

# Bush Fruit





Every year, significant losses to bush fruit crops would be incurred unless crops were protected from the ravages of various pests and diseases. The UK horticultural industry makes significant progression year on year and the current emphasis is on forecasting, monitoring, identifying and then employing biologically friendly treatments.

This Crop Walkers' Guide is aimed at assisting bush fruit businesses with their pest and disease monitoring and identification. It is intended for use in the field by owners, managers, spray operators and all other staff that may be involved in crop protection activities. It includes the major pests and diseases that affect the most commonly grown bush fruit crops in the UK including currants, gooseberries and blueberries.

It also includes a section on naturally occurring insects that regularly appear in bush fruit plantations, which can be harnessed and used within integrated control programmes to gain control of insect pests. Predators that can be introduced to bush fruit plantations are also covered.

It is impossible to show every symptom of every pest or disease and growers are advised to familiarise themselves with the range of symptoms that can be expressed and be aware that new problems can occasionally arise.

This guide makes no attempt at offering advice on the measures available to control these pests or diseases as both chemical active ingredients and their approvals frequently change. However, having identified a particular pest or disease in their crops, growers can refer to other AHDB Horticulture publications that contain information on various control measures.

### **Scott Raffle**

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**CROP WALKERS' GUIDE**  
**Bush Fruit**

**SECTION 1** Invertebrate Pests







## Clay-coloured weevil

*Otiorhynchus singularis*



- Attacks all bush fruit crops, but blueberries are particularly susceptible. This weevil is most commonly found in Scotland.
- The adults are greyish brown in colour, often with particles of soil adhering to them. They emerge from late April and feed at night, hiding in holes in the ground during the day.
- Adults feed on developing buds, on the rind of shoots and stems, on leaf petioles and flower stems.

## Vine weevil

*Otiorhynchus sulcatus*



- Attacks all bush fruit crops, but blackcurrant and blueberries are most susceptible.
- Adults emerge in early summer and feed on the foliage at night causing distinctive marginal notching.
- Eggs are laid from mid-summer at the base of the plant. The larvae feed on the plant roots and stem bases through the autumn and winter, weakening the plant and, in severe cases, causing plant death.

## Contaminants of mechanically harvested crops



- The presence of ‘berry-sized’ invertebrates in the bushes during mechanical harvesting results in contamination of the harvested fruit.
- Contaminants are most common where fruit is harvested into bulk bins.
- The contaminants most commonly recorded tend to be slugs, snails, caterpillars, earwigs, spiders and vine weevils.

## Blackcurrant leaf midge

*Dasineura tetensi*



- This only attacks blackcurrants. Three generations occur each year, starting in April when females lay eggs in shoot tips.
- Feeding by the tiny white larvae causes severe leaf distortion that hides and protects the larvae from predators and parasites.
- Feeding damage restricts the extension of shoots and can kill shoot tips. Young plantations and nursery crops are most seriously damaged.

## Blueberry gall midge

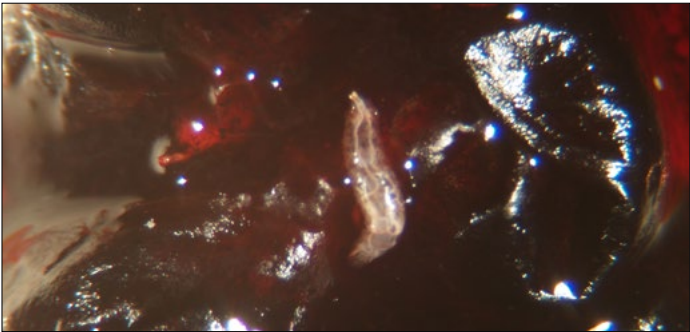
*Dasineura oxycoccana*



- Adult midges (<3mm long) lay eggs singly under bud scales in spring, or later in the season in growing points.
- Larvae, which feed protected in folded shoot tips, are white on hatching, but turn orange as they mature. Pupation occurs in the shoot tips; overwintering occurs in the soil. Up to five generations occur each year in some countries.
- Feeding damage kills and blackens shoot tips resulting in excessive shoot branching.

