Controlled Moisture Content During Release of Dormancy in Tree Seeds — Large Scale Handling

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The Tree Improvement Station (TIS) is part of the National Forest and Nature Agency under the Ministry of Environment and Energy. TIS has three main objects:

- Seed supply to the Danish forestry, both state and private nurseries and forest districts;
- Nursery production of plants to the Danish state forest districts;
- Tree improvement in order to secure seed supply of the best genetic material in the future by establishing seed orchards and seed stands in a great variety of forest tree species. Furthermore TIS has a close cooperation with Danida Forest Seed Centre in seed testing of tropical tree species and in projects in developing countries.

The release of dormancy is in many tree species necessary in order to achieve germination. In nature this is taking place during the winter under the cold and humid conditions on the forest floor. This has been copied and improved by nurserymen over the years. Seeds have been collected and placed in cold storage where dormancy is released at low temperature and high moisture content. The problem with this method is that the seeds sometimes begin to germinate at an awkward time (normally before sowing is possible). In addition, the seeds will be sown when 5% to 10% of the seeds have started to germinate; this means that perhaps only 30% of the seeds have been released from dormancy.

TIS has since 1992 been breaking dormancy in beechnuts (*Fagus sylvatica*) on a large scale and in addition has been working with *Prunus avium, Acer pseudoplatanus* (in commercial seed lots), and *Abies nordmanniana* (in large-scale tests).

In all species, seeds have been placed in net trays (seed layer 5 to 8 cm) and the moisture content has been raised from storage moisture content to the moisture contents given in the table below by spraying the seeds with water and mixing the seeds manually. This was repeated three to four times to reach the target moisture content. During pretreatments seed were mixed manually every 2 weeks to keep a uniform moisture content in all the seeds and to avoid spread of fungal attacks. The moisture content was measured weekly.

This pretreatment has been carried out successfully yearly since Spring 1993 with *F. sylvatica*. The average quantity of seed was 3500 kg per year.

For *A. pseudoplatanus* and *P. avium* we have found big differences in the germination capacity after pretreatment depending on the seed lot. Poor results in some seed lots were due to pretreatment periods that were too short. The quantities of seed pretreated were 200 kg (*Acer*) and 100 kg (*Prunus*) per year.

Abies nordmanniana has been tested on two seed lots of 40 kg each. The standard pretreatment is 6-weeks cold-wet stratification. For both seed lots we found no difference in germination capacity and speed of germination between the standard method and the method using reduced moisture content. Furthermore we found no effect from increasing the pretreatment with reduced moisture content to 10 weeks.

The next step will be to try to minimize the hard physical labour in connection with the manual mixing of the seeds.

The results so far has encouraged us to continue using this pretreatment with controlled moisture content on other species. We are at the moment testing this method on several broadleaf and conifer species.

Table 1. Pretreatment using controlled moisture content.

Species	Moisture content (target) (% FW)	Duration
Abies nordmanniana	30 - 33	6 - 10 weeks
Acer pseudoplatanus	44 - 50 (50-58 in seed)	x[y] + 2 weeks (10 - 12)
Fagus sylvatica	30 - 32	x + 2 weeks (8 - 18)
Prunus avium	27 - 30	18 - 26 weeks[z]

[y]The factor x is the number of weeks of prechilling of a reference sample kept at full hydration until 10% of the seed is germinated.

[z]2 weeks 25C + 2 weeks 3C + 2 weeks 25C + 12-20 weeks 3C.