



Department
for Environment
Food & Rural Affairs

Plant Pest Factsheet

Pepper vein yellows viruses (PeVYVs)



Figure 1. Symptoms of PeVYVs on *Capsicum frutescens*. Image courtesy of Dr. Aviv Dombrovsky, Department of Plant Pathology and Weed Research, ARO - the Volcani Center.

Background

The Pepper vein yellows viruses (PeVYVs) are an emerging group of pepper viruses worldwide. So far six different, but related, species have been identified, all showing similar symptoms on *Capsicum* species.

In 1981, symptoms of vein yellowing and leaf roll were first observed in greenhouses in Okinawa, Japan, and later identified as a unique *Luteovirus* named *Pepper vein yellows virus* (PeVYV). A similar disease was observed in Israel in 1998, and given the name of *Pepper yellows leaf curl virus* (PeYLCV). Three species isolated from Australia, China and Spain have now been identified as related to PeVYV. Most recently, an emerging yellows disease of *Capsicum* in Greece led to the identification of another polerovirus causing similar symptoms, related to both PeVYV and PeYLCV called *Pepper yellows virus* (PYV).

Because of the molecular and biological similarity between the species, and the similarity in their symptoms, this factsheet is considering all the emerging pepper vein yellows disease causing viruses as the Pepper Vein Yellows Viruses.

Geographical Distribution

PeVYVs have been recorded in 20 countries across 5 continents. A scattered distribution like this is likely indicative that such viruses may have a broader distribution despite a lack of further reports. These viruses have been found in North America in the USA, in Africa in the Ivory Coast, Mali, Republic of Benin, Sudan, and Tunisia, in Asia in China, India, Indonesia, Israel, Japan, Pakistan, the Philippines, Taiwan, and Thailand, in Australia, and in Europe in Greece, Italy, Spain and Turkey.

Host Plants

The most economically important hosts of PeVYVs are *Capsicum* species, *C. annum* and *C. frutescens*, but *Solanum nigrum*, a common perennial in the wider UK environment, has also been recorded as infected. Hosts which have only been infected experimentally include *Chenopodium amaranticolor*, *Curcubita pepo* (squash), *Datura stramonium* (jimsonweed), *Gomphrena globosa* (globe amaranth), *Nicotiana clevelandii* (Cleveland's tobacco), *Nicotiana benthamiana*, *Petunia hybrid* (petunia) and *Physalis floridana* (cape gooseberry). The full host range of these viruses is not well understood at present, neither are the differences between the individual species.

Biology

PeVYVs are poleroviruses, transmitted by aphid species. The symptoms of infection include interveinal yellowing, upward leaf curling, and the abnormal ripening of the fruits, including off-colouring for the variety of pepper being produced.

The virus is taken up by the vector during feeding, after which a viruliferous aphid can then spread the virus to new hosts. As luteoviruses the virus will be transmitted in a persistent manner, but the viruses do not replicate within the vector, so high levels of virus accumulation occur only after longer feeding periods or prolonged exposure to infected hosts. The viruses are not transmitted parthenogenically – a vector can only acquire the virus through feeding.

It is unclear what environmental factors shape symptom development at present, but it has been suggested that the plants in shadier parts of glasshouses do not develop symptoms.

Vectors

PeVYVs can be transmitted by two very common aphids in the UK, *Aphis gossypii* (melon and cotton aphid) and *Myzus persicae* (peach-potato aphid). The aphids are persistent problems in both outdoor and protected cultivation. If an infected host is transplanted into protected cultivation, or if a viruliferous vector feeds on an uninfected host in protected cultivation, the virus is very likely to establish. The presence of suitable vectors is not a limiting factor for the establishment or spread of PeVYVs.

Because the virus could be harboured in *S. nigrum*, a natural host of PeVYVs in the wider environment, aphids could acquire and spread PeVYVs from local hosts into protected cultivation.

Dispersal and Detection

The most likely route of entry into the UK is the import of infected pepper plants for planting. There is significant trade of *Capsicum* spp. from European countries where the virus has established, with no mitigations in place.

There is a lower risk from the import of infected fruit or cut flowers, as feeding by vectors is limited to fully developed fruit, however infected vectors may be associated with the calyx and pedicle, or on leaves and stems. Most fruit would be imported for consumption with little opportunity for infected vectors to move into protected cultivation. If packhouses and growers are co-located however, there may be a risk where imported fruit for packing comes into the vicinity of growing crops.

Both vectors are widespread across the UK, and diseases borne by them have typically spread across the country rapidly. The virus is not known to be transmitted through seed or mechanical transmission.