# Spotted wing drosophila

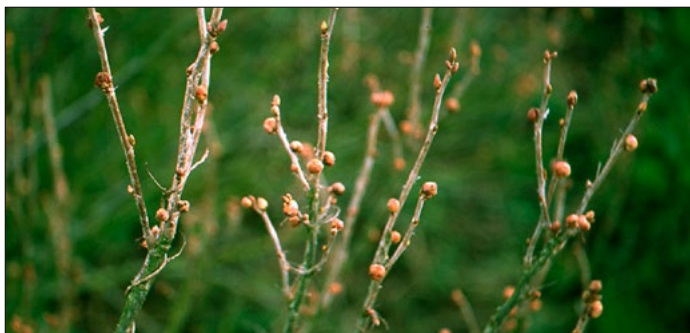
*Drosophila suzukii*



- Potentially, a very serious pest of all bush fruit crops. Males are characterised by a spot on each wing and females by a serrated ovipositor which allows them to penetrate the surface of the fruit skin.
- Eggs are laid under the surface of the skin and hatch into small, white larvae.
- The larvae contaminate the fruit and their feeding can give rise to fruit collapse.

## Blackcurrant gall mite

*Cecidophyopsis ribis*



- Primarily a pest of blackcurrants, the mites are less than 0.25mm long. They feed and breed within buds causing distinctive bud swelling.
- Mites emerge from infected buds in the spring and seek new buds. Infested buds start to swell in summer but are most obvious in winter.
- Reversion virus is carried by mites and substantially reduces cropping (see Section 3.18).

## Two-spotted spider mite

*Tetranychus urticae*



- All bush fruit is attacked, but blackcurrants are most susceptible. Found on the undersides of leaves from early spring to autumn. Infestations are worst in long periods of hot and dry weather. Adult female mites overwinter on debris on and around the plant.
- Sap sucking results in plant weakening, premature leaf drop and reduced fruit size and quality.
- In hot dry conditions damage is usually seen as a general bronzing rather than the more normal leaf-speckling.



## Currant clearwing moth

*Synanthedon tipuliformis*



- Adult moths fly from June and lay eggs singly on the stem close to a bud.
- On hatching, the larva bores into the stem and feeds on the pith. No external damage is seen on the stem until after pupation and emergence.
- Infested shoots are less vigorous but are very difficult to spot in the summer. Previously infested stems are brittle and may snap off.

# Tortrix caterpillars

Various species



- As their colloquial name (webbers) indicates these small caterpillars produce silk that they use to bind leaves tightly together forming a protecting canopy.
- They attack young leaves in shoot tips, often killing the terminal bud causing stem branching.
- Caterpillars are slim and yellow green or brown, sometimes heavily spotted, and wriggle backwards rapidly when disturbed. Most species have two, or sometimes three, generations each year.

## Winter moth

*Operophtera brumata*



- All bush fruit is attacked, but damage is most serious on blackcurrant and blueberry.
- Single generation each year with eggs hatching in early spring at bud break.
- The caterpillars only have two pairs of prolegs (soft rear legs) and use silk to pull leaves loosely together for protection.
- They usually feed mainly on the foliage, but feeding on flowers and young fruitlets can cause significant yield loss.

# Sawflies

*Nematus* species



- All species attack gooseberries, red and whitecurrants; blackcurrants are only attacked by blackcurrant sawfly (*N. olfaciens*). Pale-spotted gooseberry sawfly (*N. leucotrochus*) and common gooseberry sawfly (*N. ribesii*) are the other significant pests.
- Caterpillars of all three species are green with numerous black spots.
- Damage often starts in the centre of the bush making early detection difficult.
- Small gooseberry sawfly (*Pristiphora pallipes*), which has no black spots, is also common.

## Aphid – Currant-lettuce

*Nasonovia ribisnigra*



- Common on gooseberry, but occasionally found on redcurrant; this is a medium-sized dark shiny green aphid, with pale legs and slender black-tipped siphunculi.
- Aphids hatch in the spring from overwintering eggs and move to the shoot tips, where they form dense colonies and cause leaf curl and shoot stunting.
- They are often present with other species.

