Barley Yellow Dwarf

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Barley yellow dwarf is a viral disease that attacks a wide range of grass hosts, including wheat, oats, and barley. Oats are usually considered more susceptible than wheat. Barley yellow dwarf is most frequently a serious problem in southeast Kansas, but the disease is rarely a serious issue in northwest Kansas. The occurrence of barley yellow dwarf is sporadic in other areas of the state.

Quick Facts

- Symptoms of barley yellow dwarf include stunting and yellow or red discoloration of the leaf tips. The discolored leaves often have dark flecks within the affected area. The disease usually occurs in patches that are 1 to 5 feet in diameter with stunting most severe near the center of the patch.
- Aphids spread the virus that causes barley yellow dwarf, and control of the disease is strongly associated with the biology of these insects. Planting wheat after the Hessian fly free date or using systemic insecticide seed treatments can reduce the risk of severe barley yellow dwarf. These control strategies may produce inconsistent results when weather conditions remain conducive for aphid populations in the fall.

Symptoms

The primary symptoms of barley yellow dwarf are stunting and yellow or red discoloration of the leaf tips (Figure 1). The disease can be uniformly distributed in fields, but it is most commonly found in patches that are 1 to 5 feet in diameter (Figure 2). Stunting is typically most severe near the center of a patch.

The color of the symptoms depends on the variety. In most cases, the discoloration of the leaf tips increases over time until eventually the entire leaf is discolored. The midrib of the leaf often remains green longer than the edges of the leaf.

Typically, there is no mosaic pattern on the leaf, but sometimes there is some striping at the border between the discolored leaf tip and the green leaf base. In addition, leaves affected with barley yellow dwarf often have small black spots or streaks randomly spaced over the discolored portion of the leaf tip. These are presumably opportunistic infections by bacteria.

Infection by barley yellow dwarf is often associated with the occurrence of dark heads with shriveled grain. These occur in small patches similar to barley yellow dwarf patches. It has not been conclusively proven, but it is suspected that barley yellow dwarf causes the dark heads.

Barley yellow dwarf can be confused with other production problems such as wheat streak mosaic or nutrient deficiency. Accurate serological tests for barley yellow dwarf virus are available from the Plant Diagnostic Lab at Kansas State University.

Life Cycle

The virus that causes barley yellow dwarf has a broad host range within the grass family, including many perennial weeds and forage grasses. Therefore, the reservoir of virus is potentially large. The virus is carried to small grains

Figure 1. *Yellow or purple leaf tips caused by barley yellow dwarf.*

Figure 2. *Barley yellow dwarf often occurs in 1- to 5-foot diameter patches.*

by several species of aphids, including greenbugs, English grain aphids, and bird cherry-oat aphids.

There are at least five described strains of the virus that cause barley yellow dwarf, and each is defined by preferences for different aphid species as vectors. The most common strain in Kansas, the PAV strain, does not have a specific vector. The source of aphids may be local, or aphids may migrate great distances from southern states. Infection may take place in the fall or the spring.

Losses

The amount of yield loss depends on the percentage of plants showing symptoms. Unfortunately, casual observation often overestimates the percentage of infected plants. Collecting random samples while moving through a field in a systematic way will give a more accurate estimate of the incidence of infected plants.

The timing of the infection relative to crop development also influences the potential yield loss associated with barley yellow dwarf. When infection takes place in the fall, the virus has more time to disrupt plant growth and losses can exceed 35 percent. If plants are infected after heading; however, the losses are usually minimal.

Control

The control of barley yellow dwarf is closely linked to control of the aphids that introduce the virus into the plants. One of the primary means of controlling barley yellow dwarf is to avoid early planting, which often increases the likelihood that aphids will infest a field in the fall. Planting after the Hessian fly-free date reduces the risk of aphid infestation and minimizes the risk of barley yellow dwarf infection. The Hessian fly-free date works well against barley yellow dwarf unless there is a mild fall that allows aphids to survive longer than usual. The aphids that survive these mild conditions can spread the disease and increase the potential for severe yield losses.

Ratings of wheat varieties can be found in *Wheat Variety Disease and Insect Ratings*, MF-991. No wheat varieties have high levels of resistance to barley yellow dwarf, but some are more tolerant than others. Under severe barley yellow dwarf pressure, a tolerant variety (rating 4 or 5) might have a loss around 15 percent while a susceptible variety (rating 8 or 9) could have more than a 30 percent loss.

Chemical control of the aphid vectors can suppress barley yellow dwarf. Unfortunately, spraying insecticides for aphid control has not proved practical. First, multiple applications would be required to achieve satisfactory control. Second, it is not possible to wait for obvious aphid populations before spraying because by the time they are detected, significant virus transmission would already have occurred. Therefore, applications would have to be made on a preventive schedule. Given the unpredictable nature of barley yellow dwarf epidemics, it is not economical to make several preventive sprays in the fall and early spring.

Seed treatments containing the systemic insecticides (e.g., Gaucho XT, CruiserMax Cereals) are labeled for aphid control. These products have shown fair to good suppression of barley yellow dwarf in university trials. The variability in effectiveness is probably due to the timing of aphid infestation. If aphids arrive after the 6- to 8-week period of protection provided by the chemical, then the insecticide will have minimal effect. These seed treatments are more expensive than other seed treatments, so their use has been limited in Kansas.

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