



# DISEASES

## Barley yellow dwarf

no. 2.934

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### Quick Facts...

Barley yellow dwarf (BYD) is a virus disease that attacks wheat, barley, oats, and many other grasses.

Barley yellow dwarf is spread by aphids.

Planting as late as feasible reduces the risk of fall infection.

Fall infection causes more severe yield losses than spring infection.

There are no commercially available BYD-resistant varieties of wheat and barley.

Barley yellow dwarf (BYD) virus disease has been found in all areas of Colorado where wheat and barley are grown. Although BYD is named after the disease found in barley, it also causes serious losses in wheat and oats. In oats it has been called "Red Leaf". The virus infects over 92 other species of the grass family. Some grasses show symptoms whereas others, such as Bermuda and orchard grasses, show no symptoms but are capable of harboring the virus.

### Symptoms

The symptoms of BYD vary and often are overlooked or associated with nutritional or other nonparasitic disorders. In many instances BYD can be confused with wheat streak mosaic, other small grain viruses and Russian wheat aphid (*Diuraphis noxia*) damage. Diagnosis usually is based on the presence of aphid vectors and the occurrence of yellowed, stunted plants with stiff, upright leaves found singly or in small groups among normal plants. Where infected plants occur in small patches, plants in the center often are more severely stunted than plants near the edge. This produces saucer-shaped depressions in the wheat. In some instances under Colorado conditions BYD has appeared wide spread throughout whole fields and not as localized patches.

Symptom expression varies according to time of infection and host infected. Leaf discoloration varies from shades of yellow, red (especially in oats) or purple (Figure 1). In current season infections, discoloration is usually from the leaf tip to the base and from the leaf margin to the midrib often forming a chevron effect (Figure 2). Seedling infections, if not lethal, can cause prominent, brilliant yellowing of older leaves. Yellowed or reddened flag leaves, on plants that are otherwise normal, are indicative of later infections. Root systems are underdeveloped and severe grain reduction in the heads is frequently found depending on time of infection. Severe fall infection can lead to significant levels of winter-kill.

### Spread

The BYD virus is not spread by either mechanical means or seed. Only aphids can spread the BYD virus. There are more than 20 species of aphids that can spread BYD viruses. Among them, the bird-cherry oat aphid, corn leaf aphid, English grain aphid, and greenbug are the most important. Russian wheat aphids do not spread the BYD virus.

Aphids acquire the virus by feeding on infected plants. The aphids remain infectious throughout their lives. The virus is not passed from generation to generation in the aphids.

Barley yellow dwarf diseases are actually caused by a group of viruses that are characterized by the specific aphid vectors. The present system of naming BYD virus isolates is based on the use of letters that denote the principal vector



Figure 1. Barley yellow dwarf (right) and oats (left).



Figure 2. Wheat infected with BYD virus. Note yellowing from tip to base.

and was developed at Cornell from 1970 to 1978. There are presently five isolates (sometimes referred to as strains) of the BYD viruses. All five isolates have been identified in Colorado.

- RPV--transmitted by *Rhopalosiphum padi*, the bird-cherry oat aphid.
- RMV--transmitted by *Rhopalosiphum maidis*, the corn leaf aphid.
- MAV--transmitted by *Macrosiphum avenae*, now called *Sitobion avenae*, the English grain aphid.
- SGV--transmitted by *Schizaphis graminum*, the green bug (aphid).
- PAV--transmitted by *R. padi* and *S. avenae*.

## Disease Cycle

The BYD virus carries over in cereals, perennial and annual grasses and in the aphids that spread the virus. It also carries over in corn in many instances where fall infection of winter cereals is involved. The virus is spread solely by the aphid carriers. BYD epidemics are more likely to occur in cool (50- to 64-degree F) years with moist springs and or falls that favor both grass and cereal growth as well as aphid reproduction.

## Management

Wheat varieties vary in their resistance to BYD, but none have enough resistance to provide adequate control. Controlling aphids with systemic insecticides may help somewhat with spring grains, but very little time is needed for aphids to infect plants and therefore is seldom practical. Control through aphid management with insecticides would depend on planting time treatments or early detection of aphid population increases.

Planting at times that coincide with periods of low or no aphid activity is presently the best management technique. The present aphid trapping system in Colorado helps to monitor populations of vector aphids. Normally it is recommended to plant winter grains as late in the fall and spring grains as early in the spring as possible.

Avoid seeding winter wheat near corn or millet that is still green. Both are hosts for the aphid vectors and BYD virus. Avoid planting highly susceptible grasses (e.g. fescue) in Conservation Reserve Program (CRP) fields. Aphids can spread the virus to recently emerged wheat. Elimination of wheat volunteers also will help to decrease the BYD virus carry over through the summer and subsequent infection of the fall planting.