Photo by David B Davis

Figure 2. A wooden frame covered with hardware cloth makes an effective grass seed cleaning device.

paper bags, too. After collecting seed heads, we sit on the ground with the screen and rub the plant material vigorously a few times to dislodge the seeds from the inflorescences, which fall onto the drop cloth. We pour seeds into paper bags for transport back to the nursery.

Wildrye (*Elymus* spp. L.) and bromes (*Bromus* spp. L.) are species we commonly and easily pre-clean in the field with our screens. For smaller-seeded grass species, such as prairie junegrass (*Koeleria macrantha* (Ledeb.) J.A. Schultes), hairgrass (*Deschampsia* spp. Beauv.), and fescues (*Festuca* spp. L.), we use frames with smaller diameter hardware cloth (3.1 mm [0.125 in] holes).

We think you will be surprised how easily small lots of many species can be cleaned with this method, and how minimal the amount of chaff in the seed lot will be.

REFERENCE

USDA NRCS. 2002. The PLANTS database, version 3.5. URL: http://plants.usda.gov (accessed 20 Apr 2003). Baton Rouge (LA): The National Plant Data Center.

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TUMBLING FOR SEED CLEANING AND CONDITIONING

David Dreesen |

ABSTRACT

Small rock tumblers can be used to clean and condition seeds both in an aqueous and a dry mode. During the process, grit and gravel remove fruit pulp and abrade seed coats. Wet tumbling of seed aids imbibition, leaches water-soluble germination inhibitors, and may partially substitute for cold stratification for some shrub seed lots.

KEY WORDS

Oleaceae, *Forestiera pubescens* var. *pubescens*, New Mexico olive, Platanaceae, *Platanus wrightii*, Arizona sycamore, Grossulariaceae, *Ribes aureum*, *Ribes cereum*, Solanaceae, *Lycium torreyii*, wolfberry, Cornaceae, *Cornus sericea* ssp. *sericea*, redosier dogwood

NOMENCLATURE

USDA NRCS (2002)

At the Los Lunas Plant Materials Center in New Mexico, we use small hobby-size rock tumblers to accomplish a number of seed cleaning and seed conditioning treatments. The principal application of the tumbler has been the maceration of dried or hydrated fruit pulp. We commonly use it to remove pulp from dried New Mexico olive (*Forestiera pubescens* Nutt. var. *pubescens* [Oleaceae]) fruits. The fruits are collected in late summer or fall after the pulp has dehydrated and adheres tenaciously to seeds. A wet tumbling procedure employing pea gravel/crushed stone and water in a rubber-lined tumbler vessel allows the rehydration of the pulp and the slow abrasion of pulp from seeds. The amount of water is minimized so that the gravel and fruit makes a slurry. This method is not quick, but the tumbler can be run overnight and checked the following day. After a course of tumbling, the contents are dumped into a sieve and the pulp is washed off, leaving clean seeds. The tumbling process is repeated until clean seeds are achieved (Figure 1).

Another cleaning application involves removal of fine hairs attached to achenes of Arizona sycamore (*Platanus wrightii* S. Wats. [Platanaceae]). The dry fruiting heads are crushed under water to partially liberate the achenes while preventing dust and fine hairs from becoming airborne (Figure 2). A slurry of achenes with pea gravel is tumbled and the hairs detach over

time and can be separated using sieves and strong sprays of water. In addition, the wet tumbling thoroughly imbibes seeds and may leach out water soluble germination inhibitors. After cleaning and imbibition, seeds are typically cold stratified.

Dry tumbling to scarify legume seeds has been investigated (Bonner and others 1974; Dreesen and Harrington 1997). The rationale for dry tumbling is to avoid seed destruction that can readily occur with sulfuric acid, boiling water, and high energy impact mechanical scarification treatments. Dry tumbling is a slow process taking several days to a week, but we often use it when we have small seed lots we do not want to risk with other scarification treatments. The procedure uses carborundum grit (sold by rock tumbler dealers), pea gravel, and seeds. After tumbling, scarified seeds are separated from the grit and gravel with sieves. The grit can also be reused by washing the seed coat debris through a fine sieve or by floating off the debris and then drying the grit. Different size grits are available and we typically use fairly coarse material. Coarse grit size is still much smaller than most legume seeds, allowing the easy sieve separation of grit, seeds, and gravel.

Wet tumbling can be used for scarification if an abrasive (typically pea gravel) is incorporated in the seed and water slurry (Dreesen and others 2002). The force imparted to the grit by the tumbling gravel facilitates abrasion. Although this treatment method may result in some seed coat degradation, other effects may be more important, such as assuring complete imbibition in well-aerated water and the leaching of water soluble germination inhibitors in the seed coat. A typical treatment would involve wet tumbling for several days to a week with daily changes of water.

