EMPHASIS

Effective **M**anagement of **P**ests and **H**armful **A**lien **S**pecies - **I**ntegrated **S**olutions

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BREEDING OF ASHES (FRAXINUS) RESISTANT TO ASH DIEBACK

Jelle A. Hiemstra – DLO (Wageningen Research)

SOCIO-TECHNOLOGICAL LEARNING LAB (SLL)
Brno, May 16th, 2017

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 634179.

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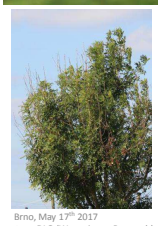
Breeding of ashes (Fraxinus) resistant to Ash Dieback

Disease Cycle (2)

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Ash Dieback

- New, strongly invasive disease
- Serious losses all over Europe: Forest & Urban trees
- No effective treatment
- Only sustainable solution: Resistant trees: not yet available
- So far research mainly directed to forestry → 1-2% resistant

Cause

- New, strongly invasive fungus from Asia:
  Chalara fraxinea → Hymenoscyphus pseudoalbidus → **Hymenoscyphus fraxineus**
- Strongly pathogenic on European ash (F. excelsior)!
- NB. Hymenoscyphus albida = endemic species (not pathogenic)

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What can be done?

Situation

- Fraxinus is important in forestry and urban green
- New pathogen from another part of world
- Present species/cultivars are (highly) susceptible

Solution: Find resistant selections

- Breeding: takes a lot of time in trees
- Selection in existing material: much faster

Essential in both strategies:

- Genetic variation available within Fraxinus
- Variation in susceptibility present within existing plant material
- Methods to test for resistance/tolerance to ash dieback (ADB)

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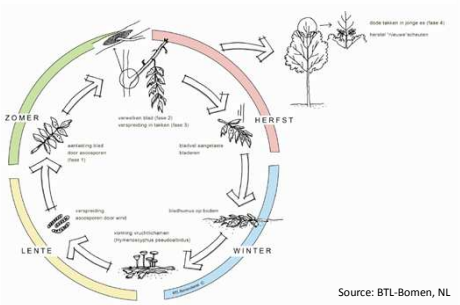
Disease Cycle (1)



Source: BTL-Bomen, NL

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Variation in susceptibility for ADB?

Denmark

- 39 clones of native trees
  → large variation in susceptibility
- Seedling populations from 101 mother trees
  → sign. variation in % disease

Germany

- 246 clones in seed orchards
- Trees from 8 native provenances

→ sign. differences in % disease

Conclusions

1. Variation susceptibility within *F. excelsior*
2. Variation genetically determined → selection possible

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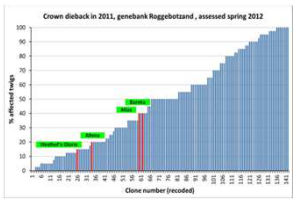
Situation in the Netherlands

- F. excelsior very important in urban green, landscaping and forestry
- Ash dieback very common and causing serious problems
- Differences observed in % disease between cultivars and clones (seed orchards)



Conclusion

- Large variation in % disease → **Good prospects for selection**

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Field test for screening of collected plant material

1114 plants (15 sp + 25 cv) planted in May 2016

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Genetic variation within existing plant material needed

List of names of woody plants:

- 21 *Fraxinus* species
  - 4 common in NL:
  - F. *excelsior, americana, pennsylvanica, ornus*
- 35 cultivars of *F. excelsior*
  - 5-10 common in NL

Collection built for resistance/tolerance screening

- 15 species and 25 cultivars
- Propagated by grafting on seedling rootstocks
- Cooperation with stakeholders

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Field test for screening of collected plant material

Situation in summer 2016
To be inoculated in 2017

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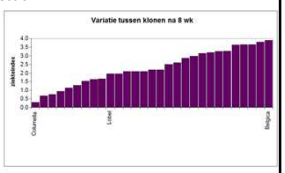
Procedure for resistance testing

