Field Crop Disease Facts

Barley Yellow Dwarf

Barley yellow dwarf is one of the most widely distributed and destructive viral diseases of small grains. The disease can affect wheat, barley, and oats, resulting in yield losses ranging from 5 to 25 percent. The disease is often found at low levels in all areas of Pennsylvania, but severe epidemics have been reported. Outbreaks of barley yellow dwarf are often associated with warm fall and mild winter conditions that favor the spread of the disease to fall-sown small grain crops.

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Symptoms

Symptoms of barley yellow dwarf vary with crop and variety. In wheat, the most common symptoms include a yellow to red discoloration that begins at leaf tip or margins and progresses toward the base of the leaf (Figure 1). The last leaf of the crop, often referred to as the flag leaf, may become prominently discolored and retain an upright posture. When infection takes place at early growth stages, plants often become severely stunted and produce heads of reduced size. Infected barley plants frequently become golden yellow in color. In oats, the virus produces a distinctive red discoloration of leaves.

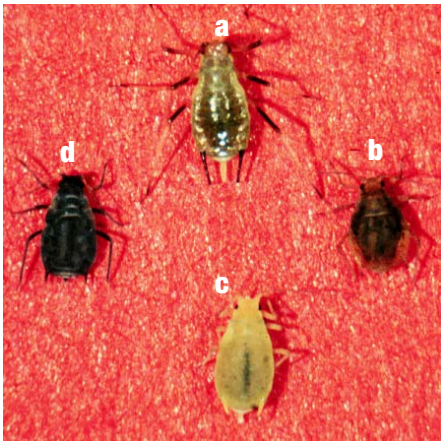
Figure 1a. Symptoms of barley yellow dwarf in wheat include a marked yellow (a) or red discoloration (b) of upper leaves. Symptoms may also include a pronounced stunting and reduced head (c) development.

Vectors

Barley yellow dwarf is caused by a virus of the Luteovirus group, and is spread, or vectored, by aphids. In Pennsylvania, four aphid species are known to vector the virus, including the oat bird-cherry aphid (*Rhoplasiphum padi*), the corn leaf aphid (*R. maidis*), the English grain aphid (*Sitobion avenae*), and the greenbug (*Schizaphis graminum*) (Figure 2). Aphids can acquire the virus by feeding on infected plants for as little as 30 minutes, but acquisition within feeding periods of 12 to 30 hours is more common. The virus can be transmitted to additional plants after a 1- to 4-day latency period. The virus is then transmitted during subsequent feedings of greater than 4 hours.

Five strains of the barley yellow dwarf virus have been reported to be common in the United States. The transmission of these strains is often specific to an aphid species; however, some strains can be vectored by multiple aphid species. The PAV strain, which is vectored by the oat bird-cherry aphid, and several other aphid species, is the most common in Pennsylvania. Other strains found less frequently in Pennsylvania include RPV, MAV, and RMV. When testing plants that may be infected with the virus, you should test for all viral strains.

Figure 2. The virus that causes barley yellow dwarf is spread by aphids. In Pennsylvania, the most common vectors of the barley yellow dwarf virus include the (a) English grain aphid, (b) oat bird-cherry aphid, (c) greenbug, and (d) corn leaf aphid.



Disease Cycle

The biology of the barley yellow dwarf virus is closely linked to it aphid vectors. In North America, climatic and other factors limit continuous production of small grain crops. Therefore, the virus must persist in wild grass hosts, volunteer small grains, or be reintroduced each year from distant locations by virus-carrying aphids. The distribution of the disease in a field depends on patterns of aphid movement and feeding. In Pennsylvania, the disease commonly occurs in small patches ranging from 1 to 5 feet in diameter (Figure 3). These patches may have a linear orientation that results from aphids feeding within a row of plants or may be associated with field margins. Plants infected with the virus will develop symptoms within two weeks at 68°F, and within four weeks at 77°F. No symptoms develop when temperatures are above 86°F. Epidemics of barley yellow dwarf are most likely to occur in when weather conditions that favor growth of the small grain crops and aphid reproduction and migration.

Figure 3. Barley yellow dwarf virus often occurs in patches within a wheat field. These patches result from localized feeding by aphids carrying the virus. Notice the area of this research plot with stunted growth and yellow discoloration.

Management

Little can be done to save diseased plants after infection. Losses to barley yellow dwarf will depend on variety susceptibility, growth stage at the time of infection, and persistence of cool weather conditions that favor disease development. Producers should focus on minimizing the risk of infection by the virus. Consider the following when attempting to manage this disease:

1. Resistant oat varieties are available, but barley and wheat varieties have only limited resistance to barley yellow dwarf. Contact your seed dealer for recommendations about resistant varieties.
2. Sowing winter cereals within the recommended planting dates is one way to minimize the risk of barley yellow dwarf damage. Early planting dates for winter wheat and barley should be avoided to limit exposure to aphids carrying the virus during early stages of crop growth. See the *Penn State Agronomy Guide* for planting date recommendations in your area.
3. Control volunteer wheat, barley, and oats as well as wild grasses. These plants may harbor virus that can be moved to successive crops.
4. Symptoms of barley yellow dwarf can resemble environmental stress or nutritional disorders. The only way to confirm the presence of the virus in plants is to have them tested by a qualified laboratory. Your county extension office can contact Penn State's plant pathology department for a current listing of laboratories providing this service.
5. Foliar insecticides are available for control of aphid populations, but are not recommended for barley yellow dwarf management. Contact insecticides will kill the aphids, but the short residual life of such products may limit their usefulness in disease management. Systemic insecticides (including seed treatments) may provide improved longevity, but aphids must feed on plants for the insecticide to be effective. This brief feeding may allow time for the aphids to transmit the virus; however, the systemic insecticide should limit spread of the virus. While these systemic insecticides can be effective when applied before build-up of the aphid population, the sporadic occurrence of barley yellow dwarf in Pennsylvania makes the economics of these treatments questionable.