FREEZING LOWERS SURVIVAL OF THREE SPECIES OF SOUTHERN PINES

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Conifer seedlings are shipped from southern tree nurseries throughout the winter. In many instances seedlings in the shipping bundle are held in the open at the planting site or remain on open trucks for as long as 2 weeks before they are planted. During this time, periods of subfreezing temperatures often occur, resulting in freezing of the seedlings. The planting of frozen seedlings has often been considered one of the causes of planting failures, but nothing could be found in the literature concerning survival of seedlings planted after they had been frozen while in the shipping bundle.

In 1958, seedlings of loblolly, slash, and longleaf pines and eastern redcedar were bundled and held for 2 weeks at 20° F. Upon removal from storage, the seedlings were allowed to thaw slowly, after which they were watered and planted. Survival after one year in the field was only 2 to 4 percent for all species, whereas the minimum survival of unfrozen controls for all species was 72 percent.

Since 2 weeks is longer than the seedlings would normally be subjected to subfreezing temperatures, another study was run in 1959 to test the survival of loblolly, longleaf, and slash pines at a subfreezing temperature for varying exposure times.[1] One hundred seedlings in lots of 25 plants for each species tested were packed in each of 5 regular shipping bundles. Four bundles were placed in a cold room regulated to 20° F. at various intervals calculated to give final exposure times of 6, 12, 24, and 48 hours. All. the bundles were removed from the cold room at the same time. The seedlings were allowed to thaw slowly in a sheltered place, watered, and planted in 4 replications of 25 seedlings each. Nonfrozen seedlings served as a control.

Freezing at 20° F. for periods of up to 24 hours only slightly lowered the survival of slash and loblolly pines (table 1). Following the 12- and 24-hour exposure times, several successive seedlings in the row died, possibly indicating that seedlings toward the outside of the bundle may have been damaged more than those in the interior. Sur

TABLE 1.--Survival of loblolly, longleaf, and slash pines frozen at 20° F. for varying periods of time

Species	Survival				
	0 hours	6 hours	12 hours	24 hours	48 hours
	Pct.	Pct.	Pct.	Pct.	Pct.
Loblolly.....	84	76	76	76	1
Longleaf.....	45	28	27	2	0
Slash.....	84	81	69	68	1

[1] Appreciation is expressed to Mr. William Bland and Mr. Graham Chamblee, N. C. Division of Forestry, for their assistance in the study.

vival of all species after freezing for 48 hours was practically nil. Although the survival of the nonfrozen longleaf pine seedlings was relatively poor, it was evident that freezing for periods of 6 or 12 hours substantially lowered survival and that freezing for 24 and 48 hours resulted in almost complete mortality of the seedlings.

Several periods of 24 consecutive hours of subfreezing temperatures were recorded during the 1960 shipping season in North Carolina and South Carolina and at least one period of 72 hours occurred. If seedlings are not stored in a sheltered place during such periods, freezing and a resulting decrease in survival is likely. If seedlings cannot be stored in buildings, they should at least be protected with plastic or canvas covers. Longleaf pine seedlings appear to be extremely sensitive to freezing temperatures and special precautions should be taken to store seedlings of this species at temperatures above freezing.