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Flotation in Ethanol Reduces Storability of Southern Pine Seeds

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Abstract. Flotation in ethanol to separate full and empty seeds of spruce pine and slash pine caused viability to decline in storage. Drying for extended periods after the soaks alleviated some of this effect. Flotation of longleaf pine seeds in pentane did not affect storability. ***Forest Sci. 17: 50–51.***

Additional key words. *Pinus palustris, Pinus glabra, Pinus elliottii,* seed germination.

FLOTATION in a liquid of suitable specific gravity is one of the easiest methods for separating full and empty southern pine seeds (McLemore 1965). Longleaf pine (*Pinus palustris* Mill.) seeds can be sorted in *n*-pentane; shortleaf (*P. echinata* Mill.), sand (*P. clausa* [Chapm.] Vasey), and spruce pine (*P. glabra* Walt.) seeds can be separated in 95-percent ethanol; and slash pine (*P. elliottii* Engelm.) seeds in a 1:1 mixture of ethanol and water.

Viability of seeds sown soon after treatment was not harmed by soaking in pentane or ethanol for as long as 4 hr, and the seeds germinated faster than those in control lots (Barnett and McLemore 1965, McLemore 1965). It was not determined if the two chemicals affected germinability of seeds placed in storage after the seeds were separated. Baldwin (1932) did find that viability of red spruce (*Picea rubens* Sarg.) seeds soaked in absolute ethanol was reduced when the seeds were held in storage. This Note reports the effects of pentane and ethanol flotation on storability of longleaf, slash, and spruce pine seeds.

Longleaf pine seeds were separated in *n*-pentane, spruce pine in 95-percent ethanol, and slash pine in a 1:1 mixture of 95-percent ethanol and water. Tests were run with fresh seed lots of each species that were divided to provide for three replications of five drying treatments after flotation. Some seeds in each lot were not soaked and served as the control; seeds in the other four portions were soaked for 4 min and dried for 1, 4, 8, or 24 hr at 24°C. After drying, samples were tested for germinability, and the remaining seeds were sealed in polyethylene bags for testing after 1 and 2 years' storage, at 1°C. All seeds were stored at 1°C at a moisture content of about

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TABLE 1. Germination of longleaf, slash, and spruce pine seeds after pentane or ethanol treatment, drying, and storage for 1 or 2 years.

(In percent)

Hr dried after soaking	Longleaf pine			Slash pine			Spruce pine		
	Initial	1 yr	2 yr	Initial	1 yr	2 yr	Initial	1 yr	2 yr
1	90	86	89	100	1	0	91	2	0
4	93	85	88	99	96	94	90	4	2
8	93	83	93	100	97	98	92	17	7
24	92	87	91	99	98	98	91	31	18
0[a]	92	82	87	99	90	96	90	56	48

[a] Not soaked—control treatment.

10 percent. Germination tests of longleaf and slash pine were conducted with unstratified seeds, but spruce pine seeds were stratified for 28 days at 1°C. Empty seeds in the control treatments were removed by flotation immediately before testing.

Longleaf seeds were not affected by the pentane, even when dried for only 1 hr and stored for 2 years (Table 1). Viability of untreated seeds before storage was 92 percent, and the range for seeds soaked and dried for varying times was from 90 to 93 percent. None of these differences were significant. After 2 years of storage, all seeds that had been soaked germinated slightly better than those of the control, but differences had no practical significance. Germination after 2 years averaged 5 percentage points higher than after 1 year. Although unexplained, such variations in viability between years frequently occur with stored longleaf seeds. Pentane, then, seems to be relatively safe for separation of longleaf seeds even when storage is necessary.

Germination of slash pine seeds stored after soaking in a 1:1 ethanol-water mixture was affected by drying time. Initially, germination of the control and the four treated lots was at least 99 percent. Germination dropped 3 percentage points for the control during 2 years of storage. Soaking and drying for 1 hr resulted in a total loss of viability. Germination of seeds dried for 4 hr was significantly lower than for those dried longer periods, but the differences of 4 percentage points were too small to be important. Eight and 24 hr of drying were equally effective and the loss in viability over the 2-year period was only 1 percentage point. Drying should probably extend for at least 8 hr since the 4-hr treatment may have a more adverse effect on seeds weaker than those in this study.

Storability of spruce pine seeds was reduced greatly by ethanol flotation. All seeds soaked and dried for 1 hr were dead after 2 years. Each successively longer period of drying resulted in significantly higher germination, but even 24 hr of drying failed to result in germination as good as that of the control. Viability of the control was 90 percent initially, but it dropped by 42 percentage points after 2 years. No reason is known for this rapid decline. It is recommended that flotation of spruce pine seeds be delayed until just prior to use.

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