

ASHGEN

Identifying the scale of suspected hybrid ash in Ireland and its potential for genetic pollution of indigenous ash germplasm

PROJECT TEAM

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COMPLETION DATE: June 2010

BACKGROUND

Ash plants imported from 1993 to 2000 have produced poorly growing plantations in a substantial number of cases. This project investigates whether the planting stock was true common ash (*Fraxinus excelsior*) or natural hybrid material involving another continental species (*F. angustifolia*). These plantations are now seeding. The project is investigating the origin of the imported trees and their interbreeding capacity because the dispersal of hybrid seed into the landscape may give rise to a wild population that would interbreed with native stock, resulting in genetic pollution of native ash germplasm.

OBJECTIVES

The overall objective of this research is to provide a set of tests that can confirm the hybrid nature of ash that is present at suspect sites in Ireland and the potential of these plantations to interbreed with indigenous ash.

The specific objectives are:

- to examine suspect material in Ireland using known morphological criteria;
- to examine suspect material in Ireland using known molecular criteria;
- to assess the potential threat of the confirmed hybrid material to further introgress with native stocks of ash.

PROGRESS

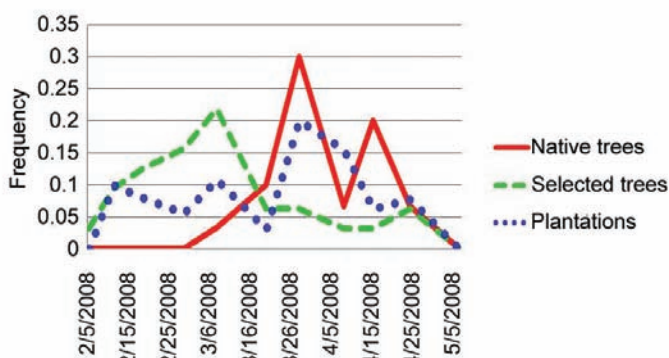
Fourteen suspect plantations were examined and four of these were intensively sampled to study morphology and molecular

markers in Meath, Wicklow, Kerry and Dublin, as well as material from control populations in France.

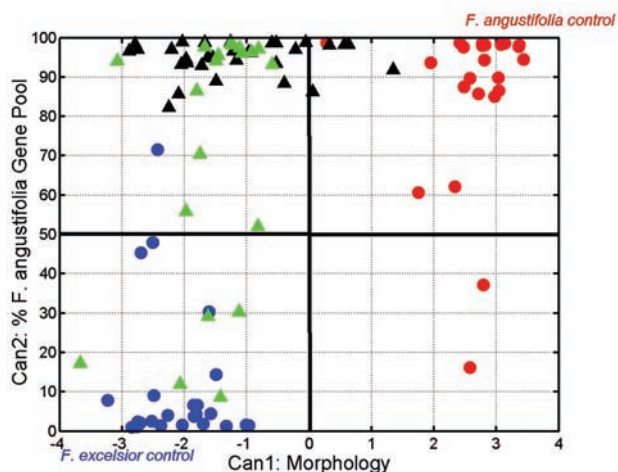
Morphological features of the leaves from three sites did not fit well with the set of characters that were found in pure control populations of either *F. excelsior* or *F. angustifolia*. The lack of significant clustering of the Irish plantation ash with either control population from France may indicate that these controls may not be the most appropriate to use. Hybridisation of ash is known in several regions of France and control populations from other areas may give more useful information. Furthermore, the results showed that material in two of the plantations share more characters with each other than with either species. This suggests that the source of the plantation ash may be from the same or nearby regions of provenance.

Molecular analysis of single gene markers were equivocal but indicated a strong component of *F. angustifolia*. Several features including 11 morphological and 13 molecular markers were examined using multivariate statistics. For the Irish samples it showed that most of the trees indicated a hybrid nature (Meath and Kerry) while those in Wicklow were very close to *F. angustifolia*. However, morphological characters of *F. angustifolia* were only apparent in certain individuals, suggesting the cryptic hybrid nature of many trees.

