



Department
for Environment
Food & Rural Affairs

Plant pest factsheet

Emerging pest and diseases of blueberry

Date: March 2023



Figure 1. Blueberry red ringspot virus © Timothy Miles, Michigan State University

Background

This factsheet provides summary information for growers on some of the most important emerging or potential threats to UK blueberry production.

The pests included in this factsheet are either quarantine pests (QP) or regulated non-quarantine pests (RNQP) based on their listings in the GB Plant Health Regulations.

Under these regulations a QP is a pest or disease considered absent from GB (or under official control) which poses an unacceptable risk to GB plants. Action would be taken to eradicate QPs wherever they are found.

A RNQP is a non-quarantine pest or disease whose presence in plants for planting affects the intended use of those plants with an economically unacceptable impact and is therefore regulated. RNQPs are only regulated when identified in association with specific plants for planting and their presence on the specific plants for planting would mean that cannot meet plant passporting requirements and therefore can not be moved within GB.

The establishment and/or spread of these pests and pathogens could result in significant losses to the UK blueberry sector, and therefore, it is important that any suspected findings are reported to the relevant plant health authorities (see contact details on page 14).

Please note, there may be differences between how these pest and diseases are regulated in GB and Northern Ireland.

Glossary

American cranberry -	<i>Vaccinium macrocarpon</i>
Bilberry -	<i>Vaccinium Mytilus</i>
Blueberry -	<i>Vaccinium</i> sect. <i>Cyanococcus</i>
Cowberry -	<i>Vaccinium vitis-idaea</i>
European cranberry -	<i>Vaccinium oxycoccos</i>
Northern Highbush blueberry -	primarily <i>Vaccinium corymbosum</i> or a <i>Vaccinium corymbosum</i> hybrid
Lowbush blueberry -	<i>Vaccinium angustifolium</i>
Rabbiteye blueberry -	<i>Vaccinium ashei</i> , also known as <i>Vaccinium virgatum</i>
Sour top blueberry -	<i>Vaccinium myrtilloides</i>
Southern highbush -	a variety developed from crossing highbush blueberry with other <i>Vaccinium</i> species

Blueberry leaf mottle virus

UK distribution: Absent

Status in GB plant health regulations: Quarantine pest

Status in NI plant health regulations: Quarantine pest

Blueberry leaf mottle virus (BIMoV) is present in Canada, South Korea and the USA. The virus infects highbush and lowbush blueberry plants, sour top blueberry and grapevines. To date it has not been intercepted or found in the UK.

The virus is spread to new areas via infected vegetative propagating stock. BIMoV belongs to a group of viruses called the nepoviruses. BIMoV is transmitted via infected pollen, requiring bees and other pollinators for local spread. It can also be seed-borne, with seed from infected plants being shown to have a level of infection of around 1.5%.

Plants may remain symptomless following infection for up to four years, but eventual symptoms include yellow to pink mottling and mosaic patterns on leaves, narrow leaves, leaf deformation (Fig 2) and rosetting, stunting, reductions in fruit quality, delay in ripening of fruit and reduced yields. The reduction in yield is often severe, with losses in Michigan reported to be virtually 100% four to five years after infection.



Figure 2. Leaf mottle symptoms caused by BIMoV © Annemiek Schilder

Blueberry scorch virus

UK distribution: Absent

Status in GB plant health regulations: Quarantine pest

Status in NI plant health regulations: Regulated Non-Quarantine pest

Blueberry scorch virus (BIScV) causes scorch disease in highbush blueberry, southern highbush, rabbiteye blueberry and cranberry. This virus is present in parts of Canada and the USA, as well as Switzerland, Poland, Italy, Germany, and the Netherlands.

Symptoms of scorch disease vary between cultivars. Symptoms develop in the first or second year after infection. Sensitive cultivars suffer complete blighting of flowers (Fig 3), shoots and young leaves, and chlorosis. Yield was reduced by more than 85% in one cultivar. In contrast, tolerant cultivars exhibit no symptoms - making disease control more difficult. There is no damage to yield of tolerant cultivars, but they can still infect other blueberry plants.

