Observatree
monitoring tree health

www.observatree.org.uk

‘**Host of the month**’ is a series of information sheets and blogs that highlight a tree host and their associated priority pests and diseases that are best seen and recorded in that month. For December we’re looking at Common ash (*Fraxinus excelsior* L.), Ash dieback, and Emerald ash borer.

Whilst England has Cricket and the sound of leather on willow, in Scotland it’s the clash of the ash and the sport of shinty (fig. 1) – the clash being between the camans, the shinty sticks which have traditionally been made from ash. The wood of ash trees is particularly shock resistant making it perfect for applications such as tool handles and sporting goods but unfortunately with the arrival of Chalara ash dieback other woods such as Hickory (*Carya* species) are now starting to replace ash.

Figure 1: Bute shinty player (Bute 2nd 7-2 Ardnamurchan 2nd | ufopilot | Flickr, https://creativecommons.org/licenses/by-nc/2.0/)

The 60-ish species of Ash are all members of the olive family (*Oleaceae*) which it shares with Privets (*Ligustrum*), Lilacs (*Syringa*) and Olives (*Olea*) amongst others. Ash have pinnate (feather or wing-like) compound leaves, i.e., a single leaf is made up of smaller leaflets that are clearly separated from each other (fig. 2). Leaves are arranged in opposite pairs on the shoots, each at 90° to the pair above and below. Flowers are exclusively male or female but individual trees can be either male, female, or hermaphrodite, often becoming more female as they age. Botanically the winged fruits are known as samaras, but they’re commonly referred to as keys.

Only Common ash (*F. excelsior*) is native to the UK, but Narrow-leaved ash (*F. angustifolia*), particularly subspecies *oxycarpa*, and Manna ash (*F. ornus*) are also reasonably widely planted. The latter two are native to mainland Europe and can be very difficult to tell apart from common ash. However, during the autumn *F. angustifolia* subsp. *oxycarpa* (aka Raywood ash) turns an eye-catching dark red/purple and in early summer manna ash has frothy white flowers. In winter common ash can be identified by the black buds which resemble a Bishop’s mitre or perhaps deer hooves (fig. 2). In narrow-leaved ash the buds are dark brown, and in manna ash they’re dark grey and minutely hairy.

Observatree is a citizen science project led by Forest Research, in collaboration with key organisations

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The mountain ash, also known as rowan (*Sorbus aucuparia*), is not related and is not affected by either ash dieback or emerald ash borer. Like common ash the leaves are pinnate compound, but they are attached to the shoots alternately and the seeds are formed within fleshy orange berries rather than winged fruits.

Figure 2: left to right – common ash foliage (*Robert Vidéki, Doronicum Kft., Bugwood.org*), winter buds (*Rob Routledge, Sault College, bugwood.org*), and fruits (*Gil Wojciech, Polish Forest Research Institute, Bugwood.org*).

Priority disease – ash dieback (Hymenoscyphus fraxineus*)*

Ash dieback hit the headlines when it was identified in the UK in 2012 and is now present in most parts of the United Kingdom. The fungus originated in eastern Asia where native ash species such as Chinese ash (*F. chinensis*) and Manchurian ash (*F. mandschurica*) show only minor symptoms on their foliage. It appears that all ash species are affected to some degree, but tolerance varies. Narrow-leaved and Manna ash for example seem to be more tolerant. In contrast common ash is highly susceptible and once infected there is no cure, but tolerance is variable.

The scientific name of the causal agent has changed several times since it was first identified and described in 2009 as *Chalara fraxinea*. 'Chalara' is still widely used to describe the disease. In 2010 molecular work caused a change in thinking and it was renamed *Hymenoscyphus pseudoalbidus*, and then in 2014 it changed again to *H. fraxineus*. You may see all of these names used in the literature.

The fungus is spread via wind-blown spores produced from late spring which settle on ash leaflets and invade the leaf tissue. From there the fungus grows into the leaf mid-rib (rachis), down the leaf stalk (petiole) and into the shoot (fig. 3). Once in the shoot it spreads down into the larger branches or main stem where it forms lesions which can girdle the shoot leading to wilting of foliage and death above that point. The rachises of infected leaves fall to the ground in the autumn, producing very small fruiting bodies the following spring and starting the cycle anew. The spores can travel tens of miles but the disease can also be spread via infected plants.

Identification

Once in the woody stems and branches the fungus causes roughly diamond-shaped lesions that are always at the insertion points of leaf stalks, shoots, and branches (fig. 4). At the surface lesions can be light to dark brown, beneath the bark they penetrate deeply and stain the underlying wood dark brown. Where girdling occurs the foliage above the lesion wilts but is retained on the tree (fig. 4), this is particularly noticeable in early summer. Below lesions the infected trees often produce abundant epicormic shoots which are most easily seen (along with the lesions) following leaf fall in the autumn.

