

## INSECT PEST MANAGEMENT

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. 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. For the most part, beneficial insects such as lady beetles are not active during the winter and only exert some control over aphids during the spring in wheat.

Aphids also vector a viral disease named barley yellow dwarf (BYD). Wheat and barley can be severely damaged, but oats are most susceptible to this disease. BYD is present in most fields in most years throughout Georgia. Yield losses of 5-15% are common but losses 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 Georgia are mostly associated with infestations of bird cherry-oat aphid. Planting date is the single most important management practice affecting aphid infestation and BYD infection in the fall. Early plantings generally have greater aphid numbers and greater BYD incidence than late plantings.

Systemic seed treatments, imidacloprid (Gaucho, Attendant) and thiamethoxam (Cruiser), can be effective in controlling aphids in the fall and winter and can substantially reduce infection rates of BYD virus. These seed treatments are more effective in the northern half of the state, but are expensive and 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 use. Seed treatments also may reduce fall infestations of Hessian fly when applied at maximum rates.

A single, well-timed insecticide application of the insecticide lambda cyhalothrin (Karate Zeon, Silencer, and similar products) or gamma cyhalothrin (Declare) 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 at full tiller also may be beneficial. In southern Georgia, the best treatment time usually is at full-tiller stage in early 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. Lambda cyhalothrin / gamma cyhalothrin

treatment at full tiller can be applied with top-dress nitrogen. OP insecticides, such as dimethoate and methyl parathion, 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 8 to 16 locations per field. Treat when populations reach or exceed the following thresholds:

Seedlings: 1-2 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 infest and damage triticale. Barley and rye also may be infested but damage normally is 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 often 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 weed hosts. 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 spring 2009 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 2009.

<b>Poor (Susceptible)</b>	<b>Fair</b>	<b>Good</b>
<b>AGS</b> 2031, 2020 <b>AgriPro</b> Panola, Gore Chesapeake <b>NK-Coker</b> 9511, 9553, 9663, 9700 <b>Pioneer Brand</b> 26R15, 26R22, 26R24, 26R87 Neuse, Pat, Roberts <b>Progeny</b> 117, 119, 127, 130, 136, 145, 185 <b>SS</b> 518R, 520, 524, 535, 560, 8404 <b>Terral</b> LA821, LA841, LA842 <b>USG</b> 3295, 3477, 3555, 3592, 3725, 3910 <b>UAP (Agrium/CPS)</b> Dominion, McIntosh, Tribute	<b>AGS</b> 2000, 2055 <b>AgriPro</b> Crawford Fleming, Magnolia <b>NK-Coker</b> 9152 <b>Pioneer Brand</b> 26R12, 26R31 <b>Progeny</b> 122, 166 <b>SS</b> 8308 <b>USG</b> 3209, 3350, 3665	<b>AGS</b> 2010*, 2026*, 2035, 2485, 2060 <b>Pioneer Brand</b> 2580, 26R38, 26R61* <b>Roane</b> <b>SS</b> 8641 <b>Terral</b> TV8558, TV8589 <b>USG</b> 3592, <b>UAP (Agrium/CPS)</b> Baldwin, Oglethorpe* * Resistant to Biotype L.

**For susceptible varieties**, systemic seed treatments, such as Gaucho or Cruiser, when applied at high rate (see Table 20) will suppress fall infestations but will not prevent Hessian fly infestation in winter or spring. Granular insecticide applied at planting, such as Di-Syston, Thimet or Phorate, are no longer labeled for use on wheat. Control of spring infestations also is possible in February through mid-March with a properly-timed foliar application of lambda cyhalothrin. But 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 in most of the upper coastal plain region. Cereal leaf beetle 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. Newly emerged adults also will feed on summer grasses such as corn, sorghum and crabgrass.

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 head emergence through the dough stage of wheat development. Larval damage reduces grain yield and test weight mostly by reducing seed size. 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 before moving to over-summering sites. Corn planted next to wheat fields can be extensively 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. Lambda cyhalothrin (Karate Zeon, Silencer, and similar products) and gamma cyhalothrin (Declare) also can be applied early when egg hatch is occurring, which may coincide with an application of foliar fungicide for leaf rust control.

**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. Sometimes they climb stems and cut grain heads off the plant. Very large infestation sometimes will march en-mass 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. Several materials are labeled that give good control in wheat. The most cost effective treatment is an aerial application of methyl parathion 4E. If methyl cannot be used, various pyrethroid insecticides also are effective.

