Tree Improvement Branch

Cone and Seed Improvement Program
BCMoF Tree Seed Centre

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2008 Sowing Request Quality Assurance Results

This article provides an update on Tree Seed Centre Quality Assurance (QA) program for sowing requests. The 5-year (2004-08) average for moisture content and germination capacity (GC) representing over 1000 sowing requests is presented in Table 1. In general, operational germination results over this period were very good with seed preparation matching lab results (only a 0.2% difference) and the average nursery falldown being 2.5%. Under nursery conditions, subalpine fir (BL) and western white pine (PW), two deeply dormant species showed large falldowns in addition to red alder (DR) which is considered non-dormant. At the other extreme, yellow cedar performed better in the nursery and although not a large sample size, the results indicate a need for improvements in lab testing protocols.

Table 1. Results of Quality Assurance sowing request monitoring for moisture content and germination presented as the Seed preparation and Nursery germination difference from lab test results. Numbers in brackets indicate sample sizes.

Species	Moisture Content %	Lab Germination %	Seed Prep Difference %	Nursery Difference %
BA	33.0 [10]	73.9 [10]	+3.9 [10]	-2.9 [7]
BG	33.8 [13]	71.9 [13]	+2.4 [13]	-4.7 [10]
BL	37.4 [53]	64.2 [53]	-0.6 [53]	-10.1 [29]
CW		82.7 [167]	-1.2 [160]	-4.9 [135]
DR		69.7 [18]	-3.1 [18]	-9.5 [13]
FDC	32.3 [92]	91.4 [111]	+1.2 [96]	-1.1 [78]
FDI	33.4 [100]	89.3 [106]	+2.4 100]	-0.3 [87]
HM	33.5 [21]	83.3 [21]	+4.9 [21]	-2.6 [20]
HW	27.8 [72]	85.7 [79]	+1.5 [79]	+1.0 [70]
LW	34.9 [85]	84.9 [87]	+1.7 [87]	-0.7 [74]
PLC	28.4 [21]	93.7 [21]	0.0 [21]	-1.9 [11]
PLI	29.8 [146]	94.6 [180]	0.0 [146]	-1.9 [138]
PW	37.4 [95]	90.3 [94]	-5.4 [94]	-8.4 [80]
PY	27.4 [56]	90.5 [57]	-2.2 [57]	-1.9 [37]
SS	25.5 [43]	92.6 [47]	-1.0 [47]	-3.3 [40]
SX	28.6 [133]	89.3 [150]	+2.1 [136]	-0.5 [124]
SXS	29.8 [24]	87.4 [25]	+1.8 [25]	-3.5 [19]
YC	44.6 [9]	48.7 [9]	+3.7 [9]	+19.3 [6]
MEAN	**31.6** [973]	**87.0** [1248]	**+0.2** [1172]	**-2.5** [978]

An area actively discussed at the TSC is how nursery falldowns relate to actual stratification duration. This was examined for 2008 sowing requests by using the actual soak date and the actual sow date (supplied by the nursery) to calculate actual length of stratification for comparison with

standard lab stratification durations. The graphical results are presented in Figure 1 and are colour-coded by quadrant – Green indicates increased stratification resulted in increased GC; Pink indicates reduced stratification resulted in reduced GC; yellow indicates increased stratification results in reduced GC and the grey quadrant indicates reduced stratification results in increased GC, but no sowing requests fell into this category. Although somewhat complicated, this Figure provides some insights into current sowing practices:

a) Most sowing requests are sown after extended stratification (more stratification vs. lab testing) – most points right of the zero mark on the X-axis and some extensions are as long as 5 to 6 weeks.
b) Reduced stratification results in reduced GC (pink quadrant) – No reductions in stratification resulted in increased GC (grey).
c) For most sowing requests, increased stratification did not result in increased GC. It was a little surprising that most points fell into this quadrant (yellow), but the explanations for the nursery falldowns are basically the same ones that have been presented in the past –germination conditions used can be quite different (especially germination temperature), germination criteria, count duration, and any additional treatments (other than extended stratification) at the nursery may also be explanations for these falldowns. Most of the nursery falldowns occur within 5% of the lab test results and are probably not a large problem for growers to meet requested numbers of seedlings. This falldown level also generally falls within the inherent variation associated with lab germination test results[1]. Not all species had examples of reduced stratification, but western white pine (Pw), subalpine fir (Bl) and coastal Douglas-fir (Fdc) sowing requests exhibited reduced germination when stratification was reduced by even one week.

In general, extending stratification is a beneficial as it will increase the rate of germination (decreasing required heat inputs and window of opportunity for pests) and increase the ability of the seed to germinate under suboptimal conditions. Extended stratification has a metabolic cost associated with it and at some point embryo reserves will be depleted and may not sustain normal germination. The data does not suggest this is currently a problem, otherwise one would expect the greatest stratification extensions to show larger falldowns (i.e. clustering in the bottom right corner of the yellow quadrant in Figure 1).

