



# Barley yellow dwarf virus (BYDV)

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## What You Should Know

- BYDV is transmitted by aphids in a persistent manner.
- Transmitted by the English grain aphid and bird cherry oat aphid.
- Damage is most severe if plants are infected in early fall.
- The virus is not seed borne or mechanically transmitted .



Fig. 1. English grain aphid (*Sitobion avenae*).

## INTRODUCTION

Barley yellow dwarf virus (BYDV) is found worldwide. It infects small grains like barley, wheat, oats and rice as well as many wild grass species. There are two strains of the barley yellow dwarf virus- BYDV-MAV and BYDV-PAV. BYDV-MAV is transmitted by the English grain aphid. (*Sitobion avenae*) (Fig. 1) BYDV-PAV is transferred by the bird cherry-oat aphid (*Rhopalosiphum padi*) (Fig. 2) and the English grain aphid (*Sitobion avenae*). The strain identified in Utah is BYDV-PAV.



Fig. 2. Cherry oat aphid (*Rhopalosiphum padi*).

## SYMPTOMS

Symptoms caused by BYDV-PAV can sometimes be mistaken for nutrient deficiencies. Initially leaf tips turn yellow or red (Fig. 3). The discoloration gradually moves down toward the base of the leaves. Foliage and roots can be stunted (Fig 4). Seed heads are smaller with reduced seed size resulting in reduced yield (Marshall and Rashad, 2014). Winter wheat is infected in early fall which causes losses between 10 and 20% but can reach in severe cases up 100%. Infected wild grasses exhibit similar symptoms to wheat and in some cases the weeds (Fig. 5) have red leaves.



Fig. 3. Yellow discoloration of leaf tips.

## DISEASE CYCLE

Aphids feed on an infected small grain or grass plant and ingest the virus. The virus particles circulate in the aphid and when they feed on a healthy plant they inject the virus with their saliva into the plant. The time it takes from the aphid acquiring the virus while feeding on an infected plant to being able to transmit it to another plant is a few hours. Once the virus is in the plant it multiplies and moves in the phloem through the plant. Another aphid feeding on the newly infected plant can then acquire the virus. There have been no reports that aphids can pass the virus on to their offspring. All aphids have to feed on infected plants to acquire the virus. The virus can also not be spread mechanically by farm machines.



Fig. 4. Yellow discoloration down to the base of the leaves, stunted roots and foliage.

## MANAGEMENT

There are no resistant wheat varieties to BYDV.

**Insecticide:** Application of insecticides to control aphids can be used to reduce secondary spread within fields. Aphids have to feed on treated plants in order to ingest the insecticide. In the process they leave the virus behind. But infections can be reduced beyond the initially infected plants with insecticide treatments (D'Arcy and Domier, 2000).

**Planting date:** In Idaho, determination of peak aphid flight activity and adjusting planting dates accordingly reduced disease incidence (Marshall and Rashad, 2014). Yellow sticky cards placed on field edges can be used for monitoring aphid activity. If planting schedules are adjusted seedlings can avoid infection. Fall planting should be delayed to later in the fall and spring planting should take place earlier in the spring. Later planted fall seedlings will avoid much of the aphid activity in contrast to earlier fall planting that will be up at the time that aphids are looking for a new green host. Earlier planted spring wheat will be older and not quite so susceptible to BYDV when aphids attack.

**Volunteer small grains control:** Volunteer wheat and barley can serve as a reservoir for BYDV. A reduction in infection can be achieved by avoiding overlapping crop cycles and having a couple of weeks with no grass host plants for aphids to colonize before planting wheat in the fall (Marshall and Rashad, 2014).



Fig. 5. Red leaves on weeds infected by BYDV-PAV.

## REFERENCES

- D'Arcy, C.J., and Domier, L.L. 2000. Barley yellow dwarf. The Plant Health Instructor. DOI: 10.1094/PHI-I-2000-1103-01 Updated 2005.
- Marshall, J., and Rashad, A. 2014. Barley yellow dwarf virus in Idaho cereal crops. CIS 2010. University of Idaho Extension

<sup>1</sup>Images courtesy of Kansas Department of Agriculture Archive, Bugwood.org

<sup>2</sup>Image courtesy of Adam Sisson, Iowa State University, Bugwood.org

<sup>3</sup>Image courtesy of Courtney L.L. Domier; <http://www.apsnet.org/edcenter/intropp/lessons/viruses/Pages/BarleyYelDwarf.aspx>

<sup>4</sup>Image courtesy of William M. Brown Jr., Colorado State University, Bugwood.org

<sup>5</sup>Image courtesy of Juliet Marshall, University of Idaho

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