

AGRICULTURAL GUIDE

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Sorghum
Pest Control

Sorghum aphid pest management

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Three species of aphids commonly are found on grain and forage sorghums in Missouri. One species, commonly known as "greenbug," has been the most consistently damaging species since its introduction to Missouri in 1969.

Descriptions and Life Histories

Greenbugs are light greenish-yellow aphids with a narrow, darker green streak down the center of the abdomen (back). Antennae, eyes, tarsi (feet) and the tips of cornicles are black (see illustrations). All remaining parts of body, legs and cornicles are greenish-yellow.


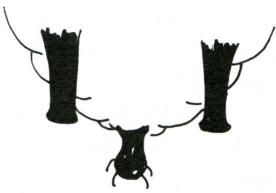


Both winged and wingless forms occur within the same colony. You can distinguish winged forms of greenbugs from other winged aphid species by the single fork of the median vein of the fore wings (see illustrations). The strain of greenbugs attacking sorghums differs from other aphids by their ability to reproduce at relatively high temperatures.

Greenbugs give birth to living young. A female may produce from 50 to 80 offspring within her three to four week life span. These newly born greenbugs may complete their growth and development within one to three weeks depending on the temperature. Upon reaching the adult stage, females begin reproducing; this explains how high populations develop in a short period of time. There may be 10 to 15 generations per year on sorghums in Missouri.

Winged forms develop under crowded and droughty conditions or upon maturity of the host plant. Winged forms may be dispersed many miles by flight and prevailing winds.

Corn Leaf Aphids are greenish-blue in color. Antennae and all of the legs and cornicles are black (see illustrations). These aphids usually are found in the whorls and on the tops of newly emerged leaves of sorghum plants. The life cycle of corn leaf aphids is similar to that of greenbugs.

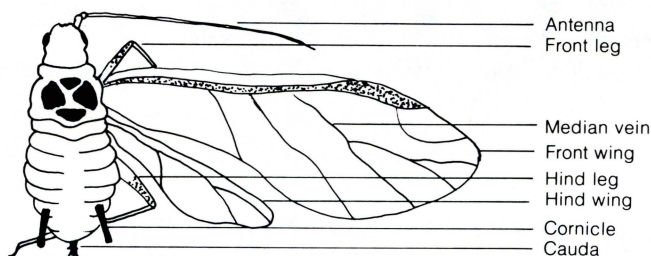
Yellow Sugarcane Aphids, as the name implies, are lemon yellow in color. These aphids are slightly

GREENBUG	CORN LEAF APHID
	
Only tips of cornicles are black.	Cornicles are completely black.
Wingless Aphids: Body is greenish-yellow with a dark green stripe down center of back; tips of leg segments, tips of cornicles and most of antennae are black.	Wingless Aphids: Body is bluish-green; all of legs, cornicles and antennae are black.
Winged Aphids: Body is green and brown; median vein in front wings is one-forked; legs, cornicles and antennae are same as above.	Winged Aphids: Body is green and black; median vein in front wings is two-forked; legs, cornicles and antennae are same as above.
	

Illustrations are redesigned from a drawing by Horace W. Van Cleave, Assistant Professor, Department of Entomology, Texas A&M University.

Descriptions of greenbugs and corn leaf aphids

Parts of the aphid's body



larger than the previous two species. Their bodies are slightly oval (nearly round) and covered with setae (hairs) and two double rows of tubercles (small raised spots bearing setae) down each side of the back. This aphid's life cycle, in general, is similar to the greenbug's, but detailed biological data and host preferences are not well known.

Damage

All aphids have piercing, sucking mouth parts which they use to suck juices from plant tissue.

Greenbugs and yellow sugarcane aphids inject a toxin along with saliva into plant tissue, causing a yellowish spot to develop around the point of feeding. Such damaged tissue quickly results in a reddish color on the leaf surface. These reddish areas gradually enlarge as the aphid colonies on the underside of leaves increase in numbers. Eventually, feeding causes the leaves to start browning at the outer edges and ultimately to die.

Seedling sorghums, struggling for survival under abnormal growing conditions, may be killed by *as few as 10 or more* greenbugs or yellow sugarcane aphids per plant. Under adequate growing conditions, larger plants can tolerate more greenbugs (to a point) than smaller plants without a stand or yield reduction. (See economic thresholds under insecticidal control.)

