FACTSHEET

Virus management in cereals and oilseed rape

Figure 1. Yellow sticky trap

The transmission of viruses to cereals and oilseed rape by aphids is the focus of this publication. Some soil-borne vectors can also transmit viruses. These are described in the AHDB Encyclopaedia of cereal diseases.

The key period for virus transmission by aphids is in the autumn. Symptoms typically appear in spring. When infections are unusually extreme, entire plants can be killed. The extent of yield losses is determined by numerous factors, which are outlined in this publication.

Earlier-sown winter crops and late-sown spring crops tend to be at a higher risk, due to the timing of aphid migrations. Risk is heightened in all crops by mild conditions in autumn and winter, which encourage aphid flight, reproduction and movement within the crop.

Barley yellow dwarf virus

Figure 2. Symptoms of barley yellow dwarf virus

Virus

Barley yellow dwarf virus (BYDV)

Hosts

Wheat, barley, oats, rye and triticale

Symptoms

Infections cause leaf yellowing and stunting. Initially, symptoms are confined to individual plants scattered throughout the crop. Eventually, distinct circular patches develop. Sometimes, these patches can merge to form extensive areas of infected crop. Red tipping of upper leaves can also occur. Very early infections can result in plant death.

Life cycle

The virus, which exists as several strains, is transmitted by various species of cereal aphid. The bird cherry–oat aphid (*Rhopalosiphum padi*) is the principal vector in the South. In the Midlands and the North, the grain aphid (*Sitobion avenae*) is usually more important.

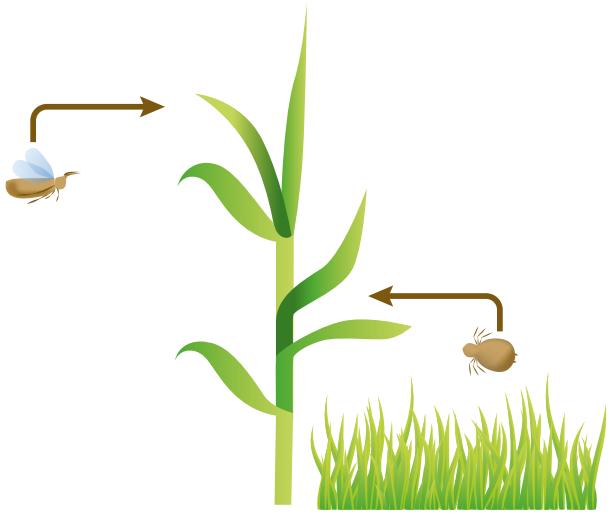

Figure 3. Winged and wingless aphids can enter crop

In the autumn, BYDV can be introduced into cereal crops in two ways:

1. Indirect transfer by winged aphids, from grass or volunteer cereals elsewhere. This is the most common source of BYDV infection.
2. Direct transfer by wingless aphids, from grass or on volunteer cereals that survive cultivation. This is known as the ‘green bridge’ effect.

BYDV is transmitted in a persistent, non-propagative manner. This means that the virus does not pass directly to the aphids’ offspring and must be acquired through feeding on infected host plants. The time between acquisition and the aphid being able to transmit the infection is 12–48 hours.

Bird cherry-oat aphid

Bird cherry-oat aphid is a host-alternating species. In autumn, relatively high numbers fly to the primary host (bird cherry trees) to overwinter. In mild conditions, a proportion of the population continues to reproduce asexually in cereals and grasses, increasing the virus transmission risk. This species first colonises the lower leaves and stems of plants.

Figure 4. Bird cherry–oat aphid (*Rhopalosiphum padi*)

Grain aphid

Grain aphid is a non-host alternating species. This means it overwinters in cereals and grasses. Relatively low numbers fly in the autumn. As populations overwinter on cereals, they can increase rapidly on crops in spring. This species first colonises the flag leaf and upper leaves of plants. Grain aphid is also a vector of Potato virus Y (PVY), which affects potato crops.

Figure 5. Grain aphid (*Sitobion avenae*)

Importance

BYDV is the most economically important virus in UK cereals. Initially, only a small proportion of aphids are likely to carry BYDV. However, because of the way virus spreads from plants to aphids, even initial small populations of infected aphids can lead to significant economic damage. The scale of yield loss depends on aphid activity, BYDV presence and strain, growth stage at infection and environmental conditions. In the case of severe infections, BYDV can cause losses of up to 60% in winter wheat and 50% in winter barley. However, the occurrence of these levels of infection is rare.

Risk factors

As early sown winter crops have a longer period of exposure to aphid infestation, these tend to be at the highest risk of infection. In a warm autumn, aphids continue to reproduce and move through the crop until late into the season. Aphid activity greatly reduces at temperatures below 3°C, and virus inoculation efficiency decreases to 23–25% at temperatures below 6°C. Crops suffer little yield loss from new infections after growth stage 31. The effects of BYDV can be exacerbated by other stress factors, including adverse weather, soil acidity and other pests or diseases.