## Aphid – Currant-Sowthistle

*Hyperomyzus lactucae*



- Commonly found in blackcurrants, but also red and whitecurrants, appearing in spring/early summer and again from early autumn, overwintering as eggs.
- Medium-sized green aphids with long siphunculi (the tubes extending along the rear of abdomen), they form dense colonies on shoot tips.
- Feeding damage causes downward curling and a yellow mottling of the leaves, particularly on the shoot tips.

## Aphid – Gooseberry

*Aphis grossulariae*



- Small grey-green to green aphids, with a light wax dusting, overwintering as eggs in gooseberry.
- Mainly feeding on shoot tips, they may remain on the crop all year, or migrate in the summer to willowherb. They can often be present with other species.
- Feeding causes shortened internodes and substantial leaf and shoot distortion. Damaged leaves remain a uniform colour with no banding.

## Aphid – On blueberries



- Potato aphid (*Macrosiphum euphorbiae*) is large, pale green through to pink, with very long antennae and siphunculi.
- Peach-potato aphid (*Myzus persicae*) is a small, pale green through to pale pink aphid and an excellent virus vector.
- Melon and cotton aphid (*Aphis gossypii*) is small black, olive-green through to pale green, often with a noticeable wax dusting. It forms dense colonies on shoot tips and is an excellent virus vector.



## Aphid – Permanent currant

*Aphis schneideri*



- Attacks all currants (most commonly blackcurrant) throughout the year, with highest numbers from April to June; overwinters as an egg.
- Wingless adults are dark olive green or dark blue-green in colour and have light dusting of a pale waxy powder.
- Very dense colonies form on shoot tips in the spring causing shortening and twisting of petioles and internodes, but the leaves remain green in colour.

## Aphid – Redcurrant blister

*Cryptomyzus ribis*



- This only attacks blackcurrants. Three generations occur each year, starting in April when females lay eggs in shoot tips.
- Feeding by the tiny white larvae causes severe leaf distortion, which hides and protects the larvae from predators and parasites.
- Feeding damage restricts the extension of shoots and can kill shoot tips. Young plantations and nursery crops are most seriously damaged.

## Aphid – Other aphids on currants and gooseberries



- Currant stem aphid (*Rhopalosiphoninus ribesinus*) feeds on old wood, usually in shaded areas and where insecticide use is low.
- Blackcurrant aphid (*Cryptomyzus galeopsidis*) is creamy-green with a darker dorsal stripe – often present with other species.
- Gooseberry-Sowthistle aphid (*Hyperomyzus pallidus*) causes shoot distortion and a distinctive yellow vein. Currant root aphid (*Eriosoma ulmi*) and gooseberry root aphid (*Eriosoma grossulariae*) can weaken young bushes.

## Common green capsid

*Lygocoris pabulinus*



- Adults are up to 6.5mm long and run rapidly over plants, but fly readily if disturbed; juvenile stages cannot fly but run rapidly.
- Two generations occur each year. Adults migrate into plantations in May with a second generation occurring from July onwards.
- Feeds mainly on shoot tips causing small irregular holes in the expanding leaves and stunted growth; sometimes kill the growing point leading to branching of the shoot tips.

## Woolly currant scale

*Pulvinaria ribesiae*



- In May, eggs are laid under the scales. As they mature, the scales lift, revealing a mass of pink eggs embedded in wax threads that can contaminate the fruit.
- In June eggs hatch into 'crawlers' which move onto first year wood, become sedentary and form new scales.
- Mainly found on currants but also on gooseberry.
- Scales that are distinctly domed and up to 6mm long, only attack the woody stems.



**SECTION 2** Naturally Occurring and Introduced Predators







## *Amblyseius* species

Introduced to control spider mites



- Predatory mites (*A. cucumeris* is the most commonly used) that hide in young leaves and flower buds and can be difficult to find.
- Adults and juveniles feed on small mites and thrips, but can be slow to achieve good control. They need to be present in high numbers for good control to be achieved.
- Temperatures should be at least 10°C for these mites to work and leaves should be touching to allow mites to move from plant to plant.

## Anthocorid bugs



- Feed on aphids, spider mites, scale insects, small caterpillars, thrips and various eggs.
- Both adult and larval stages are predatory.

## Ground beetles

Carabids



- Feed on a wide range of soil pests and others that pupate in the soil, including caterpillars, vine weevil and slugs.
- Although they live primarily in soil, they may climb onto the lower leaves of bushes.