Corn leaf aphids also suck sap from leaves, but these aphids do not inject a toxin. Therefore, corn leaf aphid feeding does not result in discolored or dying tissue or foliage. Under severe drought stress, heavy infestations may cause some reddish streaking of top leaves and failure of some heads to completely emerge from the boot.

All of the aphid species that are common to grain sorghum can act as vectors for the Maize Dwarf Mosaic Virus (MDMV). This virus can be a problem in fields in which Johnsongrass is abundant because the grass serves as the overwintering perennial host. The virus disease produces distinct mottling of leaf tissues. Infected leaves are yellow with light green islands. Red leaf symptoms occur in highly susceptible varieties in cool weather.

The symptoms are more easily seen on young

leaves than on older ones. When the plants reach the boot stage, symptoms become less apparent in the leaves, but stunting and poor filling of heads can result. Time of infection determines how much yield loss is likely to occur on susceptible hybrids. If plants are infected before reaching 45 days of age, losses are greater than if infection occurs later.

Control

Four methods of control can be used in the management of aphid infestations on sorghums. These are:

- time of planting,
- greenbug resistant or tolerant varieties,
- natural control by beneficial insects, and
- insecticides.

These management methods usually perform best when used in combination, but they may also be used separately.

Time of Planting. Sorghums are warm weather crops. Planting should be delayed until soil temperatures are about 60° F. These temperatures allow more rapid seed germination, seedling growth and root system establishment without the adversities associated with cool to cold weather.

Soil temperatures in Missouri usually reach this 60° F level during the last half of May or early June. Planting at this time does not reduce the maximum yield potential and may even increase yields. This suggested planting time corresponds with small grain ripening and peak migration of winged greenbugs from small grains to other hosts. Theoretically the majority of greenbugs will have moved to other hosts by the time seedlings emerge.

Because of the severity of sorghum midge and other head damaging pests in the southeastern area of the state, earlier planting may be best regardless of the risk of seedling greenbug infestation and other associated cool weather problems.

Resistant and Tolerant Varieties. Greenbugs have evolved over time and each change resulted in a new biotype. Greenbugs did not begin to attack grain in Missouri until 1969. That biotype was called Biotype "C."

Biotype "D" was a localized, insecticide-resistant (to Disyston) biotype which developed in the mid-1970s. After greenbug resistant sorghum hybrids were developed, wheat breeders began work to develop greenbug resistant wheat varieties. In 1979 or 1980, the wheat lines which had shown resistance to greenbug began to be destroyed by the new Biotype "E" greenbug. This biotype also could destroy grain sorghum hybrids which had shown resistance to Biotype "C" greenbugs.

Currently, a few grain sorghum hybrids show good resistance (even in the seedling stage) to Biotype "E" greenbugs. Undoubtedly, more hybrids with resistance will be developed in the future. This resistance involves both tolerance and antibiosis (an association between organisms which is injurious to one of these organisms).

Resistant varieties will be infested by any or all of the three sorghum aphids. The resistant hybrids tolerate the aphids better than susceptible hybrids. Often the rate of reproduction of aphids on the resistant hybrids is less than would be observed on susceptible hybrids and damage is usually less also. You should select hybrids carefully for their yield potential. As more hybrids with Biotype "E" greenbug resistance are developed and tested, yields from performance tests should show them to be equal to their susceptible counterparts.

In areas where grain sorghum will be planted in fields with known Johnsongrass infestations, be sure to select a virus tolerant hybrid. High yielding hybrids with tolerance to MDMV are available.

Natural Control by Beneficial Insects. Greenbug and other sorghum aphids are reduced in numbers by several predatory insects including lady beetles, damsel bugs, aphid lions, syrphid fly larvae and several species of parasitic wasps.

The adults and larvae of at least two species of lady beetles are the most common and probably the most beneficial of the predatory insects. The oval shaped bodies of the most common lady beetles have either dull red or deep orange colored wing covers with varying numbers of black spots or similar shaped black markings.

Lady beetle eggs are orange-yellow in color and are laid on end in small clusters usually on the underside of leaves. The larval stage is black with orange or yellow stripes across the back and, in general, has the shape of an alligator. The pupal stage of lady beetles is not enclosed within a cocoon; it is exposed on the leaf or stalk and firmly attached by the tip of the abdomen. Importing and releasing lady beetle adults in sorghum fields is of questionable value since only a low percentage remain within the field.