1. Building of collection of plant material to be tested
2. Actual testing
   - All material under same conditions
   - Avoid "escapes" → usually artificial infection
3. Monitoring of disease development
   - Symptom development recorded
4. (Observations from natural infections)
5. **Conclusions** on differences between cv/sp



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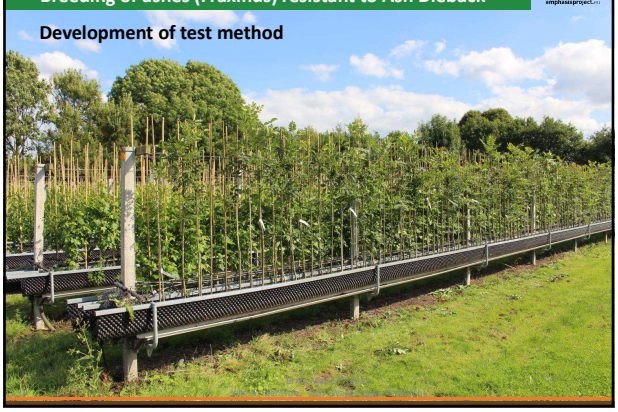
Development of test method



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Artificial infection: 1. inoculum

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Artificial infection: 3. symptom development (controls)

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Artificial infection: 2. inoculation

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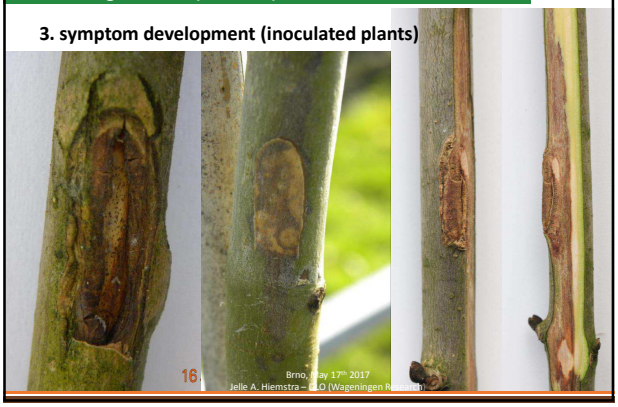
3. symptom development (inoculated plants)



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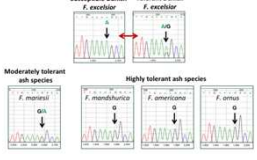
New developments: DNA methods (1)

- Molecular (DNA) markers for tolerance to ADB
  - Developed by Harper *et al. (2016)*
  - Still in experimental phase
  - 2 types:
    - 2 expression markers: GEM
    - 1 cDNA based SNP marker: cSNP




SCIENTIFIC REPORTS
OPEN
Molecular markers for tolerance of European ash (*Fraxinus excelsior*) to dieback disease identified using Associative Transcriptomics

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New developments: DNA methods (2)

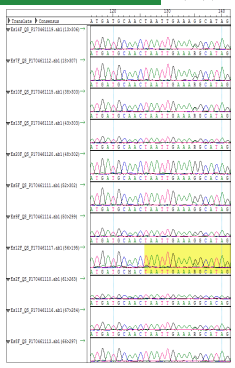
DLO tested cSNP

- 10 genotypes:
  F. americana and 9 *F. excelsior* cv's
- Technique works well
  - *F. americana* tested highly tolerant
  - *F. excelsior* cv's vary:
    moderately tolerant – tolerant

Conclusion

Preliminary results in agreement with
(limited) info from literature and practice

-- > Good prospects for further testing in 2017



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Summary

Ash Dieback (ADB)

- Newly introduced disease
- Variation in susceptibility within Fraxinus
- Selection for resistance/tolerance possible

Finding less susceptible Fraxinus selections

- Large collection of sp/cv built for screening
- Actual testing in 2017 (inoculation experiment)
- Simultaneously screening with DNA markers

→ Identification of less susceptible sp/cv

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Thanks for your attention

Acknowledgements:
Khanh Pham
Bart van der Sluis

Partners in project

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