## What determines adaptability? a case study with Silver birch (*Betula pendula*)







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## Background

- Climate change challenges long lived forest trees.
- Genetic diversity and phenotypic plasticity are key factors in species survival in a changing environment.
- Biomass accumulation provides a clue about the adaptation of individuals to current and future conditions.





## **Study material**

- Common garden experiment established in Punkaharju (Finland) in 1999.
- 22 Silver birch genotypes micro-propagated from randomly selected trees in a single, naturally regenerated birch stand.





## Study material

15 genotypes selected for further study.





## Environment

 Large variation in environmental conditions between years.





### Photosynthesis

- Differences between genotypes in P<sub>n</sub> generally small
  - In 2011 strong, genotype dependent response to high temperature and low soil moisture.





## Control of water loss

Genotypic differences in water use may be related to volume growth.





Used photosynthetic capacity

 Slower growing genotypes may need to work harder.





#### Leaves

- Small and light leaves may result in higher biomass
  - Small differences on leaf level may be important on a canopy scale.





## Phenology

- Relates to the length of the growing season
  - Large differences between genotypes, but not directly related to volume.



## Key messages

 Different combinations of physiological, morphological and phenological traits can results in good growth (by volume).

Genotype	16	18
Volume (2008)	=	=
P <sub>n</sub>	=	=
WUE	+	-
PC	-	+
SLA	-	+
Bud burst	=	=



## Key messages

- Gas exchange is fairly constant and unlikely to be strongly linked to good growth in Silver birch (*Betula pendula*).
- Leaf traits -and their flexibility in response to the environment- are important determinants for volume growth.
- Not spring, but autumn phenology may be important for good growth.
- In Silver birch it is difficult to find good and simple indicators of good adaptation.



# Questions

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