## Hoverflies



- Feed mainly on aphids, but will also feed on small caterpillars and spider mites.
- Larvae are voracious feeders, particularly in established aphid colonies.



- Feed on mainly aphids and spider mites.

- Voracious predators – all larvae and some adults are predators.

# Ladybirds



- Feed on aphids, spider mites, thrips, small caterpillars and scale insects.
- All motile stages are predatory.

## Parasitic wasps of aphids

*Aphidiidae*



- A number of different species, mainly in the genera *Aphidius* (some species are sold commercially), *Aphelinus* and *Praeon*.
- Adult wasps are tiny, normally 2–3mm long.
- The wasps fly and seek out colonies or individual aphids. The adult female wasps lay one egg in an aphid. On hatching, the larva feeds inside the aphid, killing it to leave a mummified aphid, before pupating and hatching into a new adult parasite.

## Other parasitic wasps

Braconids, Chalcids and Ichneumons

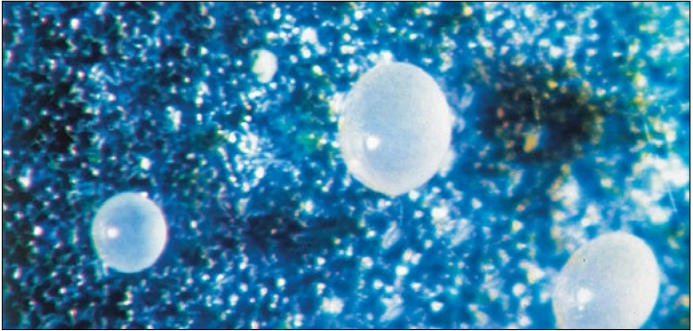


- Larvae parasitise caterpillars of moths and sawflies and a wide range of other invertebrates. May be specific to one host genus.
- Most are internal parasites, some with only one parasite per host (most Ichneumons), but others with many parasites per host.
- The parasites normally pupate alongside their dead host, sometimes under a loose silk covering.



## *Phytoseiulus persimilis*

Introduced to control two-spotted spider mite



- A predatory mite – both adults and juveniles feed on all stages of two-spotted spider mite.
- Works best in warm conditions (15–30°C), but not in very hot, dry conditions.
- Plant foliage should be touching to allow the predatory mites to spread easily throughout the plantation.

## Predatory midges



- The tiny delicate adults (<3mm) lay ovoid orange eggs in prey colonies. The larvae of *Feltiella acarisuga* predate two-spotted spider mite. The larvae of *Aphidoletes aphidimyza* predate aphids. Both species are sold commercially.
- *Feltiella* larvae are cream/brown; the loose silken pupae are formed alongside veins on leaves.
- Larvae of *Aphidoletes* are usually a bright orange colour; pupation occurs in the soil.



- Several species of the genus *Amblyseius* plus *Typhlodromus pyri* (typhs) are common on wild perennial plants in hedgerows and woods.
- The mites are up to 3mm long, usually are slightly shiny and almost opaque, and either colourless or a pale straw colour.
- Very good predators of two-spotted spider mite, they also feed on eriophyid mites such as blackcurrant gall mite, particularly when mites leave the galls in the spring.

## Rove beetles

*Staphylinids*



- Feed on a wide range of soil pests and others that pupate in the soil, including caterpillars, vine weevil and slugs.
- Normally found in the soil, but some species readily feed on pests such as aphids and spider mites on the foliage.







- This bacterium is present in the environment and also affects plums and cherries. It lives on the surface of the plant stem and infects through wounds or leaf scars.
- The canker can infect the entire length of the stem causing death of buds in the infected region.
- Infection can occur in the autumn, but symptoms are generally seen in the spring. It is often associated with frost damage and can be serious in wet springs.

# Crown gall

B

*Agrobacterium tumefaciens*



- A naturally occurring bacterium that causes large swellings (galls) on major roots or at the bases of branches. Occasionally, they develop higher in the bush.
- The galls draw upon the plant's resources, leading to weak growth and stunted bushes.