Figure 3: left to right – fruiting bodies on a fallen rachis (*Crown copyright. Forestry Commission / Ana Perez-Sierra*), early-stage infection of ash leaflets (*Crown copyright. Forestry Commission / Ana Perez-Sierra*), and infection moving from leaflet towards ash leaf rachis (*Crown copyright. Forestry Commission / Joan Webber*)

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Figure 4: *Top,* left to right – wilted dead foliage retained on the shoot associated with stem girdling by ash dieback lesions (*Crown copyright. Forestry Commission / Ben Jones*), stem lesion on a young sapling (*Crown copyright. Forestry Commission / Mick Biddle*), and a lesion on an older tree (*Crown copyright. Forestry Commission / Clive Brasier*). Bottom, left to right - frost damage on young ash foliage, surface lesion caused by *Phoma exigua*, and basal wet lesion caused by *P. syringae* (*all images Crown copyright, Forestry Commission*)

Lookalikes

Dieback of ash trees can have many causes besides that caused by *C. fraxinea,* so it is important to check for key symptoms such as the dark diamond-shaped lesions.

Frost damage is common on freshly emerged ash foliage (fig. 4) but produces the same wilted and dead foliage as ash dieback at around the same time of year. In ash dieback this happens when lesions girdle the stem below the wilted foliage so it's worth searching the shoots to see if a lesion can be seen.

Phoma exigua is another fungus that attacks younger ash trees, causing pale sunken cankers on younger trees. These cankers often contain pustule-like fruit bodies visible (fig. 4)

Phytophthora syringae can also affect ash trees, causing large basal wet lesions on the trunks (fig. 4)

Priority pest – emerald ash borer (*Agrilus planipennis*)

Emerald ash borer (EAB) is native to Asia but was identified as the cause of ash decline and death around Detroit USA in 2002 and is now found across 22 states and into Canada. EAB has also been spreading eastwards across Eurasia from its native range and is now established in Ukraine. It is not currently known to be present in the UK.

The adult beetles appear in early summer and immediately start to feed on ash foliage. They're between 7.5 and 13.5mm long, slender bullet-shaped and metallic emerald-green (fig. 5). Females lay their eggs in bark crevices and once hatched the whitish flattened larvae (fig. *5*) burrow into the tree and begin feeding. Over the course of one to two years they chew out sinuous tunnels (fig. 5) beneath the bark, eventually reaching 26-32mm in length. Once fully mature they excavate chamber beneath the bark or within the outer wood and overwinter as a pre-pupa, finally pupating in spring. As they emerge in late spring they chew out the D-shaped exit holes characteristic to all *Agrilus* species (fig. 6). In Asia EAB predominantly attacks stressed or otherwise unhealthy native ash trees, in the USA and Europe it attacks and kills healthy ash native to those areas.

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Figure 5: Top, left to right – adult emerald ash borer (*Pennsylvania Department of Conservation and Natural Resources – Forestry, Bugwood.org*), adult beetle on an ash leaflet with foliar feeding damage *(© Natural Resources Canada, Canadian Forest Service*), and EAB larvae, 2nd, 3rd and 4th instars (*David Cappaert, Michigan State University*). Bottom, left to right – D-shaped exit hole left by EAB (*William M. Ciesla, Forest Health Management International, Bugwood.org*), longitudinal split caused by callus tissue as a result of EAB tunnelling (Michigan Department of Agriculture, Bugwood.org), and sinuous galleries of EAB larvae beneath the bark of an infested tree (*David Cappaert, Michigan State University*).

Identification

Early symptoms of EAB infestation are related to the girdling effect of tunnelling. Foliage discoloration is soon followed by crown and branch dieback, usually starting at the top of the tree and moving downwards as infestation progresses. These symptoms might also be accompanied by abundant epicormic growth throughout the tree and sometimes heavy seed production. Tunnelling can also trigger callus development which presents on the exterior as 50-100mm long vertical cracks (fig. 6). In severe infestations the galleries may be revealed when patches of bark fall from the tree.

Lookalikes

Dieback of ash trees can have many causes (see above) so looking for D-shaped exit holes is critical. However, there's now a possibility that EAB might not necessarily be the cause. In the summer of 2023 another non-native *Agrilus* species was found in south-west Surrey, *A. convexicollis (fig. 6)*. This species also feeds predominantly on ash species, but privet (*Ligustrum* sp.), lilac (*Syringa vulgaris*), and olive are also affected. Unlike EAB, *A. convexicollis* appears to target dying and dead ash rather than healthy trees and prefers shoots less than 3cm in diameter (in contrast EAB prefers stems greater than 5cm in diameter). As with other *Agrilus* species the adults create D-shaped exit holes as they chew through the bark.

Figure 6: Adult *Agrilus convexicollis* (*Dick Belgers, licensed under http://creativecommons.org/licenses/by-nc-nd/4.0/*)

Reporting

December is an ideal time to seek out ash trees and see if you can identify any signs and symptoms of ash dieback or EAB. Ash dieback is now widespread throughout the British Isles but there are still areas where it has not been reported so records of infected trees are still valuable where this is the case. The chalara map shows 10km grid squares where the disease has been reported and is updated every six months.

Emerald ash borer is a notifiable pest so if you find it you must report it.

Please report possible sightings of both via TreeAlert. Healthy tree data is equally important, particularly in the case of ash dieback so please do report those too.

For more information and resources on ash dieback and EAB please check the Observatree website.

Matt Parratt, Forest Research, November 2024