Containerized pine seedlings thrive in wood-fiber blocks

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Six-week-old loblolly pine seedlings grown in soilless wood fiber blocks and outplanted in early July survived better and grew faster than seedlings grown in soil filled kraft-paper tubes. Survival of longleaf seedlings was lower in blocks than in tubes, but growth in the blocks was markedly better. Growth of seedlings in a late August planting was not satisfactory with either species in blocks or tubes.

Soilless blocks offer several advantages over a tube-type container for growing and planting seedlings. Blocks require no labor and material costs for filling with media, can include incorporated nutrients, do not restrict lateral root development after planting, and are readily adaptable to automated planting because they are easily handled.

One of the first blocks to become available consisted of acrylonitrile bonded softwood pulp (l,2). This product, originally manufactured by the American Can Company under the trade name BR-8, is currently manufactured by Famco, Inc. and called Gro-block.

Gro-blocks were evaluated in this study as containers for growing southern pines to be outplanted in midsummer.

Methods

Loblolly *(Pinus taeda* L.) and longleaf *(P. palustris* Mill.) pine seeds were sown in Gro-blocks and in paper tubes on a staggered schedule so that different aged seedlings could be outplanted on the same day. Loblolly seed were stratified for 30 days before sowing.

The Gro-blocks were 5/8 by 5/8 by 3-1/8 inches and 3/4 by 3/4 by 3-1/2 inches (fig. 1). They were molded into a truncated wedge-shaped strip of 14 small or 12 large blocks. The

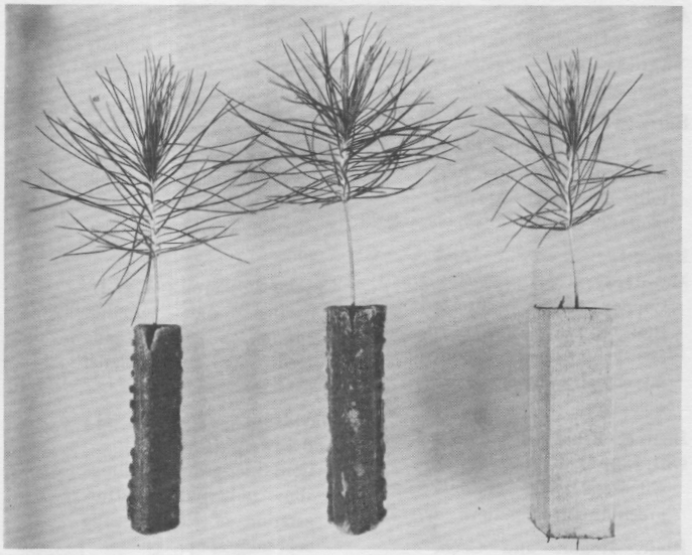

Figure 1.—Loblolly pine seedlings growing in small and large Gro-blocks and in square kraft-paper tubes.

square kraft-paper tubes were 7/8 by 3-1/2 inches and were filled with a 1:1:1 mixture of topsoil, peat, and sand. Supplemental nutrients were not added to either blocks or tubes; however, nutrients were incorporated into the blocks at time of manufacture.

All seedlings were grown on copper screen to prevent loss of roots growing through the containers, and all

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were placed in an air-conditioned greenhouse with a maximum temperature of 75°F. Seedlings were moved directly from the greenhouse to the field without a period of hardening off.

Two-, 4-, and 6-week-old seedlings were outplanted on July 6 and August 27, 1971. The planting site was a Beauregard silt loam soil which had been disked about 2 months earlier. Seedlings were planted at a spacing of 2 by 4 feet to reduce variations in soil and to make measurements easier. Holes for planting were made with specially fabricated planters. For each species, there were four 25-seedling plots for each of the 18-treatment combinations.

The July 6 planting was made when soil moisture was adequate, but no rain occurred for about 2 weeks thereafter; so survival was tested under fairly severe conditions. Seedlings planted on August 27 had adequate moisture.

Seedling survival and size were assessed 18 months after outplanting. Height of loblolly pines was measured to the nearest 0.1 foot; since longleaf had not begun height growth, rootcollar diameters were measured to the nearest 1/16 inch. Differences among treatments were analyzed for statigtical significance at the 0.05 level by an analysis of variance.

Results and Discussion

SURVIVAL

Loblolly Pine

Survival of 2-week-old seedlings outplanted in July was unsatisfactory (table 1). However, those in the kraftpaper tubes did somewhat better than those in either size block. Seedlings in blocks probably performed poorly because the roots were not ready to emerge from the blocks, which desiccated after planting. In contrast, paper tubes prevented rapid loss of moisture from the growing media to the dry soil on the site, and better survival resulted.

