

NURSERY CULTURE OF HARDWOODS

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**With the renewed interest in hardwood seedling production many nurserymen now raising pine seedlings may want to grow hardwood stock as well. To catalog the production techniques of the individual hardwood species with their often unique growing methods is beyond the scope of this paper. However, to enlighten the potential hardwood nurseryman, comparisons can be made between pine and hardwood practices that will be encountered in: seed collection, seed processing, seeding, growing, lifting and storage.**

#### SEED COLLECTION:

Most of the pine seed used in the South comes from orchards with known genetic performance. The seed produced in these orchards usually have high germination, high purity, and low moisture content. They are often sized and are stored in lined cardboard drums for efficient freezer storage. Hardwood seed, on the other hand, is usually collected from wild trees, and if collected by the public the only selection criteria is an individual tree with an abundant seed crop. Many times these seed collections, especially with the oaks, contain several species all mixed in one lot. The postharvest care is often lacking, thus reducing the quality of the seed. Better education and closer coordination with those involved with hardwood seed collection will alleviate many of these problems. In addition, purchasing seed from reputable seed dealers will eliminate many of the problems associated with buying from the general public.

#### SEED PROCESSING:

**Pine seed can be removed from the cone and cleaned in any one of the many modern extractories that dot the** South. In contrast, hardwood seed is usually cleaned at the nursery by hand. Some machines such as macerators, air screen cleaners, ventilation fans, and gravity tables may be used to process hardwood seed. Sycamore, ash, and sweetgum can be extracted and cleaned in a dry state like pine, but others like the oaks must be maintained at relatively high moisture contents to retain viability. Water is often used with hardwood seed to remove fleshy seed coats, float debris and float empty seed.

Germination may be estimated by cutting the seed that sink when they are fully imbibed. If time permits, the seed can be sent to the National Seed Laboratory at Macon, GA for a complete analysis. The U. S. Forest Service Laboratories at Starkville and Stoneville, MS have substantial experience with hardwoods and can be contacted if specific problems develop. They also offer shortcourses to inform the hardwood

#### SEED STORAGE:

Storage of hardwood seed in a cooler at approximately 35 degrees F is usually satisfactory for over winter storage. Some seed can be stored below freezing for several years. On the other hand, oaks are difficult to store more than one year and in sealed containers they may sprout. To prevent this some nurserymen store acorns in burlap bags or they may leave the plastic liner open if stored in a cardboard seed drum. Oak radicals broken during the seeding operation will resprout.

#### SEEDING:

Many hardwood seeds are sown by hand. The seeding rate can be determined by the lab report, if available; otherwise a cutting test to estimate germination and subsequent seeding rate is the standard procedure. Experienced nurserymen can translate the cutting percentage to the amount of seed needed for a given seedbed distance. They then measure this distance and sow the determined amount in this area. Those who successfully sow by hand using this method may not be interested in machines to sow their crop.

A variety of seeders are used in hardwood nurseries. However, no one seeder is capable of handling the wide range of seed sizes found in the hardwood group. The drill type and vacuum drum seeders may be used for the small seed such as black locust or shrub lespedeza. For trial plantings, the push type seeder with interchangeable plastic plates used by home gardeners performs well. Many nurserymen use modified fertilizer spreaders for the medium sized seed such as water, willow, and cherrybark oak. For the larger seeded species like Shumard oak, Nuttall oak, pecan, hickory, and walnut, shop made seeders using large roller chains or flat planter chains to pull the seed from the bottom of a hopper are popular. With this type of machine seeding four or five drills per bed is common practice.

The target density for most hardwoods is 10-12 seedlings per square foot. The old rule of planting depth: twice the thickness of the seed works for most hardwoods. The type of mulch and irrigation capabilities need to be considered for seed depth.

**To eliminate seed storage and balance the work load at the nursery many hardwoods are sown in the fall. This practice allows the seed to germinate earlier than traditional spring seeding would. This extra growing time produces larger seedlings that the market may demand. For the white oak group fall seeding is essential as they don't store very well. With fall sowing some problems can develop with early emergence, winter freezes, and late spring frosts. To minimize these problems: store and plant the seed as late in the fall as possible, mulch the seedbeds heavily, and be**

prepared to protect emerged seedlings from late spring frosts with irrigation.

