Seed Storage and Testing at Pennsylvania Department of Conservation and Natural Resources Penn Nursery and Wood Shop

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Kozar JJ. 2008. Seed storage and testing at Pennsylvania Department of Conservation and Natural Resources Penn Nursery and wood shop. In: Dumroese RK, Riley LE, technical coordinators. National Proceedings: Forest and Conservation Nursery Associations—2007. Fort Collins (CO): USDA Forest Service, Rocky Mountain Research Station. Proceedings RMRS-P-57:48-50. Available at: http://www.fs.fed.us/rm/pubs/rmrs_p057.html

KEYWORDS
seed collection, seed testing, conifers, hardwoods

Seed Collection

Planting tree seeds at the Pennsylvania Department of Conservation and Natural Resources Penn Nursery, Spring Mills, Pennsylvania occurs in spring and fall. Seeds acquired for these plantings come from 3 sources. The first source is our own orchards, which were developed to provide "improved" seeds. Improved seeds are produced from scion material collected from trees selected for various characteristics and grafted onto rootstock. The second source is from general collections that are collected by forestry personnel from various forest districts. We have developed a barter system with these districts; they receive credit from our wooden and plastic sign shops for any seeds they bring in. The third source of seeds is from privately owned seed companies, which we use only when the other 2 sources do not meet our needs.

Record-keeping

All seeds, no matter the source, are given individual lot numbers upon arrival. A record is kept of the species, date, amount of seeds, county and township where collected, who made the collection, and the GPS coordinates. This is to ensure that the seedlot can be traced back to its source of origin if needed.

Seed Storage

Seeds are placed in our cold storage locker, which is kept between 1 and 2 °C (33 and 36 °F). Any excess seeds (not sown in the nursery beds) are kept in this cold storage for future use during years having poor seed crops. These cold temperatures reduce the rate that the seeds deteriorate over time, keeping their viability as long as possible. Some of our conifer seeds have retained a certain amount of their viability up to 30 years at these temperatures.

Various containers are used for storage, depending on species and size of seeds. Large seeds, such as walnut (*Juglans* spp.) and acorns (*Quercus* spp.), are kept in 70-L (2-bushel) tubs. These species do not store well, and are discarded after the required amounts are sown; new seeds are acquired yearly. Large quantities of smaller seeds are kept in plastic carboys and placed on shelves. Smaller quantities of seeds are placed in plastic bags and stored in metal containers. All bags, carboys, and metal containers are marked with the seedlot and container number. These are recorded in the seedlot record books to ensure easy identification.

The only seeds we currently store in a freezer are aspen (*Populus* spp.). They are kept in small plastic jars and placed in a chest freezer located inside the cold storage.

We do monitor the moisture content of our conifer seeds using an Ohaus™ moisture meter. A 10 g (0.35 oz) sample is placed on the pan and heated for 22 minutes, at which time a reading is taken. A moisture percentage between 6% and 9% is desired for storage.

Seed Testing

As previously stated, our sowing occurs in spring and fall. Certain information is needed in determining the amount of seeds needed to be sown in order to acquire the desired quantities and densities of seedlings in the nursery beds. This information includes purity, seeds per pound, and germination percentage.

The first step is to obtain a good sample of seeds for testing. For seedlots stored in carboys, a seed trier is used. The seed trier allows samples to be drawn from the top to bottom of the container, yielding a truly representative sample. For small lots of seeds or large-sized seeds, samples are taken by hand.

To determine purity and seeds per pound, seed size determines the size of the sample: 50 seeds are sampled for very large seeds, such as acorns and walnuts; 10 g (0.35 oz) are used for large seeds, such as white pine (*Pinus strobus*), sugar maple (*Acer saccharinum*), white ash (*Fraxinus americana*), and so on; a 5-g (0.18-oz) sample is taken for medium seeds like white spruce (*Picea glauca*); and a 1-g sample is used for small seeds.

Purity

To determine purity of a seedlot, a representative sample is weighed, and then seeds are separated from impurities. Total weight of the seeds, in grams, is recorded, and then divided by the total weight of seeds plus the weight of impurities, multiplied by 100.

Seeds Per Pound

To obtain the number of seeds per pound, the number of clean seeds in the sample is multiplied by 453.6 g and divided by the total weight of seeds plus impurities in grams.

Seed Viability

The last test, which can be done several ways, is to determine seed viability. The preferred method is a germination test. We use a Pfeiffer germinator (JP Pfeiffer and Son Inc, Baltimore, Maryland), which simulates the daily fluctuation of tempera-

ture and light found in nature. We use a 10-hour photoperiod with the temperature ranging from 20 to 28 °C (68 to 82 °F). For this test, we use 4 Petri dishes per seedlot. A piece of Kimpak™ is placed in the bottom of the dish to hold moisture. A piece of blotter paper is then placed on top with the seedlot and container number written using a china marker. One hundred seeds are counted out and spread out on the blotter paper, making sure none of the seeds touch each other. This is replicated 4 times for each seedlot, with a total of 400 seeds per test. Seeds are kept moist and checked once a week for 4 weeks. Each week, any seed with a radical emerged to one half the length of the seed coat is considered to be a viable seed. These seeds are then counted and discarded. At the end of the 4-week period, the 4 samples are averaged for the germination percentage of that seed lot.

Some species may require stratification before testing. A cover is placed over the Petri dish, and they are placed in a refrigerator for the required amount of time before being put in the germinator.

When new seeds are received and sowing needs to occur immediately, we can't wait a month for results. In this case, a cutting test or x-ray is performed on the seeds to determine the filled seed percentage in the lot. A sample of 50 to 100 seeds is taken, depending on seed size. Seeds are cut longitudinally or x-rayed to see if the cotyledon fills the seed and has a healthy embryo.

Throughout the process of receiving seeds, it is very important that accurate records are kept for the storage, testing, and planting in the nursery beds. Seedlots should never be mixed so their source can be tracked for future reference.