In the early stages of infection, symptoms of the disease are difficult to detect and later stages might be misinterpreted as drought or nutrient deficiencies, making the identification of an infected host difficult. Detection of symptomatic plants for planting would be possible on more mature plants where symptoms are visible, but plants are usually traded when young, when symptoms are unlikely to be visible. Although propagated pepper seedlings are likely to be of high quality, at the time of transplanting the seedlings will be too small to have manifested significant symptoms, lowering the likelihood an infected host could be identified before transplanting.



Figure 2. Interveinal yellowing of *Capsicum frutescens* infected with PeVYVs. Image courtesy of Dr. Aviv Dombrovsky, Department of Plant Pathology and Weed Research, ARO - the Volcani Center.

Economic Impact

Capsicum annum is the most economically important host in the UK, with over 90 Ha of glasshouse grown peppers planted in 2016 worth approximately £18.5 million (<https://www.gov.uk/government/statistics/latest-horticulture-statistics>). *Capsicum frutescens* is commonly grown domestically.

Where outbreaks have occurred, significant reduction in the value of the crop has been observed. PeVYVs cause a reduction in the size, and significant discolouration, of infected fruit. For a high value crop like pepper, the symptoms can make the fruit unmarketable.

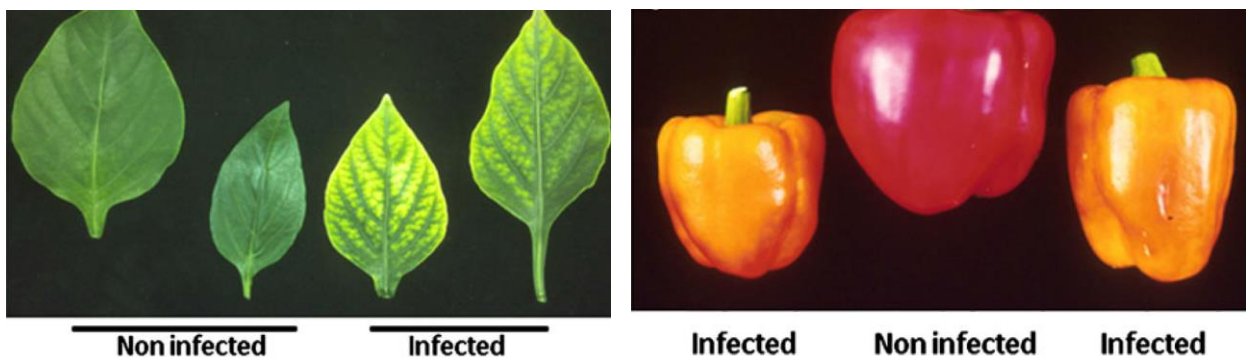


Figure 3. Symptoms of PeVYVs on *Capsicum frutescens* leaves, and fruit. Image courtesy of Dr. Aviv Dombrovsky, Department of Plant Pathology and Weed Research, ARO - the Volcani Center,

The incidence of symptomatic plants when an outbreak occurs is typically very high. In the 2012 outbreak in Almeria, Spain, over 10,000 Ha of *C. annum* grown in protected cultivation were infected with the virus, with an incidence of up to 100% within glasshouses. In Greece, PeVYV was not considered a limiting factor in pepper cultivation before 2013, but an outbreak in Crete in 2013 led to significant losses, with incidences in glasshouses between 40 and 60%

Advisory Information

The most effective means of controlling PeVYVs will be preventing its introduction. Careful sourcing of plants, keeping aphid numbers low in pepper growing glasshouses, raising awareness of the symptoms and reporting suspected outbreaks will assist in preventing the establishment of this disease. If an outbreak is suspected, removal of the infected plants, monitoring of vectors and suppression of the vectors using chemical, biological and cultural controls is advisable.

Suspected outbreaks of Pepper vein yellows viruses or any other non-native plant pest should be reported to the relevant authority:

For **England and Wales**, contact your local **APHA Plant Health and Seeds Inspector** or the **PHSI Headquarters**, Sand Hutton, York. Tel: 01904 405138

Email: planthealth.info@apha.gsi.gov.uk

For **Scotland**, contact the **Scottish Government's Horticulture and Marketing Unit**:
Email: hort.marketing@gov.scot

For **Northern Ireland**, contact the **DAERA Plant Health Inspection Branch**:
Tel: 0300 200 7847 Email: planthealth@daera-ni.gov.uk

For additional information on UK Plant Health please see:

<https://secure.fera.defra.gov.uk/phiw/riskRegister/>

<https://planthealthportal.defra.gov.uk/>

<https://www.gov.uk/plant-health-controls>

<http://www.gov.scot/Topics/farmingrural/Agriculture/plant/PlantHealth/PlantDiseases>

<https://www.daera-ni.gov.uk>

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