COLLECTING AND PROCESSING METHODS AFFECT PINE SEED GERMINABILITY

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Abstract.--Viability of all southern pine seeds can be maintained long enough to meet all practical needs if collecting, processing, and storage conditions are carefully controlled. However, adverse conditions at any stage of handling can markedly reduce seed germinability.

Additional keywords: Pinus, cone maturity, cone storage, seed moisture contents, dormancy.

Numerous factors during cone collection and seed processing can reduce seed viability. The most important of these are cone maturity, cone storage, cone and seed processing, seed moisture content and storage temperature. Unfavorable conditions in any one of these areas can cause secondary seed dormancy, the reduction of storability, or the immediate loss of viability.

Cone Maturity and Storage

Initial germination of longleaf (Pinus palustris Mill.) and slash pine (P. elliottii Engelm.) is directly related to cone maturity at the time of extraction (Barnett 1976, McLemore 1959, McLemore 1975). Loblolly pine seeds mature at earlier stages of cone maturity, and viability is high whenever the cones open.

Cone storage before processing increases both seed yield and germination from immature slash and loblolly pine cones (Barnett 1976, McLemore 1975). Three to five weeks of storage are recommended before cones collected early are processed. Longleaf cones should be collected only when mature; storage decreases the germination of seeds from immature cones. They can be picked when ripe and stored 3 to 5 weeks to increase seed yields without reducing viability (Barnett 1976), but the storage period should not exceed 5 weeks (McLemore 1961).

Cone and Seed Processing

Seeds are usually extracted from southern pine cones in forced-draft kilns. Temperature and duration of kilning are critical for southern pines, particularly longleaf: temperatures of 115 F or more markedly reduce germination (Rietz 1941). Increases in the length of treatment also reduce viability.

After seeds are extracted, they must be dewinged, cleaned, and dried. The wings on seeds of all southern pines, except longleaf, are completely removed by brushing and tumbling in mechanical dewingers. The structure

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of longleaf seeds makes dewinging difficult, The wings are mechanically reduced to stubs, so dewingers must be carefully regulated to prevent injury to these thin-coated seeds. Wing removal which does not damage the seedeoats has no effect on seed storability (Belcher and King 1968, Barnett 1969). The dewinging process for all species is hastened and improved by moistening dry seeds, but this excess moisture must then be removed before storage.

The trash, wings, and empty seeds are usually removed from large lots in a cleaning mill; this is ideal for large lots and has little effect on viability. Small lots can be cleaned by flotation in a liquid of suitable specific gravity. Loblolly seed can be cleaned in water; longleaf in n-pentane; shortleaf (P. echinata Mill.), sand (P. clausa Chapm.), and spruce pine (P. glabra Walt.) in 95-percent ethanol; and slash pine in a 1:1 water-ethanol mixture. Because pentane is highly volatile, it does not affect the storability of longleaf seeds. However, the use of ethanol for flotation does reduce seed storability unless the seeds are aired well before storage (Barnett 1971). It is safer to delay ethanol flotation until just before seed use.

Seed Storage Conditions

Careful control of the moisture content of the seed and its storage temperatures is essential to viability (Barnett and McLemore 1970, Jones, 1966). General recommendations for long-term storage are to dry seeds to 10 percent or less moisture content and hold at subfreezing temperatures. Seeds that are damaged or are known to have low vigor can be preserved by lowering storage temperatures to about 0 F (Kamra 1967), if moisture contents are as low as 8 to 10 percent, Storage at temperatures near 0 F can reduce viability if moisture levels are higher (Barnett, 1970. It should be added, however, that lower temperatures are more expensive to maintain.

Seed-moisture content in storage can also affect the amount of secondary dormancy that develops during storage. Loblolly seeds stored for 1 to 5 years at moisture levels below 10 percent are *less* dormant than those held at levels between 10 and 18 percent (McLemore and Barnett 1968).

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