Longleaf Pine: Cone Collection and Seed Conditioning Guidelines

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Introduction

These guidelines are designed to provide some specific criteria that are necessary to insure good germination of longleaf pine seed. The guidelines are divided into five (5) topics:

I. Longleaf Pine Cone Collection Criteria
II. Seed Extraction Criteria
III. Seed Dewinging Criteria
IV. Seed Conditioning Criteria
V. Seed Testing Criteria

The National Tree Seed Laboratory personnel has developed these guidelines to assist the southern region's forestry professionals in maximizing their effort to collect and clean longleaf pine seed. The guidelines were chosen by seedlab personnel through experience working with longleaf pine seed, the valued opinion of their customers, and published research.

If any additional information or assistance is needed, please contact the National Tree Seed Laboratory, Rt. 1, Box 182B, Dry Branch, GA 31020-9696; phone (912-751-3551) or FAX (912-751-3554).

I. Longleaf Pine Cone Collection Criteria

1. Collecting cones at the right stage of maturity is absolutely critical in producing high quality longleaf pine seed. Barnett and Pesacreta (1993) report that cones with a specific gravity higher than 0.89 have lower germinating seed. In a bumper crop year there is the tendency to start early so you have time to collect all the cones. This will only reduce your overall germination.

2. Cone collection ranges from October 1st until the end of October. A good rule of thumb is to start collection around October 15th. To test for ripeness, float the cones in SAE 20 weight oil. Wakeley (1954) recommends delaying collection until 19 out of 20 cones float in SAE 20 motor oil. Wakeley stresses floating cones immediately after picking so immature cones will not dry out and then float.

3. Wait until cones from early ripening clones begin to open before collecting, to insure that the majority of your cones are ripe. For good seed germination, you should be willing to lose some seed from the early ripening clones.

4. Seed orchard clones do not ripen all at the same time. It is a good practice to check each clone's cone maturity before harvesting. The specific gravity can be determined by floating cones in motor oil or in large, water-filled, graduated cylinders. By measuring the cone's water displacement in the cylinder, you can calculate the cone's specific gravity.

5. Cones left on the ground overnight are subject to attack by fungi. Unripened cones have a higher moisture content and are more susceptible to fungi than ripened cones.

6. A bushel contains about 50 cones with a range between 25 to 75 cones. Bumper crop yields range between 0.75 to 1.0 lb. of seed per bushel.

7. Skip trees with small cones because they may be hybrids with loblolly. Concentrate collection on your best trees.

II. Seed Extraction Criteria

1. Fungal growth, seed deterioration, and premature germination are encouraged when cones are left outside. The best temporary storage is to place cones on screens one layer thick under a shelter where cones can air dry.

2. Seed extraction needs to be completed within 30 days of harvest (Barnett and Jones, 1993; Barnett and Pesacreta, 1993). Bonner (1987) found that cone specific gravity should be below 0.80 before drying begins, and drying temperatures should be about 95° F. Barnett and Jones (1993) reported that temperatures of 115° F. reduces longleaf pine seed viability.

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http://www.bugwood.caes.uga.edu/

3. According to Dr. Barnett, longleaf pine seed is shed from the cones at high moiture (15 to 25%) even after kiln drying. The seed needs to be dried below 10% moisture content after the cones have been tumbled. The thin seed coat does not prevent moisture absorption during processing, so monitor the moisture content with moisture meters.

4. This additional seed drying creates a bottleneck in the processing operation. Usually the kiln capacity is not big enough to dry cones and seed simultaneaously. Most of the time the seed is placed in cold storage (38° F) until all the seed has been extracted from the cones. Seed stored too long at a high moisture content in cold storage begins to deteriorate and germination drops precipitously (Barnett and Jones, 1993; Barnett and Pesacreta, 1993).

5. A seed dryer that forces air through the seed is needed to free up the cone kiln for drying cones. Commercial seed dryers can be purchased or one can be made with lumber, screens, and fans. The seed should not be more than a couple inches thick on the screens for good air circulation. Turning the seed aids in uniform drying.

6. A psychrometer and chart aids in determining the potential to dry the crop and the temperature required to achieve the desirable relative humidity for drying. A relative humidity of 30% usually dries the cones at an acceptable rate.

7. Dried seed can be stored in moisture-proof containers at -8° C. without significant seed deterioration. Anytime after drying, the seed can be dewinged and cleaned.

III. Seed Dewinging Criteria

1. Longleaf pine seed is easily damaged in the dewinging process! This is a critical element in the processing of longleaf pine seed. The dewinger can easily crack the seed by removing too much of the wing or removing the wing too harshly. An experienced person needs to monitor the dewinging process continually.

2. Personnel needs to be trained in the proper operation of the dewinger and shown what kind of seed damage to avoid. Training can be obtained from attending tree seed processing workshops or receiving individual instruction.

3. Barnett and Pesacreta (1993) recommend only dewinging longleaf pine seed that has been dried to a moisture content below 10%. If available, take X-rays during dewinging to check for seed damage.

4. Damaged seed does not store nor germinate well. Once the seed is mechanically damaged, the only way to correct the problem is to separate the damaged seed from the good seed. This requires more time and labor in seed processing and drives up the cost of the seed.

IV. Seed Conditioning Criteria

1. Basic cleaning after dewinging is performed with air cleaners. Any remaining cone bracts can be removed with large round hole screens and the gravity table.

2. Size seed so gravity table can be used to remove damaged seed. Seed-sizing creates homogenous seedlots which make the gravity table more efficient. The seed can be sized by width with round hole screens and by thickness with oblong hole screens. The round hole screens needed for longleaf pine seed range from 22/64th to 16/64th in size. The oblong hole screens range from 12/64th to 8/64th in size.

3. If your organization does not have a gravity table, make arrangements now to have your seed run over a gravity table. The seed needs to be sized because the gravity table cannnot separate seed by size and weight simultaneously. Once the seed is dimensionally homogenous, the gravity table can remove the malformed and damaged seed which can significantly raise your seed germination.

4. If your organization has a gravity table and any other equipment that its personnel does not know how to operate correctly, call the National Tree Seed Laboratory and make arrangements to get free training.

5. Properly processed longleaf pine seed can easily be sown with a precision seeder.

V. Seed Testing Criteria

1. Germination tests of seed are neeeded for calculating nursery sowing rates. The seed is planted in the best germinating conditions to measure its maximum potential of producing a plant.

2. Stratified germination tests more accurately reflect the environment in the nursery. When longleaf pine seed is sown in the fall, it goes through natural stratification causing the seed to germinate more rapidly. Stratified seed sown in the spring has a greater chance of establishing a small plant by germinating rapidly before adverse weather destroys the seed.

3. The commonly used stratification period for longleaf pine seed is moist, cold treatment for 14 days @ 38° F. A paired germination test is needed to look at the effect stratification has on the seedlot.

4. The National Tree Seed Laboratory's longleaf pine germination data demonstrates that stratified seed has, on average, a 15% greater germination than unstratified seed. Barnett and Pesacreta (1993) reported a 10% decrease in laboratory germination but a 2 to 21% increase in nursery germination with stratified longleaf pine seed.

5. Karrfalt (1988) planted a longleaf pine seed soaking study in a southern nursery and found no significant differences in nursery germination between soaking the seed before planting or planting dry seed.

6. Degraded seed is usually very moldy in the germination dishes causing greater variability in the test results. Over the life of the test, the mold can spread to the good seed hindering its ability to germinate, thus lowering the overall germination of the seedlot.

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