[1] Germination Tests: How Precise Are They? TSWG Newsbulletin #36
http://testwww.for.gov.bc.ca/hti/publications/misc/GCTSWG36.pdf

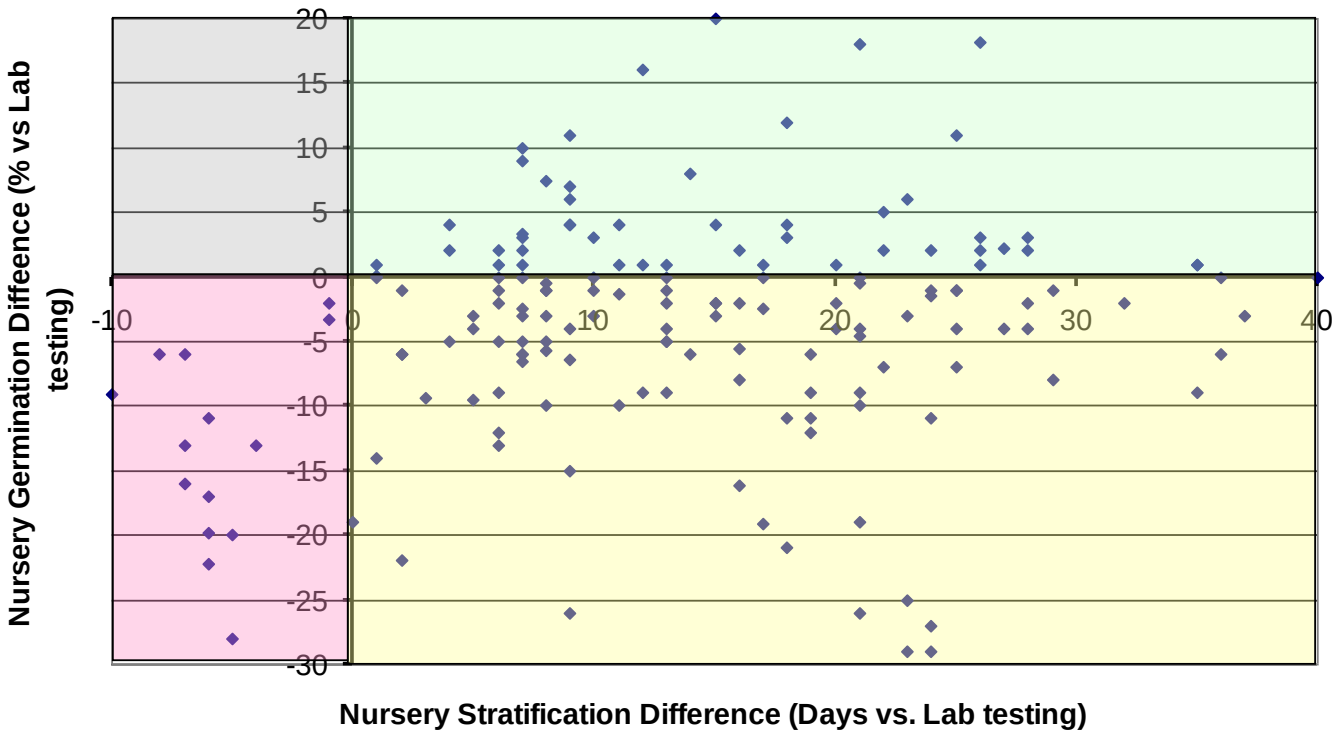

Figure 1. The relationship between the Nursery stratification duration difference (days) versus the Nursery Germination % difference, compared to lab testing protocols and results.

Pelleting

Another aspect of the QA program is to evaluate the efficiency of the pelleting procedure with western redcedar (CW) and red alder (DR). A sample of 200 pellets (8 replicates of 25 pellets) are individually broken down and assessed for whether they contain: i) a single seed (the desired outcome) ii) nothing = are empty iii) debris (a function of seedlot purity) or iv) more than one seed. The pelleting efficiency is the proportion of pellets with only one seed per pellet. For Cw, the 2008 value, based on 34 sowing requests, was 97.8% and for Dr, based on only two sowing requests, was 92.8%. The difference in efficiency can primarily be tied to differences in seed size as Cw averages about 778 seeds per gram, but Dr has much smaller seeds at 1764 seeds per gram. Germination differences are also influenced by pelleting as standard lab tests are performed on naked seeds while QA and nursery results are based on pelleted seeds. Part of the seed prep and nursery differences in Table 1 are explained by the pelleting process itself. Seedlot deterioration in Cw is also a factor with this species consistently showing higher than average deterioration rates[2]

Returned Seed

There were about 22 seedlots sown from returned seed last year accounting for 1.7 million seedlings. These were primarily from lodgepole pine (14=64%) and interior spruce (6=27%) with coastal Douglas-fir (2=9%) accounting for the remainder. Average nursery falldown was only 0.8% confirming the good results with returned seed obtained over the last few years[3] Part of the

[2] Conifer Seed Longevity. TSWG Newsbulletib #45
http://www.for.gov.bc.ca/hti/publications/misc/ConStorTSWG45.pdf

[3] Returned Seed Quality. TSWG Newsbulletin #45
http://www.for.gov.bc.ca/hti/publications/misc/RetSeedTSWG45.pdf

success with returned seed is attributed to the re-stratification process even though some evidence exists indicating that seed dried back after stratification does not result in dormancy re-imposition (Adams, E.A. 1975; Allen 1962;Danielson & Tanaka 1978; Hall and Olson 1986; Muller et al 1999). The second dose of stratification can be thought of an extension of stratification with the respective benefits of increased speed and vigour of germination. The same cautions exist that if the extension is excessive, germination reserves can be depleted. Returned seedlots can be recognized by their seedlot numbers – all returned seedlots are in either the 52000 series (wild stand seedlots) or the 62000 series (orchard seedlots).

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