



Cone and Seed Improvement Program BCMoF Tree Seed Centre

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Returned Seed Quality

This article will focus on the quality of seed following the practice of stratified seed being dried back and stored for future use. This situation generally results from excess seed reaching the nursery. In British Columbia, seed that is withdrawn for growing seedlings on crown land, but not used must be returned to the Tree Seed Centre for evaluation and testing¹. The returned seed program consists of an initial evaluation of seed quality and quantity. Requests that appear to have obvious seed deterioration, significant fungal contamination, debris contamination (other species of seeds, peat), where identity is in question or when the quantities do not justify further testing - are discarded. Returned requests for the same seedlot, from the same nursery and stratified within a month of each other may be combined into common fractions to increase efficiencies of subsequent processing, testing and registration. For portions with pregerminated and decorticated seed or minor fungal contamination the portion may be hand-cleaned, screened and/or upgraded on the gravity table to remove these undesirable seeds. As seed arrives in a variety of moisture conditions, the first step, after any required cleaning, is to dry the seed to storage moisture content. This is done at ambient conditions over several days with progress being monitored using non-destructive moisture meters. Once the seed is considered dry enough for long-term storage it is sampled for germination and moisture content testing. Once moisture content is confirmed to be less than 10% the seed is placed in our freezers at -18°C. An initial germination test is performed on the seed and an additional test is performed six months later. All testing is performed using the standard stratification regime for each species. Even if the original seed quality was maintained the seed is not re-mixed with the parent seedlot due to concerns with pathogens as well as the reduced vitality of the seed (even if it doesn't show up in germination tests).

This review looks at the results that we have had at the BC Tree Seed Centre with returned seed requests from the 2002 to the 2006 sowing season for lodgepole pine (*Pinus contorta*), interior spruce (*Picea glauca/engelmannii complex*) and Douglas-fir (*Pseudotsuga menziesii*²). The results are intended to illustrate that the practice allows for the re-use of previously stratified seed. This is not a static program and we continue to evaluate the best practices to increase seed-use efficiency. The success of this activity is highly dependant on how the seed is treated at the nursery following sowing and how quickly it is returned to freezer storage. Optimal treatment includes drying the seed back to below 10% moisture content (once the nursery is confident that they have achieved expected germination), placing the seed under cool conditions and shipping the seed to the Tree Seed Centre as soon as possible.

The results of our germination testing of returned seed is presented in Table 1. The average germination results on returned seed for all three species is quite high and exceeds the A-ranked

¹ This is a requirement of the 'Chief Forester's Standards for Seed Use' for crown land reforestation in BC.
http://www.for.gov.bc.ca/code/cfstandards/pdf/CF_Seed_Standards.pdf

² Coastal and interior varieties are grouped together as Douglas-fir.

result for Douglas-fir and many seed portions within the other two species. The average time since the last germination test was 2.2 years for lodgepole pine and 1.7 years for the other species. For all three species, the majority of seed was returned to the Tree Seed Centre within two to three months after shipping to the nurseries, although some seed was returned after up to eight months later without appreciable decline in quality.

Table 1. The germination capacity (GC) results for returned seed in comparison to available A-ranked lab tests and portion retesting after 6 months storage.

Species ³	# Portions	A-ranked GC (%)	Returned Seed GC (%)	Returned Seed 6-month GC (%)	# Portions (6-month retest)
Pli	275	94.8	94.9	95.1	219
Fd_	123	92.4	93.0	93.0	79
Sx	103	93.5	92.4	92.4	72

Our practice has been to retest returned seed after six months of freezer storage. Again, there was very little difference between these results and the original seedlot germination and initial testing of the returned seed. The sample size {#Portions (6-month retest)} was smaller for the 6-month retest as some portions were used for sowing before a second test could be completed.

The results indicate that the re-use of stratified seed of lodgepole pine, Douglas-fir and interior spruce is possible. This program extends to other species, but there is no attempt to save *Abies* spp. requests due to the long stratification periods required, concern with resin vesicle damage, and inherent variability in germination exhibited by these species. This is an operational program designed to maximize seed-use efficiency. The returned seed portions are registered as new seedlots for subsequent sowing. The preference is for nurseries or clients to reduce seed quantities ahead of stratification, so there is no returned seed, but not everyone chooses to participate in this activity. In 2007, approximately 6.5 million seedlings were produced from returned seed.

Although many of the comparisons indicate an increase in germination, these increases are quite small and not considered operationally significant. Sampling variability, seed upgrading at the nursery and subsequent removal of germinated, decorticated or fungal contaminated seed at the Tree seed Centre are the most reasonable explanations for these modest germination gains.

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³ Pli = *Pinus contorta*; Fd= *Pseudotsuga menziesii*; Sx = *Picea glauca/ engelmannii* complex