**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.

### **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 lesser cornstalk borer or 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**

Insecticides generally are not widely used in wheat in the Southeast. Except for the Hessian fly, most other insect pests can be controlled by applying foliar insecticides when population densities exceed economic thresholds (Table 19). Granular insecticides at planting, such as phorate and Di-Syston 15G, are no longer registered for use on wheat. Systemic seed treatments such as Gaucho 600 or Cruiser 5FS may control aphids, suppress BYD infection and at high rates control Hessian fly in fall. Consult the Georgia Pest Control Handbook and Table 20 for specific chemical recommendations. Some insecticides registered for use on wheat, such as Baythroid XL, Sevin, Declare and others, are **NOT** registered for use on oats, rye and barley. For current insecticide recommendations for oats, rye, and barley see the most recent edition of the Georgia Pest Management Handbook, Commercial Edition.

## **Summary of Management Practices for Insect Pest Control**

1. If possible, avoid continuous planting of wheat in the same field. Also avoid using wheat as a cover crop year after year in the same field.
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. A rescue foliar treatment of lambda cyhalothrin based on egg sampling also may provide control of the spring infestation.
8. Scout wheat for aphids at 25 - 35 days after planting and in mid-February. Scout at boot and heading stages 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.**

<b>Insect</b>	<b>Damage Symptoms</b>	<b>Treatment threshold</b>
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: 2/row ft., 6-10 inch plants: 5/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: 1 adult 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 3 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.
Lesser corn stalk borer	Larvae bore into base of seedlings in fall. Usually only in early plantings for grazing.	Not established.
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 and borer numerous and before they bore into stems.
Mites, winter grain mite	Suck plant sap; cause leaf discoloration.	Treat when leaf discoloration appears over large areas of a field.
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.	Almost never require control in wheat. Treat if 1 or more bugs per sq. ft at milk stage. Do not treat in dough stage.

Table 20. Insecticide recommendations for wheat insect pests.

