



Cone and Seed Improvement Program BCMoF Tree Seed Centre

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Stratification Moisture Content

The moisture content of stratified seed has been determined on 1422 sowing requests, before shipping, between 1992 and 1999 as part of the Tree Seed Centre (TSC) Quality Assurance program. The overall average moisture content was 31.7 %, which varied by species from a low of 26.0% for Sitka spruce to 36.1% for subalpine fir (Table 1).

Table 1. Stratification moisture contents, confidence intervals, minimum and maximum values for sowing requests at time of shipping: 1992 to 1999.

Sp. ¹	Number of Requests	Mean MC%	95% Confidence Interval	Minimum Value	Maximum Value
Ba	81	32.9	0.8	26.0	46.6
Bg	31	33.6	1.2	27.0	42.0
Bl	72	36.1	1.0	30.4	52.3
Fdc	106	32.9	0.6	27.0	40.0
Fdi	128	35.1	0.5	29.0	41.0
Hm	20	33.2	1.2	29.5	40.1
Hw	86	27.1	0.8	18.5	36.0
Lw	123	35.0	0.9	21.9	45.0
Plc	33	30.7	0.6	26.0	34.0
Pli	208	30.4	0.3	22.4	36.0
Pw	75	34.0	0.7	26.0	42.2
Py	84	27.8	0.5	23.8	33.0
SS	46	26.0	1.3	18.0	35.0
Sx	291	30.1	0.4	21.1	41.0
SxS	38	30.2	1.0	25.0	37.0
	1422	31.7			

The general target of 30% moisture content corresponds well to the surface dry state in lodgepole pine and interior spruce which accounts for the majority of our requests ($\approx 75\%$). Several species are consistently under this 30% level when surface dry: Sitka spruce, western hemlock and Ponderosa pine. In 1998, a co-op student project looked at moisture uptake in Ponderosa pine and found that the 30% level was achieved after 24 hours, but moisture uptake continued beyond that point to approximately 32% after 48 hours. The situation will be further investigated to determine if a 24-hour running water soak is adequate. The goal of imbibition is to fully hydrate the internal components (megagametophyte and embryo). The other two species achieve higher germination at sub-30% moisture contents and are not as large of a concern.

¹ Ba=Amabilis fir; Bg=grand fir; Bl=subalpine fir; Cw=western redcedar; Fdc=coastal Douglas-fir; Fdi=interior Douglas-fir; Hm=mountain hemlock; Hw=western hemlock; Lw=western larch; Plc=coastal lodgepole pine; Pli=interior lodgepole pine; Pw=western white pine; Py= Ponderosa pine; SS=Sitka spruce; Sx=interior spruce and SxS=Sitka X interior spruce hybrid.

In Table 1, confidence limits are given for each species indicated that 95% of the data fall within the range defined by the mean plus and minus the confidence interval (i.e. for Ba 95% of the requests are between 32.1 and 33.7% [32.9 ± 08]). In Figure 1 the species are arranged in order of increasing stratification moisture content with the confidence intervals represented by the attached bars. From this data I suggest that our species fall into three stratification moisture content groupings.

Low [$<30\%$] **SS, Hw and Py**
Medium [30 to 32%] **Sx, Pli, Plc and Sxs**
High [$>32\%$] **Fdc, Ba, Hm, Pw, Bg, Fdi, Lw, BI**

These values and groupings approximate the equilibrium moisture content of the internal seed components. Although both Pli (30.4%) and Sx (30.1%) approximate the general target of 30% there is much greater variability present in the equilibrium moisture content of interior spruce.

