DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

Agriculture and Natural Resources

Wheat Production Series

Wheat Insect Management and Control

Glenn E. Studebaker
Assistant Professor/
Extension Entomologist

Tim Kring
Professor/Research
Entomologist

Gus Lorenz
Professor/Extension IPM
Coordinator/Extension
Entomologist

Jeremy Greene
Assistant Professor/
Extension Entomologist

The primary insects which may cause economic losses in wheat are fall armyworms, true armyworms, greenbugs and Hessian fly.

Armyworms

Fall – During the early growing season, fall armyworms cause a problem by feeding on seedling plants. They may eat small plants to the ground, causing a loss of stand. Damage of this type may occur from emergence until a hard frost or freeze eliminates the threat of armyworms. Wheat will recover from moderate fall armyworm damage if moisture is adequate and the wheat has a 4-inch shoot left following the attack. The treatment threshold of five to six worms per square foot will justify treatment and should increase yield more than the 1 or 2 bushels per acre required to pay for the treatment. Treat only during the warmer part of the day; most of the recommended materials have limited activity below 60°F.

Spring – True armyworms are a threat in the spring about the time heading starts to occur. Wheat is less attractive than some of the other small grains, but thick, vigorously growing fields can attract heavy infestations. Occasionally when wheat starts to mature, armyworms will move up from leaf feeding and cut the wheat heads from the plant stems. Because this type of damage can have such serious consequences on yield, close field observations are required. Treatment should be made if head cutting is beginning to occur and armyworms are present.

Scouting fields for armyworm infestations should occur weekly from planting until a hard freeze occurs and resume in the spring after wheat starts vigorous growth.

Control Recommendations

The armyworm may be controlled using several insecticides listed in Table 1. Field tests on the

Table 1. Control of Armyworms and Army Cutworms in Wheat

Insecticide	Formulation Per Acre	Acres Per Gallon	Minimum Days to Harvest	Grazing
Methyl Parathion 4 EC	1 pt	8	15	15
Penncap M 2E	1 qt	4	15	15
Sevin 80S	1 1/4 - 1 7/8 lb		21	7
Sevin XLR	1 - 1 1/2 qt	2.7 - 4	21	7
Lannate 2.4 LV	3/4 - 1 1/2 pt	5.3 - 10.6	7	10
Warrior T 1.0 EC	3.2 - 3.84 oz	33 - 40	30	7
Tracer 4E	1.5 - 3.0 oz	85-43	21	14 (forage or hay)
Mustang Max 0.8 EC	1.76 - 4.0 oz	32 - 72.7	14	14

Arkansas Is Our Campus

Visit our web site at:
https://www.uaex.uada.edu

Table 2. Control of True Armyworm in Wheat Using Various Insecticides in 1990*			
Insecticide	Dosage Rate Lb ai/A	Formulation Per Acre	No. Armyworms Per Square Foot[1]
Methyl Parathion	0.25	0.5 pt	2.25 b
Methyl Parathion	0.5	1.0 pt	1.75 b
Penncap M	0.25	1.0 pt	0.75 b
Penncap M	0.5	2.0 pt	0.75 b
Lannate L 1.8	0.338	1.5 pt	1.75 b
Lannate L 1.8	0.45	2.0 pt	1.75 b
Malathion 5#	1.25	2.0 pt	2.25 b
Asana XL 0.66	0.03	5.8 oz	2.5 b
Untreated			7.25 a

* Research sponsored by Arkansas Wheat Board.
[1] Means followed by same letter, not significantly different at 0.05 level of probability.

true armyworm indicate that all insecticides recommended provide good control (Table 2). The best time to apply insecticide would be late afternoon since the armyworm feeds primarily at night.

Greenbugs

During fall and early winter, and then again in late winter and early spring, greenbugs can seriously damage wheat.

The greenbug is a pale green aphid. When the young aphids become about half grown, they have a dark line down the middle of the back. This is an internal marking, not a surface stripe. The dark green marking or line on the back is a reliable identification characteristic for non-wing 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.

The yellowing of leaves caused by greenbug feeding on wheat is quite distinct. This is the result of toxin injected into the plants when aphids feed. Plants may later turn brown and die. Heavily infested plants observed from a distance appear similar to plants under drought stress. It is quite typical for greenbugs to be higher in number on sandy knolls or higher places in the field. These heavier infested areas cause the field to exhibit the symptoms in spots over the field. Keep in mind, however, that many of the yellow-looking areas within typical wheat fields in the Arkansas delta may be the result of "wet-feet," poor nutrition or other conditions.