PEST	INSECTICIDE <sup>1</sup>	AMOUNT OF FORMULATION PER ACRE	LBS. ACTIVE INGREDIENT PER ACRE	REMARKS
<b>Aphids</b>	<u>Seed Treatments</u>			
	Gaicho, Attendant 600	0.8 fl. oz./100 lb. seed	0.03 lb./100 lb. seed	<b>NOTE:</b> Gaicho XT formulation also contains Raxil and Apron fungicides.  <b>NOTE:</b> Cruiser 5FS is available as a commercial seed treatment. CruiserMaxx Cereal also contains two fungicides.  <b>NOTE:</b> OP insecticides, methyl parathion on dimethoate, control aphids but are not effective at suppressing barley yellow dwarf disease.
	Gaicho XT	3.4 fl. oz./100 lb. seed	0.03 lb./100 lb. seed	
	Cruiser 5FS	1.0 fl oz./100 lb. seed	0.04 lb./100 lb. seed	
	CruiserMaxx Cereals	5.0 fl oz./100 lb. seed	0.04 lb./100 lb. seed	
	<u>Foliar Treatments</u>			
	Baythroid XL	2.4 fl. oz.	0.019	
	Dimethoate 4EC, 400	0.5 to 0.75 pt.	0.25 to 0.375	
	Dimethoate 2.67EC	0.75 to 1 pt.	0.25 to 0.375	
	Methyl 4EC	0.5 to 1.5 pt.	0.25 to 0.75	
	Pennacp-M	2 to 3 pt.	0.5 to 0.75	
Karate Zeon 2.08CS	1.28 to 1.92 fl. oz.	0.02 to 0.03		
Silencer, Lambda (others) 1.0	2.56 to 3.84 fl. oz.	0.02 to 0.03		
Declare, Prolex 1.25	1.02 to 1.54 fl. oz.	0.01 to 0.015		
Proaxis 0.5	2.56 to 3.84 fl. oz.	0.01 to 0.015		
<b>Armyworm</b>	Baythroid XL	1.8 to 2.4 fl. oz.	0.014 to 0.019	True armyworm usually in late winter and spring at boot/head stage. Treat when larval numbers exceed 4 larvae per square foot before pollen shed and 8 larvae per square foot after pollen shed.  <b>NOTE:</b> Tracer is most effective against small larvae.
	Lannate 2.4LV	1.5 pt.	0.45	
	90SP	0.5 lb.	0.45	
	Methyl 4EC	1.5 pt.	0.75	
	Pennacp-M	2 to 3 pt.	0.5 to 0.75	
	Mustang MAX 0.8EC	3.2 fl. oz.	0.025	
	Tracer 4SC	2 fl. oz.	0.062	
	Karate Zeon 2.08CS	1.6 fl. oz.	0.025	
	Silencer, Lambda (others) 1.0	3.2 fl. oz.	0.025	
	Declare, Prolex 1.25	1.28 fl. oz.	0.0125	
Proaxis 0.5	3.2 fl. oz.	0.0125		
<b>Fall or beet armyworm, Yellowstriped armyworm, and Cutworms</b>	Lannate 2.4LV	1.5 pt.	0.45	Usually in fall on seedling plants. Treat when larval populations of any one or any combination of these insects exceed 3 larvae (1/2 inch long or larger) per square foot.  <b>NOTE:</b> Tracer is more effective against small larvae. Tracer is not labeled for cutworm control.
	90SP	0.5 lb.	0.45	
	Mustang MAX 0.8EC	3.2 to 4.0 fl. oz.	0.025	
	Sevin 80S	1.875 lb.	1.5	
	XLR Plus, 4F	1.5 qt.	1.5	
	Tracer 4SC	1.5 to 3.0 fl. oz.	0.047 to 0.094	
	Karate Zeon 2.08CS	1.6 fl. oz.	0.025	
Silencer, Lambda (others) 1.0	3.2 fl. oz.	0.025		
Declare, Prolex 1.25	1.28 fl. oz.	0.0125		
Proaxis 0.5	3.2 fl. oz.	0.0125		
<b>Cereal leaf beetle</b>	Baythroid XL	1.0 to 1.8 fl. oz.	0.008 to 0.014	Treat when an average of 1/2 larva per stem are found. Karate, Silencer, Declare and similar products can be applied at 50% egg hatch. Other materials should not be applied until after 90% egg hatch.
	Lannate 2.4LV	0.75 to 1.5 pt.	0.225 to 0.45	
	90SP	0.25 to 0.5 lb.	0.225 to 0.45	
	Malathion 5EC	1.5 pt.	0.94	
	Malathion 8EC	1.25 pt.	1.25	
	Mustang MAX 0.8E	2.6 to 3.2 fl. oz.	0.02 to 0.025	
	Sevin 80S	1.25 to 1.875 lb.	1 to 1.5	
	XLR Plus, 4F	1 to 1.5 qt.	1 to 1.5	
	Karate Zeon 2.08CS	1.28 to 1.6 fl. oz.	0.02 to 0.025	
	Silencer, Lambda (others) 1.0	2.56 to 3.2 fl. oz.	0.02 to 0.025	
Declare, Prolex 1.25	1.02 to 1.28 fl. oz.	0.01 to 0.0125		
Proaxis 0.5	2.56 to 3.2 fl. oz.	0.01 to 0.0125		

