

Chapter 8

Wheat Insect Management and Control



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Because wheat is a winter crop in Arkansas, the insects that attack wheat generally occur in fall and spring. In the fall, the primary insects of concern are aphids, fall armyworms and the initial infestation of Hessian fly. The Hessian fly will develop during periods of warmer weather in winter and can be more troublesome in areas where wheat is produced every year and on the more susceptible varieties. The true armyworm and aphids are the greatest concern in the spring. Armyworms are a problem in the state in late May and early June. Infestations of armyworms can reach high levels in some years, and fields should be scouted during this time period.

Armyworms

Fall armyworms (Figure 8-1) can be a problem in seedling plants in the fall. Fall armyworms feed on the young plants and eat the plants to the ground, causing a loss of stand. Damage of this type can occur from plant emergence until a hard frost or freeze eliminates the threat of armyworms. Wheat will usually recover from moderate fall armyworm damage. An infestation level of six worms per square foot will justify treatment. A one foot by one foot square constructed from PVC pipe is easy to make and can be used as a sampling aid. Insecticides



Figure 8-1. Fall armyworm.

Photo by Scott Akin, UA Division of Agriculture

should be applied when temperatures are warm, as most of the recommended materials have limited activity below 60°F.

In the spring, true armyworms (Figure 8-2) become a threat at about the time that heading starts to occur. Wheat is very attractive to armyworms, and thick, vigorously growing fields can attract high infestations. Scouting of fields for



Figure 8-2. True armyworm.

Photo by Glenn Studebaker, UA Division of Agriculture

armyworm infestations should occur in the spring when wheat starts to grow vigorously. Before milk stage, an application should be considered if most leaves are destroyed and more than 20 larvae per square foot are observed in the panicles. Occasionally, armyworms will move up from leaf feeding and cut the wheat heads from the plant stem when wheat begins to mature. Since this type of damage can have serious consequences on yield, close field observations are recommended at beginning maturity. Treatment should be made if larvae are present and head cutting is occurring after wheat has reached milk/soft dough stage.

Armyworm Control Recommendations

Armyworms can be controlled using registered insecticides (see Table 8-1 below). The best time to apply an insecticide would be late afternoon since armyworms feed primarily at night.

Aphids

Wheat in the Mid-South is attacked by four species of aphids. These include the greenbug, English grain aphid, bird cherry-oat aphid and the corn leaf aphid (Figure 8-3). All of these aphid species may occur in wheat fields at any time during the production season. In addition to wheat, these aphids attack a wide range of grass hosts, including other small grain crops. Most aphids that occur on wheat can transmit the Barley Yellow Dwarf Virus (BYDV) (also see Chapter 7, *Wheat Diseases*). Preventing

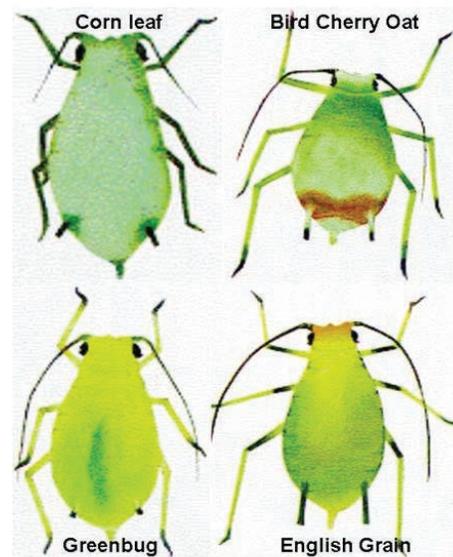


Figure 8-3. Identification of aphids in wheat.

Table 8-1. Insecticides for control of armyworm in wheat.

