Cloning elite trees get economical advantage on seed regeneration due to the previous evaluation of the plant development that takes place at the adult stage. However, a technology of mass propagation is required at the lowest cost.

The “Plant propagation Unit” of the CRA W Department Biotechnology is involved in the development of mass propagation technologies of forest trees since 1978 when the first wild cherry clones were established in vitro from meristem tips. From that time, several species have been investigated with success, like alder, maple, ash, oak, cork-oak, whitebeam, poplar, elm, walnut, sorb tree, horse chestnut, Eucalyptus, Acacia, Terminalia, Cypress and Abies nordmanniana

Several propagation models have been developed according to the species. Starting from meristem culture followed by axillary branching, shoot elongation and in vitro rooting successively, adaptations were required about the preparation of the initial explant, the regulation of further steps (Gruselle et al., 1995, Dolcet-Sanjuan et al., 2004).

The production of initial explants from forest elites selected at the adult stage is a major step when meristem culture is not workable: shoot flushing from twigs (1), shoot regeneration from forced roots (2) or branches fragments (3), heat killed graft (4), are prerequisite before node culture

Meristematic aggregates of Eucalyptus camaldulensis
(Arezki et al., 2000, 2001)
Established in vitro from nodes of 2 years old plants, Eucalyptus camaldulensis Deh.,

Somatic embryogenesis of elite Christmas tree: Abies nordmanniana from mature zygotic embryos to plants (Misson et al., 2006)

“Polyclonal variety” of elite wild cherry: vitroplants and softwood cuttings from miniaturized vitrophylls

80 elite clones were included in a multiclonal variety of wild cherry. Each year, 13 to 26 clones were established in vitro to maintain genetic variability in yearly propagation based on a minimum of 30 clones. Oldest trees issued from in vitro auxillary branching (among the 50 000 thousands trees) grow in the forest since 1985. Mini stock vitroplants for cuttings have been trained in greenhouse. Softwood cuttings are harvested every 6 (± 1) weeks after GA3 (200mg/l) spray. Darkness, bottom heating and IBAx (2g/l) together maintained high rooting rates (around 80%) during 7 years (6) during spring and summer seasons. Plants of 1.8 to 2.0 m height can be produced after one year growth in nursery. The ability to propagate in vitro and ex vitro as well is clone dependent.

References
Technologies for mass propagation of elite forest trees: 30 years activities at the CRA W.

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Meristematic aggregates of Eucalyptus camaldulensis
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form single structures so called “Meristematic Agglomerates” when cultivated in the dark in Petri dishes in presence of auxin and activated charcoal. Those dense axillary shoot clusters (5) mostly limited to meristematic domes of reddish colour (6) appeared from the third subculture after internodes shortening, leaf shape reduction and stem tissue swelling (7). Vascular system changed from straight to sinusous and compacted line. Starting bud proliferation is associated to dramatic increases of the endogenous cytokinin/auxin ratio (8) and significant ethylene accumulation in the confined atmosphere of the Petri dishes. Bud proliferation enhanced while bud size reduced. Such de novo phenotype maintained stable high proliferation rates for more than 2 years and may depend upon an interrelationship between ethylene biosynthesis and DNA methylation (unpublished results). A reversion to normal growth occurred after supplying the culture medium with aminoethoxyvinylgycine (AVG) as anti-ethylene agent.

Great reduction in propagation cost and simplification of handling.

The production of one Petri dish from mature zygotic embryos to plants (Misson et al., 2006) may depend upon an interrelationship between ethylene biosynthesis and DNA methylation (unpublished results). A reversion to normal growth occurred after supplying the culture medium with aminoethoxyvinylgycine (AVG) as anti-ethylene agent.

References