

Vegetative Propagation of Trees for Complementing Seed-based Strategies

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<https://www.iufro.org/science/divisions/division-2/20000/20900/20902/>

The 5th International Conference of IUFRO WP 2.09.02 placed the focus on “Clonal Trees in the Bioeconomy Age: Opportunities and Challenges”. It took place from 10-15 September 2018 in Coimbra, Portugal, and was organized by the University of Coimbra, Centre for Functional Ecology.

Forests are a considerable source of biomass, wood and other products. Their rational management is therefore a key component of the “green economy” on the way towards a more efficient and sustainable use of resources. Forest regeneration is mostly achieved through seed-based propagation of wild or improved varieties. However, seed production is a critical and long process that can be severely impacted by environmental stresses, especially those associated with climate change. Efficient and flexible reproduction strategies based on clonal propagation may therefore become more essential for plantation forestry and conservation of genetic resources. Also see *Proceedings of the 4th IUFRO 2.09.02 conference, La Plata, Argentina*: <https://www.iufro.org/science/divisions/division-2/20000/20900/20902/publications/>



Giant eucalyptus, the base of the trunk surrounded by participant of the 5th 2.09.02 Working Party Conference in Coimbra, Portugal, 2018. Photo: J.-F. Trontin.

Clonal varieties for dynamic adaptation of planted forests

Clonal forestry can complement seed-based forestry for sustainable wood production and restoration of endangered resources together with reducing the pressure on native forests. Bulk propagation of elite clones would mitigate perceived risks such as (bio) diversity losses. The long process of field-testing may be streamlined by early genomic selection followed by deployment of clones with greater flexibility and faster turnover.

Towards a cost-effective production of clones

Vegetative propagation technologies are developed according to objective (conservation, sanitation, breeding) and economic potential. “Rejuvenation” through tissue culture can reactivate organogenetic capacities. Specialized platforms including mobile biofactories are key tools to design low-cost, automated and scaled-up production.

Vegetative propagation to access useful complementary technologies

Vegetative propagation (especially somatic embryogenesis) enables technologies such as hybrid breeding, genotype screening for stress tolerance, cryopreservation and further variety improvement (gene editing, endophytes, priming for increased resilience).

(Epi)genomics: towards tight control of somatic embryogenesis

Epigenetic changes are associated with phenotypic plasticity and considered as key factors of embryogenic competence. (Epi)genome-wide profiling produces valuable resources for refining somatic embryogenesis, including from mature tree explants. Automatic screening may support high-throughput optimization of the process.

Summary

Rational management of forests is a cornerstone of the bioeconomy. Clonal plantation forestry can outperform seed-based forestry together with reducing pressure on native forests. Early genomic selection strategies coupled with clonal propagation have the potential for flexible deployment with faster turnover of new varieties for dynamic adaptation of planted forests. Somatic embryogenesis is particularly amenable to industrial clonal production provided that tight control can be achieved. Epigenomic changes associated with developmental and phenotype plasticity appear critical for expressing embryogenic competence.

Student Competition

Encouraging the participation of young scientists in international events is of high priority for IUFRO WP 2.09.02. At the Coimbra conference the Third Biennial Student’s Scientific Competition for graduate students and recent PhD graduates was organized with great success (read more in the full report).

Proceedings and next meeting

The publication of short or extended abstracts and full papers is expected by mid-2019 (Eds: Park Y.-S., Bonga J.-M et al.). The next meeting will take place in Harbin, China, in 2020, organized by Hailong Shen, Laboratory of Tree Genetics and Breeding, School of Forestry, Northeast Forestry University, China.

Proceedings: <https://www.iufro.org/publications/proceedings/proceedings-meetings-2018/#c27427>

Meeting website: <http://www.uc.pt/en/uid/biotec/events/iufro2018>

Find the full unedited report here: <https://www.iufro.org/science/divisions/division-2/20000/20900/20902/activities/>