 8% of tillers and when spring stem infestations exceed 15% of stems.

The Hessian fly is a cool season insect and is dormant over the summer in wheat stubble as a puparia which is sometimes called a 'flaxseed'. Adults begin to emerge about September 1. Since wheat is not yet planted, the first generation develops entirely in volunteer small grains and little barley. Thus reduced tillage, lack of crop rotation (wheat after wheat), and lack of volunteer wheat control in summer crops enhance problems with Hessian fly in autumn.

Planting a Hessian fly-resistant variety is the most effective way to control Hessian fly.

Varieties in the Georgia state wheat variety trials are evaluated for Hessian fly resistance each year and these ratings also are available in the Small Grain Performance Tests Bulletin. The next table provides a list of varieties with good, fair and poor resistance to Hessian fly in Georgia. But also check the “Characteristics of Recommended Varieties” section in the first part of this publication, because some varieties may not be recommended due to agronomic problems.

Wheat variety rating for Hessian fly resistance in spring 2018.

Poor (Susceptible)	Fair	Good (Resistant)
AgriMaxx 413, 415, 444, 446, 480 AGS 2031, 2020, 2040, 2055, 3201, CL7 Croplan 8302 Dyna-Gro 9053, 9171, 9522, 9750, Dominion, McIntosh, Tribute Pioneer Brand 26R15, 26R22, 26R53, 26R59, 26R87 Progeny 117, 185, 308, 357, 870, #Boss Public: Roberts, Chesapeake, Jamestown, NC-Cape Fear, NC-Yadkin, Hillard SS 520, 560, 5205, 8340, 8404, 8412 Syngenta Seeds Panola, Gore, Magnolia, Arcadia, Cypress Syngenta Coker 9553, 9700, 9804, Viper Terral LA821, LA841, LA842, TV8525, TV8535, TV8626 USG 3153, 3201, 3244, 3251, 3404, 3438, 3555, 3689, 3694, 3895, 3933	AgriMaxx 474 AGS 2000, 2035, 2038, 3040 Dyna-Gro Baldwin, 9862 Pioneer Brand 26R31, 26R94 Progeny 122, 166, #Turbo, #Boss Public: Fleming, SS 8308, Syngenta AgriPro Misten Syngenta-Coker 9152 Terral LA754 USG 3209, 3592, 3665, 3833	AgriMaxx 473 AGS 2026*, 2027, 2033, 2060, 2072, 3000, 3030 Dyna-Gro Oglethorpe*, Savoy, Dyna-Gro 9701, TV8861 Pioneer Brand 26R10, 26R20, 26R38, 26R41, 26R61* Progeny #Bullet, Public: Roane SS 8415, 8629, 8641 Syngenta AgriPro Syngenta-Coker Sou. Harvest 5550 Terral TV8589, TV8848, GoWheat TV8861 USG 3120, 3458, 3536 * Resistant to Biotype L.

For susceptible varieties, systemic seed treatments, such as Gaucho, Cruiser, or NipsIt Inside, when applied at a **high rate (see Table 20)** will suppress fall infestations but will not prevent **Hessian fly infestation** in winter or spring. In February through mid-March with a properly-timed foliar application of lambda cyhalothrin also may suppress spring infestation but consistent control is difficult. This application must be applied while adults are active and eggs are being laid, so sampling of eggs on leaves is needed for proper timing.

Cereal Leaf Beetle: Cereal leaf beetle, *Oulema melanopus*, was first discovered in northwest Georgia in 1989. The insect is spreading southward and now occurs throughout the mountain and Piedmont regions and in most of the upper coastal plain region. Larvae feed on many grasses including oats, wheat, barley, rye, orchard grass, and annual ryegrass, but the insect is a problem mostly on oats and wheat. Adult beetles are 5 mm long and blue-black with a reddish thorax (neck) and legs. Larvae are yellow-white and up to 6 mm long, but appear shiny and black, because they are covered with fecal material. Adults and larvae defoliate or skeletonize long narrow sections of the flag and upper leaves. Adults are present in wheat during March and April when they mate and lay eggs. Larvae are present during wheat head emergence through

dough stage. There is one generation per year; newly-emerged adults over summer and overwinter in fence rows and wooded areas. These adults will feed on green grasses in adjacent fields, such as corn, sorghum, and crabgrass, before moving to over-summering sites. Corn planted next to wheat fields can be damaged by the beetles, although damage to corn usually is confined to field margins.

