

Ash die-back : Is there any hope?

Over the last few decades our nation has experienced several waves of tree losses due to diseases that have affected different species of once abundant trees. These have compounded the effects of human activity over hundreds of years which reduced our woodlands and forests to a shadow of what once existed.

The UK is one of the least densely forested countries in Europe with around 13% of its total land area covered in forest in 2020 compared with 46% for Europe as a whole and 31% worldwide.

We can all probably recall the shock headlines when Dutch Elm disease appeared and sudden Oak death were reported. The continuous bad news has diminished our sensitivity to such events. It is only when we see the effects of extensive felling that changes the appearance of our neighbourhood, we begin to take notice. Some of the older Lympsham residents can still remember the stately Elm trees that once graced the area close to what is now the cricket field.

Accelerating international trade and climate change made pathogen spread an increasing concern. *Hymenoscyphus fraxineus*, the causal agent of Ash dieback, is a fungal pathogen that has been moving across continents and hosts from Asian to European Ash.



Symptoms of Ash dieback on *Fraxinus excelsior*. (a) necrotic spots on a leaflet; (b),(c) necrotic lesions on leaflet midribs and adjacent leaf blade tissues; (d) leaf wilting distal to a necrotic lesion on the rachis; (e),(f) necrotic bark lesion on a shoot originating from an infected side leaf and twig; (g) extensive bark necrosis leading to shoot dieback; (h) wood discoloration beneath a necrotic bark lesion on a shoot; (i),(j) tongue-shaped bark lesions at the base of *F. excelsior* trunks; (k) wedge-shaped wood discoloration beneath a root collar lesion.

The disease is also known as 'Chalara' to distinguish it from dieback on ash trees caused by other agents.



The felling of swathes of young and mature Ash trees in woodland across the nearby Mendip Hills due to their “high risk” locations, has been driven guidance issued to Councils by the Government. A drive past Shute Shelf to visit the popular walking area around King’s Wood near Winscombe, is a good example.

The fungus, *H. fraxineus*, jumped host from Asian Ash species, where it is a leaf pathogen with little impact on its host. In Europe it has killed Ash at an alarming rate and displacing the non-aggressive indigenous fungus, *H. albidus*. It appears to have been just two genetic variants of the fungus gained the ability to infect European trees with such devastating consequences. The disease was first observed in Europe in north-western Poland in 1992 and, moving west, was identified in the UK in 2012

For a fungus to successfully infect a host plant, it needs to overcome the natural immunity of the host. This requires the neutralisation of protective substances secreted by the Ash tree bark and then the ability to weaken the surface and penetrate into the tissues beneath.

Some five years ago, new research identified the genetic basis of resistance to ash dieback in UK trees, opening up new avenues for conservation. Researchers from Queen Mary University of London and the Royal Botanic Gardens, Kew sequenced the DNA from over 1,250 ash trees to find inherited genes associated with ash dieback resistance.

The study, published in leading journal *Nature Ecology & Evolution*, showed that resistance is controlled by multiple genes, offering hope that surviving trees could be used to restore diseased woodlands, either by natural regeneration or selective breeding. Many of the genes found to be associated with ash dieback resistance were similar to those previously shown to be involved in disease or pathogen responses in other species.

The astonishing advances in genetic studies across the world, now means that is becoming possible to look for useful gene variations that may predict which tree line will be most successful. The twenty or more specific genes that confer the greatest resistance to this disease are now being identified and it is hoped that colonies of the most suitable remaining trees can be identified and used for selective breeding.

https://cdn.forestresearch.gov.uk/2022/02/ch9_international_fs2020.pdf#:~:text=The%20UK%20is%20one%20of%20the%20least%20densely,worldwide.%20Source%3A%20FAO%20Global%20Forest%20Resources%20Assessment%202020.

<https://www.gov.uk/government/publications/managing-ash-trees-affected-by-ash-dieback-operations-note-46a/managing-ash-trees-affected-by-ash-dieback-operations-note-46a>

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<https://www.nature.com/articles/s41559-018-0548-9>