Propagating Wild-Collected Seed of Woody Species©

Shelley Dillard
Morris Arboretum of the University of Pennsylvania, 100 Northwestern Ave., Philadelphia, Pennsylvania 19118 U.S.A.

In propagation by seeds, the goal of the propagator is to obtain the highest germination percentage possible and one that will hopefully result in a healthy plant. Germination rates are affected by the time of collection, cleaning procedures, storage, moisture content of the seed, and other factors in addition to the treatments given to the seed to induce germination. These are factors that cannot always be controlled, particularly in wild-collected seeds.

The Morris Arboretum of the University of Pennsylvania has a long history of domestic and international plant exploration and seed collection (Aiello, 2004). Among the goals of these explorations is to obtain new sources of germplasm for common species of plants, as well as to obtain seed from unusual or less common species. Plants propagated are added to the Arboretum's living collection and distributed to other institutions and nurseries.

A recent trip to the Republic of Georgia produced seeds from species such as *Abies nordmanniana*, *Fagus orientalis*, *Tilia dasystyla*, and others. These are species for which there may not be a body of research relative to propagation. There are a number of strategies that will further the goal of germination.

It is first helpful to assess the viability of the seed. This would, hopefully, be done in the field via a cut test to determine if the fruit contains a viable seed. Many species, such as *Acer griseum*, produce fruit that contain a small percentage of viable seed. Knowing this will influence the number of seeds collected as well as effects the calculation when establishing a final germination percentage. If seeds cannot be processed immediately—and they frequently cannot be when received en masse—they should be cleaned and refrigerated.

The first step in determining a germination protocol is to check reference books. At the Arboretum, records from the past 25 years are also accessed. If information is not available for the specific species, e.g., *Tilia caucasica,* refer to simply another *Tilia* species. As a last resort, refer to general propagation information for the genus. If enough seed is available, it is helpful to try different treatments, including varying combinations of warm and cold stratification. At the Arboretum, all seeds that need stratification are placed in plastic bags in moist perlite. This allows for moisture to be available for uptake by the seed without rotting the seed. Small seeds may be sown in trays in a mix of 3 perlite : 2 peat (v/v) and placed in a plastic bag for stratification. Since the general guideline used in determining the pre-germination treatments for a woody seed are those that would occur in nature, seeds are often sown in trays and placed in a cold glasshouse and left for nature to take its course. The Arboretum has a glass house (the "Medicinal House") that it maintains during the winter months at 35 °F. On sunny winter days, the temperature may fluctuate, but the fluctuation of cold and warm temperatures is sometimes what is needed to break dormancy.

Following are some examples of seeds that were collected in the Republic of Georgia and successfully propagated at the Morris Arboretum. Seeds were collected in approximately September 2004 and received at the Arboretum in early November

2004. Seeds arrived mostly cleaned, and some were packed in moist sphagnum.

Enough seed of *F. orientalis* was received that we were able to sow only those that appeared plump and healthy. They were sown in trays and placed in the Medicinal House from 5 Nov. 2004 though 21 Feb. 2005, when one seedling was observed to have emerged. The tray was removed from the Medicinal House and placed in the propagation greenhouse with 65 °F air temperature and 70 °F soil temperature. Sixteen of the 25 seeds germinated.

Abies nordmanniana was successfully germinated by all the methods. Either 1-month cold stratification in moist perlite at 41 ºF, or direct sown and placed in the Medicinal House. The 2-months-warm/3-months-cold stratification was somewhat more successful but not statistically significant. The key to successful propagation of *Abies* and most conifers is dusting the seed with a fungicide such as Captan before any other treatments.

Two treatments of *Carpinus orientalis* were both successful. The first treatment of 2-months-warm followed by 3-months-cold stratification was slightly more successful than the second treatment of direct sowing and placing in the Medicinal House. Different collections (seeds collected from different trees/at different times) germinated better than others, but the reasons for the different germination rates are unclear.

Two accessions of *Picea orientalis* were both sown in flats and placed in the Medicinal House at the same time. One accession had excellent germination, while the second failed to germinate. Once again, the seeds were collected from different plants in different places.

Tilia caucasica showed, once again, varying results. The typical treatment of sulfuric acid followed by cold stratification worked "well enough," but produced no real data to swear by.

Zelkova carpinifolia successfully germinated with all treatments. The easiest method was 2-months-cold stratification at 41 °F in moist perlite prior to sowing.

While the reasons for failure are often unknown, sometimes they may be very clear. Two accessions of *Pinus sylvestris* var. *hamata* were given the same treatments. One treatment was completely successful with 100% germination, while the second was a complete failure. Further inquiry revealed that the seeds were removed from the cones after collection and before transportation to the Arboretum by drying in an oven. The accession that failed to germinate had been left in the oven too long and was good only for eating.

The factors affecting germination range from sterile seeds to human error. Propagating wild-collected seeds is a challenge not for the faint of heart. It can be wildly frustrating or hugely rewarding, and is usually both. The successful propagator views each success as a personal triumph and each failure as a signpost on the road to success.

LITERATURE CITED

Aiello, A.S. 2004. Cold hardiness evaluation of *Cornus kousa* provenance *Cornus* provenances. Comb. Proc. Intl. Plant Prop. Soc. 54: 494-498.