TABLE 1.—Survival after 18 months of loblolly and longleaf pine seedlings grown in three types of containers for different lengths of time and outplanted on two dates

Species	Planting date	Seedling age	Container type: Paper tube	Container type: Small block	Container type: Large block	Average
		Weeks	*Percent*	*Percent*	*Percent*	*Percent*
Loblolly	July 6	2	33	4	1	13
		4	60	76	56	64
		6	64	82	61	69
		Avg.	52	54	39	48
	Aug. 27	2	40	41	20	34
		4	57	35	28	40
		6	39	51	42	44
		Avg.	45	42	30	39
Longleaf	July 6	2	48	1	11	20
		4	75	44	57	59
		6	82	28	53	54
		Avg.	68	24	40	44
	Aug. 27	2	80	59	75	71
		4	92	72	79	81
		6	93	88	93	91
		Avg.	88	73	82	81

Four- and 6-week-old seedlings in the July planting averaged 64 and 69 percent survival. Best results were obtained with the small blocks. Average survival for 4- and 6-weekold seedlings in small blocks was 79 percent, which was about 20 percentage points better than survival of similar seedlings in large blocks and 17 percentage points better than survival of those in paper tubes. Small blocks probably allowed roots to make quicker contact with the soil than the large blocks.

None of the August plantings survived satisfactorily. Survival in the various treatments ranged from 20 to 57 percent. Two-week-old seedlings performed a little better when planted in August than in July; but survival was still poor. All the other seedlings did worse in the August planting than in July. Heavy mortality was attributed to insufficient time for roots to grow out of containers and become established before cessation of growth in the fall. Many of the small seedlings were probably killed by cold weather, as young loblolly is highly vulnerable to subfreezing temperatures.

Longleaf Pine

In the July planting, longleaf seedlings grown in paper tubes survived better than those grown in blocks. In the August planting, type of container had little effect on survival, which averaged 88, 73, and 82 percent for paper tubes, small blocks, and large blocks.

Unlike loblolly pine, longleaf seedlings survived better in large blocks than in small blocks. This difference between the species may be associated with longleaf's faster root development, which allowed greater utilization of the block and its nutrients.

Because of better soil moisture conditions later in the summer, overall survival was 81 percent for the August planting and only 44 per. cent for the July planting. Longleaf survived late planting much better than loblolly because longleaf is the more cold hardy of the two species.

Growth

Loblolly Pine

In the July planting, seedlings in blocks grew faster than those in paper tubes. Data for 2-week seedlings had little meaning since survival was so low, but the growth of 4- and 6-week seedlings showed the superiority of blocks (table 2). After 18 months in the field, the height of 6-week seedlings averaged 2.3 feet in large blocks, 1.9 feet in small blocks, and 1.2 feet in paper tubes. With all three types of containers, older seedlings planted in July grew much better than younger ones. Some were over 4 feet tall at 18 months.

Nursery-grown seedlings, which had been refrigerated since March, were planted on the same site about 1 week after the July 6 planting. Height of these bare-root seedlings after 18 months averaged 1.7 feet. Seedlings planted in March after lifting averaged 2.7 feet tall. So the height of 6. week-old seedlings in large blocks was superior to that of nursery seedlings planted about the same time, and was only 0.4 foot less than that of bareroot stock planted 4 months earlier.

All loblolly seedlings planted in late August grew slowly; the best treatment combinations averaged only 0.4 foot in height after 18 months (table 2). Although growth of seedlings was slightly better in blocks than in tubes, seedling age had little or no affect on growth. Apparently this planting was made so late in the summer that the seedlings did not have sufficient time to become established before growth ceased. Similar results have been obtained from subsequent studies of fall and winter planting.

TABLE 2.—Size of 18-month-old loblolly and longleaf pine seedlings grown in three types of containers for different lengths of time and outplanted on two dates

Species	Planting date	Seedling age	Container type: Paper tube	Container type: Small block	Container type: Large block	Average
		Weeks	*Feet*	*Feet*	*Feet*	*Feet*
Loblolly	July 6	2	1.10	1.45	1.00	1.18
		4	1.11	1.27	1.80	1.39
		6	1.20	1.88	2.27	1.78
		Avg.	1.14	1.53	1.69	1.45
	Aug. 27	2	.32	.33	.32	.32
		4	.30	.42	.37	.36
		6	.28	.39	.42	.36
		Avg.	.30	.38	.37	.35
			Inch	Inch	Inch	Inch
Longleaf	July 6	2	.45	.50	.47	.47
		4	.44	.48	.53	.48
		6	.44	.48	.57	.50
		Avg.	.44	.49	.52	.48
	Aug. 27	2	.24	.24	.30	.26
		4	.28	.25	.24	.26
		6	.27	.27	.29	.28
		Avg.	.26	.25	.28	.26

Longleaf Pine

Seedlings grown in blocks and planted in July grew better than those in paper tubes, and the larger blocks seemed to perform better than the smaller ones. There was also some indication that in the larger blocks older seedlings grew better than younger ones. These results, and those of other studies, imply that 8to 10-week-old seedlings may have performed better than those 6 weeks old in this test. The size of seedlings 18 months after planting in July was about twice that of seedlings planted in late August. Container material and seedling age had little effect on growth in this later planting.

Conclusions

As a container for growing loblolly seedlings, wood-fiber blocks are preferable to paper tubes. Six-week old seedlings grown in blocks survived as well as or better than those in paper tubes. They grew much faster than seedlings in tubes and somewhat faster than bare-root nursery-grown seedlings planted at the same time.

For longleaf pine, seedlings in blocks had lower survival but better growth than those in tubes.

Both species respond best to outplanting early in the summer.

Literature Cited

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