Management of ash in the light of Chalara dieback

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Overview of presentation

- Ash age profile
- Scenarios

- Silvicultural options
  - State-of-the-art
  - Options for Ireland?
    - Systems
  - The future
Age profile of ash (GB)

Figure 16a  Stocked area by age class of ash for GB

- Nursery sites
- Recently planted sites
- Wider environment

Sites (no.)
Nursery sites Recently planted sites Wider environment

Thousand of hectares

Age class (years)
0-10 11-20 21-40 41-60 61-80 81-100 100+

0 50 100 150 200 250 300 350
Age profile of ash (R. Ireland)
Age profile of ash (N. Ireland)
Ash age profile compared

R. Ireland

N. Ireland
Ash age profile compared

R. Ireland

G.B.

N. Ireland
UK and R.I compared

UK: ≈ 142,000 Ha. ash
RI: ≈ 21,000 Ha. ash
UK: ≈ 260 cases per 100,000 km²
RI: ≈ 170 cases per 100,000 km²
UK: ≈ 4.6 cases per 1,000 ha ash
RI: ≈ 5.8 cases per 1,000 ha ash

- Ireland has had very few “Wider environment” cases to-date.
  Current eradication program.
- UK “wider environment” cases predominantly in the South and East. Will this spread westwards??
  No eradication program.
- Is there potential in the coming decades for dieback to spread across GB and over the Irish Sea?
Dieback scenarios

Chalara dispersal

<table>
<thead>
<tr>
<th>Chalara widespread but only partial dieback?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ash recovery?</td>
</tr>
<tr>
<td>Ash extinction?</td>
</tr>
<tr>
<td>Chalara containment?</td>
</tr>
</tbody>
</table>

Ash susceptibility to Chalara
Future scenarios

1. Dieback incidence increases uncontrollably
2. Dieback is eradicated in Ireland but windblown re-infection occurs
3. Dieback is eradicated in Ireland and no re-infection occurs

1. Selective breeding successful and timely
2. Selective breeding unsuccessful
Owner risk aversion

1. Chalara viewed by owners as a
   • High risk?
   • Low risk?

2. Different management strategies required?
Ash dieback in Slovenia

- Stop promoting ash for afforestation
- Replace in affor with sycamore
  - Or other suitable spp.
  - *Populus* on sandy soils near rivers
- Sanitary felling of heavily damaged ash trees
Dieback of ash in Eastern Austria

- Damage and mortality levels are much higher on:
  - Nursery seedlings
  - In afforestations
  - On natural regeneration
  - In thicket-sized and pole-sized stands
    ...than on old trees

- Ash dieback causes immense problems for establishing and tending young stands
- Old trees appear to be capable to endure the disease for a relatively long time
Patterns and Severity of Crown Dieback in Young Even-Aged Stands of European Ash (Fraxinus excelsior L.) in Relation to Stand Density, Bud Flushing Phenotype, and Season

Remigius Bakys¹, Rimvydas Vasaitis¹ and Jens Peter Skovsgaard²

¹Department of Forest Mycology and Plant Pathology, Uppsala BioCenter and ²Southern Swedish Forest Research Centre, Swedish University of Agricultural Sciences, Alnarp, Sweden

Abstract


The extent and temporal pattern of crown damage (attributed to Hymenoscyphus pseudoalbidus) in even-aged stands of Fraxinus excelsior in relation to bud flushing phenotype, stand density, and season was investigated. Data were collected in 2007 in four statistically designed thinning experiments located in 12–15-year-old plantations of ash in Denmark. The study included 21 plots of four contrasting, residual stand densities: (1) 1700–5500 trees/ha (unthinned control plots), (2) 1500 trees/ha, (3) 500 trees/ha, and (4) 100–150 trees/ha. Assessments included estimation of flushing phenotype in May, followed by evaluation of severity of crown damage (percentage of crown killed) in June and September. Simultaneously, for each tree, the presence or absence of crown wilt and dead tops were recorded. The seasonal pattern of disease severity (average crown damage) was similar in all stands, and disregarding stand density the extent of tree crown damage increased significantly towards the end of the growing season (P < 0.005). Disease severity was the worst in unthinned plots, but otherwise unrelated to stand density. Late-flushing trees were most severely affected (P < 0.001). The observed patterns of disease severity are probably associated with ecological features of the pathogen that still remain largely unknown.