Insecticide	Formulation/acre	Lb ai/acre	Acres/gallon	Minimum days last application to:	
				Harvest	Grazing
<i>beta</i> -cyfluthrin (R) Baythroid XL 1 EC	1.0-1.8 oz	0.008-0.014	71-128	30	3
carbaryl Sevin 80 S Sevin XLR	1.25-2.5 lb 1-2 qt	1.0-2.0	2.0-4.0	48	14
<i>gamma</i> -cyhalothrin (R) Declare 1.25 CS Proaxis 0.5 CS	1.02-1.54 oz 2.56-3.84 oz	0.01-0.015	83-125.5 33.3-50	30	
<i>lambda</i> -cyhalothrin (R) Karate Z 2.08 CS (generics available)	1.28-1.92 oz	0.02-0.03	66.7-100	30	7
methomyl (R) Lannate 2.4 LV	0.75-1.5 pt	0.22-0.45	5.3-10.6	7	10
spinosad Blackhawk	1.67-3.3 oz	0.038-0.075		21	when spray has dried
<i>zeta</i> -cypermethrin (R) Mustang Maxx/Respect	1.76-4.0 oz	0.011-0.025	32-72.7	14	14

(R) = Restricted-use insecticide

transmission of BYDV (Figure 8-4) by controlling aphids is difficult to achieve using insecticides. The most effective method of controlling BYDV is avoidance of early-planted wheat. Later planting dates allow infected summer hosts to die before wheat emerges, reducing chances of aphid transmission.



Figure 8-4. Barley yellow dwarf virus symptoms.
Photo by Gus Lorenz, UA Division of Agriculture

Greenbugs

The greenbug is a pale green aphid (Figure 8-5). When greenbugs are about half grown, they develop a dark line down the middle of the back. This is an internal marking rather than a surface stripe and is a reliable identification characteristic for non-winged forms. In the winged forms the head is brownish-yellow and there are blackish lobes on the back of the thorax. The medial vein of the forewing has one branch, whereas it has two branches in the forewing of the apple grain aphid, English grain aphid and the corn leaf aphid.



Figure 8-5. Greenbugs.
Photo by Gus Lorenz, UA Division of Agriculture

Greenbugs are a serious threat to wheat from planting through early spring. Greenbugs inject a toxin when they feed that causes distinct damage symptoms on the leaves. Affected leaves will turn yellow and develop chlorotic spots. Heavy infestations can even kill plants. Greenbug damage symptoms are usually not uniform, occurring instead in spots scattered across the field. It is typical for greenbugs to be higher in number on sandy knolls or higher places in the field. Heavily infested plants observed from a distance may appear similar to plants under drought or flooding stress. Yellow areas within wheat fields could also be the result of “wet-feet,” poor nutrition or other conditions. Therefore, when yellow spots are observed, the field should be scouted further to determine the cause of the problem.

During warm weather, beneficial insects such as lady beetles and parasitic wasps and flies have some effect in maintaining greenbug populations in check. However, the activity of beneficial insects is slowed or may cease when temperatures cool below 60°F, while greenbug activity may continue until temperatures drop below 45°F. For this reason, periodic scouting of wheat fields is necessary to determine the need for control of greenbug.

Field scouting for greenbug infestations should occur weekly from emergence until cold weather (temperatures below 45°F) is occurring regularly. As spring temperatures start to exceed 45°F, weekly scouting should resume. Table 8-2 lists the guidelines on suggested treatment levels for greenbugs. Greenbug infestations typically begin on the undersides of the lowest leaves in the spring. For drilled wheat, whole plant examination of every plant in a 1-2 foot section of row at several points throughout the field should be used to determine infestation levels. For broadcast-planted wheat, sample on a square foot basis and double the treatment levels given for linear feet. When treatment is required, treat during warmer periods (above 50°F) to receive the greatest activity from the insecticide.

Table 8-2. Treatment thresholds for greenbugs in wheat.

Aphids Per Linear Foot	Plant Height	Time in Season
50	4-6 inches	Fall and early spring
200	6-10 inches	mid-March
300	18-20 inches	mid-April
800	30+ inches	mid-May

Bird Cherry-Oat Aphid

The bird cherry-oat aphid is one of the most common aphids found in Arkansas wheat. This aphid is relatively easy to identify in the field. The bird cherry-oat aphid is about $\frac{1}{16}$ inch long. The body is usually olive green but may vary from nearly black to a pale green. A reddish-orange patch or band occurs at the tail of the insect between and at the base of the cornicles (Figure 8-6). This is the most distinguishing characteristic for identification purposes. The legs and cornicles are pale green with black tips.



Figure 8-6.
Bird cherry-oat aphids.