This virus is spread to new areas by infected propagative material, such as cuttings grafted onto a healthy plant. BIScV can also spread by aphids, mainly *Ericaphis fimbriata*, an aphid that colonises blueberry and is present in the UK. Spread is inefficient but can happen quickly when the aphid population is uncontrolled.



Figure 3. Symptoms of Blueberry scorch virus © EPPO Global Database

Blueberry shoestring virus

UK distribution: Absent

Status in GB plant health regulations: Quarantine pest

Status in NI plant health regulations: Regulated Non-Quarantine pest

Blueberry shoestring virus (BSSV) is present in Canada, Poland and the USA. The virus infects lowbush and highbush blueberries.

The pathogen is spread long distance by infected stock but locally during grafting and via an insect vector, the blueberry aphid *Illinoia pepperi*. This aphid is not present in the UK. Once a plant is infected, the virus begins to replicate and move systemically throughout the plant. Although symptoms may take between two and four years to show, the disease has resulted in severe losses due to reductions in yield and bush decline in the USA.

Blueberry plants infected with BSSV develop narrow, strap-like leaves which may become curved and turn partly or entirely red. Some leaves may display a reddish 'oak leaf' pattern along the major veins, which is characteristic of BSSV infection along with red streaks on stems (Fig 7). Flowers may have a pink tinge or develop reddish streaks, and developing fruit remains reddish purple instead of turning blue. Symptoms may be restricted to a few shoots or affect the entire plant with infected plants becoming stunted and weak over time. This can leave them vulnerable to environmental or mechanical damage as well as attack from other pests and diseases.



Figure 7. Symptoms of blueberry shoestring sobemovirus: (a) pink flowers (b) oak leaf patterns on the leaf veins and (c) narrow red strap-like leaves © Timothy Miles, Michigan State University

Diaporthe vaccinii

UK distribution: Absent

Status in GB plant health regulations: Quarantine pest

Status in NI plant health regulations: Regulated Non-Quarantine pest

Diaporthe canker and dieback of blueberry (*Diaporthe vaccinii*) is a fungal pathogen that attacks all *Vaccinium* species, particularly cranberries, highbush blueberry, lowbush blueberry and rabbiteye blueberry.

The import of plants for planting, namely potted plants or cuttings, is most likely to introduce this pathogen from countries where the pest already exists. Latvia is the only European country where this fungus is present. It is also present in parts of the USA, Canada, Chile, China, and possibly in Russia and Belarus. Spore dispersal only occurs over short distances.

Following infection, this fungus can kill blueberry plants within a few months. Infected new shoots wilt and form long, narrow cankers often covered by bark or epidermis. *Diaporthe vaccinii* then spreads down through the stem (Fig 8), killing main branches or whole plants. Leaves turn yellow-red before they wilt. Any infected fruits turn reddish-brown and soft, often leading to fruit rot.



Figure 8. Dieback on blueberry due to *Diaporthe vaccinii*. © Gerald Holmes, Strawberry Center, Cal Poly San Luis Obispo, Bugwood.org

Rhagoletis mendax

UK distribution: Absent

Status in GB plant health regulations: Quarantine pest

Status in NI plant health regulations: Quarantine pest

The blueberry maggot (*Rhagoletis mendax*) is only present in Canada and parts of the USA, where it is a damaging pest of blueberry, on highbush and particularly lowbush varieties.

This insect lays its eggs in the blueberry fruit (Fig 11), resulting in visible puncture holes on the skin of each berry. Larvae then feed internally on the fruit pulp, resulting in a loss of turgidity, and causing the berries to collapse and shrivel. Infested fields can be identified by having a lot of fruit on the ground. After feeding, larvae will pupate in the soil and overwinter, with adults emerging in the following season, however the pupae can remain in the soil for three or four years.

The movement of infected fruits is the main pathway for long distance spread, though there is also a risk of transporting the pest as pupae in soil or packaging with plants for planting.



Figure 11. Adult *Rhagoletis mendax* on blueberry fruit © Jerry A. Payne, USDA Agricultural Research Service, Bugwood.org

Scirtothrips citri

UK distribution: Absent

Status in GB plant health regulations: Quarantine pest

Status in NI plant health regulations: Quarantine pest

The Californian citrus thrips (*Scirtothrips citri*) (Fig 12) is present in Mexico, parts of the USA and Israel. This pest mainly attacks citrus plants but can also target southern highbush blueberry and blueberry hybrids.

