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Small Lot Seed Handling of Species Native to British Columbia©

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INTRODUCTION

Every spring a seed need list is compiled, based on the following year's plant production schedule and the remaining seed inventory at the nursery. The list includes about 125 plant species native to British Columbia and the Pacific Northwest. The seed is collected by a number of plant collectors, including our own nursery team, from different geoclimatic zones in the region. We attempt, as much as possible, to match seed source with the eventual planting sites. This means, for example, that a species collected on the coast will not be used for planting in inland areas and vice versa.

A seed/berry order collection form is sent to each collector, who then proceeds to collect the required species and quantities, depending on availability for that particular season. Collectors take care of shipping procedures, which often means sending seed/berries in sealed pails by Greyhound or courier.

NURSERY PROCEDURE

Harvested, ripe seeds arrive from early summer through fall as berries or dry seed. All unprocessed material is inspected upon arrival and weighed. All collection data is entered on a seed collection record sheet, one for every collector in a given year. This can be done on the computer or manually on a paper document. Collection data include: name and address of the collector, species name, seedlot number, seed/berry weight, date of arrival, and any particular remarks. The seedlot number provides an easy reference to the origin of the seed. An example of a seedlot number is: JB-04-06. JB indicates the name of the collector, John Baker, 04 means this is his 4th collection of the year and 06 indicates the collection year. The seedlot number accompanies the seed through the processing stage and throughout its growing life at the nursery. Berries are stored in a cooler at 2 °C (36 °F) for a period of time until they are processed. Dry seed does not always have the low moisture content (below 10%) required for processing and storage. For this reason it is usually spread out on trays or racks for drying and curing to ensure optimum maturity of the seed.

BASIC TOOLS OF THE TRADE

Possibly the most expensive equipment required is a set of scales, mechanical or electronic, analogue or digital. Personal preference and price will determine the choice. It is important that the incoming, unprocessed seed is weighed upon arrival. For this a scale is needed that has a capacity to weigh up to 20 kg. A mechanical scale will be by far the cheapest option. After processing the seed, which may weigh up to several kilos (pounds), is weighed as well. A scale that weighs down to 1.0 g or 0.035 oz and up to 2 kg (70 oz) is the most useful. For very low seedlot weights and to make seed counts, a scale that reads down to at least 0.01 g (0.00035 oz.) is required.

Because we are dealing in most cases with small seedlot processing, the next biggest expense may be one or two food processors to process berries. We buy the cheapest ones we can find. If they wear out they can be replaced easily and cheaply. It is a good idea to have a spare one handy. We often use two machines simultaneously to speed up the processing.

For drying, freshly processed seed screens of different sizes can be used. Our stackable screens for drying measure 90 cm by 90 cm (3 ft by 3 ft) with a mesh size of 7 mm (1/4 inch). We usually line the screens with a material cut out of rolls of curtain backing purchased at a fabric store. The curtain backing can be cut at different sizes and is used for many different purposes during seed processing and stratification.

For both "wet" processing of berries and "dry" processing and cleaning of dry seed, a variety of strainers, colanders, and screens are used to separate seed from pulp, husks, and debris. The larger the seed, the larger the mesh size and size of the strainer; the smaller the size of the seed, the smaller the mesh and size of the strainer. It is good to have a substantial collection of separation tools. Screens can be easily made from pieces of lath and different mesh wire screens available from hardware stores and lumberyards. Also needed for "wet" processing are a variety of pails and buckets of different sizes. Ice-cream buckets are worth collecting. White is a good color for any container because the seed and other particles stand out against the white background.

Another tool needed when processing seed is a sharp utility knife, or better yet, a one-sided razor blade (Fig. 1). It is used to perform cut tests to check for filled versus empty, partially filled, and "woody" seeds, as well as possible inscent damage. Cutting seed is done at all stages of processing and assessing seed. It also helps to determine the stage of ripeness or maturity of the seed based on color of the seed coat, megagametophyte (food reserves for the embryo), and size and color of the embryo.

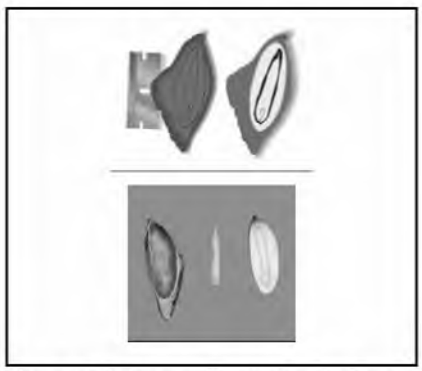

Figure 1. The use of a single-edged razor blade for seed cut tests.

Finally, there is one tool you can do without, but that is very useful if there are larger amounts of seed to be processed. It can be built from materials available from most hardware stores and PVC pipe suppliers. It is an air separator (Fig. 2), which separates empty or partially filled seeds and debris from filled seeds. It is easy to use and works by itself, leaving you time for other jobs. Its basic components are: a shop-vac at one end that draws a vacuum in a clear PVC pipe system and a PVC pipe seed container at the other end that feeds seeds into the air stream through a vibrator feeder. The vacuum can be regulated with a voltage regulator. The air stream will pick up light, empty seeds and debris and dump it into one container, while the filled, heavy seed drops through the air stream straight into another container. The air separator provides an efficient final seed cleaning method. It can be custom built fairly easily. Drawings are available from the author.

Figure 2. Air separator for cleaning seeds.