Cereal leaf beetle can be effectively controlled by one application of an insecticide to foliage. Fields should be scouted by counting the number of larvae and adults on 10 stalks at 6 to 10 locations per field. Treatment should be considered when populations exceed 1 larva per 4 stems. Most insecticides should be applied after most eggs have hatched but before larval damage becomes extensive. Tank mixing with a foliar fungicide at heading time is usually feasible.

Fall Armyworm: Fall armyworm looks much like other armyworm species. It is brown to black in color with an inverted Y on its head and four dots spaced in a square on the upper side last abdominal segment. Fall armyworms cannot tolerate freezing temperatures and die out in Georgia each fall. The moths are migratory and fly up from southern Florida each spring. There are several generations and in outbreak years they heavily infest and damage pastures grasses in late summer and the fall. In these year fall armyworm also may infest seedling cereal grains especially fields planted early for grazing. If present, larvae can completely destroy a seedling stand of cereal grains. Field should be scouted soon after planting and an insecticide used if larvae are present and damage is occurring.

True Armyworm: The true armyworm looks much like other armyworm species. It is brown to black in color. Larvae have three, orange, white and brown stripes running the length of each side. The larvae will also have a narrow broken stripe down the center of its back. Wheat fields should be checked for the presence of true armyworms when wheat is heading usually in March and early April, two weeks later in north Georgia. Armyworms generally are active at night and rest during day under plant residue at the base of stems. Armyworms chew large irregular holes in leaves generally from the bottom up, but may climb stems and cut grain heads off the plant. Very large infestation sometimes will march in large numbers out of defoliated wheat fields to continue feeding on crops in nearby fields. Treatment should be considered if 4 or more worms per square foot are found before pollen-shed stage and if 8 or more worms per square foot are found after pollen-shed stage. Insecticides listed are effective but coverage of dense foliar and lodged plants sometimes makes control difficult.

Stink bugs: Wheat is often infested with stink bugs in spring during grain fill. The brown and southern green stink bugs may reproduce and have a complete generation in wheat before harvest. Rice stink bug adults also are common in wheat. As wheat dries down, stink bug adults will disperse to nearby summer crops such as corn and vegetable crops. Stink bugs almost never require control in wheat. Treat if 1 or more bugs per square foot are present at milk stage. Treatment is not needed in the dough stage, except to prevent dispersal to adjacent summer crops as wheat matures. However, stink bugs are highly mobile and in most cases it is best to sample and treat adjacent crops such as corn and vegetables when stink bugs move into and reach threshold levels in those summer crops.

Sampling for Insect Pests

Wheat should be scouted for aphids, cereal leaf beetle and secondary pests. Scout the entire field. Insects tend to clump, and thus an examination of the whole field should be made. Fields should be inspected soon after planting to verify timely emergence. If emergence is poor, the field should be checked for soil-inhabiting insects such as fall armyworm before replanting.

After stand establishment, scout fields for aphids at 4 critical times: 25 - 45 days after planting, warm periods in January, full-tiller in mid-February, and boot stage to head emergence. The first three periods are intended to control BYD infection and some direct aphid damage; the last period is to prevent damage by grain aphids, armyworms and cereal leaf beetle.

To sample aphids, inspect plants in 12 inches of row in fall and 6 inches of row in winter. In spring, inspect 10 grain heads (+ flag leaf) per sample. Sample plants at 8 to 16 locations per field. Treat according to thresholds listed for aphids. Inspect fields for cereal leaf beetle adults and larvae weekly for several weeks beginning at boot stage. Count the number of larvae and adults on 10 stalks at 6 to 10 locations per field. No other insect pest justifies routine sampling in wheat except possibly inspecting fields for armyworms during a boot stage while sampling for aphids and cereal leaf beetle.