- Thinned stands are less severely infected
- Late-flushing trees most severely affected
Senescence

- Trees with early leaf senescence in the autumn are less prone to infection.
Associations among symptoms

- The disease was associated with symptoms of *Armillaria gallica*
- No associations were found for symptoms of *Neonectria galligena*, *Pseudomonas syringae* subsp. *savanastoi* pv. *fraxini*
- Dieback was more frequent on trees of average or below-average size
  - suggesting that individual tree resistance decreased with decreasing growth potential or tree vigour

Development of phytosanitary silviculture prescriptions should primarily be targeted towards young stands as these represent the most critical phases of stand development.
Occurrence on infected logs

- The pathogen was able to produce conidia from infected wood
- Export of ash logs could represent a potential risk?
  - (requires confirmation [tested in the lab])
  - the available data do not support control of ash log trade as a quarantine measure
- Involvement of Armillaria spp. in the decline process was confirmed
Silviculture

Regeneration

Tending

Thinning

Most critical phase
- Too late for replacement planting?
- Too early for commercial timber sale?
Uninfected site

- Slow the impact of any future infection
  - promote fast growth of selected trees
  - Maximise timber value at time of felling
  - High standards of silviculture and establishment
Infected pole-stage

• Low disease level
  • Selective thinning of diseased and suppressed

• Stand is a mixture of species, and there are enough trees of other species to form a closed stand within 10 years, it is likely that management objectives can still be achieved without replanting after felling the ash.

• Stand is a mixture and there are NOT enough trees of other species to form a closed stand within 10 years, it is likely that the stand will have to be regenerated after felling by planting alternative species

• Stand consists of pure ash then consider what alternative species would do well on the site.
Older stands

- Individual-tree approach is recommended for older stands with infected trees.
- > 50% of the crown is infected, and where survival of the tree depends on epicormic shoots, felling should be considered.
- < 50% of the crown is infected, trees should be regularly monitored. Assess the risk of Armillaria (honey fungus) attack. This is often the ultimate cause of death of ash trees once they are infected with Chalara.
Increase resilience of woodlands

- Increase the genetic and age diversity of the woodland
  - Developing stands of mixed species should make the woodland less vulnerable to disease
  - Adopting a continuous-cover approach, where practicable, is one way to promote higher levels of species and age diversity.
GUIDANCE FOR LANDOWNERS & MEMBERS OF THE PUBLIC ON MANAGING ASH DIEBACK DISEASE IN THE NATIONAL FOREST

WOODLANDS

Is timber production a main objective for the woodland?

- **YES**
  - Are there enough trees of other species to form a closed stand within 10 years?
    - **NO**
    - Does the woodland contain > 33% of ash
      - **NO**
        - No action necessary. Allow development of deadwood in ash trees along with open space/glades for natural regeneration of other species and expansion of existing trees.
      - **YES**
        - No action necessary. Allow development of deadwood in ash trees along with open space/glades for natural regeneration of other species and expansion of existing trees.
    - **YES**
      - Are the ash trees older than 5 years old?
        - **NO**
          - No action necessary. Allow development of deadwood in ash trees along with open space/glades for natural regeneration of other species and expansion of existing trees.
        - **YES**
          - Remove and/or interplant ash component/replant and tube with other fast growing species suited to the site conditions and landscape.
            - N.B. NFC & Forestry Commission grants may be available to remove infected trees and guidance will be provided.

Once signs of the disease emerge in the locality, consider felling the ash component. Replant and tube with other fast growing timber species suited to the site conditions and landscape where gaps are significant or encourage natural regeneration to develop where gaps are small.

N.B. Ensure that full compliance with both NFC & Forestry Commission contracts and regulations are met.