"WET" PROCESSING

All berries are macerated in the food processor (Fig. 3). The processor is filled to two-thirds from the top of the container that holds the berries. The knife in the processor should be kept sharp. When the processor is operating, water is added until the berry/water mixture flows smoothly. The processing duration varies per species; typically, it takes from 1–5 min. For most species there is no danger that the seed will be damaged by the knife. For some of the softer, larger seeds (e.g., *Mahonia* sp., *Oemleria cerasiformis)* it is necessary to keep a closer watch during the processing since they may get damaged if processed too long. In this case 1 to 3 min will be sufficient.

Once the seed is separated from the berries the mixture will become a thick slurry. Now, the processor content is dumped into a small pail under a tap (Fig. 4). A gentle flow from the tap into the pail will cause the pulp to rise to the surface while the heavy, filled seed sinks to the bottom. This process is continued until most or all of the pulp, light seeds, and debris have been floated off. The material that is floated off is caught into a strainer to prevent clogging of the drain. The contents in the strainer are dumped into another pail, which allows for checking whether any good seed may have been floated off inadvertently. It may also happen that berries have not been processed long enough, and in that case the mixture can be reprocessed. During the entire process some seeds should be cut with a razor blade to ensure that mostly filled seeds are left in the pail with the good seed and mostly empty and imperfect seed in the other. The entire process is fairly time consuming, and it cannot be hurried too much.

Finally, the good seed is run though a strainer and then dumped onto a drying rack or screen lined with curtain backing (Fig. 5). Here it is spread out evenly to ensure even drying. Often we will place a household fan to blow over the trays with the wet seed to speed the drying process.

Figure 3. Food processors used for processing seeds found in berries.

Figure 4. Seed and water slurry resulting from the food processor treatment.

The drying will take from 2–4 days depending on the temperature in the room. By then the seed should be below 10% moisture content and be ready to receive a final cleaning using screens, strainers, or the air separator. When the seed is clean and dry, the following information is recorded and entered into the inventory data sheet: seedlot weight, seed count per gram, processing yield (final clean weight : received weight = grams of clean seed per kilo of received weight), storage location, date, and processing time (Fig. 6).

Now the seed is ready to be packaged in clean, clear plastic bags (Fig. 7) and stored alphabetically by species name in plastic boxes in the cooler (Fig. 8). All our seed is stored at 2 °C (35 °F) and can be kept for a number of years, depending on species. Most seeds would store longer if frozen at −5°C (23 °F) to −10°C (14°F). However, we use the cooler also for stratification purposes, and 2°C (35°F) is the suitable temperature in this case.

Figure 5. Seeds spread out on a screen for drying.

DRY PROCESSING

Not all seed come in berries. Many seeds are shipped more or less dry to us by the collector. These may come in a variety of seed structures in strobiles (cones) (*Alnus* sp.), in achenes (*Aster* sp.), in pods (*Lupinus* sp.), or in capsules (*Lilium* sp.). In each case they are dried and cured upon arrival in trays or on screens to ensure maximum maturity and storability (Fig. 9).

When dry, the seeds are worked, "massaged" gently by hand through miscellaneous strainers and/or screens to separate seed from chaff (Fig. 10). Sometimes pods or other seed structures are put dry through a food processor. The food processor will more or less pulverize the seed mixture, after which the seed can be easily separated with screens, strainers, and/or the air separator. When using screens and strainers, always go from a large mesh to a smaller mesh.

Figure 6. Weighing seeds on an analytical balance getting ready for packaging.

Again, upon finalizing the seed cleaning process, the seed weight and other data are recorded. Sometimes, in the case of a custom cleaned seedlot or when the seed still contains a high percentage of debris that cannot be cleaned out, we may determine the "purity percentage" of the seedlot. This is done by manually separating all impurities, including partial seeds, from a sample. The pure seed weight and the weight of the debris taken out must be weighed. The sample size we take usually

Figure 7. Seeds packaged in clear plastic bags ready for storage.

Figure 8. Seeds in individually labeled plastic boxes kept in cool storage.

consists of the final product including about 100 seeds. The following calculation is used to find the purity percentage:

$$\text{Purity (\%)} = \frac{\text{pure seed weight}}{\text{pure seed weight} + \text{debris weight}} \times 100$$

As an example, conifer tree seed in British Columbia must have a purity of 97% or better to be used in the provincial reforestation program. However, for most practical nursery purposes the purity is hypothetical, and a visual test may tell you whether the cleaning process has been adequate or not.

Figure 9. Labeled seeds are dried and cured in open trays.

Figure 10. Miscellaneous strainers and/or screens to separate seed from chaff.

Once the purity percentage is known it is possible to accurately calculate the seeds per gram using the following calculation:

$$\text{Seeds per gram} = \frac{100}{\text{weight}/100} \times \frac{\text{purity \%}}{100}$$

If the purity of the seed is not calculated it is still important to know the number of seeds per gram in order to be able to correctly calculate the number of seeds required for nursery plant production. For seedlots that have passed the visual purity inspection, follow a simplified method of finding the number of seeds per gram. Just count the number of seeds in e.g., 0.25 g, multiply that number by 4 and you have the number of seeds/g. Or, for smaller seeds count the number of seeds/0.10 g and multiply by 10 to find the number of seeds per gram. For some of the smaller seeds counting the actual number of seeds is not practical, as you would spend a lot time counting seeds.

CONCLUSION

The processing of small amounts of seed of many of the plant species native to British Columbia and the Pacific northwest requires mainly basic equipment that can be easily found in local stores and the ability to make simple methods work effectively. It also requires patience and creativity in finding solutions to processing problems. The result can be the satisfaction in providing some of the building blocks needed to maintain and restore our natural environment.

Acknowledgement. Figure 1 was kindly provided by Dave Kolotello of the British Columbia Ministry of Forests.

ADDITIONAL READING

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