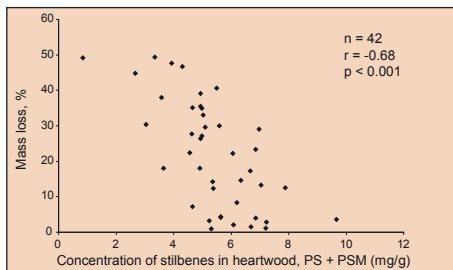


## Towards utilization of the quantitative variation in heartwood extractives

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The heartwood samples having a large between-tree variation in the extractive concentrations, and subsequently in the mass loss in a 7-week decay test (the range of mass loss 1 – 49 %, *Coniophora puteana*).



Heartwood that has high stilbene concentration (pinosylvin + pinosylvin monomethyl ether) loses less mass in decay test (*C. puteana*), i.e. is more decay resistant than the heartwood with low stilbene concentration.



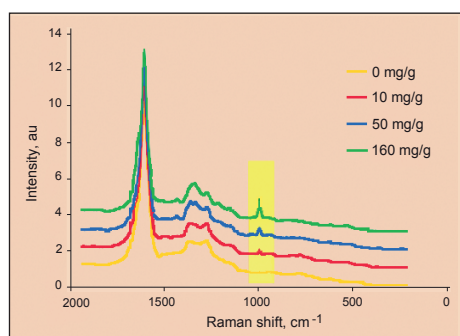
Selective seed harvest in Scots pine seed orchards would be one way to speed up the utilization of the existing genetic variation in stilbene concentration and decay resistance.

### Heartwood extractives as protectors of wood

Stilbenes are the main extractives responsible for the decay resistance of the Scots pine (*Pinus sylvestris* L.) heartwood timber. These compounds are related also to pest and pathogen resistance of living trees. Ample phenotypic and genetic variation has been found in the decay resistance of heartwood [1] as well as in the concentration of stilbenes in the heartwood [2] and in the mechanically injured seedlings [3]. To be able to utilize the existing variation, there is a need for fast and reliable selection and grading techniques of timber and living trees.

### High throughput screening of stilbenes: from wet chemistry to optical analyses

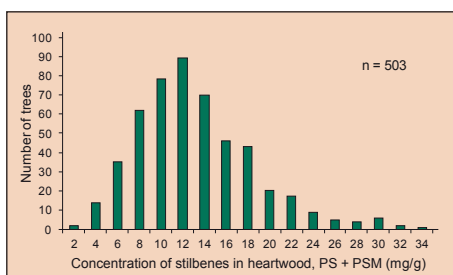
Accurate, fast and non-destructive methods to screen stilbenes are needed for small increment core samples from adult trees. Chemical stilbene analyses from the increment cores of adult trees have been carried out in Metla and the optical measurements in A!/TKK.



Stilbene content of wood samples was quantified based on the intensity of the band at ca. 996 cm<sup>-1</sup> (A.-S. Jääskeläinen/VTT).

### Natural genetic variation in heartwood extractives

Stilbene concentrations are estimated from a natural Scots pine stand and from a subset of Scots pine breeding material. Grafts representing original plus trees and their open-pollinated offspring growing in old progeny trials have been studied.

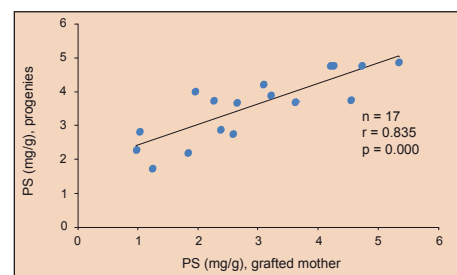


Results from a 44-year-old progeny trial: there is wide variation in stilbene concentration of heartwood among the trees.

### Selective seed harvest in seed orchards

Seed orchard clones that have genetic potential to produce heartwood with high concentration of extractives transmit this characteristic to their offspring [4].

Selective seed harvest seems to be a promising way to obtain reforestation material having inherited potential to produce high-quality heartwood as mature trees.



Correlation in the concentration of pinosylvin (PS) in the heartwood between the grafted mothers in the seed orchards and their offspring in the progeny trial (17 clones/families).

### Utilization of the results

The results can be utilized in the grading of heartwood timber, in the marketing of tested forest regeneration material, as well as in the breeding of resistant trees.

#### References

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- [4] Partanen, J., Harju, A. M., Venäläinen, M. & Kärkkäinen, K. 2011. Highly heritable heartwood properties of Scots pine: possibilities for selective seed harvest in seed orchards. *Can. J. For. Res.* 41(10): 1993–2000.

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