For a few species, wet tumbling may partially substitute for a cold stratification requirement. Two currant species (*Ribes aureum* Pursh and *R. cereum* Dougl. [Grossulariaceae]) and wolfberry (*Lycium torreyii* Gray [Solanaceae]) generally require 2 to 3 m of cold stratification to achieve acceptable germination. Wet tumbling followed by 1 to 2 wk of storage in a warm moist environment has resulted in germination without cold stratification. The dry seeds of another important riparian species, redosier dogwood (*Cornus sericea* L. ssp. *sericea* [Cornaceae]), generally require 1 h scarification in concentrated sulfuric acid and then 2 to 3 mo of cold stratification for acceptable germination. Using fresh fruit with hydrated pulp, rapid germination has been achieved by wet tumbling the fruit with 1 to 2 cm (0.5 to 0.75 in) gravel. Most of the pulp is removed in the first day of tumbling and separated by screening and float/sink manipulations in water. After pulp removal, seeds are wet tumbled for several more days with daily water changes. The imbibed seed is then stored in a warm moist environment; germination starts in about 7 to 10 d and continues for several weeks. Although a limited number of species have been tested with wet tumbling for seed conditioning, additional species may benefit from this treatment.

Figure 1. The pulp of naturally dehydrated fruits (top) of New Mexico olive can be removed using a rock tumbler, leaving extremely clean seeds (bottom).

Photos by Tara Luna

Figure 2. At Los Lunas Plant Materials Center, dry fruiting heads of Arizona sycamore, seen lower left, are crushed under water in a large pan. The hairs agglomerate into balls (gray sieve in foreground). A slurry of achenes and pea gravel are tumbled in the rock tumber to dislodge the hairs. Finally, the achenes, hairs, and pea gravel are separated with soil sieves with the cleaned achenes visible in the brass sieve (background).

REFERENCES

Bonner FT, McLemore BF, Barnett JP. 1974. Presowing treatment of seed to speed germination. In: Schopmeyer CS, technical coordinator. Seeds of woody plants in the United States. Washington (DC): USDA Forest Service. Agriculture Handbook No. 450. p 126–135.

Dreesen DR, Harrington JT. 1997. Propagation of native plants for restoration projects in the Southwestern U.S.—preliminary investigations. In: Landis TD; Thompson JR, technical coordinators. National proceedings, forest and conservation nursery associations. Portland (OR): USDA Forest Service, Pacific Northwest Research Station. General Technical Report PNW-GTR-419. p 77–88.

Dreesen DR, Harrington J, Subirge T, Stewart P, Fenchel G. 2002. Riparian restoration in the southwest: species selection, propagation, planting methods, and case studies. In: Dumroese RK; Riley LE; Landis TD, technical coordinators. National proceedings: forest and conservation nursery associations—1999, 2000, and 2001. Ogden (UT): USDA Forest Service Rocky Mountain Research Station. Proceedings RMRS-P-24. p 253–272.

USDA NRCS. 2002. The PLANTS database, version 3.5. URL: http://plants.usda.gov (accessed 10 Jun 2003). Baton Rouge (LA): The National Plant Data Center.

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LOW COST TOOLS FOR SEED COLLECTION AND SEED SOWING

Dawn Thomas |

ABSTRACT

A modified 35-mm film canister is a useful tool for controlled sowing of small-seeded native species, and a simple, metal, custom-made harvester makes for efficient collection of late-season fleshy fruits.

KEY WORDS

Salicaceae, *Populus, Salix, Philadelphus lewisii,* Hydrangeaceae, *Carex, Schoenoplectus,* Cyperaceae, *Juncus,* Juncaceae, *Rosa woodsii,* Rosaceae, *Symphoricarpos albus,* Caprifoliaceae

NOMENCLATURE

USDA NRCS (2002)

In my nursery program, I find that simple, inexpensive tools often work well. Two tools that I use regularly are a 35-mm film canister with a hole punched in the lid, and a custom-made, "fingered," tin fruit harvester.

FILM CANISTER FOR ACCURATE SEED SOWING

I use a film canister to accurately sow small seeds. First, I measure the size of seeds of the species I intend to sow to get an idea of how large or small to make the hole in the film canister lid. Next, I heat the tip of a piece of wire and melt a hole in the center of the lid from the bottom side out. I found that if I melt the hole from the top inward, seeds will hang up on the plastic edges around the hole and will not shake through easily. I test the shaker to see how many seeds come through the lid by simply turning it over with 1 or 2 shakes. I modify the size of the opening on a new film canister lid based on the results.

For willows (*Salix* L.), quaking aspen (*Populus tremuloides* Michx.), and black cottonwood (*Populus balsamifera* ssp. *trichocarpa* (Torr. & Gray ex Hook.) Brayshaw [Salicaceae]) seeds, I try for a hole of sufficient size to allow 2 seeds to easily fall through the opening per shake so that nursery workers do not have to vigorously shake the containers. By taking time to make the hole size accurate, I reduce the amount of seeds sown per container, the time it takes to sow the crop, and eliminate hours of thinning multiple germinants per container (Figure 1).

This method works well for other small-seeded species, such as Lewis' mockorange (*Philadelphus lewisii* Pursh