



PLANT MATERIALS TECH NOTE

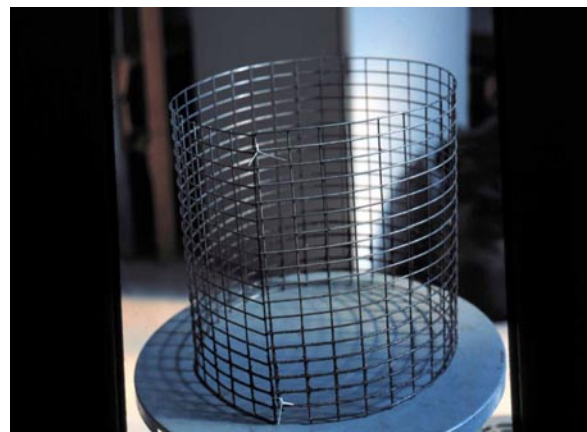
Improved Processing of Rocky Mountain Juniper Seed

Introduction: Rocky Mountain juniper *Juniperus scopulorum* Sarg. is one of the most widely propagated and planted conservation species in the Northern Plains. The collection and processing of fruit, and hence seed, are time consuming and difficult operations. The Bridger Plant Materials Center (PMC) has developed an improved seed cleaning protocol that reduces cleaning time and enhances product quality. The following information describes techniques for processing small (1 to 6 pound) lots of Rocky Mountain juniper fruit with a Dybvig® macerator. Other equipment and methodologies may be available when cleaning larger lots. This technology may prove useful for other difficult-to-clean species, but should be tested on sample lots before large-scale implementation. This information may be of value to seed collectors, seed producers, nursery growers, landscapers, researchers, Extension agents, and others.

FIGURE 1



1- AND 2-YEAR FRUIT



MACERATOR AND SCREEN

Fruit and Seed Collection: Effective cleaning of Rocky Mountain juniper seed begins with proper collection and storage of the fruit. Multiple seed crops (first-year and second-year) are often found growing on the same plant during the two year maturation period (FIGURE 1). Collecting mature fruit (second-year) at the optimal time reduces the chances of picking immature (first-year) seed. Mature fruit is dark blue to nearly black in color with a waxy coating, whereas, immature fruit is green or light blue. It is helpful to rub off the waxy coating from fruit samples while picking to assure ripeness and determine the true color of the berries. Look for ripe fruit on the previous year's growth, i.e., not at the very tips of the branches. Avoid collecting from trees that have a high percentage of fruit with evidence of insect damage. The most common symptom of insect attack is a small (<1 mm) exit hole at the base of the fruit.

Mature fruit is readily stripped from branches with a rolling and light pulling motion of the fingers, with little or no damage to foliage. Ease of collection appears to be both timing (ripeness) and temperature dependent. By reducing the amount of immature fruit that is collected, cleaning time and product quality is significantly improved. Fruit collection at the PMC occurs from late November through early December, depending on the year. Monitor fruit condition and persistence often to minimize losses to birds and animals. Fruit is best processed as soon as possible after collection, but can be stored for several months under proper environmental conditions. Rocky Mountain juniper fruit stores well in paper sacks in a cooler maintained at 34°F with high humidity (estimated at 75 to 90 percent). The fruit surface must be dry prior to storage to prevent molding. Avoid conditions that lead to heat build-up and molding such as overly full containers or stacked sacks that reduce air circulation among the fruit. Fruit that becomes dehydrated prior to processing will require presoaking in water or a weak lye solution to soften the skin. A 24-hour soak in a 1 teaspoon of lye per gallon of water is the standard recommendation. Some nursery growers will use the lye soak on cleaned seed that has been purchased from commercial collectors to assure asepsis.

