STORED LONGLEAF SEED SUCCESSFULLY DIRECT SEEDED

James P. Barnett
Southern Forest Experiment Station
Forest Service, U.S.D.A.
New Orleans, La.

Longleaf pine seed stored for 7 years can be successfully direct seeded. It germinated well when treated with repellents and sown under severe field conditions at Alexandria, La. Established seedlings from stored seed appear as vigorous as those from fresh seed.

In trials from 1948 to 1956 on the Kisatchie National Forest and in tests conducted by numerous industrial landowners, repeated failures with stored longleaf seed led to the belief that direct seeding demands fresh seed. The failures should have been blamed on improper storage. But the belief has persisted, even though it is now known (1, 2) that high viability can be maintained for years.

Procedure

Seed collected locally in 1954 was stored in all temperature-seed moisture combinations of 0° F., 25° F., and 34° F. and 8 and 14 percent.

Samples were drawn in the fall of 1961 from each of three replications of the six treatments and from fresh seed from the 1961 crop, which was used as a check. All samples were cleaned to remove empty seeds, and the number of sound seeds per pound was determined.

Laboratory germination tests were conducted with 200 seeds from each sample. Germination of fresh seed was 73 percent, while that of the four best stored lots ranged from 75 to 84 percent (table 1). It was unsatisfactorily low for lots stored with a 14-percent moisture content at 25° F. and 34° F.

One-third of a pound from each sample was treated with liquid Arasan 42-S containing 4 percent Dow Latex 512-R and 2 percent Endrin 50W. Two gallons per 100 pounds of seed was applied.

This seed was sown on December 7, 1961, at the rate of 3 pounds per acre. Each of the seven treatments was replicated three times on 0.1-acre plots. The soil was a fine

TABLE 1.--Laboratory and field performance of fresh and stored longleaf seed

Treatment	Storage temperature	Seed moisture content	Laboratory germination	Initial tree percent	Seedlings per acre	
					Initial	First-year
	°F.	*Percent*	*Percent*	*Percent*	*Number*	*Number*
1.....	0	8	84	27	3,800	1,300
2.....	0	14	80	28	3,900	1,500
3.....	25	8	79	24	3,300	1,200
4.....	25	14	50	14	1,900	700
5.....	34	8	75	16	2,200	900
6.....	34	14	12	4	500	400
Fresh seed (check).	--	--	73	29	4,500	1,800

sandy loam and was moderately well drained. A very light grass cover had developed after a prescribed burn 3 months earlier. Germination conditions were severe: first heavy rains washed the seed into piles of debris; then cold weather delayed germination for about 1 month; and finally subfreezing temperatures and ice killed some of the germinating seed. The following summer conditions were also adverse--rainfall was low during the hot months.

Initial stocking was estimated in February 1962 from a count of seedlings on 16 sample milacres per plot. Seedlings were recounted the following winter.

Results

Seed from the three best storage environments--0° F. at 8-, 0° F. at 14-, and 25° F. at 8-percent moisture--yielded tree percents almost as high as those obtained from fresh seed. The differences of 1 to 5 percentage points were not statistically significant. Seed stored at 34° F. and 8 percent moisture germinated fairly well in the laboratory, but poor field performance suggests that its vigor declined during storage. Tree percents for the other two lots were low--4 and 14 percent--as forecast by laboratory germination tests.

The three best lots of stored seed produced highly satisfactory initial stands. Stocking ranged from 3,300 to 3,900 seedlings per acre; 85 to 98 percent of the sample milacres had one or more seedlings.

Seed from treatments 4 and 5 yielded borderline catches, 1,900 and 2,200 seedlings per acre. Only 500 seedlings per acre grew from seed in treatment 6; this seed was stored at 34° F. and 14-percent moisture.

The summer of 1962 was very dry. In plots where stocking was sufficient to provide an accurate estimate, more than half of all seedlings died. Despite heavy losses, the plots from fresh seed and from treatments 1, 2, and 3 were adequately stocked at the end of the first year, if we assume acceptable minimums to be 1,000 trees per acre and 60-percent milacre stocking.

First-year survival of seedlings from seed in treatments 1-5 was 34 to 41 percent, compared with 40 percent from fresh seed. As shown by treatments 4, 5, and 6, diminished seed viability did not influence survival of seedlings. There was no evidence that seed viability influenced survival.

Discussion

Landowners who sow several thousand acres in one season know the disadvantages of using only fresh seed. The 6-week period between cone ripening and the optimum time for sowing is often too short for efficient collecting and processing of large amounts of seed. Findings of this study can be applied to facilitate such large operations and reduce seed costs.

In most cases, 10,000 viable seeds per acre are needed to insure adequate stocking. The exact sowing rate should be computed from laboratory germination tests.

To maintain longleaf seed viability in storage, subfreezing temperature and a seed moisture content of less than 10 percent are recommended. However, these conditions alone will not assure successful seed storage. Proper cone and seed handling is a prerequisite.

McLemore (3) found that prolonged cone storage weakens seed and hastens deterioration, even under optimum cold storage. In cones held for more than 30 days before extraction, seed viability was sharply reduced after 1 year of storage. Seed storability also is influenced by premature collection, cone storage under adverse conditions, and prolonged delays between extraction and storage.

In this study fresh seed probably germinated slightly better in the field than any of the stored lots. But three of the lots stored for 7 years performed satisfactorily. While fresh seed will always be preferred in direct seeding, longleaf seed that has been properly stored can be used with confidence.

Literature Cited

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