

BARLEY YELLOW DWARF VIRUS FACT SHEET



SOUTHERN REGION

MANAGEMENT TIPS TO AVOID YIELD PENALTIES

Growers in high rainfall zones should be proactive and develop a Barley Yellow Dwarf Virus (BYDV) management plan which includes crop monitoring, green bridge management, foliar pesticide sprays and pre-sowing seed treatment. These actions will control aphid populations which spread BYDV.

KEY POINTS

- BYDV infects cereal crops such as wheat, barley, oats, rye and triticale and grasses.
- It is transmitted by aphids which can pass the disease onto plants within 15 minutes of feeding.
- The virus only survives in living tissues. It does not survive in stubbles or soils and is not airborne.
- It is most damaging in higher rainfall zones, such as the South East of SA, Adelaide Hills, Kangaroo Island, Western Victoria and the Northern Tablelands in NSW, where permanent grasses and pastures act as a reservoir for the virus and aphids over summer.
- The earlier the infection, the more severe the damage. Leaves turn yellow from the tips and develop yellow stripes extending towards the base. Some reddening or purpling of the leaves may occur along the edges.
- Growers should have a management plan which includes selecting resistant varieties, continual crop monitoring, managing the green bridge, presowing seed dressing and spraying foliar insecticides if required (noting correct label usage).



PHOTO: ANTHONY MITCHELL, NORTHERN GROWER ALLIANCE

The corn aphid is one of the key vectors in the spread of Barley Yellow Dwarf Virus.

BYDV transmission

BYDV is transmitted from plant to plant by aphids. When aphids feed on plants their mouthpart, called the stylet, penetrates the leaf epidermis and enters the plant's vascular system, namely the phloem. Within 15 minutes of feeding, the aphid either contracts the virus (if the plant is already infected) or it transmits the disease to the uninfected plant. The infection is restricted to the phloem where it replicates and blocks phloem tissues, reducing transport of sugars through the leaves. BYDV is a persistent virus which means an infected aphid will transmit the virus for the rest of its life.

The virus survives from one season to the next in infected summer crops, weeds and

host volunteer plants. It can only survive in living tissues and does not survive in stubbles or soils. It is not airborne.

There are five different species of aphids which transfer different types of BYDV. However, in the southern grain growing region the most common species include the oat aphid (*Rhopalosiphum padi*), the corn aphid (*Rhopalosiphum maidis*) and rose grain aphid (*Metopolophium dirhodum*). Trial results have found that the oat and rose grain aphid are found on wheat and barley and the corn aphid favours barley and is rarely found on wheat.



PHOTO: HUGH WALLWORK, SARPI

Characteristic leaf damage on an oat plant caused by BYDV. The purpling of the leaf starts at the tip and extends down to the base. It is most pronounced along the edge of the leaf.



PHOTO: HUGH WALLWORK, SARPI

A wheat leaf damaged by BYDV. The leaf shows yellowing at the tip with the colour extending down the base plus streaks of purple.



PHOTO: HUGH WALLWORK, SARPI

BYDV symptoms in barley. Note the yellowing of the leaf tip.

Symptoms

Symptoms of BYDV infection may take at least three weeks to appear. When assessing a paddock for an outbreak, growers should look for:

- Sporadic patches of plants that have turned a yellow, red or purple colour which is most defined at the tip of the leaf, extending to the base. Plants may also appear stunted.
- Damage to crops along the fenceline. If aphids are moving into the crop from a 'bridge' of adjoining pastures, crops, weeds or grasses then they are likely to first attack plants near fencelines.
- Aphids located on the crown and lower stem, then leaves.

BYDV symptoms vary with the crop and include:

- Oats: Infected oat plants are most likely to turn bright red or bronze, with the colour starting at the leaf tip and leaf margin. There will be yellow streaking or mottling on the leaf which extends toward the base. Plants will appear stunted. The infection can cause sterility.
- Wheat: Leaves may show a range of symptoms including a slight mottling to bright yellow colour. Leaves first turn yellow at the tip with the colour extending down the base in a dappled pattern. There may be streaks of red to purple at the tip. An infection before tillering can lead to stunted growth, sterility and reduced grain fill.
- Barley: Leaves may show symptoms similar to wheat with a slight mottling to a bright yellow colour starting at the tips and moving down to the base of the leaf.

Compared to wheat, barley leaves will turn a more brilliant yellow and more plants will be dwarfed. Leaves are unlikely to turn red.

If left untreated, damage will radiate outwards as wingless juvenile aphids crawl to the next plant to feed, spreading the virus.

Yield loss

All early BYDV infections of cereal plants will mean they have less above-ground biomass and a less extensive root system. Grain size can be smaller or it can become shrivelled, which causes lower yields, higher screenings and reduced marketing options.