Feeding damage appears on the young leaves of blueberry plants and includes curling and abnormal growth of the new leaves as well as scarring of new twigs. Such symptoms can significantly reduce plant growth and fruit yield in the following years.

Adults measure just under 1 mm in length and could be spread to the UK on imports of blueberry fruits or plants for planting. It is more of a risk to plants being grown under protection.



Figure 12. Adult *Scirtothrips citri* © EPPO Global Database

Blueberry mosaic associated virus

UK distribution: Absent

Status in GB plant health regulations: Regulated Non-Quarantine pest

Status in NI plant health regulations: Regulated Non-Quarantine pest

Blueberry mosaic associated virus (BIMaV) is believed to cause blueberry mosaic disease in highbush blueberry. This virus is present in parts of Europe (Poland, Serbia, Slovenia), Asia (Japan), and North America (Canada and the USA). Symptoms of blueberry mosaic disease have been reported beyond this range. Despite this, BIMaV is currently considered to be absent from the United Kingdom.

After infection, there can be a long latent period before symptoms appear. Mild to brilliant yellow, yellowish green or pink mottle and mosaic patterns can develop on a few leaves (Fig 4) that spread to most of the canopy. Blueberry mosaic disease may also cause late ripening, reduced yield, and poor berry quality. In some cases, though, the plants remain asymptomatic. This makes the virus difficult to spot at import.

BIMaV can be spread via the spores of a fungus, *Oplidium virulentus*, on infected roots. As a result, this virus is likely to enter the UK on plants for planting. The grafting test for the certification scheme may help to reduce spread.



Figure 4. Mosaic patterns on blueberry leaf symptomatic of Blueberry mosaic associated virus © EPPO Global Database

Blueberry red ringspot virus

UK distribution: Absent

Status in GB plant health regulations: Regulated Non-Quarantine pest

Status in NI plant health regulations: Regulated Non-Quarantine pest

Blueberry red ringspot virus (BRRV) is a virus that causes red ringspot disease in highbush blueberry, southern highbush (a variety developed from crossing highbush blueberry with other *Vaccinium* species), rabbiteye blueberry and cranberry. BRRV is absent from the UK. However, this virus is currently present in parts of North America and Asia. It has also been recorded in Europe (Belarus, Czech Republic, Poland, Serbia, Slovakia and Slovenia) though the cases were very limited.

This virus spreads by plants for planting. Infection can occur through diseased softwood cuttings and grafting. BRRV may also be spread by aphids or mealybug vectors, however there is currently insufficient evidence to support this.

Following infection, red rings or blotches develop on new growth of the plant in early to late summer and on the older leaves in the autumn (Fig 6). There may be a latency period where no disease is shown. The impacts on each cultivar vary. Overall, the negative impacts of this pest appear limited. No impacts on yield were recorded in Europe.



Figure 6. Leaf lesions symptomatic of Blueberry red ringspot virus. © Timothy Miles, Michigan State University

Blueberry shock virus

UK distribution: Absent

Status in GB plant health regulations: Regulated Non-Quarantine pest

Status in NI plant health regulations: Regulated Non-Quarantine pest

Blueberry shock virus (BIShV) is present in Canada and the USA. The virus infects blueberry and cranberry crops but has not been found in wild *Vaccinium* species to date.

The virus is spread to new areas via infected vegetative propagating stock, and is transmitted via infected pollen, requiring bees and other pollinators for local spread. This means that infection starts during flowering, when infected pollen is transferred to new hosts. There is a low level of seed transmission. Following infection there may be a period of 1-2 years with hosts showing no sign of disease.

Symptoms begin to develop during early summer, with foliage, young shoots and flowers becoming suddenly blighted and leaves falling prematurely to leave bare branches (Fig 5). This can be limited to a few branches or affect the entire plant. This leads to general dieback, death of blossoms and subsequent yield losses with reports of up to 90% yield loss in the USA. However, these dramatic symptoms can be followed at the end of the season with a new flush of growth, including the growth of reproductive buds for the following year.

