



RHS science update

ASH DIEBACK

Caused by the fungus *Chalara fraxinea*, ash dieback is an aggressive new disease that could be as damaging as Dutch elm disease was to UK forest and amenity trees

Author: **Béatrice Henricot**, Principal Research Scientist, Plant Pathology, RHS Garden Wisley

While still trying to cope with the recent introduction of *Phytophthora ramorum* (ramorum dieback), another serious disease, ash dieback is affecting the UK's ash trees (*Fraxinus excelsior* and other species). This is caused by the fungus *Chalara fraxinea* (*Hymenoscyphus pseudoalbidus*).

Fungal taxonomy

The ash dieback fungus has a sexual (teleomorph) and asexual (anamorph) stage, confusingly with different names. First described as a new species in 2006, it was eventually shown that *Chalara fraxinea* was the anamorph of new species *Hymenoscyphus pseudoalbidus*. The fungus' teleomorph name (*H. pseudoalbidus*) has precedence over the anamorph name *Chalara fraxinea*, but the latter has become more widely associated with the disease.

Disease history

The fungus was first reported in Poland in 1992, as a new fungal species associated with widespread dieback of ash (see fungal taxonomy, below left). Since then, the pathogen has been found in many other European countries, reaching Italy and Belgium in 2009, and the Netherlands in 2010.

In February 2012, the fungus was found in the UK for the first time: in Buckinghamshire, in a batch of trees imported from the Netherlands. A ban was implemented on 29 October 2012 in the UK on all movement of ash trees, including seeds, to try to prevent further spread of the disease.

Following a survey carried out in November 2012, cases have now been confirmed on trees in nurseries, new plantings and – more significantly – on well-established trees growing in the countryside that have no associations with

recent nursery plantings.

At the time of going to press, cases on mature trees in East Anglia, Kent and Sussex suggested that the fungus has been in the UK for longer than expected, possibly more than two years. More than 100,000 trees have already been felled as a precaution.

Chalara fraxinea causes a lethal disease. The main symptoms (see opposite) are necrotic lesions in the bark and xylem (water-conducting vessels), leading to crown dieback and leaf loss. The disease can affect trees of all ages. It is estimated that Britain has 130,000ha (321,230 acres) of predominantly ash tree woodland, and around 80 million trees in total including amenity trees.

Ash is native to most of Europe and has a high conservation value. Its airy canopy allows a rich ground flora to thrive, and trees support a wide variety of insects and birds. Its timber

1 Mature ash trees are common in UK hedgerows and field boundaries but may become increasingly rare.

2 The effect of ash dieback on young trees in Denmark, where up to 90 per cent of *Fraxinus excelsior* have been lost.

3 A UK-wide survey in November 2012 recorded ash dieback in more than 520 localities. Use was made of the latest portable genetic profiling equipment.

4 Typical dark bark lesions produced by infection with *Chalara fraxinea*.

More information Search 'Ash dieback' at www.rhs.org.uk for more on the disease and further links.

It is a quarantine disease: you are legally obliged to report suspicious symptoms to: **Forestry Commission** Plant Health Service: 0131 3146414; email: plant.health@forestry.gsi.gov.uk or **Fera** Plant Health and Seeds Inspectorate: 08459 335577; email: planthealth.info@fera.gsi.gov.uk

is strong and flexible, and it can be coppiced to produce firewood and charcoal. Unsurprisingly, this aggressive new disease is being compared to Dutch Elm disease, which killed 25 million UK trees from the late 1960s.

Spread and infection

While the fungus that causes Dutch elm disease is spread by bark beetles, *Chalara fraxinea* is carried in the air over long distances by sexual spores (ascospores). These are produced by fruiting bodies called apothecia, which so far have not been seen in the UK. In Europe apothecia are produced June–October (see symptoms, right), so were probably missed by the November UK survey.

The ascospores are estimated to have a dispersal rate of about 12–19 miles or more per year. With the English Channel being about 22 miles across at its narrowest point,

and as all identified cases on established trees are in counties close to mainland Europe, there is a theory that the disease may have reached the UK naturally as spores blown in from the Continent.

Because the disease has been found in mature trees in woodland, it is now unlikely that it can be eradicated from Britain. Reducing the spread of the fungus is a priority, and to tackle this a management plan was drawn up in November 2012. Conserving the species by collecting seed and identifying trees showing resistance are also being considered.

The finding of *Chalara fraxinea* will hopefully lead to a rethink about how to best protect our environment. This may mean changes in practices that currently make it more economical to collect seeds in the UK but send them to continental Europe to be grown, then re-imported as saplings. ●

Questions & answers

What is the host range of *Chalara fraxinea*?

Fraxinus species: so far *Fraxinus excelsior* (including 'Pendula'), *F. angustifolia* (including subsp. *danubialis*), *F. ornus*, *F. nigra* and *F. pennsylvanica*. Least susceptible, but still infected, are *F. americana* and *F. mandschurica*.

Is mountain ash susceptible?

No – *Sorbus aucuparia* is not affected.

Is the disease always fatal?

Young trees (2–10 years) can be killed rapidly, even in one season, but older trees can survive for several years.

What has been the damage so far in Europe?

The epidemic is moving east to west: in Poland, 80 per cent of ash stands are affected; in Lithuania, 60 per cent of ash died; and in Denmark 60–90 per cent died.

Where does the disease come from?

This is unknown. There is evidence the fungus has been present in Switzerland for more than 30 years, although the disease did not occur there before 2007. The favoured explanation for the current outbreak is that it took time for the pathogen to reach high enough density levels.

Why did it take so long to bring in a ban?

The identity of the fungus was unclear (see taxonomy, p56) and a ban considered only when it was properly identified and could be proven the UK had been free of this disease. A consultation process began in February 2012; once concluded, a ban was then implemented.

Why are seeds included in the restrictions?

Recent research has shown seeds can carry the fungus.

Is the disease soil-borne?

This is unknown at this stage.

Can trees be protected with fungicide?

No fungicides are labelled to control this disease; the efficacy of those available to gardeners to control diseases on ornamentals is unproven.

What is the future of ash?

Breeding from resistant individuals may be possible.

What do you do if you own ash trees?

There are other causes of dieback in ash, so become familiar with *chalara* dieback symptoms – see below. A smartphone app, 'Ashtag' (www.ashtag.org) allows you to send pictures to plant pathologists for advice.

Identifying symptoms

Fruiting bodies (right) of *H. pseudoalbidus* (see taxonomy box, p56) form on the previous year's leaf litter. Spores land on leaves and the fungus penetrates the tissue, causing lesions.

✦ **Leaves:** show brown-black spots, eventually becoming entirely brown/black (pictured below right). The fungus spreads down the leaf stalks into stems.

✦ **Stems:** small diamond-shaped lesions appear on the bark, enlarging to form perennial cankers orange, brown, purple or black in colour. When these cankers girdle the tree, they disrupt the supply of water and nutrients (new shoots below cankers can mean the tree appears healthy). Stem sections show brown-grey discoloration extending beyond the dead bark. Badly infected trees show extensive dieback, but no exudates (weeping wounds).