Photo by Gus Lorenz, UA Division of Agriculture

The aphid gives birth to live young, and the life cycle is typical of aphids. The bird cherry-oat aphid does not inject a toxin into the plant and thus does not cause injury to the plant. Damage seldom occurs directly from feeding by this insect, and plants tolerate high populations without losses. The more pressing concern with bird cherry-oat aphid is its potential to vector BYDV. Treatment for bird cherry-oat aphid is seldom required.

English Grain Aphid

The English grain aphid is slightly larger than other aphids. The body is usually green or yellow-green, but occasionally is orange or brown in coloration. The antennae and cornicles are black, and the legs are green with black bands.

The English grain aphid overwinters in heavy growth of cultivated or volunteer oats, rye or wheat. The overwintering forms are all females,

and as the weather warms, they begin giving birth to live young. The female reproduces as temperatures warm and may produce high numbers of aphids. They feed during the early spring on the growing wheat plant, sucking the sap from leaves and stems. Leaf feeding by the English grain aphid does not cause yellowing of the leaves. As the wheat starts to head, many of the aphids may move up the stem into the grain heads. The English grain aphid feeding on wheat and other small grains damages the crop primarily when heads begin to form. Feeding on the head causes shriveling and shrinking of the newly formed grain, while feeding on the foliage doesn't cause any significant damage to the plant. Scouting for English grain aphids should begin at early boot stage, with treatment recommended if infestation levels reach an average of 25 aphids per head.

Corn Leaf Aphid

The corn leaf aphid is about $\frac{1}{16}$ inch long. The body is greenish-blue with darker spots surrounding the base of the cornicles. The cornicles are short and broad with a dark spot at the base. The legs and cornicles are black.

Corn leaf aphid is common, but it seldom requires treatment. The corn leaf aphid reproduces rapidly, and large numbers are common in some years. Sometimes they cover entire leaves. Both winged and wingless forms are found, with winged forms observed more often when populations are high. Corn leaf aphids persist in the fall until they are killed by a heavy frost and in the spring until their food plants dry up. Large numbers can be tolerated on small grains and grain sorghum without loss in yield, and treatment is seldom recommended.

Aphid Control Recommendations

Insecticide applications should be made only when aphids reach treatment levels. Heavy rainfall and natural parasitism can significantly reduce aphid populations, so these factors should be considered before making insecticide applications (see Table 8-3).

Grasshoppers

Grasshoppers occasionally feed upon the borders of wheat fields. Damage to fields is usually restricted to small areas, so spot spraying may be sufficient to control populations. See Table 8-4 for a list of insecticides to control grasshoppers.

Table 8-3. Insecticides for control of greenbug and other aphids in wheat.

Insecticide	Formulation/acre	Lb ai/acre	Acres/gallon	Minimum days last application to:	
				Harvest	Grazing
dimethoate Dimethoate 4E	0.75 pt	0.375	10.6	35	14
malathion Fyfanon 5 lb (generics available)	1.5 pt	1.0	5.3	7	7
methomyl (R) Lannate 2.4 LV	0.75-1.5 pt	0.225-0.45	5.3-10.6	7	10
<i>beta</i> -cyfluthrin (R) Baythroid XL 1 EC	1.0-1.8 oz	0.008-0.014	71-128	30	3
<i>gamma</i> -cyhalothrin (R) Declare 1.25 CS Proaxis 0.5 CS	1.02-1.54 oz 2.56-3.84 oz	0.01-0.015	83-125.5 33.3-50	30	
<i>lambda</i> -cyhalothrin (R) Karate Z 2.08 CS (generics available)	1.28-1.92 oz	0.02-0.03	66.7-100	30	7
sulfoxaflor (R) Transform 50 WG	0.75 oz	0.023		14	7
<i>zeta</i> -cypermethrin (R) Mustang Maxx/Respect	3.2-4.0 oz	0.02-0.025	32-40	14	14

(R) = Restricted-use insecticide

Table 8-4. Insecticides for control of grasshoppers in wheat.