Aphid colonisation is generally lower on fields with minimum tillage, particularly if straw is left, which may also benefit aphid natural enemies. However, the presence of aphid-infested grass weeds, especially annual meadow-grass, increases the risk of 'green bridge' transmission, where virus is carried over into the new crop.

Aphid immigration varies on a field-by-field basis. Fields located in landscapes with a large amount of grassland are at increased risk. Coastal fields in the South West are also at higher risk.

Management

BYDV management aims to reduce the risk of aphid colonisation and spread.

Cultivations can help bury plant material. However, aphids can survive below the ground, especially in warm, moist conditions. These aphids can feed on crop roots, and transmit virus.

The risk of 'green bridge' infection can be reduced by leaving a period of at least five weeks between ploughing and sowing. Emerged weeds can then be sprayed off with a desiccant herbicide.

Natural enemies, such as predatory beetles and web-spinning spiders, are active over autumn and can be effective at reducing aphid numbers. Use of diverse field margins and minimised pesticide inputs can help increase the population of natural enemies in fields.

During the autumn, crops should be monitored for aphid activity. Sticky traps, positioned on the soil surface 5m into the crop, are useful for in-field monitoring. Regional information on aphid numbers at key times of year is published at **ahdb.org.uk/aphid-news**

Chemical control

If chemical control is necessary, it should be targeted at the secondary generation of aphids, as these are responsible for virus spread. Based on accumulated daily average air temperatures, the AHDB BYDV management tool can be used to predict aphid development, help time chemical applications and reduce the risk of unnecessary sprays. Access the tool at **ahdb.org.uk/bydv**

Moderate levels of pyrethroid resistance are widespread in grain aphid populations in the UK. Insecticide resistance guidelines, produced by the Insecticide Resistance Action Group (IRAG), can be found at **ahdb.org/knowledge-library/irag**

Turnip yellows virus

Figure 6. Symptoms of turnip yellows virus in oilseed rape

Virus

Turnip yellows virus (TuYV)

Hosts

Oilseed rape and a wide range of other field crops

Symptoms

Infection initially appears as purple tinging of leaf edges, with later symptoms (interveinal yellowing and reddening of leaf margins) usually expressed after stem extension. The signs of TuYV can be easily confused with frost damage, nutritional deficiencies or other stress symptoms.

Life cycle

Peach–potato aphid

The peach–potato aphid *(Myzus persicae)* is the main vector of TuYV, although other aphid species can be vectors. The virus is transmitted to oilseed rape in the autumn, when peach–potato aphids migrate into crops. These aphids are normally found on the underside of leaves.

Figure 7. Peach–potato aphid (*Myzus persicae*)

Importance

TuYV is the most important viral disease of oilseed rape in the UK. Annual sampling has shown that up to 72% of winged forms can carry TuYV. The virus can decrease yields by up to 26%, affecting both the seed production and oil content.

Risk factors

Peach–potato aphid has multiple hosts. The virus can infect a wide variety of crops, in addition to oilseed rape, including most brassica types, lettuce, spinach, peas and beans, as well as a number of common weed species.

The virus is most likely to move into new oilseed rape crops from other crops in the ground in September (especially from sugar beet, vegetable brassicas and potato crops).

The prevalence of TuYV varies from year to year but tends to be relatively high in Southern England and in areas of high brassica production, such as Lincolnshire and Suffolk.

The earlier the infection, the greater the impact on yield. Risk of infection is higher when aphids are numerous, typically following mild winters and warm springs. Mild autumns also create favourable conditions for aphid migration and reproduction and, therefore, increase the risk of virus spread. Aphid activity is greatly reduced at temperatures below 3°C.

Management

The AHDB Recommended Lists includes specific recommendations for winter oilseed rape varieties with TuYV resistance. Such varieties can play a valuable part in an integrated disease management strategy. **ahdb.org.uk/rl**

Natural enemies can help control aphid numbers through predation and parasitism but may not prevent virus transmission. Use of diverse field margins and minimised pesticide inputs can help increase natural enemies in field populations. Weed management is also important to reduce the risk of ‘green bridge’ infection.

Chemical control

Peach–potato aphid is resistant to a number of active ingredients, and options for chemical control are limited. Therefore, timing of treatment is important. Autumn crops should be monitored for aphid activity. Regional information on aphid numbers at key times of year is published at **ahdb.org.uk/aphid-news**

Insecticide resistance guidelines, produced by the Insecticide Resistance Action Group (IRAG), can be found at **ahdb.org/knowledge-library/irag**

Further information

Further information on aphid species, including life cycle, identification and feeding (as well as virus transmission) risks, can be found in the AHDB Encyclopaedia of pest and natural enemies in field crops.

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