Somatic embryogenesis (SE) of Norway spruce (*Picea abies*) using primordial shoot explants

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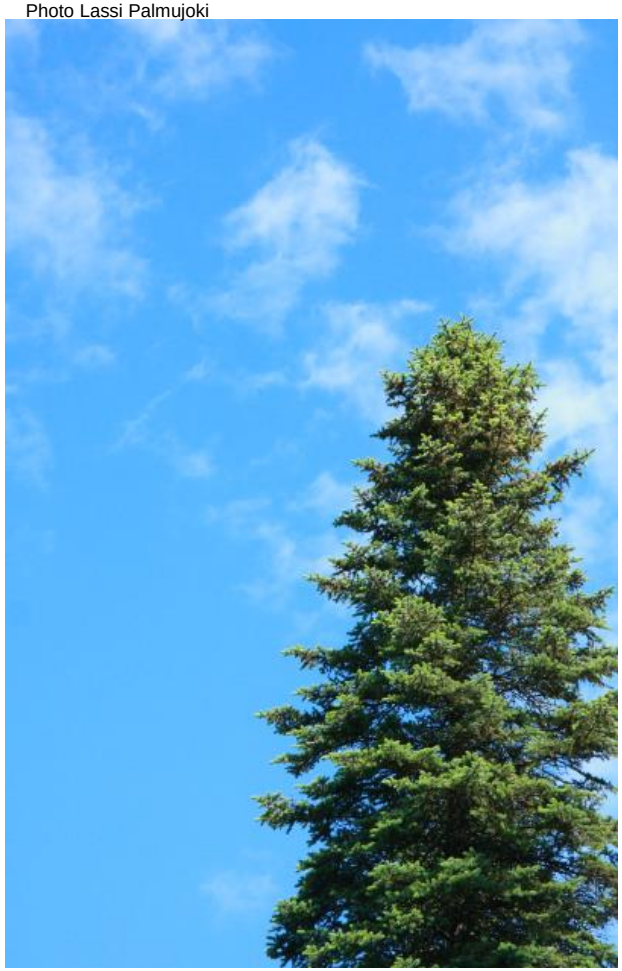
SE from Norway spruce primordial shoot explants

Content

Photo Lassi Palmujoki



- Background and benefits
- What's done before
- What we have done
- Results
- Conclusions and what next?

SE from Norway spruce primordial shoot explants
Background and benefits

Photo Lassi Palmujoki

- Recalcitrance of adult conifers has prevented vegetative propagation of trees with known and desired characteristics
- This far conifer embryogenic cultures could have been initiated only from young material, in practice from **zygotic embryos**
- Method for the initiation of SE cultures from adult trees would benefit tree breeding
- Production of trees with elite characteristics which become evident after sexual maturation
- Special forms which are not flowering

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What's done

- Promising results in *Pinus sylvestris*: embryogenic tissue initiated from shoot bud explants, but no plant regeneration

- Successful initiations in white spruce
  - Mature SE trees as the source of explants
  - Primordial shoots as explants
  - Initiation and plant production protocol developed for the zygotic embryo explants

Trontin et al.(2016) In: Yill-Sung Park, Jan M Bonga, Heung-Kyu Moon (eds) Vegetative Propagation of Forest Trees. Korea Forest Research Institute. Seoul, Korea. p. 211-260.

Klimaszewska and Rutledge (2016) In: Yill-Sung Park, Jan M Bonga, Heung-Kyu Moon (eds) Vegetative Propagation of Forest Trees. Korea Forest Research Institute. Seoul, Korea. p. 211-260.

Klimaszewska et al. (2011) Planta 233: 635-647.

SE from Norway spruce primordial shoot explants
What we have done?

- SE induction protocol for white spruce was applied to Norway spruce
- Collections of primordial shoots from SE plantation
  - March and April 2015, April 2016 and 2017
  - October 2016 and November 2017
- Original SE lines were initiated 2011, plants were produced winter/spring 2012 and planted spring 2014
- Shoots were collected from 40 genotypes

Photo Teijo Nikkanen

SE from Norway spruce primordial shoot explants
What we have done?

- At least 40 buds from each genotype
  - At first all trees/genotype were pooled
  - Later collections from parts of the trees/genotype
- Protocol includes:
  - Removing of the needles and base scales
  - Disinfection with ethanol and H_2O_2
  - Removing of the shoot from a halved bud
  - Halving the shoot again
  - Removing to mLM proliferation media
  - Waiting

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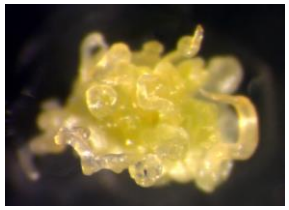
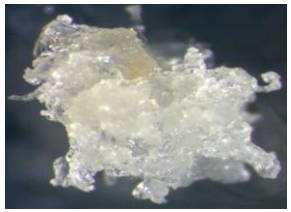
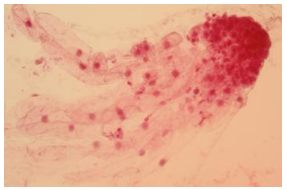
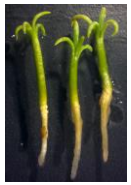
Results





- Two genotypes responded positively
  - Genotype A produced 5 and genotype B 23 well proliferating sublines
  - Both from spring and autumn collections
  - Genetic stability of sublines was detected using microsatellite markers
  - However, not all trees among genotype were responsive
- A lot of callus growth, covers embryogenic cells?
- Different embryo production capacity between genotypes
  - Although numerous early embryos shown in cell mass of both genotype

SE from Norway spruce primordial shoot explants

Conclusions and what next?

- SE initiation protocol developed for primordial shoots of white spruce can be introduced to Norway spruce
- Have to screen a lot of genotypes to find embryogenic tissue growth
- Need for more studies on factors regulating explant's response to SE induction
  - Responsive and non-responsive trees among the same genotype gives new opportunities
  - Gene expression analysis without genotype-specific factors
- Other tissues as explants, artificial induction of rejuvenation?
  - Bonga (2017) Trees, 31:781-789, Bonga (2018) Can. J. For.Res, 48:1-5


Thank You!