During warm weather, beneficial insects, such as lady beetles and parasitic wasps and flies, have some effect in holding 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 reach 45°F. For this reason, biological control is not always dependable.

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 go above 45°F., weekly scouting should resume. It is quite common for greenbug infestations to first occur on the undersides of the lowest leaves, so whole plant examination should be used to determine infestations.

Treatment levels for greenbugs are as follows:

Number 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

For broadcast wheat, use a square foot measurement and double the numbers above.

When treatment is required, treat during warmer periods (above 50°F.) to maintain activity of insecticide.

Bird Cherry-Oat Aphid

The bird cherry-oat aphid is about 1/16 of an inch long. The body is usually olive green but may vary from nearly black to a pale green. A reddish-orange patch occurs at the tail of the insect that is between and at the base of the cornicles. The legs and cornicles are pale green with black tips.

The aphid gives birth to living young, and the life cycle is typical of aphids and similar to the greenbug.

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 from this insect, and plants tolerate high populations without losses. Treatment is seldom required.

Corn Leaf Aphid

The corn leaf aphid is about 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.

The corn leaf aphid reproduces rapidly, and large numbers are common some years. Sometimes they cover entire leaves. Both winged and wingless forms are found. The insects feed until they are killed by a heavy frost or until their food plants dry up.

Large numbers may be tolerated on small grains and grain sorghum without loss in yield. Treatment is seldom required.

Table 3. Control of Greenbug and Other Aphids in Wheat				
Insecticide	**Formulation Per Acre**	**Acres Per Gallon**	**Minimum Days to Harvest**	**Grazing**
Furadan 4F	1/2 pt	16	Apply before heads emerge from boot	Do not feed treated forage to live cattle
DiSyston 8	1/4 - 1/2 pt	16 - 32	30	Do not graze.
Dimethoate 4EC	3/4 pt	10.6	60	14
Fyfanon 5 pound (malathion)	1 1/2 - 2 pt	4 - 5.3	7	7
Methyl Parathion 4EC	1/2 - 1 pt	8 - 16	15	15
Warrior T 1.0 EC	2.56 - 3.84[1]	33.3 - 50	30	7
Lannate 2.4 LV	3/4 - 1 1/2 pt	5.3 - 10.6	7	10

* Do not apply after heads emerge and do not graze after treatment.

[1] Use higher rate against greenbugs anytime and when wheat has started to boot for other aphids.

Aphid Control Recommendations

Aphids may be controlled effectively using insecticides listed in Table 3.

Field tests on the greenbug and bird cherry-oat aphid demonstrate that most insecticides currently recommended give fair to excellent control (Table 4). The greenbug was controlled by most insecticides tested, but the bird cherry-oat aphid was more difficult to control. Fortunately, the bird cherry-oat aphid doesn't damage wheat unless extremely high numbers are present. On the other hand, the greenbug can damage wheat severely if populations are present, but control may be accomplished using most insecticides.

Insecticide applications should be applied when aphids reach treatment levels. Heavy rainfall and natural parasitism will significantly reduce aphid populations, so these factors should be considered before applying insecticide applications.

Aphids and BYD

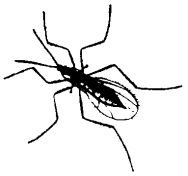
The bird cherry-oat aphid is the vector of the common strain of the Barley Yellow Dwarf Virus (BYD) in Arkansas. However, controlling aphids in order to prevent BYD is not an economical practice. Damaging BYD outbreaks occur approximately 1 out of 10 years. Therefore, in any given year, controlling the aphids that year will only give you at best a 10 percent chance of preventing BYD outbreaks with a significant potential to reduce yield. The most effective method of preventing BYD is to avoid planting early. Early plantings are at a much greater risk of developing BYD infections.

Grasshoppers

Grasshoppers may occasionally feed upon the borders of wheat fields. Damage to fields is usually restricted to small areas, so spot spraying may control populations. Control recommendations are listed in Table 5.

Hessian Fly

The Hessian fly, *Mayetiola destructor*, recently has become a major factor limiting 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, although rye generally is not damaged by the insect. Hessian fly does not attack oats but can develop on some grass weeds such as little barley and wild ryegrasses.