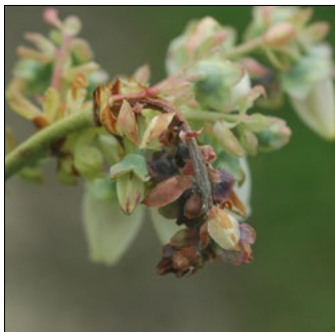


- This pathogen affects twigs, spurs and fruits, the first symptom appearing as shoot blight at late blossom. It is favoured by warm, humid conditions.
- Dark brown lesions occasionally develop on wood around buds.
- Ripening fruits become sunken and wrinkled at the blossom end, with small orange/pink fruiting bodies developing.

## Blueberry mummy berry

F

*Monilinia vaccinii-corymbosi*



- Infected blueberry flowers turn brown and wither. Young leaf and shoot growth is blackened in the centre and eventually dies.
- During early berry development, diseased fruit looks healthy, but if cut open, the spongy white fungal growth is revealed.
- As berries approach maturity, infected berries become a pink colour; mature mummified berries are grey, shrivelled and hard.

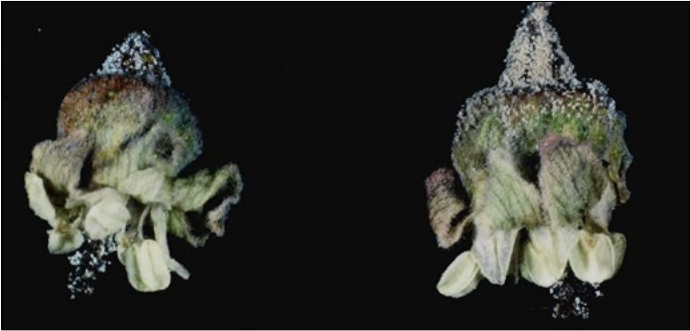


- *Botrytis* infects the flowers, with rotting occurring as the fruit starts to ripen.
- Blossom and young leaves can be killed outright and shoot tips die back.
- Infection requires several days of wet or humid weather.
- The disease can be more severe when excess nitrogen fertiliser has been used causing soft growth, where air circulation is poor, or where frost has injured blossoms.

## Botrytis in currants

F

*Botrytis cinerea*



- Mycelium develops on fruits leading to a brown rot and grey/brown sporulation.
- Most infection occurs during flowering and early fruit development, particularly during wet or humid weather.
- Frost damaged blossoms are particularly susceptible. Further infection can occur on split or overripe fruit.
- Symptomless or latent infection of flowers may be a contributory cause of flower/fruit abscission ('run-off').



- *Botrytis* infection of the flowers, via the stigma and style, frequently causes them to drop prematurely, or 'run-off'.
- The empty flower stalks remain on the strig and the dropped flowers can be seen on the ground under the bushes.

## Botrytis in gooseberries

F

*Botrytis cinerea*



- Can cause damage to both fruits and bushes in gooseberries.
- Infects dead flowers at the base of developing fruits, leading to small brown patches and a soft rot.
- May infect branches through wounds, which leads to wilting, branch die back and bush death.

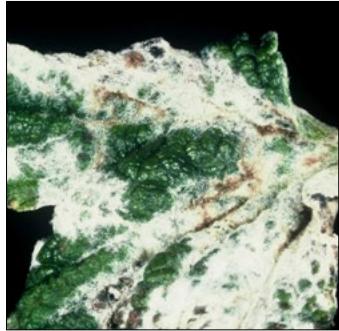


- This fungus affects currants and gooseberries, causing die-back of branches.
- The fungus often enters at wound sites, such as dead tissue or pruning cuts.
- It attacks the water conducting tissue, leading to wilting.
- Small, salmon-coloured pustules develop on dead branches and later, dark red fruiting bodies may be produced.

# American gooseberry mildew

F

*Podosphaera mors-uvae*



- Affects both currants and gooseberries, infecting both shoots and fruits. Infection occurs during high humidity.
- White fungal patches appear on leaves and new shoots, becoming brown and matted later. This leads to shoot stunting and reduced yields in subsequent years.
- Initial white mycelium and powdery sporulation on fruits; later turns brown and matted.