Insecticide	Formulation/acre	Lb ai/acre	Acres/gallon	Minimum days last application to:	
				Harvest	Grazing
<i>beta</i> -cyfluthrin (R) Baythroid XL 1 EC	1.8-2.4 oz	0.014-0.019	53.3-71	30	3
dimethoate Dimethoate 4E	0.75 pt	0.375	10.7	35	14
<i>gamma</i> -cyhalothrin (R) Declare 1.25 CS Proaxis 0.5 CS	1.02-1.54 oz 2.56-3.84 oz	0.01-0.015	83-125.5 33.3-50	30	
<i>lambda</i> -cyhalothrin (R) Karate Z 2.08 CS (generics available)	1.28-1.92 oz	0.02-0.03	66.7-100	30	7
malathion Fyfanon 5 lb (generics available)	1.6 pt	1.0	5	7	7
<i>zeta</i> -cypermethrin (R) Mustang Maxx/Respect	3.2-4.0 oz	0.02-0.025	32-40	14	14

(R) = Restricted-use insecticide

Hessian Fly

The Hessian fly, *Mayetiola destructor*, can be a major limiting factor for wheat production throughout the southern United States. Wheat is the primary host of the Hessian fly, but it also will infest triticale, barley and rye. Hessian fly does not attack oats but can develop on some non-cultivated grasses such as little barley and wild rye.

Adult Hessian flies are small black flies about the size of a mosquito (Figure 8-7). Adults live for about two days. After mating, females lay about 200 eggs in the grooves of the upperside of wheat leaves. Eggs are orange-red, 1/2 inch long and hatch in three to five days. Newly hatched larvae are reddish in color and move down the leaf groove beyond the leaf sheath to the stem where they begin to feed at the base of the leaf. Maggots become white after the first molt and appear greenish-white when fully grown (Figure 8-8). After approximately 14 days in the larval stage, maggots molt into a resting stage, or pupa. The pupa is often referred to as the “flaxseed” stage because it resembles seeds of flax (Figure 8-9). The entire life cycle requires about 35 days at 70°F. Newly hatched larvae are exposed on the leaf surface and are susceptible to adverse disease and weather conditions. Once larvae move into the stem base they are protected from natural enemies and the environment.

Hessian fly maggots suck sap and stunt tillers, possibly by injecting a toxin into the plant. Feeding by a single larva for several days is sufficient to completely stunt or kill a vegetative tiller. Stunted vegetative tillers are dark green, do not



Figure 8-7. Hessian fly adult.

Photo by Scott Bauer, USDA Agricultural Research Service, Bugwood.org



Figure 8-8. Hessian fly maggot and pupa.

Photo by Reggie Talley, UA Division of Agriculture



Figure 8-9. Hessian fly pupae, “flaxseed.”

Photo by Jason Kelley, UA Division of Agriculture

elongate or produce new leaves, and usually die after the maggots pupate. Infested jointed stems are shorter and are weakened at the joint where feeding has occurred. Grain filling of infested stems is reduced, and damaged stems often lodge before harvest.

The Hessian fly is a cool-season insect that can function normally at temperatures as low as 38°F. Hessian flies spend the summer as pupae (flaxseed) in wheat stubble; therefore, burying stubble can reduce fall populations. The number of generations during the year is governed largely by temperature. Three to four generations occur per season in Arkansas. Adults emerge from over-summered pupae with the first cool rains of fall, often before wheat has been planted. Consequently, the first generation often develops entirely on volunteer small grains and weed hosts. A second and sometimes a third generation occur

in late fall and winter, and one to two generations develop in the spring. The fall and winter generations may stunt and kill seedlings and vegetative tillers. The spring generation infests jointed stems during or after head emergence.

While Hessian fly-resistant varieties of wheat are available in some areas, they are often not effective against the biotypes of Hessian fly that occur in Arkansas. Crop rotation, destruction of volunteer wheat and tillage that buries wheat stubble will help reduce Hessian fly infestations in susceptible varieties.

