NURSERY CULTURE OF LONGLEAF PINE

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Longleaf pine (Pinus palustris Mill) management has been handicapped for decades due to unfounded beliefs associated with the species (Coker 1989). More recent studies have identified key components in an intergrated system that increases longleaf pine success (Cordell, Hatchell, Marx 1989). Success comes only by intergrating a combination of techniques from site preparation, seed collection, nursery practices, planting and even postplanting care. There is much cause for alarm because many plantings of longleaf pine have failed. Failure to a large degree has been caused by inferior seedling quality. This paper will discuss techniques to develop better quality bare-root and containerized longleaf pine seedlings.

I. BARE-ROOT CULTURE OF LONGLEAF PINE

Seed

Obtain the very best seed available. Insist on most recent collections from the source seedlings will be planted. Longleaf seed deteriorates in cold storage so recent collections are important. A high degree of viability and purity is also important. Insist on up to date germination test when purchasing seed and pay close attention to moisture content. Processed seed should have a moisture content of 5 to 9 percent and can be stored at 20 to 25 degrees F. If moisture content is above 10 percent store at 35 to 37 degrees F. Dry seed to low moisture level (5 to 9 percent) and store at low temperature (20 to 25 degrees F.) for long storage periods.

Short stratification periods (10 to 14 days) can improve longleaf pine seed germination, however, stratification can be deterimental to some seed lots. A Benlate drench (2 Tbl./gal. water) will also improve germination. Some method of treating seed for birds and rodents is a prerequisite to nursery sowing. Gustafson-42-S works very well.

If you have seed orchards or seed production areas, pick cones at the peak of ripeness and process quickly. Seed yields and viability will diminish if cones are held over long periods of time. Cleaning longleaf seed is a major problem. Remove as much of the wing as possible with a dry dewinger without damaging seed. Do not over clean. Seed without wing portions are very low in germination.

NURSERY PRACTICES

1. Bed Preparation and Fertilization

Soil fumigation is a prerequisite to longleaf seedling production. Prior to making beds apply fertilizer as soil tests recommend. Do not over supply with nitrogen. Apply nutrients that will produce a good root system. After roots are well developed begin top dressing with nitrogen as necessary to keep foilage green and growing.

Keep a close check on soil pH. Maintain pH levels between 5.0 and 6.0. Levels above 6.0 can lead to damping - off diseases. It is possible to alter high pH levels by substituting ammonia sulfate in the place of ammonia nitrate when top dressing.

2. Sowing

Longleaf pine seed can be either fall or spring sown. Fall sown seed has several advantages over spring sowing.

A. Seedlings are larger by lifting time.
B. Soil conditions are usually better for fumigation.
C. Takes pressure off busy spring schedule.
D. Seedlings are well established in spring and can withstand early summer heat.

One major disadvantage to fall seeding is that cold winters can cause severe damages to seedlings by freezing. Sowing dates for fall seeding can be from September through October, while spring sowing takes place in late March. Special attention should be given to soil temperatures while spring sowing. Do not plant longleaf seed until soil temperature will permit germination.

Marx and Cordell have demonstrated at a South Carolina State nursery that quality longleaf seedling production can be accomplished by spring sowing. Their seedling management regimen has consistently produced longleaf seedlings with root collar diameters of 0.4 inch and larger.

3. Seedbed Density

Seedbed density regulates longleaf pine seedling quality. Plant for 9 to 15 seedlings per square foot. 10 to 12 seedlings per square foot would be ideal. Low seedbed densities (10 to 15 seedlings per square foot) coordinated with additional nursery cultural practices, such as row seedings, precision sowing, and lateral and horizonal root pruning, significantly improve longleaf pine seedling quality (Hatchell 1985). A root collar diameter of 0.4 to 0.6 inch makes an ideal longleaf pine seedling for handling and planting.

4. Irrigation

Irrigation is critical during seed germination. Water frequent enough to keep seedbeds moist but do not over water. After germination is well established water less frequent but apply more water. Irrigation should be properly timed. Over watering can cause foilage and root diseases, while inadequate watering can cause desiccation and stunting of seedlings.

5. Root Pruning

Undercutting (severing the tap root) and lateral root pruning increases longleaf pine seedling quality. Spring sown seedlings should be root pruned twice (August and October) while fall sown seedlings should be root pruned three times (June, August, October). The first undercut should be to a depth of 5 to 6 inches. Second and third undercuts should be an inch or so below previous undercut. Undercutting and lateral root pruning will produce a more compact root system and stimulate laterals. After root pruning the seedlings should be sprayed with Benlate and watered well to resettle soil around seedling roots.