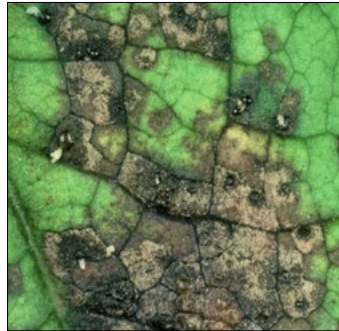


- This rust overwinters on pine trees and commonly infects currants and gooseberries.
- Infection is more commonly seen late in the season, when yellow to brown rust pustules appear on the undersides of leaves.
- This can lead to premature defoliation, which subsequently weakens the bush.

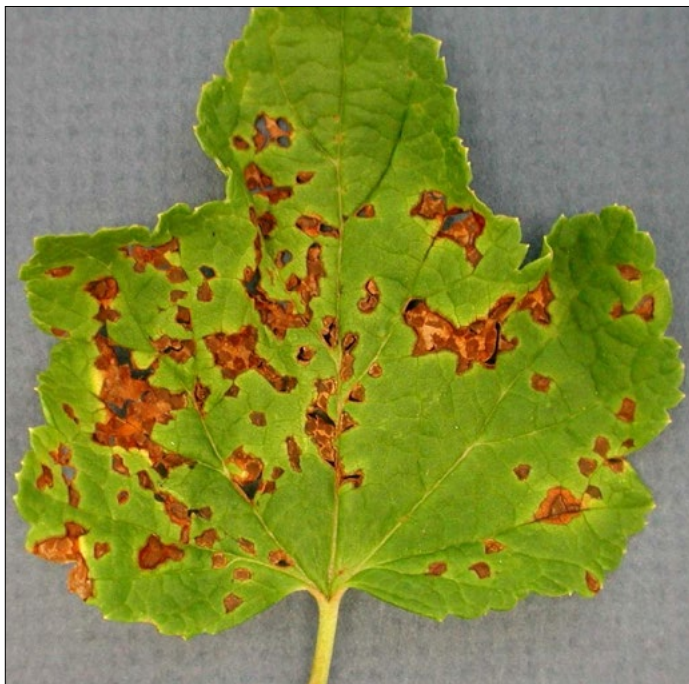
## Currant leaf spot

F

*Drepanopeziza ribis*



- Affects all currants and is particularly prevalent in wet or damp conditions.
- Small, irregular dark brown spots appear initially on older leaves from May onwards.
- Spots increase in number and coalesce, leading to leaf death and premature leaf fall.
- This can adversely affect fruit bud development and subsequent yields.



- This is the same pathogen that causes leaf spot in currants and is more prevalent in wet or damp conditions.
- Scattered dark-brown shiny pin head sized blotches appear on the upper leaf surface in early summer. The spots appear fawn on the lower surface.
- Spots increase in number and coalesce, leading to leaf death and premature leaf fall.
- This can adversely affect fruit bud development.



- Although commonly found in UK blueberries, the exact cause has not yet been confirmed. Although fungal species of *Phomopsis* are commonly associated, *Botrytis*, *Botryosphaeria* and *Neofusicoccum* may also be involved.
- Blossom death commonly occurs along with 'die-back' and 'die-up'

from a point of infection in the plant crown. Individual branch or whole bush death occurs.

- *Phomopsis* is often found on bushes without symptoms, but the disease can be triggered when the host plant is stressed by other factors.



- The true cause of die-back has yet to be fully established, but under initial investigations, *Phomopsis*, *Eutypa* or *Botryosphaeria* have been implicated.
- Affected branches initially wilt, but leaves fail to drop in the autumn, being retained on the branch. Affected branches do not break bud in the spring.
- Ben Gairn, Ben Avon, Ben Alder and Ben Tirran are particularly affected. Whole bush death occurs in Ben Tirran, but individual branch death occurs in others.

