BETTER SEEDS FOR NURSERY SOWING

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The need to improve planting stock has been pointed out along with the importance of choosing appropriate seed sources. One of the most important factors in producing quality seedlings, and in producing sufficient quantities of them, is the use of high quality seed. There are many factors that can influence seed quality. It is, therefore, necessary to well understand the principles involved in seed extraction, processing, testing and storage.

Since the greatest amount of seed used in the Intermountain Region encompasses the western conifers (namely pine, fir, larch and spruce), I will confine my comments to these species.

SEED EXTRACTION

The object in extraction is to dry the cone sufficiently so that the seed can be removed. This is accomplished by circulating air of low relative humidity over the cones. Heat is not essential to good drying. Heating the air permits it to take on moisture, but if high heat is applied too long the seed will be damaged. Temperatures of 100° F or less are very effective for drying at low humidities. These temperatures work equally well for serotinous cones if the cones are first dipped in hot water. The water should be heated almost to the boiling point, but the dip should not last longer than 60 seconds. Some species such as Pinus banksiana and P. ponderosa var. scopulorium, which do not require hot water, might benefit from being rewet after an initial drying and then dried a second time.

Data gathered on P. lambertiana and P. jeffreyi show that these cones have a 50 percent moisture content (on a dry weight basis) by the end of August. This is decreased to 30-35 percent at a specific gravity of 1.00 and 20-25 percent at a specific gravity of .80 just prior to natural cone opening. Cones which open in nature have about 9 percent moisture content. Therefore, we can assume that kiln drying reduces moisture content about 11 percent (20 percent to 9 percent). Predrying, or blowing dry air among the cones before the application of artificial heat, should reduce the amount of moisture in the cones by at least one-half and possibly more.

Fungus spores are continually in the air and will germinate anytime moist and warm or moist and cool conditions prevail. Therefore, caution should be exercised in storage of cones in burlap sacks for extended periods. Frequent and regular examinations need to be made to detect any possible growth of fungus. It is best to keep the sacks in a dry environment. Cones

placed in drying racks can mold also if the air becomes stagnant. A fan is often sufficient to keep the air moving so that moist air is carried away from the cones.

SEED PROCESSING

The normal schedule for processing conifer (except true fir) seed is to (1) remove large debris and dust, (2) dewing the seed and (3) remove the remaining debris and empty seed. If this sequence of steps is not followed, damage is likely to occur. Large particles, such as cone scales in a dry dewinging machine, can cause considerable damage by crushing seed. Machines must not be overloaded with seed or they will not provide the desired results and damage can also result. One final rule for processing is: minimize the number of times the seed passes through a machine, and minimize the number of machines used. This is best achieved by choosing the proper machines and adjusting them correctly. Every time the seed passes through a machine, some level of damage occurs, so the fewer passes the better.

Steps one and three above are accomplished well by air-screen cleaners. Other types of blowers and vibrators have been developed and are very useful in the right situations.

The Crippen dewinger is adequate to dewing most pine seed but requires close control to insure the brushes are not damaging the seed. Rather than take the chance of damaging the seed coat, most nurserymen operate the Crippen with the brushes open more than necessary which then requires more than one pass through the dewinger. However, the additional trips through this machine may very likely cause impact damage. It would be far better to dampen the seed prior to the first trip through and avoid the extra two trips. Even better, the dry dewinger may be replaced with wet dewinging. If the seed are placed in a slow revolving drum and sprayed with a fine mist while they are turned, the wing will absorb the water and release the seed. The wing can then be blown away in the fine cleaning. The key to this approach is a <u>small</u> quantity of water <u>sprayed</u> in a fine mist and <u>waiting</u> long enough for the wing to absorb it.

If the seed are wet dewinged they should be dried before storage. Agricultural driers are available to do this but caution should be exercised in evaluating them. They often use temperatures detrimental to tree seed viability. Extracted tree seed should be dried at temperatures below 100 F.

The true firs are delicate and should receive as little punishment as possible. A slow sorting or screening system is best. Mechanical damage can be identified through x-ray analysis and germination tests before and after storage. Another way to separate the seed from the bracts is with a destoner (2-way gravity separator). Seed receives far less impact on a destoner than on other equipment and the machine occupies little space.

If 10 pounds of true fir cone and seed mass were made available, the Eastern Tree Seed Laboratory would be happy to evaluate processing techniques on their laboratory models, return the cleaned seed and provide recommendations.

SEED TESTING

To produce high quality seedlings in adequate quantities, adequate numbers of viable seed must be sown at the proper density. This requires reliable estimates of the field planting value of the seed or, in other words, the potential ability of a seed lot to produce seedlings.

Seed can be cut to obtain a rough estimate of the percentage of filled seed, but this procedure tells very little about viability. A germination test is much more accurate because, even if a seed is firm and healthy upon visual examination, it can very easily have been killed by mechanical injury or heat.

Maximum germination and repeatability are criteria which must be met by the procedures used in a germination test. Otherwise, the value of the seed will be underestimated and still not accurately known. To meet these two requirements, modern facilities must be available for close regulation of temperature, light and moisture conditions. Experienced and knowledgable testing personnel are also indispensable. Seed can be germinated on the window sill or back porch, but such procedures will lead to disappointing results. Use the services of a competent seed testing laboratory to meet your needs for seed testing.

A germination test should be conducted before seed is stored (to allow detection of any losses during storage), before sowing, or every third year during long term storage. Seeds per pound and purity need only to be estimated once. A recleaning or sizing of a seed lot would, however, make new estimates necessary.

SEED STORAGE

To maintain the viability of good quality seed it is necessary to reduce seed respiration. This can be accomplished by reducing the moisture content below 10 percent, containerizing the seed to maintain this low moisture content and storing at freezing temperatures. A change in any one of these three conditions could be the cause for a major loss.

As mentioned above, drying temperatures for tree seed should not exceed 100° F. Cooler temperatures are always better if low relative humidities are available. The moisture content can be determined either by oven methods or by use of a moisture meter. The Dole Model 400 is an inexpensive meter for which charts have been developed for use with tree seed. Moisture content readings need to be taken before seed is stored and every year to be certain a safe level is being maintained. If storage containers are removed from the freezer unit to take test samples they should be allowed to reach air temperature before opening. If they are opened before warming up, condensation will form on the seed and interior container surface. This moisture will then be absorbed by the seed; thus, raising the moisture content of the seed.

Storage containers should be moisture proof to maintain a proper moisture content. Metal, glass, heavy plastic or foil lined containers are good. Plastic bags thinner than six mils, waxed cardboard or similar containers

will lead to seed deterioration through slow movement of moisture into the container.

A good storage temperature is 20° F. At this temperature any well constructed freezer will maintain cold temperatures for about 48 hours in the event of mechanical failure. During those 48 hours most failures can be corrected. Lower temperatures are of no value because they do not preserve the seed any better and are more costly to provide. Temperatures nearer 32° F can be used but do not allow a margin of safety in the event of a power outage.

In summary, high quality seed is a product of good collection procedures and better than adequate handling. It is important to remember that what you do today may effect the results of tomorrow.

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