The best method to reduce injury and damage by the Hessian fly is to delay planting. While there is no true “fly-free” date in Arkansas due to our warm climate, wheat planted after October 10 generally has substantially lower infestations of Hessian fly, while wheat that is planted in mid to late September is very susceptible. The later in the fall that wheat is planted, the safer the crop is from the threat of Hessian fly infestation, particularly in northern Arkansas. Delayed planting to reduce Hessian fly occurrence is less effective in southern Arkansas where typical winter temperatures do not limit Hessian fly activity. When choosing a planting date, the risk of Hessian fly infestation must be weighed against the threat of wet weather that can prevent the planting of the crop. Other cultural control methods include burning wheat stubble and disking it under, as well as destroying volunteer wheat. Foliar applications of insecticides in the winter and spring are not effective for Hessian fly control. When planting early, consider using an insecticidal seed treatment for Hessian fly suppression.

Table 8-5. Insecticide seed treatments for Hessian fly suppression in early plantings.

Insecticide	Formulation/ 100 lbs seed	Minimum days last application to grazing
clothianidin Nipsit Inside 5 FS	1.79 oz	
imidacloprid Gaucho 600 F Axxess 5 F Senator 5 FS	1.2-2.4 oz 1.2-2.4 oz 1.2-2.4 oz	45
thiamethoxam Cruiser 5 FS	0.75-1.33 oz	

Cereal Leaf Beetle

The cereal leaf beetle, which is native to Europe, was first found in the United States in 1962 in southern Michigan and first found in Arkansas in 1995. The adult beetle (Figure 8-10) is about $\frac{3}{16}$ inch long, metallic blue-black in color with red legs and a red pronotum (“neck”). The female is generally larger than the male. Adults begin to emerge in late March to early April from overwintering habitats, which include crop remnants, field trash, grain stubble and corn plants. After mating, females deposit eggs on the upper surface of wheat leaves. The long, cylindrical eggs are yellow and turn darker as they mature. The eggs hatch in three to seven days. The newly hatched larvae are pale yellow with a brownish-black head and legs. The larvae characteristically cover their body with fecal material and appear black and slug-like in the field (Figure 8-11). The larval stage lasts three to four weeks, and the pupal stage lasts 7 to 14 days depending on the temperature.

Adults and larvae feed on the leaves of the plant, removing long narrow strips of tissue between the veins. This damage appears similar to that caused by rice water weevil adults in rice



Figure 8-10. Cereal leaf beetle adult.

Photo by Kansas Department of Agriculture Archive, Bugwood.org



Figure 8-11. Cereal leaf beetle.

Photo by Christina Difonzo, Michigan State University Department of Entomology

except the strip is slightly larger. Fields with heavy damage have a white frosted appearance. Cereal leaf beetle adults and larvae damage oats, wheat, barley, rye, corn and grasses. Oats are the preferred host, with plant maturity playing an important part in attractiveness and susceptibility.

Cereal Leaf Beetle Control Recommendations

Adults and larvae can easily be detected in the field by visual examination. The population of cereal leaf beetles can be estimated by randomly

selecting 20 stems from five locations in the field. At each location, examine the flag leaves for the beetle adults and larvae and count the number of each. The economic threshold for cereal leaf beetle is one larva or adult per plant. See Table 8-6 below for a list of insecticides to use for control of cereal leaf beetle in wheat.

See also Extension publication MP144, *Insecticide Recommendations for Arkansas* (<http://www.uaex.edu/publications/mp-144.aspx>), for currently recommended insecticides for pests of wheat and other crops.

Table 8-6. Insecticides for control of cereal leaf beetle in wheat.

Insecticide	Formulation/acre	Lb ai/acre	Acres/gallon	Minimum days last application to:	
				Harvest	Grazing
<i>beta</i> -cyfluthrin (R) Baythroid XL 1 EC	1.0-1.8 oz	0.008-0.014	71-128	30	3
<i>gamma</i> -cyhalothrin (R) Declare 1.25 CS Proaxis 0.5 CS	1.02-1.54 oz 2.56-3.84 oz	0.01-0.015	83-125.5 33.3-50	30	
<i>lambda</i> -cyhalothrin (R) Karate Z 2.08 CS (generics available)	1.28-1.92 oz	0.02-0.03	66.7-100	30	7
methomyl (R) Lannate 2.4 LV	0.75-1.5 pt	0.22-0.45	5.3-10.7	7	10
<i>zeta</i> -cypermethrin (R) Mustang Maxx/Respect	1.76-4.0 oz	0.011-0.025	32-72.7	14	14

(R) = Restricted-use insecticide