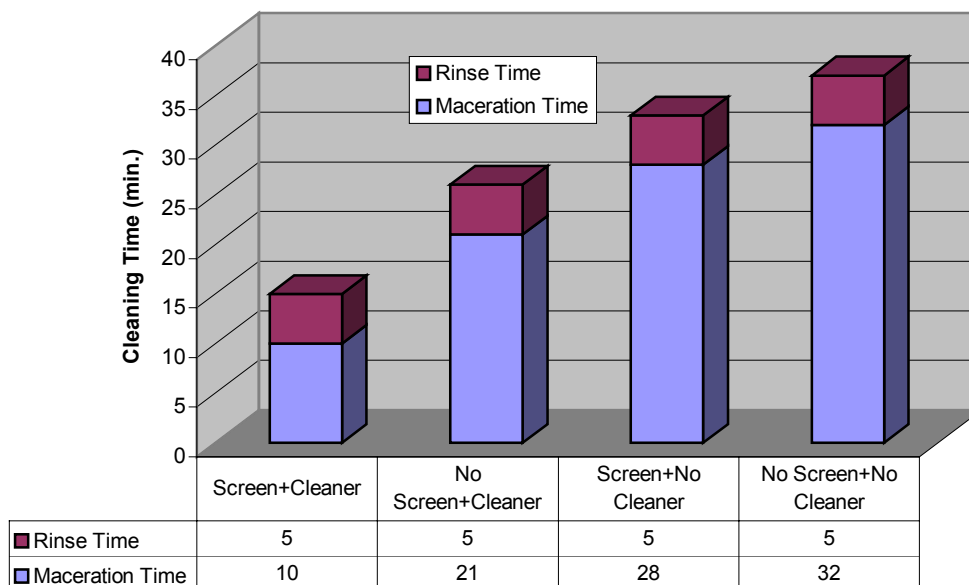
Processing: Rocky Mountain juniper fruit is usually processed in a macerator to remove the skin and pulp from the seed. This species has a tough skin and resinous pulp that make cleaning difficult. Most macerators have smooth walls that minimize mechanical damage to the seed during maceration. In the case of this species, however, the smooth walls are not abrasive enough to efficiently remove the skin and pulp. To improve abrasiveness, several materials can be used to line the inside of the macerator cylinder including textured rubber, sandpaper, or various types of screening. At the PMC, we tested two metal screens: the heavy expanded steel used on metal benches for greenhouse applications and a light-duty welded wire. The expanded metal, with its more aggressive profile, quickly stripped away the pulp from the seed, but appeared to damage the seed coat. Although we opted not to use this type of screen, it may be possible to use it for short intervals and then remove the screen from the macerator prior to seed damage. It was not determined if this screen injured the seed, and it is even possible that it may have ultimately improved germination by scarifying the seed coat. Scarification is any process of breaking, scratching, mechanically or chemically altering, or softening the seed coverings to make them permeable to water and gases. A lighter-gauge welded wire with 0.5- by 1.0- inch openings was subsequently used that did not scarify the seed coat to any degree and could be easily removed during the cleaning process (FIGURE 1). There are many types of screen that may be used for this purpose that were not tested. Based on our observations, some considerations in the selection of screen material include:

- 1) screen with holes may allow fruit and or seed to become trapped and not processed properly;
- 2) the screen should be easily removed from the macerator for cleaning and access purposes;
- 3) the cost of the screen may vary from less than \$1.00 for light-duty welded wire to over \$100.00 for rolled, aluminum deck plating;
- 4) the profile of the screen may be too aggressive or not aggressive enough for the intended purpose;
- 5) bending or rolling of heavy-gauge material may require specialized equipment and may not prove possible for all screen types based on the dimensions of the macerator cylinder or the gauge of the screen;
- 6) the use of rust proof or resistant materials such as plastic, aluminum, stainless or galvanized steel is preferred.

Once pulp is removed from the seed it is necessary to reduce the stickiness of the remaining material. To accomplish this, apply a citrus-based hand cleaner with pumice to the slurry during processing. This method effectively reduces cleaning time and improves the quality of the final product. Approximately 8-to-12 “squirts” (1 squirt ~ 1 teaspoon) are added to 3 pounds of fruit prior to maceration and then again at intervals during processing as needed. Fruit lots high in resin may require additional cleaner, maceration, and rinsing. Test stickiness by squeezing a handful of seed and then letting the seed fall back into the macerator. Your empty hand should barely feel sticky when closed and opened. Rinse the seed repeatedly to remove the cleaner from the seed and then float off unfilled seed and stems in a bucket. To reduce costs, thin the hand cleaner with up to 50 percent water prior to application. The use of hand cleaner had no measurable effects on germination.

To determine the actual benefits of the screen and hand cleaner, unreplicated trials were conducted with a “moderately difficult to clean” seed lot comparing the various treatments described in FIGURE 2. Three-pound seed lots were tested. Easy to clean lots may not demonstrate these gains, whereas, difficult to clean lots will probably show greater gains. Based upon the cleaning times indicated in this trial, the 508 pounds of juniper fruit collected at Bridger in 1999 would have taken approximately 42.3 hours to clean if the screen and hand cleaner were used, versus 104.4 hours if the screen and hand cleaner were not used. Setup and other factors will lengthen the actual total cleaning time, in either case. It takes approximately the same amount of time to macerate five pounds of fruit as it does to macerate only one pound.

FIGURE 2



CLEANING INTERVALS BASED ON VARIOUS COMBINATIONS OF SCREEN AND HAND CLEANER

The amount of water needed to rinse the seed slurry during processing in the macerator was substantially reduced by the use of the screen and/or hand cleaner. In addition, the use of a screen improved stem and foliage processing, and reduced the amount of hand cleaner needed. Results will vary based on impeller speed, individual seed lot, amount and timing of water and hand cleaner used during processing, and other factors. This system works well for 1- to 6- pound fruit lots (0.3 to 1.8 gallons). Fruit lots weighing less than 1 pound did not provide enough material for efficient maceration (slower RPM's helped), whereas, lots greater than 6 pounds stressed the macerator motor. Small fruit lots may be pre-macerated in a blender if the impeller blades of the blender are covered with duct tape or other material to reduce seed damage. After thorough rinsing, the seed is dried on kraft paper in a warm, dry location for approximately 48 hours. The seed is then run over a seed cleaning mill to remove inert matter and empty seed. The seed can then be tetrazolium tested for viability and additional mill cleaning performed if the percentage viability is substandard.

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