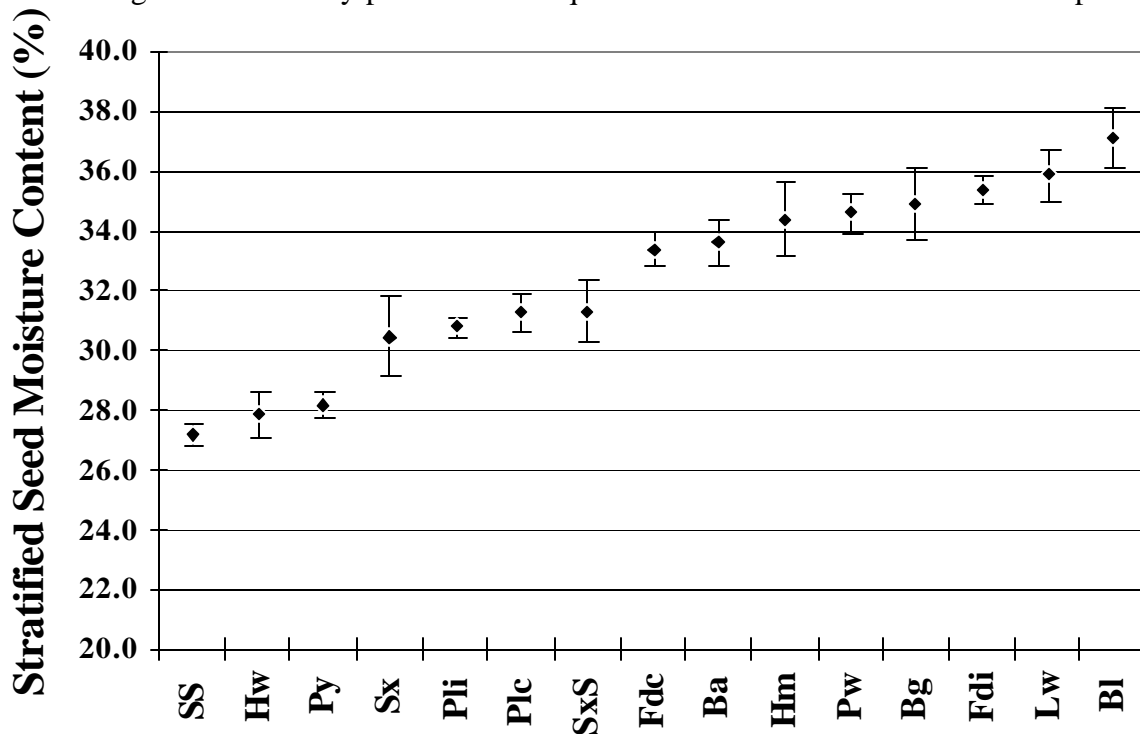


Figure 1. The means and 95% confidence intervals for stratified seed moisture content prior to shipping: 1992-1999.

Another area that we have been involved with monitoring is the moisture content at the dryback stage for Amabilis and subalpine fir. These species are tested and pretreated for 28 days at approximately 45% moisture content and then dried back to between 30 and 35% for an additional 56 days. Moisture content at dryback was estimated by weighing the stratified seed and using target moisture content (knowing the initial request weight and storage moisture content). For example, if a sowing request is for 1351 grams at 7.9 % moisture content and it weighs 1840 grams after dryback we can estimate the moisture content as follows:

1) First determine the oven -dry weight of the request by using this form of the moisture content equation

$$\text{ovendry weight} = \text{fresh weight} * (1 - \text{moisture content})$$

$$\text{ovendry weight} = 1351 * (1 - 0.079)$$

$$\text{ovendry weight} = 1244 \text{ g}$$

2) Secondly, knowing the oven-dry weight we can calculate the moisture content at any weight using this form of the moisture content equation

$$\text{moisture content} = \frac{\text{fresh weight} - \text{ovendry weight}}{\text{fresh weight}}$$

$$\text{moisture content} = (1841 - 1244) / 1841$$

$$\text{moisture content} = 0.324 \text{ or } \mathbf{32.4\%}$$

If unsure about the moisture status of a seedlot, or as part of a quality assurance program, this is a fairly simple method of determining moisture content non-destructively.

The results for the Abies species, which employ the dryback procedure, are given below in Table 2 indicating that our dryback procedures are providing seed at the desired range of 30 to 35% moisture content. The dryback, sample sizes used indicate the number of actual dryback events, which is equivalent to each bag of seed received in a sowing request. For Amabilis fir only seven requests were below 30% moisture content and only one with subalpine fir.

Table 2. The number of drybacks, average, minimum and maximum moisture contents for Abies sp. after dryback.

Sp.	Dryback #'s	Mean MC%	Minimum Value	Maximum Value
Ba	185	32.2	27.9	35.9
B1	68	33.5	27.6	38.9
Bn	3	33.1	32.6	33.8

If you have comments or concerns regarding stratification moisture content, please contact me at the TSC (604) 541-1683 ext. 228.

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