

# From a cone into the Petri dish and to the field: about the unusual trip of an immature seed

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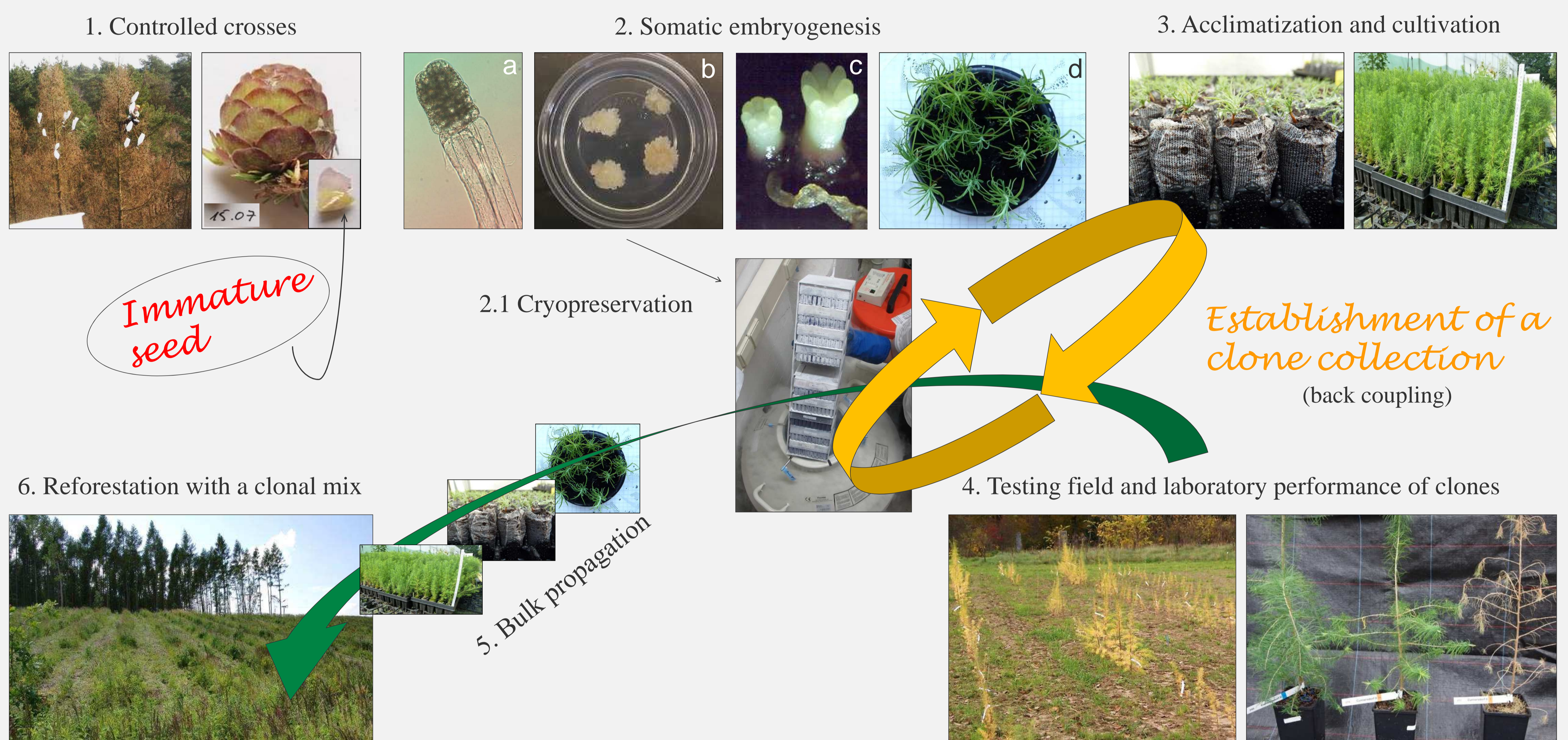
## Somatic embryogenesis for forestry

Vegetative propagation of plant material by means of somatic embryogenesis permits the establishment of clones for tree species where propagation via softwood or hardwood cuttings is impossible or inefficient. The public enterprise Sachsenforst in cooperation with the Humboldt University of Berlin makes use of this technique for breeding hybrid Larch derived from crosses between European and Japanese Larch in order to provide short rotation forestry with large amounts of high quality plants. This work is done within the frame of the joint research project 'DendroMax' funded by the Federal Ministry of Food and Agriculture based on a resolution of the German Parliament.

## The trip of an immature seed

In our case study, somatic embryogenesis starts with an immature seed. Attention should be paid to the basic material if the plants to be produced should possess desired traits like rapid growth, excellent stem straightness or high stress resistance.

For this reason, we perform controlled crosses between family parents which have been previously selected based on their combining ability for the target traits (1). Immature zygotic embryos are then excised from the seeds and placed on Petri dishes with nutrient medium where, in case of successful induction, an embryogenic mass develops after eight to ten weeks (2.a, b). The seed results here in a clonal line. Every line is maintained as back up by repeated subcultures and also cryopreserved for future use (2.1). The embryogenic mass is placed on specific media for its maturation and germination (2.c, d). Emblings are then acclimatized in the greenhouse and further cultivated in the nursery (3) until they reach the optimal size for being tested (4) and used in reforestation (6).



## Outstanding larch plants

- A collection of 445 hybrid Larch clones derived from somatic embryogenesis has been established. These clones have entered a phase of testing for growth, stem straightness, branching and resistance against drought in field trials as well as in greenhouse and laboratory experiments. Based on the results, the collection can be later redefined and serve as a source of clones with specific properties which can be reproduced at any time as needed. The collection is being continuously amended with further clones from new crosses.
- 1 ha has been reforested in the forest district of Leipzig during spring 2015 with a mix of 69 Larch clones comprising six full sib families. On average, 15 ramets per clone were planted at a spacing of 3 x 3 m. Failure of survival after planting was only 3% and plant growth in 2016 averaged 78 cm, the best clones presenting values up to 132 cm. This new forest stand will serve as shelter wood for beech after removing some of the Larch rows two to three decades later. The thinning is expected to render higher monetary returns due to the superior quality of the planted Larch as compared with standard material.
- This case study shows somatic embryogenesis in hybrid Larch as an efficient method that can render within a relative short period of time large amounts of plants for testing and that permits via cryopreservation the back coupling between clone performance and clone collection on the one hand and employment of clones in reforestation on the other hand.