

## Genetic Aspects of Adaptation and Mitigation: Forest Health, Wood Quality and Biomass Production

Report from the AdapCAR and IUFRO WP 2.02.00 meeting from 3-5 October 2012 in Riga, Latvia, by Kostya V. Krutovsky, Coordinator 2.02.00 – Conifer breeding and genetic resources (<http://www.iufro.org/science/divisions/division-2/20000/20200/>)

Pests and diseases are responsible for large reductions in income from the temperate forests today. Frequency and severity of pests and diseases will possibly change as climate is changing and the change of climate is in itself also a challenge for the forest trees as regards adaptation.



Photo from meeting website:  
Beetle attack on ash trunk in Kalmar, 2009. Photo Mats Hannerz

The objective of the meeting, which brought together 71 scientists from Latvia, Estonia, Lithuania, Belarus, Germany, Norway, Sweden, Finland and Denmark, was to promote the exchange of knowledge among researchers that are involved in resistance breeding and research concerning adaptation to climate change. The following topics were discussed:

- a) Mechanisms of resistance to pests and diseases
- b) Genetic variation of resistance to pests and diseases
- c) Genetic material for a future climate
- d) Breeding for quality and biomass production

Pests and diseases may cause the death of vast areas of a species as seen at the moment with the dieback of *Fraxinus excelsior* in Europe, or cause huge economic losses as seen for Norway spruce where the losses in Europe due to *heterobasidion annosum* are of about 800 million Euros per year. Climate change stresses the need to breed for climate resilient trees and to study if present genetic variation in adaptive traits in populations is sufficient, or if assisted migration should be considered, and to study to what extent epigenetic as observed in Norway spruce as regards phenology is present in other species increasing the phenotypic plasticity of the species.

Genetic variation in genetic resistance to pests and diseases in trees is found in many cases, and much work is ongoing to explore the genetic variation and to understand the resistance. A better understanding of the resistance is being pursued through molecular genetic studies and also has the potential to make breeding for resistance and resilience to climate change more efficient. In this context, programs for multivariate best linear unbiased predictions are under development to include genetic marker and genomic-wide molecular information and to account for indirect genetic effects. However, an economically wise use of best linear unbiased predictions requires a clear distinction between breeding objectives and criteria.

The AdapCAR network is planning to make a review on economic gains from tree improvement in 2013. The review will also serve to make a policy paper on the possible gains from resistance breeding. AdapCAR will arrange a workshop on tree genomics in 2013. The workshop will possibly be part of the Research School for Forest Genetics and Breeding at the Swedish University of Agricultural Sciences (SLU).

The meeting was generously hosted by the Latvian State Forest Research Institute (SILAVA) and sponsored by the Nordic Forest Research Co-operation Committee (SNS) – through the AdapCAR network. Study tour(s) to provenance field trials of Silava with *Pinus sylvestris* and *Pinus contorta* were offered.

Find the full report at: <http://www.iufro.org/science/divisions/division-2/20000/20200/activities/>

Visit the meeting website: <http://www.nordicforestresearch.org/adapcar/meetings/>