<b>Grasshoppers</b>	Baythroid XL Malathion 57EC Malathion 5EC Malathion 8EC  Methyl 4EC Pennacp-M  Mustang MAX 0.8E  Sevin 80S XLR Plus, 4F  Karate Zeon 2.08CS Silencer, Lambda (others) 1.0 Declare, Prolex 1.25 Proaxis 0.5	1.8 to 2.4 fl. oz. 1.5 to 2 pt. 1.5 to 2 pt. 1.25 pt.  0.75 to 1 pt. 2 to 3 pt.  3.2 to 4.0 fl. oz.  1.25 to 1.875 lb. 1 to 1.5 qt.  1.28 to 1.92 fl. oz. 2.56 to 3.84 fl. oz. 1.02 to 1.54 fl. oz. 2.56 to 3.84 fl. oz.	0.014 to 0.019 0.94 to 1.25 0.94 to 1.25 1.25  0.375 to 0.5 0.5 to 0.75  0.02 to 0.025  1 to 1.5 1 to 1.5  0.02 to 0.03 0.02 to 0.03 0.01 to 0.015 0.01 to 0.015	Treat when populations exceed 3 hoppers per square yard and are causing excessive (greater than 50%) defoliation.
<b>Green June beetle larvae</b>	Sevin 80S Sevin XLR Plus, 4F	1.875 lb. 1.5 qt.	1.5 1.5	Treat before planting if populations average 1 or more grub per square yard. Apply to infested pastures before seeding small grains. <b>Sevin</b> is not registered for use on barley, oats or rye.
<b>Chinch bug</b>	Baythroid XL Mustang MAX 0.8E Karate Zeon 2.08CS Silencer, Lambda (others) 1.0 Declare, Prolex 1.25 Proaxis 0.5	2.4 fl. oz. 4.0 fl. oz. 1.92 fl. oz. 3.84 fl. oz. 1.54 fl. oz. 3.84 fl. oz.	0.019 0.025 0.03 0.03 0.015 0.015	Gaucho and Cruiser seed treatments may provide control for a few weeks after planting. Chinch bugs are difficult to control in headed wheat.
<b>Hessian fly</b>	<u>Seed Treatments</u> Gaucho, Attendant 600  Gaucho XT plus Gaucho 600  Cruiser 5FS  CruiserMaxx Cereals plus Cruiser 5FS  <u>Foliar application</u> Karate Zeon, similar products 2.08CS	1.6 fl. oz./100 lb. seed  3.4 fl. oz./100 lb. seed 0.8 fl. oz./100 lb. seed  1.33 fl oz./100 lb. seed  5.0 fl oz./100 lb. seed 1.0 fl oz./100 lb. seed  1.92 fl oz/acre	0.06 lb./100 lb. seed  0.06 lb./100 lb. seed  0.06 lb./100 lb. seed  0.07 lb./100 lb. seed  0.03	Consider use on susceptible varieties. Systemic seed treatments, <b>Gaucho</b> and <b>Cruiser</b> , need highest rates for effective suppression. Gaucho XT alone may not provide good control.  <b>NOTE:</b> Di-Syston 15G and 8E are no longer labeled for use on wheat.  <b>NOTE:</b> Apply Karate when adults are actively laying eggs. Apply based on egg sampling for best results.
<b>Mites, Winter grain mite</b>	Methyl 4EC Pennacp-M  Mustang MAX  Karate Zeon 2.08CS	1 to 1.5 pt. 2 to 3 pt.  4.0 fl. oz  1.92 fl. oz.	0.5 to 0.75 0.5 to 0.75  0.025  0.03	<b>NOTE:</b> Karate for suppression only.
<b>Stink bugs</b>	Baythroid XL Methyl 4EC Pennacp-M  Mustang MAX 0.8E  Karate Zeon 2.08CS Silencer, Lambda (others) 1.0 Declare, Prolex 1.25 Proaxis 0.5	1.8 to 2.4 fl. oz. 1 to 1.5 pt. 2 to 3 pt.  3.2 to 4.0 fl. oz.  1.28 to 1.92 fl. oz. 2.6 to 3.84 fl. oz. 1.02 to 1.54 fl. oz. 3.2 fl. oz.	0.014 to 0.019 0.5 to 0.75 0.5 to 0.75  0.02 to 0.025  0.02 to 0.03 0.02 to 0.03 0.01 to 0.015 0.0125	
Abbreviations used are: G = granules, S = sprayable, L = liquid, SP = soluble powder, CS = concentrated solution, LV = low volume, W = wettable powder, EC = emulsifiable concentrate.				

Table 21. Forage, feed, and grazing restrictions for wheat insecticides.

Insecticide	Brand Name	Days From Last Application To:		Restricted Entry Interval (hr)	Maximum Amount Allowed Per Acre Per Crop	Precautions
		Harvest	Grazing			
beta-cyfluthrin	Baythroid XL (1.0EC), generics	30	7	12	4.8 fl. oz. or 2 applications	
carbaryl	Sevin	21	7	12	3 lbs. ai	Do not use within 21 days of harvest for straw.
dimethoate	Dimethoate, generics	35	14	48	2 applications	
imidacloprid	Gaicho, Attendant	45	45	12	Seed treatment	Gaicho XT formulation also contains Raxil & Apron fungicides.
lambda-cyhalothrin	Karate Zeon, Silencer others	30	7	24	0.06 lb ai.	Same active ingredient as gamma-cyhalothrin
gamma-cyhalothrin	Prolix (1.25) Proaxis (0.5)	30	7	24	0.19 pt. 0.48 pt.	Same active ingredient as lambda-cyhalothrin
malathion	Malathion	7	7	12	Not listed	Apply as needed.
methomyl	Lannate	7	10	48	1.8 lbs. ai	Maximum of 4 applications per crop.
methyl parathion	Methyl 4EC, Methyl parathion, PennCap-M	15	15	96	4EC: 3 pts. PennCap-M: 6 pts.	May be less effective under cool weather conditions. Use appropriate protective equipment.
spinosad	Tracer 4SC	21	14	4	9 fl. oz.	
thiamethoxam	Cruiser 5FS	-	-	12	Seed treatment	See label for crop plant-back restrictions.
zeta-cypermethrin	Mustang MAX (0.8EC)	14	14	12	21.5 fl. oz.	Do not make applications less than 14 days apart.