A companion crop of wheat or rye can be sown along with the fall hardwood seeding to provide winter protection. In the very early spring before crop emergence, Round-up can be applied to kill the companion crop. If the seedling crop emerges, over the top grass killers like Poast or Fusilade can be used. With these two herbicides most hardwood nurserymen use a non-ionic surfactant rather than crop oil to prevent damage to the seedling crop. Always read and follow the label before applying pesticides and spraying a small area for a trial is prudent.

If any of the hardwood crop is sown in the spring the earlier the better for most species, especially the small seeded oaks such as water and willow oak. On the other hand, the seeding of legumes such as shrub lespedeza or black locust can be delayed until early summer.

#### GROWING:

**Weed control is an important part of growing hardwoods as they vary considerably in their tolerance to herbicides. Most hardwood nurserymen fumigate to control weeds and reduce disease possibilities. Several nurseries with the Auburn University Nursery Management Co-op are currently evaluating granular herbicides used in container operations. Treflan, surflan, and devrinol have been applied successfully on some hardwoods. Horticulture specialists at the land grant colleges often have good recommendations for tough weed problems.**

**During the growing season hardwoods can be treated much like pines. They will require topdressing, root pruning, and in some cases top clipping. However, these practices need to be performed earlier in the growing season than they are on the pines. Avoid top pruning hardwoods with opposite leaves as this practice may promote forking.**

**Hardwoods may be grown at a higher pH than pines and some report a positive response to sulfur additions.**

#### HARVESTING:

Most hardwood seedlings are hand pulled after the seed bed is undercut with some type of horizontal blade. The FOBRO with its moving blade and root shakers does an excellent job of severing the roots and shaking the soil from them. To prevent dessication of the roots the seedlings should be placed in a protective container as soon as possible for transport to the packing facility.

**For machine harvest, the GrayCo harvester with its wide draper chains can be used when field conditions are suitable. The belt type seedling harvesters can also be used to harvest some hardwoods. Timely root culturing during the growing season will result in a more efficient harvest and a superior**

root system.

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#### SEEDLING STORAGE:

Since hardwood seedlings are larger than pine seedlings they will require more room for storage. With the large number of hardwoods grown at most nurseries it is difficult to dig a few for each order or shipment, Many times it is easier to harvest a complete bed or more and stockpile these for future orders. To handle this volume many of the ornamental nurseries in middle Tennessee have large barns made with concrete blocks. These barns have soil floors rather than concrete to protect from cold temperatures and drying. When the racks built on the walls are full of bare root stock, the walls and floor will be moistened to keep the humidity high. Many northern nurseries have a cooler for freshly dug stock as well as a cold storage facility for stock ready to be shipped. Heeling stock in sawdust is sometimes done but mold and drying from the heat generated by the sawdust may damage the root system.

In general, most hardwood seedlings used for reforestation should have a 3/3" root collar diameter and be at least a foot tall, however, most will be two to three feet tall.

The size of most hardwood seedlings presents packing as well as storage problems. One thousand pine will easily fit into a kraft-polyethylene (K-F) bag but the same sized seedling bag may hold only fifty or one hundred hardwood seedlings. In many cases the roots are packed in the bottom of the K-P bag while the tops stick out of the bag. The roots are kept moist with sphagnum peat moss, hydromulch, sawdust, clay or the hydrophylic gels. Strapping or tying the top of the bag makes a neat package. Bags packed in this manner can dry, however, and should be accorded the same precautions given to the storage of pine seedlings packed in bales. Once packed the bags should be stored at 35 degrees F

Due to their higher selling price most hardwoods should be counted and culled. In some cases they may be graded by stem size and height. Standards for grading are available from the American Association of Nurserymen.

#### SUMMARY:

At first glance, the production of hardwoods differs significantly from pines. The peculiarities of hardwoods can best be understood by obtaining as much production information as possible before a hardwood crop is attempted. The ornamental nurserymen through their state associations hold trade shows and shortcourses throughout the South annually. The forest nurserymen have ignored this group; yet they are growing many of the species often used for reforestation. Our counterpart, the Northeastern Nurserymen's Association,

meets yearly and hardwood production is on their agenda. 5

Hardwood seedling production, like pine seedling production, requires a few crops to become proficient and in many cases the test will be taken before the lesson is learned. So take the test and grow some hardwoods.