Screening technique to reinforce fight against ash dieback

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Researchers at the University of York led a pioneering study which opens up a new front in the battle against a disease affecting ash trees across Europe.

The research identified genetic markers to predict whether specific trees in populations of ash will succumb to the disease or are able to tolerate and survive a fungal pathogen that is causing ash dieback.

The technology could help to maintain the ash tree as part of the UK landscape through pre-screening of individual tree seedlings to identify non disease-susceptible individuals before they are planted out.

The research was led by the Centre for Novel Agricultural Products (CNAP) in the Department of Biology at York and involved the Department of Geosciences and Natural Resource Management, the University of Copenhagen; the School of Biological and Chemical Sciences, Queen Mary University of London and the John Innes Centre. It is published in *Scientific Reports*.

Across Europe, the European ash *Fraxinus excelsior* is being seriously affected by ash dieback with only around two per cent of trees surviving in areas where the disease is well established. The disease was first discovered in the UK in 2012 and is progressing much as expected. In addition to the 157,000 hectares of ash woodland in the UK, the 12 million ash trees outside those areas—in parklands, gardens, hedgerows and along roads for example—are also at risk.

The research was jointly funded by the Biotechnology and Biological Sciences Research Council (BBSRC) and Department for Environment, Food and Rural Affairs as part of the Nornex consortium project to develop a long-term solution to the ash dieback threat.

Using a population of selected trees with diverse susceptibility, the researchers sequenced their RNA to identify genes whose sequence and expression levels are correlated with disease symptoms. This allowed the scientists to identify gene markers that are correlated with low susceptibility to ash dieback disease. Using a second population of trees, they used these gene markers to successfully predict which of the trees were likely to have a low level of susceptibility to the fungal pathogen Hymenoscyphus fraxineus.

Professor Ian Bancroft, of CNAP, said: "Tree disease epidemics are a global problem, impacting food security, biodiversity and national economies. The approach we have used has never previously been used to screen for disease-resistant plants and in principle could be applied to identify disease tolerance in other species of trees that are currently being threatened by a range of tree pests and pathogens."

Professor Allan Downie, from the John Innes Centre, said: "This is a wonderful example of British expertise in plant genomics and genetics rapidly and successfully being applied to minimise the impact of Ash Dieback. The technology developed offers a way around anticipated loss of more than 90 per cent of UK ash trees by identifying and selecting those ash seedlings most likely to survive the epidemic of ash dieback currently sweeping across the country."

Professor Melanie Welham, BBSRC Executive Director, Science, said: "With BBSRC and Defra funding scientists have been able to rapidly collaborate and develop ways that should help mitigate the threat facing

the UK's ash trees. This technique will help protect the UK's ash population and biodiversity, which are enjoyed by millions of people across the country."

Universities and Science Minister Jo Johnson said: "This pioneering research puts Britain at the forefront of tackling ash dieback and other tree diseases that are threatening our environment and global food security. By protecting the science budget in real terms we can continue to invest in world-class science that delivers environmental benefits worldwide, while ensuring everyone can continue to enjoy Britain's woodlands."

Lord Gardiner of Kimble, House of Lords Spokesman for the Department for Environment, Food and Rural Affairs said:

"We want to make sure the graceful ash tree continues to have a place in our natural environment which is why we've invested more than any other country in research on Ash Dieback.

"The identification of genetic markers is a significant first step in developing trees with tolerance to the disease and testament to the innovation and dedication of our world leading scientists."

More information: 'Molecular markers for tolerance of European ash (Fraxinus excelsior) to dieback disease identified using Associative Transcriptomics' *Scientific Reports*, www.nature.com/articles/srep19335

Provided by University of York