Insecticides

Except for the Hessian fly, most other insect pests can be controlled by applying foliar insecticides when population densities exceed economic thresholds (Table 19). Systemic seed treatments such as Gaucho 600, Cruiser 5FS, or NipsIt Inside may control aphids, suppress BYD infection and at high rates control Hessian fly in the fall. Most insecticides registered for use on wheat also can be used on oats, rye, and barley with the exception of Transform WG, Fastac, Tombstone and similar products. For current insecticide recommendations see Table 20 and the most recent edition of the Georgia Pest Management Handbook, Commercial Edition.

<http://www.caes.uga.edu/departments/entomology/extension/pest-management-handbook.html>.

Summary of Management Practices for Insect Pest Control

1. Avoid continuous planting of wheat in the same field including wheat as a cover crop.
2. Control volunteer wheat.
3. Plow fields to bury wheat debris (burning wheat stubble alone is not effective without tillage).
4. Do not plant wheat for grain before the recommended planting date for your area.
5. Plant rye, oats, or ryegrass instead of wheat for grazing.
6. Select a Hessian fly resistant variety that is adapted to your area.
7. On Hessian fly susceptible varieties, consider using a systemic seed treatment if the field has a history of Hessian fly damage, is reduced tillage, or if planting before the recommended planting date.
8. Scout wheat periodically for aphids, true armyworms, and cereal leaf beetles. Apply a foliar insecticide if numbers exceed treatment thresholds.

Table 19. Damage Symptoms and Economic Thresholds of Insect Pests of Wheat.

Insect	Damage Symptoms	Treatment threshold
aphids	Suck plant sap and may cause yellowing and death of leaves. Reduce grain size when grain heads infested. Transmit barley yellow dwarf virus.	Seedlings: 1/row ft., 6-10 inch plants: 6/row ft., Stem elongation: 2 per stem, Flag leaf - head emergence: 5/stem, Full heading: 10 per head to include flag.
Hessian fly	<i>Vegetative plants</i> --tillers stunted dark green, tiller death; <i>Jointed stems</i> --stunted, weakening of stem at point of feeding injury. Reduced grain size and weight. Infested stems may lodge before harvest.	Fall - early winter: 8% infested tillers. Spring: 15% infested stems.
Cereal leaf beetle	Adults chew elongated holes in upper leaves, larvae remove leaf tissue leaving low epidermis causing "window pane" effect.	1 larvae or adult per 4 stems.
Chinch bugs	Suck plant sap causing discoloration.	Seedlings: 1adult per 2 plants, Spring: 1 adult per stem.
True armyworm	Primarily occur in late winter and spring from stem elongation to maturity; chew foliage and seed head glumes, also clip awns and seed heads.	Before pollen shed: 4 or more worms/sq. ft. After pollen shed: 8 or more worms/sq.ft.
Fall armyworm, beet armyworm, & yellow-striped armyworm	Primarily occurs in the fall; small larvae cause "window pane" feeding on leaves; larger larvae consume leaves and plants and destroy stands	Do not treat unless seedling damage exceeds 50% defoliation and 2 or more armyworms per sq. ft. are present.
Grasshoppers	Destroy leaves of seedlings during fall. Damage common along field margins.	Do not treat unless damage exceeds 50% defoliation and 3 or more grasshoppers / sq yd are present.
Flea beetles	Destroy leaves of seedlings in fall. Damage common along field margins.	Do not treat unless seedling damage exceeds 50% defoliation and 2 beetles /row ft. are present.
European corn borer	Small larvae chew holes in leaves; large larvae tunnel in stem killing developing grain head.	Control almost never practical; Treat when larvae are small, borers numerous and before they bore into stems.
Mites, winter grain mite	Suck plant sap; cause leaf discoloration.	Treat when leaf discoloration appear over areas of a field. Usually in spots.
Thrips	Suck plant sap; may cause leaf discoloration.	Injury not economic; do not treat. Thrips may disperse to adjacent summer crops as wheat matures.
Stink bugs	In spring, feed on developing grain from milk to hard dough stage.	Treat if 1 or more bugs per sq. ft. at milk stage. Do not treat in dough stage.