Victorian Department of Primary Industries Field Crops Pathology Group (Horsham, 1984) research found yield losses of between nine per cent and 79 per cent occurred when plants were infected early in the growing season (before the end of tillering) and losses of 69 per cent may occur when plants are infected after tillering.

A trial conducted by Trent Potter in the South East region of South Australia also investigated yield losses in wheat caused by BYDV. Yield losses varied from 'nil' in 1990 and 2002 and up to 40 per cent in 2008. In other years, the yield loss varied from 10 per cent to 20 per cent. Even where there have been large yield losses due to BYDV, trial results have not shown any difference in protein content between sprayed and untreated plots.

Additional yield loss by aphid feeding

Growers in high rainfall areas are encouraged to check for aphids on a regular basis, especially early in the season (autumn) when

winged aphids migrate into cereal crops. The autumn flight is most significant as plants are most vulnerable to damage in their early growth phase.

If aphids are observed and there is a concern about aphid feeding damage then it is suggested that you walk throughout the crop and pull up 10 to 20 plants from a range of locations. Inspect the crown, lower stem and leaves for aphids. In barley, check inside the unfurled leaf at the top of the tiller.

If plants average 10 or more aphids per tiller a foliar insecticide spray should be considered. It is likely to be too late for control of BYDV but yield loss can be reduced.

Predicting infection

The prevalence of BYDV depends on environmental conditions, host-pathogen dynamics and aphid populations. The virus is generally worse in seasons with a wet summer (which allows for significant volunteer or green bridge growth) followed by a mild autumn and winter.

However, the aphids are able to survive in hot summers in perennial grasses – such as perennial ryegrass, kikuyu, paspalum, couch and African love grass – in permanent or irrigated pasture areas and along waterways.

Winged aphids are able to migrate around the southern grain growing region regardless of summer conditions. Growers should not be complacent in dry summers.

BYDV can be caused by relatively few infected aphids if they arrive early in the growing season and are very mobile through the crop.

Management

For grain growers who decide to manage aphids, it is critical to plan the control strategy and have it in place before sowing starts. Do not wait until aphids are found because infection or damage will have already occurred.

Growers in high risk areas should treat each year as a 'BYDV year' unless there has been low rainfall over summer and autumn. Waiting until aphids or BYDV symptoms are found is too late.

Seed dressings

Seed dressings with imidacloprid have been shown to reduce aphids in cereal crops at the early stage of growth when cereals are most susceptible to BYDV. Do not graze treated cereal crops within nine weeks of sowing. In high risk areas, a top-up spray (see insecticides section) is recommended at six to eight weeks after sowing.

Insecticides

Growers must work to prevent the spread of BYDV early after crop emergence because this is when plants are most vulnerable.

In high risk areas, such as the long season areas of South Australia and Victoria, which have received high summer rainfall, growers can apply insecticides before aphids and/or BYDV symptoms are evident. This is considered a risk-based application. The insecticides will help kill and repel the aphids, leading to increased yields, particularly when plants are young and small. Growers can utilise a range of approved insecticides to manage the aphids. As well as pyrethroids, there are spray options which can have less impact on non-target insects. These may suit farmers trying to incorporate integrated pest management into their system. Advice prior to spraying is essential.

Trial results have led to the recommendation that sprays are applied three and seven weeks after crop emergence. This is because BYDV symptoms are usually not obvious until three weeks after the aphids have fed on plants. These applications will enable aphid populations to be managed before the problem has been noticed and the aphids have spread even further.

Considerable BYDV spread can occur even when aphid numbers are low. Symptoms can be hard to see in winter. Consultation with an agronomist or crop pathologist is recommended.

Insecticide trials

Research by the Department of Agriculture and Food, Western Australia has shown that foliar sprays of synthetic pyrethroids, such as alpha-cypermethrin at three and seven weeks after crop emergence, decreased BYDV spread by up to 87 per cent and increased grain yields by up to 41 per cent.

Pyrethroids were found to control BYDV better than pirimicarb or dimethoate because they kill aphids present at application and have an anti-feeding effect that deters new aphids from feeding for a further three to four weeks. Trials in south-eastern South Australia have found similar results.

These insecticides can be tank mixed with many herbicides, which will reduce spraying costs. All spray use should be recorded in a paddock diary. Grain growers must adhere to maximum residue limits and label instructions. WA trials showed that imidacloprid seed dressing gave good early season control of aphids and hence BYDV.

Trials by the Northern Grower Alliance (NGA) with NSW Department of Primary Industries in northern New South Wales found imidacloprid seed treatments provided 70 to 90 days of aphid control. A second seed treatment with a higher rate of imidacloprid appeared to provide even longer aphid control. BYDV was not evident in these trials so impact of aphid control on virus transmission could not be determined.

