

SOIL COVER AIDS GERMINATION OF PINE SEED ON SANDY SITES

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In the sandhills of west Florida, pine seeds covered with a thin layer of soil germinate better than those lying on the surface. Direct-seeding tests near Clarksville indicate that sowing depths up to three-fourths of an inch are best for slash and sand pine. For longleaf, depths should not be greater than one-half inch.

The west Florida soils, about 95 percent sand, are nearly sterile. For pine to become established and grow well, the competing wiregrass and scrub oak usually must be eliminated. Heavy brush choppers accomplish this purpose, but the bared soil dries rapidly and crusts over after rains. Surface-sown seeds often begin to germinate but die because their radicles cannot penetrate the crust. Heavy rains may cause washing even on slight slopes, thus displacing large numbers of seed.

Early studies indicated that these hazards might be overcome by covering the seed with soil. How deep the cover should be was the object of 3 years of testing on the Chipola Experimental Forest.

In 1959, seeds were sown in the field and laboratory at depths of 0, 0.3, 0.6, and 1.2 inches. Those sown in the field were given a standard Arasan-endrin-aluminum powder coating to repel birds and rodents.

In 1960, all sowing was in the field--at depths of 0, 0.25, 0.5, and 0.75 inch. Half the seed was treated with the repellent coating.

In 1961, seeds of the three species were field-sown at depths of 0, 0.25, 0.5, 0.75, and 1.0 inch on February 2. Another seeding of longleaf was made on March 6.

Top-sown seeds were tallied as germinated when their emerging radicles had penetrated the soil surface and their seed coats were lifted clear of the soil. Covered seeds were considered germinated when either the seed coats or cotyledon needles were free of the soil. A small number germinated abnormally but are not included in the data presented here.

Results

Field germination of all three species in all years was greatly benefited by a thin covering of soil (table 1). Surface-sown seed germinated very poorly except in the February 1961 sowing of longleaf pine; here it germinated better than covered seed, probably because 6 inches of well-distributed rain fell. In the March test, when rain was scant, germination of top-sown longleaf was poor, but seed at the 0.25- and 0.5-inch depths germinated as well as, or better than, those in the February trial at the same depths. The indication is that less rain is required for high germination when the seeds are covered and that rains need not be as well distributed.

Generally speaking, field-sown longleaf germinated best at a depth of 0.5 inch or less. At greater depths total germination was reduced and some seedlings died before pushing completely through the soil. The buds of these seedlings never appeared above the surface, and the needle tips were held tightly by the soil. Recovery of seed sown 1.2 inches deep in the laboratory indicated that longleaf germinated well at this depth but, because of the lack of stem elongation, few seedlings pushed through the soil to become established.

TABLE 1.--Germination of three species of pine at various depths of soil cover

Species and depth of sowing ¹ (inches)	1959		1960, field	1961, field	
	Laboratory	Field		February sowing	March sowing
Longleaf:	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
0.0.....	84	--	25	82	30
0.25 or 0.3.....	76	84	85	80	82
0.5 or 0.6.....	74	62	73	82	82
0.75.....	--	--	37	57	52
1.0 or 1.2.....	0	0	--	6	16
Sand:					
0.0.....	95	--	2	3	--
0.25 or 0.3.....	90	84	85	66	--
0.5 or 0.6.....	74	45	83	62	--
0.75.....	--	--	82	36	--
1.0 or 1.2.....	10	4	--	20	--
Slash:					
0.0.....	97	--	1	36	--
0.25 or 0.3.....	87	34	44	52	--
0.5 or 0.6.....	70	36	52	45	--
0.75.....	--	--	48	48	--
1.0 or 1.2.....	36	4	--	38	--

¹ The 0.3-, 0.6-, and 1.2-inch depths were tested in 1959 only.

Sand pine in the field germinated best at depths between 0.25 and 0.75 inch. Three-quarters of an inch may be too deep, however, if germination vigor is low, as in 1961. Below 0.25 inch germination was poor.

Field-sown slash pine was less affected by depth than sand or longleaf. Total germination, though low in all plantings, was best between 0.25 and 0.75 inch.

In the laboratory phase of the 1959 test, surface-sown seed of all species germinated better than covered seed, and germination decreased as depth increased from 0.3 to 1.2 inches. But in the field, surface-sown seed was washed away by heavy rains before germination started.

Rate of germination was affected very little by depth of seeding. Although seed near the surface germinated first, peak germination at all depths was reached about the same time for any given species.

The repellent treatment had no effect on germination of any of the three species.

In the 1960 test the heights of sand and slash pine seedlings were measured after 34 weeks, and seedlings of all species were weighed. Seedling development, as indicated by stem length and total green weight, was not affected by sowing depth.

Depth of seeding did not affect the survival of sand and slash pine, but longleaf mortality increased noticeably with increasing depth as follows:

Depth of soil covering (inch):	Seedling mortality	
	<u>1960 (after 34 weeks)</u>	<u>1961 (after 20 weeks)</u>
	<u>(percent)</u>	<u>(percent)</u>
0.0.....	17	7
0.25.....	8	13
0.5.....	7	24
0.75.....	31	29
1.0.....	--	46

The increase, though, is probably of little consequence, especially at the 0.25- and 0.5inch depths, because total germination was markedly greater at these depths.