Adult hessian flies are small black flies about the size of a mosquito. Adults live for about two days, during which time they mate. Females lay about 200 eggs in the grooves of the upperside of wheat leaves. Eggs are orange-red, 1/32 inch long and hatch in three to five days. Newly hatched larvae move down the leaf groove beyond the leaf sheath to

Table 4. Control of Aphids Using Various Insecticides, 1990*		
	% Control	
Insecticide (Rate lb ai/A)	**Greenbug**	**Bird Cherry-Oat Aphid**
Cygon 400 (0.25)	97	59
Cygon 400 (0.375)	96	49
DiSyston 8E (0.5)	100	57
Lannate 1.8L (0.225)	93	74
Lannate 1.8L (0.45)	97	79
Penncap M (0.25)	94	66
Penncap M (0.5)	89	12
Furadan 4F (0.125)	74	59
Furadan 4F (0.25)	93	0
Methyl Parathion 4EL (0.5)	98	86
Malathion 5.1E (0.94)	100	79

*Research sponsored by Arkansas Wheat Board.

the stem where they begin to feed on the leaf base. Maggots become white after the first molt and appear greenish-white when fully grown. After approximately 14 days in the larval state, maggots molt into a resting (puparial) stage. The pupa is often referred to as the "flaxseed" stage because it resembles seeds of flax. 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, but once larvae move to the stem base they are protected from exposure.

Table 5. Control of Grasshoppers in Wheat

Insecticide	Formulation Per Acre	Acres Per Gallon	Minimum Days to Harvest	Grazing
Furadan 4F	1/4 - 1/2 pt	16 - 32	*	*
Sevin 80S	0.6 - 1.87 lb		21	7
Sevin XLR	1 - 3 pt	2.7 - 8	21	7
Dimethoate 4.0	3/4 pt	10.7	60	14
Fyfanon 5 lb	2 pt	4	7	7
Warrior T 1.0 EC	2.56 - 3.84 oz	33.3 - 50	30	7
Methyl Parathion 4 EC	1 pt	8	15	15
Mustang Max 0.8 EC	3.2 - 4.0 oz	40 - 32	14	14

*Do not apply after heads emerge and do not graze after treatment.

Maggots suck sap and stunt tillers, presumably 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 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. The insect oversummers as puparia (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 oversummered flaxseed with the first cool rains of fall, often before wheat has been planted. Consequently, the first generation often develops entirely in volunteer small grains and weed hosts. A second and sometimes a third generation occurs 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.

The most effective method for controlling the Hessian fly is use of a resistant variety. Unfortunately, most wheat varieties grown in the South are not resistant to this insect. Crop rotation, destruction of volunteer wheat and tillage that buries wheat stubble will help reduce Hessian fly infestations in susceptible varieties.

Damage may be reduced in the fall by delaying planting until adult activity has decreased. The preferred planting date occurs later as you go from north to south Arkansas. Spring populations generally are not affected by planting date. Avoid planting prior to October 1 in north Arkansas and October 10 in south Arkansas. A fly-free planting date probably does not exist in southern Arkansas where winter temperatures do not limit Hessian fly activity.

The Hessian fly also can be controlled in susceptible wheat during the fall by using a systemic granular insecticide applied in-furrow at planting. This treatment, as effective as it is, will not prevent reinfestation by subsequent generations during the winter and spring. Further, the incidence of this pest is generally low, so treatments would not be recommended unless risk factors are high (early planted field with significant volunteer wheat in field). Studies have shown that foliar applications of insecticides in the spring for Hessian fly control are not effective.

Printed by University of Arkansas Cooperative Extension Service Printing Services.

GLENN E. STUDEBAKER is assistant professor/Extension entomologist, Northeast Research and Extension Center, Keiser. **DR. GUS LORENZ** is professor/Extension IPM coordinator/Extension entomologist, Cooperative Extension Service, Little Rock. **DR. JEREMY GREENE** is assistant professor/Extension entomologist, Southeast Research and Extension Center, Monticello. **TIM KRING** is professor/research entomologist, University of Arkansas - Fayetteville. All are with the University of Arkansas Division of Agriculture.

FSA7016-PD-11-04RV

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Director, Cooperative Extension Service, University of Arkansas. The Arkansas Cooperative Extension Service offers its programs to all eligible persons regardless of race, color, national origin, religion, gender, age, disability, marital or veteran status, or any other legally protected status, and is an Equal Opportunity Employer.