

Barley Yellow Dwarf Virus

BYDV is an economically important viral disease of grasses that relies upon aphid infection for disease transmission



Images 1 & 3 © JIC Entomology, Norwich

Pathogen Description

Several similar viruses belonging to the genus *Luteovirus* are known to cause BYDV. The virus particles are icosahedral in shape and approx. 25nm (nanometres) in diameter. Particles are composed of a single-stranded, positive-sense RNA packaged inside a protein coat. Occasionally a second protein, a 'read-through' domain sticks out from the surface of the virus particle. BYDV causes disease in about 150 different grass species (members of the Poaceae) including all the major cereal crops particularly barley and oats.

Mode of Infection

The virus is unable to infect these plants in the absence of a vector, namely aphids. In the UK the Bird cherry-oat aphid (*Rhopalosiphum padi*) is the most important vector (pictured left) in the warmer South-West while the English grain aphid (*Sitobion avenae*) spreads the disease in the North, the East and the Midlands (pictured right). Another 20 aphid species transmit BYDV in other parts of the world.

Symptoms

As its name suggests the principal symptoms are leaf yellowing and stunting of plants. Leaves often turn bright yellow in barley, particularly on the upper surface, with plants scattered throughout a crop. Young plants are particularly susceptible.

Disease Spread

All aphids must acquire the virus particles by feeding on phloem tissues of infected plants. The viruses travel up the aphid's stylet, through the food canal and into the gut, where they are transported into the body cavity (the hemocoel). The viruses then circulate through the hemocoel and into the salivary gland where they pass into the saliva and can be expelled into the phloem of another plant.

Control

When tackling any disease transmitted by insects there are two routes to control the disease. First, the development of plants resistant to the virus infection. Second, the control of the insect vector (in this case an aphid) using either insecticides or plant breeding strategies to generate plants resistant to aphid colonisation and feeding.

These strategies can be enhanced by adopting good cultural practices to reduce the likelihood of re-infection of freshly-sown crops. This would include a longer time without green-material in the field (ie. between harvest and sowing) to reduce the chance of aphid survival. With earlier sowing of winter cereals and milder autumns, BYDV is an increasing problem to UK agriculture.

Cereal plant resistance to BYDV is rare and complex. A considerable amount of work has been performed to date in the development of resistant cultivars and lines, with only mixed results.

Detection

With yellowing a common sign of abiotic and biotic stress in plants, methods other than visual id are required. Laboratory methods such as ELISA (enzyme-linked immunosorbent assay) and PCR (polymerase chain reaction) are used allowing different viral strains to be serotyped.

Interesting Facts

Although the virus does 'infect' plant cells because they enter the cells, they do not propagate in them, merely passing through.

Further reading

Extended pathogen description: <http://tinyurl.com/hcehuvu>

More about control (Home Grown Cereals): <http://tinyurl.com/gsdtdtd>