

Ash Trees for the Future?

A research update

News about ash dieback may have quietened down in the media, but much has been going on in the scientific community. **Jo Clark** reports on some of the progress, and highlights how foresters can help ensure ash remains on the planting list of available species for years to come.

The start of 2017 saw two important publications for ash dieback (ADB, formerly known as Chalara ash dieback) relevant to the management of ash in the UK. The first of these was the mapping of the ash genome and its genetic diversity across Europe (Sollars et al., 2017). The second saw the output from the COST FP1103 Action FRAXBACK (Vasaitis and Enderle, 2017) and is an extensive review of ADB across Europe and country responses to the disease. Guidelines for sustainable management in the European context are also discussed. Both are available online (see references).

After the confirmed outbreak of ADB on mature trees in the wider environment in 2012 many research projects were funded by the Research Councils and UK Government. These included mapping the ash genome of a low heterozygosity (self-fertilised) tree and identifying genetic markers associated with tolerance to ADB. It is perhaps worth noting that no trees are resistant to ADB, although some get the disease and then show tolerance to it to varying degrees. Work in Denmark had previously highlighted that some individuals (less than 1%) show a high degree of tolerance (less than 10% crown dieback) (McKinney et al., 2011) and experiments with controlled inoculations showed that this tolerance is heritable (McKinney et al., 2012) and therefore suitable for breeding work. Mapping the entire ash genome has enabled improved markers for reduced susceptibility to be identified. A survey of these markers within British populations suggests that reduced susceptibility to ADB may be more widespread in Britain than in Denmark (Figure 1). However, the paper also reports that the susceptibility of trees to ADB is linked to levels of iridoid

glycosides, which are a defence against herbivory, and cautions against the possibility of a trade off by selecting trees tolerant to ADB against those susceptible to the emerald ash borer (EAB, *Agrilus planipennis*), a small beetle eating its way westward from Moscow and responsible for the death of an estimated 30 million ash trees in North America (CABI, 2016). EAB is recognised as a major threat but is not yet reported in the UK. However, this gives concern for future breeding programmes, which must ensure as wide a genetic base as possible to allow for selection pressure against EAB.

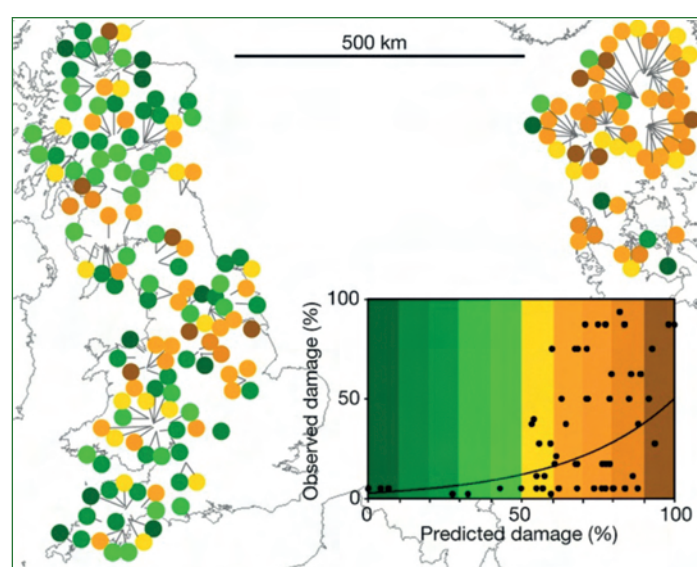


Figure 1. Predicted ash dieback damage scores in Great Britain and Denmark. High predicted damage scores are in brown and low predicted damage scores in green. Reproduced from Sollars et al. (2017).

Features

Field observations of ADB

Two additional projects, both funded by Defra and each running for five years, were initiated in 2013 with the aim of identifying trees with a high level of tolerance. The first of these is being carried out by Forest Research, which is undertaking the mass screening of seedlings by visual observation that were in nurseries ready for the 2012/2013 planting season. Fourteen trials comprising 155,000 trees were planted in spring 2013 with 15 provenances from Britain, Ireland, France and Germany, and included some qualified seed from the Future Trees Trust original breeding programme. Survival has dropped in the trials each year from 96% in 2013 (one growing season), to 80% survival in 2015 with a further 30% infected in this time frame (Figure 2). Data



Figure 2. Steve Lee with a putatively tolerant tree in the mass screening trial, October 2016. If still healthy at the end of this year, graftwood will be taken and the tree planted out in the ash archive for future breeding work. (Photo: Steve Lee, Forest Research)

are still being analysed for 2016 and survival is expected to have dropped further as inoculum levels within the trials increases. The project will also collect data for 2017, which will indicate if there are any regional variations in tolerance, and also identify individuals to take forward for breeding work.

The second project is the Living Ash Project, reported in the *QJF* (Clark, 2014), to identify trees of tolerance from across Britain, graft them and create a new population of highly tolerant ash to carry out further investigations on. We are visually screening 25 research trials including those trees selected by Future Trees Trust in situ as phenotypically superior that were the basis of the original breeding programme and seed from which is being tested in the mass screening trials. We partnered with the Sylva Foundation to carry out citizen science to monitor the wider ash population. This year we will be visiting those trees tagged by the public to ascertain levels of tolerance and to collect graftwood where appropriate, but we need your help.

Get involved

Our minimum target is to locate 400 individuals of high tolerance. We have been monitoring many thousands of trees, but want the forestry sector to also monitor their woodlands. This summer members of the Living Ash Project will be scouring the country to identify these trees from across the research programmes, and also the citizen science contributions. Any additional visits to promising looking sites can easily be accommodated. Please contact jo.clark@earthtrust.org.uk if you think you have some trees of interest.

In previous years we hosted workshops in Devon and Suffolk that have been well attended, and this year will be hosting one in the Yorkshire Dales on June 8th 2017 at Grassington, to which everyone is welcome. The morning will include four presentations on ash dieback, silviculture management, research and citizen science. In the afternoon we will visit some nearby woodland to look at the effects of ash dieback and discuss management options. June is a good time of year to be out looking for signs of ADB, as new shoots quickly wilt or fail to appear and trees have the characteristic dead tops, and epicormic regrowth (Figure 3a). A little later in the year (July and August) is also a good time to be checking trees as ascocarps are visible on the ground on last year's rachises and are the source of the current year's inoculum (Figure 3b). To book on the workshop, please contact: tim.rowland@futuretrees.org

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Figure 3. Key indicators of ash dieback. Left: 3a - Susceptible ash tree showing characteristic dead twigs with epicormic growth in the foreground, and uninfected, potentially tolerant ash tree behind. (Photo: ©James Brown, John Innes Centre). Right: 3b - Ascocarp fruiting bodies on last year's rachis. (Photo: Jo Clark)

Any trees that look promising for further research will be grafted on to rootstocks and planted on the public forest estate. In addition, each selected tree will be screened to see if it has markers for tolerance. The resulting archive of tolerant trees will be the focus of monitoring work going forward for several years, with additional trees being added, and those of lower tolerance removed.

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Jo Clark is the Forestry Research Manager at Earth Trust in Oxfordshire and project coordinator for the Living Ash Project. She is also the Research Coordinator for Future Trees Trust.

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