At each plantation site the onset of flowering was earlier among the plantation trees compared to native surrounding trees. This is more characteristic of *F. angustifolia* and it may be a useful practical indicator of hybridity. Over 60% of the



Time of flowering in plantation 'hybrid' trees and native ash in Wicklow: open flower frequency, stage 2.5.



Joint morphological (X axis) and genetic (Y axis) evaluation of the 'hybrid' ash plantation trees from Wicklow (black triangles) and Meath (green triangles) together with control material of *F. excelsior* (blue dots) and *F. angustifolia* (red dots).



Lateral buds of *F. angustifolia* and 'hybrids' may have three buds in one plane (*F. excelsior* has two) and the terminal bud may have three axes of symmetry as illustrated.

plantation trees at two sites produced some flower buds and we found an overlap in the flowering periods of plantation trees with native trees that leaves the possibility of hybridisation and gene flow from plantations to native trees and visa versa.

ACTIVITIES PLANNED

- Complete the genetic fingerprinting (genotyping) of chloroplast markers for two plantations.
- Genotyping of 96 trees from Clonee with 12 nuclear and chloroplast microsatellite markers and of the progeny (seeds) to determine the sources of pollen (from within the plantation or from outside).
- Complete the morphological analysis of Irish plantation material to compare with putative hybrid zone material from France.
- Cloning and sequencing of more trees to produce specific primers for the ETS to provide a potential 'bar code approach' to identification.
- Determine the viability of seeds from Irish hybrid plantations.

OUTPUTS

Muriel Thomasset wrote a paper on *Hybridisation, introgression and climate change: a case study in the tree genus Fraxinus*, for a book published by the Systematics Association and Cambridge University Press.

Posters

Muriel Thomasset, Gerry Douglas, Trevor Hodkinson. 2008. *Hybrid alien ash in Ireland and its potential for interbreeding with native ash*. Postgraduate Ecology Forum conference 10-12 March 2008, Trinity College Dublin. Conference book p40.

Juan F. Fernández-M., Muriel Thomasset, Trevor R. Hodkinson, Nathalie Frascaria-Lacoste, Gerry C. Douglas. 2008. *Identifying the scale of suspected hybrid ash (F. excelsior × F. angustifolia) in Ireland and its potential for genetic pollution of indigenous ash*. Climate Change and Systematics, 1-3 September 2008, Trinity College Dublin. Conference book p24.

Muriel Thomasset, Gerry Douglas, Trevor Hodkinson. 2008. *Hybrid alien ash: F. excelsior × F. angustifolia and its potential for interbreeding with native ash under current and future climatic conditions*. Climate Change and Systematics, 1-3 September 2008, Trinity College Dublin. Conference book p29.

Juan F. Fernández-M., Muriel Thomasset, Trevor R. Hodkinson, Nathalie Frascaria-Lacoste, Gerry C. Douglas. 2008. *Identifying the scale of suspected hybrid ash (F. excelsior × F. angustifolia) in Ireland and its potential for genetic pollution of indigenous ash*. Agricultural Biotechnology International Conference, 24-28 August 2008, University College Cork. Poster 1.18 Book of abstracts p8.

Communications

Douglas, G. Keeping Irish ash pure. 2008. *Science Spin* No. 31 p10.

Thomasset, M. *Hybrid alien ash in Ireland and its potential for interbreeding with native ash*. Seminar day for first year postgraduates at Trinity College Dublin, 25 March 2008.

Conference presentations

Postgraduate Ecology Forum conference, 10-12 March 2008, Trinity College Dublin.

Ecological Genetics Group (EGG) conference, 1-3 April 2008, University of Sheffield, England.

Climate Change and Systematics, 1-3 September 2008, Trinity College Dublin.