Tree Improvement Branch

Cone and Seed Improvement Program
BCMoF Tree Seed Centre

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Moisture Content Changes During Freezer Storage

This article discusses the quantification of changes in moisture content (MC) during long-term freezer (-18° C) storage and its impact on our retesting policy at the BC MFR Tree Seed Centre. The actual changes, generally gains in MC, are the result of absorption of moisture from the atmosphere during seed withdrawal for sowing requests, testing purposes, or research requests. The MC changes are most probably during the short period in which seeds are exposed to air of higher relative humidity and/or temperature when they are being sampled. The seedlots investigated all initially had moisture contents between 4.9 and 9.9% and MC testing is based on the oven-dry method as prescribed by the International Seed Testing Association (ISTA 2009). Although retesting of all seedlots for MC is not a standard procedure, for a variety of reasons we had a reasonably good dataset that may be useful in comparing species and determining if retesting MC is justified for any of our species. The results could also then be used to prioritize seedlots for drying to try and extend longevity in long-term storage.

In 1994, a co-op student looked into this question and reviewed existing records to identify seedlots above 9% MC and estimate an average change in moisture content per year for each species (Prabhu 1994). Based on this analysis, *Abies amabilis* and *Larix occidentalis* were identified as having much higher average changes in MC and retesting frequencies of 10 years were applied to these species. A common reason for retesting moisture content was when seedlot characteristics were changed by drying the seedlot to a lower level to increase longevity or upgrading the seedlot through the removal of non-viable seed to increase quality. Since these tests involved a change in the seed characteristics above what would normally occur during general use, these data points were removed from the data set.

This year I am reviewing all of our retesting frequencies and moisture content seemed like a good place to start. In this analysis further effort was extended in a) identifying upgraded or dried-back seedlots from older paper records and b) increasing the sample size for species in which we had very little information. As with the initial 1994 analysis, the primary variable estimated for comparative purposes was the average change in moisture content per year, by species. This was calculated as the change in moisture content divided by the time difference, in years, between the two tests. In the attached Table, the results of these latest changes in moisture content per year, by species, are presented as well as the results from the 1994 analysis. The average gains in moisture are much lower than estimated in 1994 with all species falling below a moisture gain of 0.01 % per year. From my perspective **this justifies the discontinuation of our retesting program for moisture content.** I also belief that these results are quite conservative as some of the averages appear biased upwards for a few seedlots tested in a specific year, but I did not feel justified removing these values from the dataset.

This information may be of marginal value to other agencies as it reflects our storage environment, our sampling environment (which is influenced by a humid climate during most of the year) and the number of times each seedlot was withdrawn for sampling. Certainly a more useful measure would be to have these results in addition to the number of times a seedlot is withdrawn, but an accurate quantification of that is not possible. We could obtain a reasonable number of withdrawals per seedlot

since 1994 (when our current electronic data management system, CONSEP was introduced), but even with that there are several problems trying to use this information. I'm convinced that the data indicated in Table 1 is the worst-case scenario for changes in seedlot moisture content (i.e. some of the data should have been eliminated from the dataset, but I couldn't find written documentation indicating dryback or upgrading practices actually occurred). I'm quite comfortable with all of our species having below a gain of 0.1% per year indicating with 'normal' use it would take 10 years for a seedlot to increase by 1%. This may or may not be a useful guide for other facilities, but it impacts our TSC policy and I'd thought I'd share our perspective.

Species	BC Species Code	Number of Samples	Average Δ MC/year 2010	Average Δ MC/year 1994
Abies amabilis	BA	123	0.031	**0.230**
Abies grandis	BG	7	0.082	0.105
Abies lasiocarpa	BL	15	0.063	0.126
Thuja plicata	CW	15	0.079	0.158
Pseudotsuga menziesii var. *menziesii*	FDC	14	0.044	0.076
Pseudotsuga menziesii var. *glauca*	FDI	34	0.061	0.078
Tsuga mertensiana	HM	5	0.022	0.116
Tsuga heterophylla	HW	15	0.046	0.103
Larix occidentalis	LW	104	0.027	**0.197**
Pinus contorta var. *contorta*	PLC	10	0.064	0.151
Pinus contorta var. *latifolia*	PLI	32	0.062	0.058
Pinus monticola	PW	40	0.096	0.156
Pinus ponderosa	PY	10	0.004	0.161
Picea sitchensis	SS	10	0.016	0.051
Picea glauca X *engelmannii*	SX	84	0.086	0.086
Picea lutzii	SXS	3	0.049	0.095
TOTAL / Average		**516**	**0.051**	

References

ISTA. 2009. International Rules for Seed Testing. Published by the International Seed Testing Association. Basserdorf, Switzerland.

Prahhu, A.-L. 1994. Estimation of moisture content change of conifer seeds during extended storage. University of Victoria Biology Co-op Work Term Report. 27 pp.

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