Infected plants can experience a phenomenon known as 'symptom recovery' with infected plants returning to full health within four years of first experiencing symptoms. This is enough to stop growers in North America removing and replanting, as the cost of this outweighs the yield losses until normal production resume.



Figure 5. Premature leaf fall on blueberry bush infected with BIShV © Jay W. Pscheidt, Oregon State University

Thekopsora minima

UK distribution: Present

Status in GB plant health regulations: Regulated Non-Quarantine pest

Status in NI plant health regulations: Regulated Non-Quarantine pest

Thekopsora minima is a fungal pathogen responsible for blueberry rust disease. The disease causes symptoms which are indistinguishable in the field from the non-notifiable native pathogen *Naohidemyces vaccinii*. The two can be separated by laboratory testing.

Thekopsora minima was initially found in Eastern North America and Japan but has spread further across North America and been introduced in parts of every continent except Antarctica. Within Europe the pathogen is present in Germany, the Netherlands, Portugal and Spain. In 2021 there were findings of the pathogen at sites in the UK. These underwent management to contain the spread of the disease.

The pathogen uses two hosts to complete its lifecycle; firstly, on ericaceous plants such as blueberry, huckleberry and *Rhododendron* species, and secondly on certain species of conifer (*Tsuga* species). In blueberry, symptoms appear on the upper surface of leaves as small, yellow spots that later become necrotic as they enlarge and merge, eventually covering large areas of individual leaves (Fig 9). On the undersides of leaves small yellow-orange pustules can be seen as the infection develops. The pathogen survives overwinter on *Tsuga*, but there are no symptoms or impact reported on this host.

The risk of entry of *T. minima* is mostly linked to trade of *Vaccinium* plants for planting. In other countries where *T. minima* has been introduced, it is a serious pest on blueberries and causing a decline in fruit yield and/or death of the plant. The disease can also affect *Vaccinium* species such as cowberry and bilberry which are native species present in the wild of the UK.



Figure 9. *Thekopsora minima* symptoms on blueberry. Symptoms on upper leaf (left), lower leaf (centre) and close up of pustules (right). © Fera Science Ltd.

Godronia cassandrae

UK distribution: Present

Status in GB plant health regulations: Regulated Non-Quarantine pest

Status in NI plant health regulations: Regulated Non-Quarantine pest

Godronia canker, caused by the fungus *Godronia cassandrae*, is a significant disease present in Canada and the USA. It has also been reported in parts of Europe (Norway, Finland, Poland, Germany, Russia and the UK). However, reports from some of these countries are over 30 years old.

Godronia canker attacks the highbush blueberry, lowbush blueberry and cranberry. Like *Diaporthe vaccinii* (see page 6), this fungus causes canker spots and necrosis to develop, resulting in wilting, stem death and/or the demise of the plant itself. Young stems initially exhibit brown or red water-soaked lesions (Fig 10) that expand over time into cankers. Fruiting bodies may form in the lesions and produce spores. Leaves may also develop light-dark brown lesions. Infection of Godronia canker can result in up to 40% fatalities. Younger plants are more vulnerable to this disease. Older plants are more likely to suffer the death of some stems, resulting in a reduction in yield and a decline in vigour.



Figure 10. *Godronia cassandrae* lesions on sections of blueberry stem © Rolf Langnes, NIBIO

Reporting information

Suspected outbreaks of Quarantine pests should be reported to the relevant authority. If the material is entered into the Fruit Propagation Certification Scheme, or are you are intending on moving blueberry plants for fruit production or as propagating material you must also ensure you inform the relevant authority of any findings of RNQPs.

For **England and Wales**, contact your local **APHA Plant Health and Seeds Inspector** or the **PHSI Headquarters**, York.

Tel: 0300 1000 313 (please select option 3 when calling)

Email: planthealth.info@apha.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

Web: <https://www.daera-ni.gov.uk/topics/plant-and-tree-health>

For additional information on UK Plant Health please see:

<https://planthealthportal.defra.gov.uk/pests-and-diseases/uk-plant-health-risk-register/> <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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