INDIVIDUAL TREES IN NON-WOODLAND SETTING

No action necessary unless a risk to public safety. If trees do pose a risk comply with the National Tree Safety Group common sense risk management of trees guidelines. Where risk is considered very low allow development of deadwood in ash trees for benefit of wildlife. Consider impact of loss of ash trees on the landscape and its wildlife and think about replacement of individual and hedgerow trees with other species suited to the site conditions and landscape.
• Includes advice for coppice systems
  • Monitor nat. regen. for signs of resistance
  • Consider alternative spp.
  • Remove symptomatic trees
• Leave 50-70% cover by maintaining canopy of ash and other spp
Silvicultural Strategies for Forest Stands with Ash Dieback

IBEN MARGRETE THOMSEN AND JENS PETER SKOVSGAARD

Abstract
Chalara fraxinea ash dieback may have devastating consequences for the survival and wood quality of Fraxinus excelsior. In this paper we suggest alternative silvicultural strategies for forest stands with ash dieback. The relevant strategy depends on stand age and the degree of dieback. Generally, the strategy should be conservative, if the dieback is less severe. An operational approach would be to identify and mark healthy trees. In case of severe dieback, the suggested approach is to harvest remaining timber as soon as possible and replant the area.

Keywords | Fraxinus excelsior, Chalara fraxinea, Hymenoscyphus pseudoalbidus, silviculture

Primary and secondary agents of ash dieback
Ash dieback caused by C. fraxinea directly affects leaves, shoots and bark. Usually, symptoms are confined to the crown, and only young trees may be killed immediately when the fungus attacks the main stem. For trees up to 40 years of age, the typical disease development is repeated shoot dieback in the crown and dry necroses of the bark on branches (Skovsgaard et al. 2010).

The main stem below the crown often remains healthy, and vigorous trees respond prolifically with regrowth of affected shoots and development of epicormic branches in the crown. While the development of new shoots delays the progress of the disease.
Forstschutz Aktuell 55, 2012

• **Severely infected young stands**
  - Clearcut and replant.
  - Use ash as shelter and underplant.
  - Surviving ash trees may be left.

• **Young stands with a high percentage of healthy trees**
  - Turn your back to the stand and hope for the best.
  - Mark >200 healthy ash trees during growing season and thin among the unmarked trees.
• Older stands
  • Inspect stands for dieback during the growing season and in winter.
  • Trees with epicormic shoots should be felled as soon as possible
    • *C. fraxinea* may cause stem wood discolouration through infection of such shoots.
• **Older stands (cont.)**
  
  • Most of the primary crown is dead and survival is based on epicormic shoots in the crown
    • should be harvested within the next year.
  
  • > 50 % of the primary crown is dead
    • consider for harvest.
  
  • > 75 % of the primary crown intact
    • may be considered healthy enough to keep for several years, unless there are signs of honey fungus attack at the base of the trees.
Our advice?

- Mark trees during or after leaf flushing
- Prefer trees that flush early and senesce early
- Thin
- Remove unhealthy stems
  - including those with epicormics
- Inspect stand annually

- Understory smooths the water balance fluctuations
  - conifers but also broadleaves?
But ...

• We may have time on our side
  • Chalara is not prevalent in the wider environment
• Let’s be pro-active
• We can prepare for the future
Rack and selection thinning
Rack and selection thinning
Rack and selection thinning

Underplant?
Rack and selection thinning
Systematic thin and underplant?
Systematic thin and underplant?
Systematic thin and underplant? - light
Relative illumination (sycamore overstory)

