Kansas State University Agricultural Experiment Station and Cooperative Extension Service

KANSAS CROP PESTS

K-STATE Research and Extension

Greenbug

The Greenbug

The greenbug, *Schizaphis graminum*, has been a serious pest of wheat on the High Plains for more than 100 years and began attacking Kansas sorghum in the late 1960s. Originally described from an 1852 outbreak in Bologna, Italy, and often assumed to be native to central Europe, its true geographic origin remains uncertain. Although the first damaging outbreaks on wheat in Kansas occurred in 1907, greenbugs may have gone unnoticed on wild grasses for many years. In fact, new biotypes have evolved to become problematic on cultivated turf grasses in recent decades. The feeding biology of greenbug is aggressive and damaging to host plants. Toxins present in greenbug saliva elicit pathological plant responses, resulting in the breakdown of tissues and severe chlorosis as the insect extracts the nitrogen required for its own growth and reproduction. Uncontrolled greenbug colonies can kill young plants quickly and severely reduce yields in mature plants.

Identification

Greenbugs are lime green aphids with a stripe of dark green running lengthwise down the back (Figure 1). Legs and cornicles ('tailpipes') are uniformly pale in color and the antennae are as long as, or longer than, the body. They prefer feeding on the underside of lower leaves (Figure 2) but may colonize upper leaf surfaces when plants become overrun with aphids. Feeding damage on wheat or sorghum begins as yellow spots that gradually turn red and coalesce into large, chlorotic lesions (Figure 3), finally killing leaves. Problems in seedling wheat may appear as yellowish or reddish-brown patches in the field where infested plants are dying. Flower sterility will result if greenbugs move into sorghum flowers after panicles emerge (Figure 4).

Figure 1. Closeup of greenbug nymphs.

Figure 2. Underside of a wheat leaf infested with greenbugs.

Figure. 3. Greenbug damage on sorghum.

Figure 4. Empty sorghum panicles from greenbug-induced flower sterility.

Life History and Behavior

Aphids have complex life cycles that involve the production of many different forms over the course of a single season (polyphenism). Thus aphids of the same species may either lay eggs or give live birth, be sexual or asexual and either winged or wingless, depending on the time of year they were produced and/or prevailing environmental conditions. Greenbug colonies are initiated by winged aphids (alates) landing on a suitable host plant and giving birth asexually to live nymphs, which develop exclusively into wingless, asexual females (apterae). Not only are all nymphs female, but females are essentially born pregnant, containing developing embryos at birth. As wingless individuals mature, they reproduce at a much faster rate than their winged mothers, and colony growth accelerates. Collectively, these biological traits enable exceptionally high reproduction rates. Colonies can grow exponentially, doubling every few days. This enables aphids to escape biological control and to kill plants or severely reduce yield. As aphids become crowded and the plant declines, nymphs develop wings. Once mature, they emigrate in search of another suitable host plant.

As a warm-season aphid, the greenbug is more tolerant of high temperatures than other cereal aphids, but it does not survive at temperatures above 95 °F (35 °C) and ceases to reproduce before this temperature is reached. In response to shorter days and cooler fall temperatures, sexual forms consisting of winged males and egg-laying females may be produced. Sexual forms and eggs generally survive poorly in Kansas, and no significant overwintering occurs much north of the Oklahoma border. Most infestations in commercial wheat and sorghum fields are initated by seasonal migrants from southern latitudes. In Oklahoma and Texas, greenbugs survive the winter in wheat fields without resorting to egg production. Asexual overwintering in southern Kansas may soon become possible as the climate continues to warm.

Management

Widespread greenbug outbreaks have largely disappeared from Kansas since the late 1990s, but isolated infestations may still arise, particularly in southern portions of the state. Although causal relationships are difficult to establish, cumulative changes in agricultural practices may have diminished the economic impact of greenbugs on the High Plains. For example, increased adoption of 'no-till' practices results in crop residues accumulating on the field surface, reducing the contrast between bare ground and young plants and making them less apparent to alate aphids. Depletion of groundwater in the Ogallala aquifer has led to reduced irrigation of wheat and sorghum fields in the Oklahoma and Texas panhandles, and the replacement of flood irrigation with more efficient delivery systems. (Flood irrigation favors aphid growth and reproduction by creating a cool microclimate under the plant canopy.)

Collectively, these changes appear to have reduced the numbers of winged migrants arriving to colonize wheat and sorghum in Kansas, such that natural biological control is normally sufficient to keep populations below economic thresholds. Consequently, when greenbugs are detected, it is important to note both the extent of the infestation and the numbers of natural enemies present. These include various lady beetle species, especially the convergent lady beetle, *Hippodamia convergens*, and the seven-spotted lady beetle, *Coccinella septempunctata*. Other important natural enemies contributing to control include predaceous larvae of green lacewings (Neuroptera: Chrysopidae) and the parasitic wasp *Lysiphlebus testaceipes*. Hover flies (Diptera: Syrphidae) are another important group of aphid predators, but aggressive weed control practices reduce their impact in commercial fields by depriving adult flies of the wildflowers they require as sources of pollen and nectar. More information on these insects is available in K-State Research and Extension publication MF2222, *Biological Control of Insect Pests on Field Crops in Kansas*.

If conditions favor greenbug populations, or inhibit the activities of their natural enemies, treatment with an insecticide may be justified. Usually, treatment can be limited to heavily affected portions of the field, limiting the cost and favoring the survival of beneficial insects in unsprayed portions. Insecticidal seed treatments will protect young plants for several weeks postemergence, but are not justified solely for greenbug protection. Although fall infestations of wheat have become relatively rare, they may still occur in southern parts of the state, and mild winters may lead to overwintering survival and outbreaks in early spring. Thresholds for treatment in wheat are generally expressed in numbers of greenbug per row foot, but must be balanced by plant size and the density of the stand. Seedlings and poor stands warrant treatment with 50 aphids per row foot; good stands with three or more tillers per plant require 100 to 300 aphids per row foot to justify treatment when plants are 3 to 6 inches tall, and 300 to 500 when plants are 6 to 10 inches tall. If threshold numbers are present, treatment should be applied without delay, but can usually be restricted to affected areas. Refer to the current K-State *Wheat Insect Management Guide* for a list of registered materials and application rates.

Problems are rare on seedling sorghum and can be prevented by planting insecticide-treated seed, although as in wheat, greenbug protection alone is not sufficient justification for such treatments. Most infestations become established in sorghum only as the crop approaches canopy closure, which provides a cooler microenvironment for aphid development and reproduction on the lower leaves. Until the early 2000s, all commercial sorghum hybrids were screened for resistance to the prevailing greenbug biotype virulent to sorghum (biotype I). Such tests are no longer conducted, but many current hybrids still express various levels of resistance to biotype I. Greenbug problems on sorghum also are diminished by infestations of corn leaf aphid prior to boot stage. Corn leaf aphids are not damaging to sorghum in vegetative stages even though they may reach large numbers, but rather attract and amplify aphid natural enemy populations before greenbug migrants arrive. Furthermore, the replacement of conventional corn with cultivars expressing the Bt toxin has resulted in reduced insecticide use in corn, and probably larger numbers of corn leaf aphid colonizing sorghum prior to greenbug migration. Thus, it is crucial that farmers do not mistake corn leaf aphids for greenbugs, as spraying them will kill natural enemies and create an opportunity for greenbugs to establish.

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