Syrphid flies are medium sized (about that of the house fly) with yellow bands across the body. These flies frequently are seen hovering around aphid in-

Economic thresholds for greenbugs in Missouri.

The economic threshold is the level of infestation which causes crop loss equal to the cost of control. These thresholds for greenbugs and yellow sugarcane aphids in Missouri are:

Growth Stage	Numbers	Damage
0-3 Leaves	10	Visible damage, yellowing or reddening of leaves
5 Leaves	50	Visible damage, same as above
8-10 Leaves	100	1 Dead leaf
Pre-boot	200	1-2 Dead leaves
Boot to head	500	2 Dead leaves
Head to Maturity	750	2-3 Dead leaves

*A colony is defined as usually closely crowded individuals representing the offspring of one parent.

festated plants. The sluglike larval or maggot stage, which is green, brown, gray or mottled in color, may be observed slowly undulating in search of aphids to feed upon.

The *damsel* or *nabid bug* is a long, dull tannish-gray sucking insect just slightly over ¼ inch in length when mature. Both nymphs and adults pierce aphids with their mouth parts and withdraw the liquid body contents. When forced, these predators also will bite humans.

The *aphis-lion*, which is the immature or larval stage of the *golden-eye* or *green lacewing*, is another good aphid predator. The mottled green and brown spindle shaped larva has a pair of long, curved mandibles (mouth parts) by which it pierces and removes the aphid's body contents.

The most important beneficial insects that attack sorghum aphids are several species of very small *parasitic wasps*. The female wasp deposits an egg within the body of an aphid. The wasp grub or larva feeds inside the body of the aphid causing the aphid to turn yellowish. As the larva grows, the aphid begins to swell to about twice its normal size and turns tannish-brown. The enlarged, parasitized aphid is called a "mummy." The grub pupates and changes to an adult within the mummy. The adult then cuts a circular opening in the aphid's back and emerges as a winged wasp.

When parasitism of greenbug populations reaches 10 to 20 percent, infestations usually collapse within a week. Normally, parasitism reaches these levels during the first ten days of August.

Maintaining populations of these predators and parasites within sorghum fields is important. If insecticidal control of greenbugs becomes necessary, select the insecticide least likely to kill a high percentage of the beneficial insects.

Insecticides. The extent of greenbug and yellow sugarcane aphid damage in grain or forage sorghums depends on aphid numbers, plant size or stage of growth, growing conditions and the presence or absence of beneficial insects. Growers should closely observe these factors before applying an aphid insecticide.

A logical approach to insecticidal control of greenbugs and yellow sugarcane aphids would be to reduce the level of infestation to its lowest possible economic level with a single application until natural controls take over. Even a properly timed application of an aphid insecticide produces varying results. Such an application sometimes produces a yield increase, but too often no appreciable yield increase occurs.

Using the suggested planting date should eliminate much of the seedling infestation problem as well as reduce the need for a planting time application of a granular systemic insecticide. The residual activity of a planting time application ranges from three to four weeks, thereby providing little or no control later when greenbug numbers increase rapidly. If one must plant early, a granular application at planting

time is a means of protecting seedlings to avoid replanting, but it will not provide full season control of sorghum aphids.

A single application of an insecticide most likely is needed during the summer increase in aphid numbers. This summer buildup of greenbugs usually occurs during late June and July. Naturally, any spray application should be made when the aphid damage and population reaches or approaches the economic threshold.

The economic threshold is the level of infestation which causes crop loss equal to the cost of control. See table for thresholds in Missouri.

Reinfestation of treated fields should not reach an economic threshold before natural controls take over, provided the initial application reduced the population at least 95 percent. To get this level of control, equip ground sprayers with drop nozzles directed to give coverage under lower leaves, and apply sufficient gallonage to give thorough coverage. Aerial application of maximum labeled gallonage should be made when temperatures are less than 95° F and when winds are less than 8 mph.

Insecticidal control of corn leaf aphids is rarely, if ever, needed. However, insecticides recommended for control of greenbugs also will control corn leaf aphids.

Since there may be periodic changes in registration and recommendations for use of sorghum aphid insecticides, please consult your local University of Missouri Extension Center for current recommendations.