6. Weeding and Pest Control

Soil fumigation will control many weed species and soil diseases such as root rot and Rhizoctonia. **It is strongly recommended that both the nursery soil and mulch be fumigated. To accomplish weeding use Goal as a pre- and post-emergence and Poast or Fusilade for grasses. Schedule sprayings to catch weeds in the two leaf stage. Rhizoctonia is perhaps the worst disease problem with longleaf pine seedlings. Benlate spray (2 lbs. a.i/acre) is the best control. Precautionary sprays of Benlate are necessary prior to and after top clipping and root pruning.**

Red spider mites are sometimes a problem in longleaf seedlings. Malathion will take care of mites.

7. Seedling Processing

Every effort should be made throughout the lifting process to maintain as much of the root system as possible. Also every precaution should be made to prevent root exposure. It is very important to get seedlings from the soil and packaged quickly. Seedling survival will be improved when kaolmite or peat moss is used as a packaging medium. Do not use hydromulch.

Scheduling of seedling lifting with planting is very important. The planting site should be ready and preferably bedded before lifting seedlings. Longleaf seedlings should be lifted and planted within a 72 hour period. Exposure to the elements will reduce planting success. Do not store (even in cold storage) for long periods. Longleaf seedlings should be lifted and planted early in the planting season (December 15 to January 15). Survival will diminish after bud

II. CONTAINER CULTURE OF LONGLEAF PINE

Containerized longleaf pine (Pinus palustris Mill) seedlings can be used as an alternative to planting bare-root stock. Planting container stock is an excellent way to extend the planting season either by planting early (September, October) or planting late (February, March). Properly handled container stock gives excellent survival. Root systems are well established in soil medium and continue to grow well after planting. Even though container seedlings have excellent root systems, their root collar diameters are small when compared to bare-root seedlings. Longleaf pine seedlings are very intolerant of grass and weed competition. Good site preparation and postplanting care (Oust-Velpar) is a must for good survival.

Seed

The procurement of quality seed is even more important when growing container seedlings. Empty cavities in containers cost the same as quality seedlings. Seed should receive a Benlate drench (2 tbl/gal water) prior to seedling.

Containers

The many container products available are divided into three general types: tubes, plugs and blocks. (Barnett, Brissette 1986). My comments will be limited **to the #8 sytroblock (14" X 20" X6"). This sytroblock holds 80 seedlings or approximately 41 per square foot. Longleaf seedlings develop and grow better root systems in the larger volume containers.**

Growing Medium

The best soil mixes include sphagnum peat moss and vermiculite. Sphagnum moss provide good water holding and buffering capacities, low Ph and high cation exchange capacity. Vermiculite provides pore space that assures well aerated roots. The ratio of peat to $_{\text{Vermiculite}}$ most often is 1:1 (Brissette, Elliott and Barnett 1989). The mix we use is blended by the Verlite Company of Tampa, Florida. It is a special blend of peat moss, Vermiculite, perlite and nutrients with reduced amounts of limestone. The pH is under 6.0. This company specializes in blending soil for horticultural use.

Filling Containers

Containers can be filled with machine or by hand. It is important that cavaties are well filled to the same level and medium well settled in container before seedling.

Sowing

Date for sowing containers is March 15.

Seed can be sown by hand or by the use of templates made to fit sytroblocks. Vacuum seeders are also available. Longleaf seed is so erratic in size and shape that hand sowing is probably the best way to sow. Firm seed into the medium. Eliminate double sowing if at all possible. Extra labor with double sowing plus thinning adds cost to seedlings.

Watering

The germination phase should have frequent light waterings. After germination is accomplished water less frequent with more water.

Fertilization

After germination spray seedlings twice weekly with a starter fertilizer. During the first few weeks or until cavaties are filled with roots use a fertilizer high in P and K and low in N. After cavaties are filled with roots use a grower fertilizer (20-20-20) until tops are of sufficient size. Switch then to a fertilizer that will finish off the seedlings. Reduce N and increase K.

After germination and prior to fertilization spray seedlings with captan to prevent damping-off.

Weeding

There will be some necessary hand weeding, but most weeds can be controlled with Goal. Extra caution must be used when spraying Goal on container seedlings.

Location for Container Nursery

Container longleaf seedlings produced in a greenhouse are inferior to seedlings grown out in the open on benches. Select a place to build benches that is convenient with easy access. It should be an area where machinery can move freely and where there is a good water source.

Handling and Planting

One advantage of container seedlings is early planting. Seedlings will be ready for planting by September when seed is sown in March. Take advantage of this, but correlate planting with soil moisture.

Extraction of longleaf seedlings should be closely scheduled with planting. Container seedlings can be cold stored or delivered to the planting site. The same rules apply to container stock as to bare-root. Keep from freezing and drying out.

Literature Cited

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