- ≈ 10%
- ≈ 40%
- ≈ 60%
Species for underplanting? - Conifer

<table>
<thead>
<tr>
<th>Species</th>
<th>Ellenberg's Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western red cedar</td>
<td>4</td>
</tr>
<tr>
<td>Lawson cypress</td>
<td>5+</td>
</tr>
<tr>
<td>Douglas fir</td>
<td>6</td>
</tr>
<tr>
<td>Western hemlock</td>
<td>6</td>
</tr>
<tr>
<td>European larch</td>
<td>7+</td>
</tr>
<tr>
<td>Lodgepole pine</td>
<td>7+</td>
</tr>
<tr>
<td>Scot’s pine</td>
<td>7+</td>
</tr>
<tr>
<td><em>Pinus nigra</em></td>
<td>7+</td>
</tr>
<tr>
<td>Norway spruce</td>
<td>7+</td>
</tr>
<tr>
<td>Sitka spruce</td>
<td>7+</td>
</tr>
<tr>
<td>Coast redwood</td>
<td>n/a</td>
</tr>
<tr>
<td>Leyland cypress</td>
<td>n/a</td>
</tr>
<tr>
<td>Monterey cypress</td>
<td>n/a</td>
</tr>
<tr>
<td>Grand fir</td>
<td>n/a</td>
</tr>
<tr>
<td>Serbian spruce</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Ellenberg’s indicator values for British plants – sapling stage

3. Shade plant, mostly <5% relative illumination, seldom >30% illumination when trees are in full leaf
5. Semi-shade plant, rarely in full light, but generally with >10% relative illumination when trees are in leaf
7. Plant generally in well lit places, but also occurring in partial shade
8. Light-loving plant rarely found where relative illumination in summer is <40%
## Species for underplanting? - Broadleaf

<table>
<thead>
<tr>
<th>Common beech</th>
<th>3+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hornbeam</td>
<td>4</td>
</tr>
<tr>
<td>Wild cherry</td>
<td>4</td>
</tr>
<tr>
<td>Large-leaved lime</td>
<td>4</td>
</tr>
<tr>
<td>Norway maple</td>
<td>4+</td>
</tr>
<tr>
<td>Sycamore</td>
<td>4+</td>
</tr>
<tr>
<td>Common alder</td>
<td>5</td>
</tr>
<tr>
<td>Ash</td>
<td>5</td>
</tr>
<tr>
<td>Small-leaved lime</td>
<td>5</td>
</tr>
<tr>
<td>Common lime</td>
<td>5</td>
</tr>
<tr>
<td>Spanish (sweet) chestnut</td>
<td>5</td>
</tr>
<tr>
<td>Holly</td>
<td>5</td>
</tr>
<tr>
<td>Field maple</td>
<td>5+</td>
</tr>
<tr>
<td>Horsechestnut</td>
<td>5+</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Black poplar</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walnut</td>
<td>6</td>
</tr>
<tr>
<td>Aspen</td>
<td>6+</td>
</tr>
<tr>
<td>Hybrid poplar</td>
<td>6+</td>
</tr>
<tr>
<td>White poplar</td>
<td>6+</td>
</tr>
<tr>
<td>Sessile oak</td>
<td>6+</td>
</tr>
<tr>
<td>Downy birch</td>
<td>7+</td>
</tr>
<tr>
<td>Silver birch</td>
<td>7+</td>
</tr>
<tr>
<td>Pedunculate oak</td>
<td>7+</td>
</tr>
<tr>
<td>Red oak</td>
<td>n/a</td>
</tr>
<tr>
<td>Southern beech</td>
<td>n/a</td>
</tr>
</tbody>
</table>
Free-growth / halo thinning
Free-growth / halo thinning
Free-growth / halo thinning
Free-growth / halo thinning

Underplant?
Group selection and nat regen / underplant
Group selection and nat regen / underplant
Group selection and nat regen / underplant
Strip felling and replanting
Strip felling and replanting
Establishment of mixtures?

- With tolerant ash provenances in the future
- Anderson Squares?
- Bands?
- Intimate?
- How many species?
Future positives from Chalara?

• Improved silviculture?
  • Amelioration of poor-performing stands
    • Better soils for tree establishment
    • Shelter present?
  • Greater emphasis on thinning
  • Greater owner (and public) interest
  • Less prescriptive silviculture, more site specific silviculture
  • Greater emphasis on establishing mixtures?
• Improved planting stock made available?
Thank you!

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