Hardwood Seed

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Abstract

New Government programs are driving a renewed interest in planting southern hardwoods. Efficient production of planting stock requires an adequate supply of high-quality seeds. Current recommendations for collecting, extracting, cleaning, storing, and stratifying seeds of southern hardwoods are reviewed. Oaks are emphasized, but information is also presented for small-seeded hardwoods, drupes, and large nuts.

Introduction

Another big push for hardwoods—that's what we are hearing these days. Increased demand for seedlings of southern hardwoods is driven by Federal programs in wetlands rehabilitation and restoration, urban tree plantings, and stewardship programs. Some will say that there has been strong interest in hardwood seed technology and seedling production all along. But is that true? I reviewed the published proceedings of the southern (formerly southeastern) nursery conferences

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from 1964 to 1990 for talks on hardwood seeds. The last formal presentation to include hardwood seeds was in 1978, and that was only half a page in a talk on nursery production of hardwoods. In contrast, from 1964 to 1976, at least one paper on hardwood seed problems was given at one of the split sessions. The record was set in 1966 with four. If technical papers at our nursery conferences are good indicators of subject matter interest, peak interest in hardwoods occurred in the late sixties and early seventies, with a long drought since 1978. I think that we are overdue for a presentation on hardwood seeds.

I would like to approach this topic by grouping hardwood species by fruit or seed type, then reviewing current practices and recommendations. For some species, recommendations made in 1964 still hold true, either because the solutions of the sixties are still the best, or because a lack of interest in a particular species or problem has allowed researchers to ignore it without arousing protests from nursery workers.

Oaks

The best indications of maturity in acorns are their physical characteristics (Bonner and Vozzo 1987). Among red oaks, the following are indices of a mature acorn:

1. The pericarp loses its green color and turns primarily dark brown or black.
2. The acorn can be easily separated from its cup without being forced or without leaving pieces of the cup attached to the pericarp.
3. The cup scar is bright in appearance. In southern red and cherrybark oaks, the cup scar may be pink or orange. Yellow or orange is common in some other red oaks.
4. A cross-section cut of the acorn will show the following colors: high-fat species (water, willow, cherrybark), dark yellow to orange; low-fat species (Shumard), light yellow.

Among white oaks, the following are indices of mature acorns:

1. For most species, the pericarp loses its green color and turns primarily brown or black. White oak and swamp chestnut oak are sometimes exceptions to this rule, since acorns from many trees are physiologically mature while still yellow or even a mottled yellow and green.
2. The acorn can be easily separated from the cup as in the red oak group. Overcup oak is an exception to this rule, because the acorns retain their cups when they fall.
3. Acorn cross-sections will show the cotyledon to be firm and white to yellow in color.

For post-collection care, moisture condition is all-important. At maturity, red oak acorns contain about 40-percent moisture and white oak acorns about 50 percent (Bonner 1974b, 1976b). It is very important to prevent excessive drying. A 5-percent loss of moisture can be tolerated, but further drying will lower acorn quality. Viability will be completely lost when

moisture content drops to about 25 percent and remains there. Laboratory tests have indicated that water oak acorns will survive temporary desiccation in the 15- to 18-percent moisture range if they are rehydrated quickly (Agmata 1982). During collection, however, the key to obtaining high-quality acorns is avoiding any desiccation.

On the day of collection, acorns should be floated in water to remove leaves, acorn cups, insect-damaged acorns, and other trash. Sound, healthy acorns should sink in water. This step also is a major aid to maintaining desirable moisture levels. If conditions are extremely dry at collection, the acorns should be left in water for 16 to 24 hours to raise their moisture content. This step is critical for acorns collected from the ground, because many sound acorns will float at first. Acorns collected during wet weather are usually moist enough to permit good separation without a soak period. With large batches (a bushel or more), some stirring is needed to give all acorns a chance to float.

After flotation, the trash should be skimmed off and the water drained away. Acorns should then be

placed in cold storage, even if they are to be planted in a few days. Surface drying before storage is not necessary as long as there is not enough water present to form a pool at the bottom of the container. If cold storage is not available, use the coolest alternative: an air-conditioned room, a basement, or a shady spot with breezes.

Flotation should remove most of the acorns infested by weevils. If additional steps are desired, there are two possible methods: hot water dips and chemical fumigation. Hot water is the simplest; immerse acorns in water at 50 °C (120 ^{0}F) for 40 minutes. Several fumigants will do the job, but their use is risky because of the high moisture content of acorns. It is best to do nothing except flotation. Many surviving larvae will emerge when the acorns are placed in cold storage and die in the bottom of the storage container. They do not attack mature acorns, so infestation cannot increase.

Because acorns are so sensitive to desiccation, they cannot be dried for storage. Because they cannot be dried, they cannot be stored below freezing. For red oaks, the best storage method is one that maintains

acorn moisture content above 30 percent, allows some gas exchange with the atmosphere, and keeps the temperature at 1 to 3 °C (34 to 37 °F). Gas exchange can be controlled by storing the acorns in polyethylene bags 4 to 6 mils thick. Under these conditions, southern species such as water, Nuttall, and cherrybark oaks will maintain good viability (60 percent or more) for at least 3 years (Bonner 1973). Very similar methods have proven successful for northern red oak and scarlet oak (Farmer 1975; Suszka and Tylkowski 1982). Shumard and willow oak acorns do not seem to store as well.

With rare exceptions, acorns of the white oak group cannot be stored more than 4 to 6 months (over winter). These nondormant species sprout very readily in storage and die rapidly. The best recommendation for white oaks is to "store" them in the ground by planting in the fall.

If white oaks are held over winter for spring planting, the best conditions are almost the same as those recommended for red oaks: temperatures at 1 to 3 °C (34 to 37 °F), maximum acorn moisture content (45 to 50 percent), and containers that allow gas exchange.