## *Eutypa* in gooseberry

F

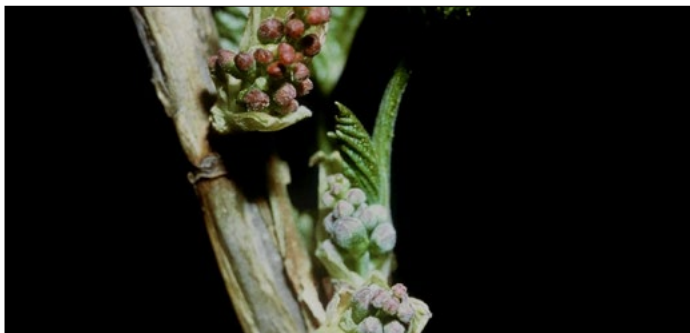
*Eutypa lata*



- Found principally in gooseberry, causing death of individual branches and whole bushes.
- The fungus can enter the bush at wound sites, commonly after winter pruning.
- Leaves on affected branches are pale and stunted, before shrivelling, leaving a 'dead arm' symptom in the bush.
- Further branches die progressively, leading to bush death. Worst affected are cordon trained gooseberries.



- Infected bushes wilt progressively over a couple of seasons until the whole bush is killed. Affected branches do not break bud in spring, and there is no regrowth from the base of dead bushes.
- The fungus enters via the roots, producing a reddish-brown discolouration under the epidermis, leading to root death.
- Spore spread is favoured by high soil moisture, and disease spread is hastened in heavy, wet soils.



- Reversion is caused by a virus spread by the blackcurrant gall mite (see Section 1.7) and reduces the plantation life.
- Leaf and blossom abnormalities are accompanied by progressive yield reduction, with virus invasion of the bush complete by the third or fourth year.
- Reverted flower buds lack hairs and thus show the purplish-red colour of the underlying tissue. Reverted leaves have fewer veins, coarser marginal teeth and a coarser texture.







AHDB Horticulture is extremely indebted to the following people for their help in the production of this Bush Fruit Crop Walkers' Guide:

Roger Umpelby (Fruit Entomologist) worked tirelessly to collect the full range of existing images of pests and beneficial insects. Special thanks however go to Roger for his extra efforts in procuring images of certain pests not previously collected in the UK, some of which didn't wish to sit still whilst he photographed them.

Erika Wedgwood (ADAS Plant Pathologist) collated the full list of diseases and took time to procure some high quality images from other parts of the world.

Rob Saunders (Technologist with GlaxoSmithKline) kindly provided some additional images from his personal library and offered industry guidance on the list of pests and diseases that should be included.

Chris Nicholson (ADAS Fruit Consultant) managed the whole process of drawing up the list of images and procuring the correct material.

Dan Chiuian (FAST Fruit Consultant) kindly provided text and images for some of the blueberry diseases included in the guide.

## SECTION 1 – Invertebrate Pests

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- 1.6 Spotted wing drosophila – (top right) adult male on raspberry, WSU
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- 1.10 Tortrix caterpillars – (top), GSK
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- 1.12 Sawflies – (bottom left) blackcurrant sawfly damage to blackcurrant bushes, GSK
- 1.16 Aphid – On blueberries – (bottom right) peach-potato aphid, ADAS
- 1.19 Aphid – Other aphids on currants and gooseberries – (top left) currant stem aphid, GSK

## SECTION 2 – Naturally Occurring and Introduced Predators

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- 2.2 Anthocorid bugs – (top) adult, ADAS
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- 2.7 Parasitic wasps of aphids – (top) *Aphidius ervi* adult laying her eggs in a peach-potato aphid, FLPA
- 2.9 *Phytoseiulus persimilis* – (all photos), ADAS
- 2.10 Predatory midges – (top left) *Feltiella acarisuga* pupa, FLPA
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- 2.10 Predatory midges – (bottom) *Aphidoletes aphidimyza* larva feeding on aphid, ADAS
- 2.11 Predatory mites – (whole page) *Typhlodromus pyri*, NIAB EMR

## SECTION 3 – Diseases

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- 3.1 Blueberry bacterial canker – (all photos), OSU
- 3.2 Crown gall – (top) crown galls on roots, Defra
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### KEY

ADAS = Agricultural Development and Advisory Service  
Defra = Department for Environment, Food & Rural Affairs  
FAST = Fruit Advisory Services Team  
FLPA = FLPA Images of Nature  
GSK = GlaxoSmithKline  
JHI = The James Hutton Institute  
MSU = Michigan State University  
NCSU = North Carolina State University  
NIAB EMR = NIAB East Malling Research  
OSU = Oregon State University  
WSU = Washington State University

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