In years conducive to aphid build-up, a follow-up insecticide application in spring, with both the early foliar or seed treatment strategies, may be required to limit feeding damage. The effect of late BYDV infection by itself is generally not sufficient to warrant spraying in spring so the decision should be purely based on aphid pressure.

BYDV resistance

There is some level of resistance to BYDV in cereals. Some wheats are highly susceptible (Brennan), while others have some resistance. CSIRO researchers have found a source of BYDV resistance and have used it in Mackellar winter wheat. There were no yield losses observed in Mackellar wheat trials looking at BYDV. In oats, current varieties range from moderately resistant eg. Wombat, to susceptible, while the barley varieties Gairdner, Bass, Flinders and Macquarie contains the Yd2 gene that gives it moderate resistance to BYDV.

Delayed sowing

Delayed sowing avoids the main autumn peak of aphid flights and can reduce the incidence of BYDV. However, other yield penalties associated with late sowing make this option generally considered a poor choice over using insecticides. Growers in the late sown high rainfall areas should note that late sowing may coincide with peak spring flights of aphids resulting in more severe damage.

Green bridge

Management of the green bridge (volunteer cereals and grass weeds) through appropriate herbicides is important for managing BYDV, not to mention the associated benefits of moisture/nutrient conservation. On top of summer weed control, spraying out perennial grasses near and around cereal paddocks at least three weeks before sowing may reduce aphid numbers.

Table 1: Products for BYDV management*

Product	BYDV
Imidacloprid containing	✓
Cruiser Opti	✓
Hombre	✓
Proguard Plus	✓
Imid-Triadimenol	✓
Proleaf Plus	✓
Zorro	✓
Veteran Plus	✓
Arrow Plus	✓
Tri-Power	✓

* Source: Cereal Seed Treatments 2013, Hugh Wallwork, SARDI

FREQUENTLY ASKED QUESTIONS

Which regions are most affected by BYDV?

BYDV is most prevalent in higher rainfall zones. In the southern grain growing region, BYDV occurs almost every year in the South East of South Australia. It is common where permanent grasses and pastures act as a reservoir for the virus and aphids over summer.

Could BYDV symptoms be confused with other crop problems?

BYDV leaf symptoms can be confused with nutrient deficiencies, waterlogging or other plant stresses that cause yellowing, reddening and striping of leaves. Contact an agronomist or regional pathologist for help with diagnosis.

Which crops are most at risk?

Trials conducted in the South East of SA have found that wheat was affected by BYDV in eight out of 10 years of testing. Similar results were found for oats while barley was only rarely affected in spring sowings. All wheat results were from winter sowings. However, where wheat was sown in spring, no symptoms were noted.

Will BYDV affect grain marketability?

It may do. Severe infections can cause poor grain fill and shrivelling of the grain.

When is an outbreak most likely to occur?

Since BYDV is transmitted by aphids, the transmission and control is dependent on when aphid numbers peak. Aphids tend to take flight in autumn and again in spring, where they colonise and cause outbreaks in cereals. Heavy rains can reduce aphid populations by knocking or washing them off the plant. It is worth rechecking numbers after a storm to assess the need to spray.

What should I do to manage BYDV?

Be prepared. Have a management plan in place which considers:

- ▶ Controlling summer weeds (the green bridge) as weeds, volunteer cereals and annual grasses can act as hosts for aphids. Growers in irrigated areas and with forage crops should be aware that these can harbour aphids over the summer.
- ▶ Choosing varieties which have appropriate ratings. Refer to your local cereal variety disease guide for information on variety ratings.
- ▶ Investigate sowing time. Crops sown later in low rainfall regions may avoid being colonised by the major autumn aphid flight. However, this needs to be carefully considered against the risk of frost. The crop may still be infected by aphids from another source.
- ▶ Trials results have led to the recommendation that sprays should be applied three and seven weeks after crop emergence (see Table 1). These applications will enable aphid populations to be managed before the problem has spread.
- ▶ Communicate with your neighbour if you find BYDV. This will enable a faster response to management and help to decrease aphid outbreaks.
- ▶ Record all spray applications, use appropriate safety equipment and follow label rates and directions at all times.

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Cereal Seed Treatments 2013, Hugh Wallwork, SARDI

www.sardi.sa.gov.au/__data/assets/pdf_file/0017/86102/cerealseedtrat2013_webversion_.pdf

Barley Yellow Dwarf Virus and Cereal Yellow Dwarf Virus Information Note (AG1113)

www.dpi.vic.gov.au (search barley yellow dwarf virus)

2010 Wheat Agronomy Trials

www.mackillopgroup.com.au

Victorian Winter Crop Summary

www.dpi.vic.gov.au/agriculture/grain-crops/crop-production/winter-crop-summary

MORE INFORMATION

DPI Field Crops Pathology

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