

## **Integrating research and nursery practices for mass cutting propagation and somatic embryogenesis in Québec seedling production**

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### **Abstract**

We present an overview of research and production on vegetative propagation of several coniferous species and hybrid poplar in Québec (Canada). The province (ministère des Ressources naturelles et de la Faune, MRNF) is responsible producing both seeds and seedlings of forest species. The MRNF is also involved in research on genetic tree improvement, seed and seedling production (including cuttings and somatic embryos). Research projects aim to improve the overall morpho-physiological and genetic quality of seedlings destined for reforestation, while respecting the environment and genetic diversity. The complementary and multidisciplinary expertise of our team, the integrated collaboration with universities researchers, coupled with rapid and continuous knowledge transfer, help resolve operational problems at the forest nursery level.

Mass cutting propagation is used in four nurseries to multiply elite seed obtained from controlled crosses (white spruce [*Picea glauca* (Moench) Voss], black spruce (*P. mariana* [Mill.] BSP) and Norway spruce [*P. abies* (L.) H. Karst.]) or from mass pollination (hybrid larch (*Larix x marschlinsii* Coaz.)). Production of cuttings reaches 4 million shippable plants. Cuttings are rooted using unique double enclosures, developed by the MRNF, then transplanted and grown as large-sized plants using various adapted culture scenarios (irrigation, fertilization). Current research focuses on improving rooting and culture conditions of cuttings, as well as on genetic variability of rooting and root architecture.

Somatic plants are produced at a gradual operational scale, with white spruce as the first target species. The first objective of somatic embryogenesis (SE) is to establish clonal tests and select the best clones. From 2004 to 2007, over 38 000 somatic plants from 515 clones have been transferred to soil, and 1154 clones from 41 unrelated crosses are cryopreserved. Two hundred clones are planted annually in clonal tests. Characterization of clones and multi-criteria analysis of nursery plants are in progress. Current research aims to increase the production scale to a commercial application.

Québec produces over 1 million hybrid poplar rooted cuttings annually, using a 1-year bareroot scenario in the nursery. Over 40 clones are produced for commercial planting, representing about 1000 ha of plantations, largely on marginal agricultural land. *P. maximowiczii* hybrids are particularly well adapted to acidic and less fertile forest sites and colder areas in Québec.

The deployment of clonal forestry in Québec will rely on the integration of SE into the breeding strategy (using a classical approach, without genetic modification). The use of somatic seedlings as stock plants for cutting propagation will combine the advantages of both propagation techniques. With the availability of efficient techniques for large-scale propagation of elite clones identified through clonal testing, Québec is in a good position to integrate conifer clonal forestry into its plantation program.

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