Seed Use Efficiency Meeting

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Seedlot Production

Seedlot production involves the steps of cone and seed processing, **seed testing**, **registration**, **storage**, pre-treatment and **distribution** for seedling production. In British Columbia the previously mentioned underlined items are considered stewardship responsibilities and costs not forwarded to clients. Cone and seed processing and seed pre-treatment are offered on a cost recovery basis. Quality Assurance (QA) will be emphasized and is defined as "the evaluation, monitoring and management of information and practices related to activities in the Seed handling System". Our QA foundations are:

1. Avoid physical contamination (debris)
2. Avoid genetic contamination (between seedlots)
3. Information management (organization)
4. Handling a perishable product (care)

Considerations regarding quality begin at the stage of pre-collection evaluation when crop size is estimated to plan for required resources, the presence of pest problems determined and maturity level assessed to ensure cones are collected at the optimal time. Interim field storage is important to reduce moisture slowly in most crops, but serotinous lodgepole pine cones can be shipped immediately. Cutting tests or seed anatomy test are an important tool in assessing maturity, quality and determining if pests are an issue.

Cone processing consists of 1) a removal of seed already released from cones, 2) a kilning process for most species and 3) a separation of seed from cones through tumbling. Species containing resin vesicles (Abies spp., western redcedar and hemlock) are currently not kilned, but allowed to dry and flex their cones under cool conditioning. Lodgepole pine is kilned at a peak temperature of 60ºC and all other species kilned have a peak temperature of 40 ºC. The stage of tumbling is critical as it is the separation of seeds from cones, so monitoring is important to ensure all viable seeds are removed from cones.

Seed processing starts with a scalping stage to remove debris that can be abrasive, add moisture or contain pathogens. This stage also greatly reduces the volume of material subsequently handled. Dewinging is performed on all species except western redcedar and yellow cedar. For pine and spruce species, wet dewinging is employed as the wing connection is quite weak and wetting allows for efficient release of the wings from the seed. The remaining species have a stronger wing-seed connection and wings are removed solely through mechanical forces, although small wing fragments may be retained compared to wet dewinged species. Wings are removed by vacuum during the process and the process shifts from removing debris to removing non-viable seed during final cleaning. This can occur via pneumatic separators or the gravity table, but both separate seed into three fractions based on specific gravity. Equipment calibration and decisions regarding seed to include/exclude in seedlots is supported by cutting tests and seed evaluations. In contrast to other seed processes, some seed may go over final cleaning multiple times to ensure that viable and non-viable seeds are separated. Once final cleaning is completed the seedlot can be blended and then sampled for testing.

Seedlot sampling is conducted in accordance with ISTA sampling guidelines. Moisture content is first tested and if between 4.0 and 9.9% the seedlot can then be placed into long-term storage at -18°C. Seedlot purity is then determined and must be above 97% for registration. Moisture content

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and purity are legislated requirements under the Chief Foresters Standards for Seed Use in BC. The seed weight test is performed and in combination with seedlot purity the variable seeds per gram is calculated [seeds per gram -= purity% / Seed weight100 seeds]. Germination tests are also performed and the germination capacity and seeds per gram are the variables used to translate between seed and seedlings. Germination is retested at intervals in relation to the species deterioration rate, so a rapidly declining species like western redcedar is tested every 18 months, but a species with good storage longevity like Sitka spruce is only retested every 48 months.

In addition to the standard tests described above for seedlots, there are a variety of QA tests performed on a subset of a seedlot. These include moisture content of unkilned seed, pellet assessments, germination testing of sowing requests and returned seed.

Seedlot registration occurs following testing, confirmation of seedlot weight and for seed orchard crops calculation of the Genetic Worth (GW) and effective population size (Ne) for the seedlot. For seedling production seed pretreatments are equivalent to those used in testing. Activities involved in seed preparation are 1) scheduling (nursery sow date is what we work back from) 2) Manage changes 3) withdraw seed 4) prepare seed in one of the following ways – soak and stratify, pellet, or send dry to nursery 5) monitor during stratification especially with our species requiring long stratification periods and 6) ship seed to the nursery.