Effects of Rate and Kind of Seedbed Mulch and Sowing Depth on Germination of Southern Pine Seed

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In nurserybeds, slash and loblolly pine seedling emergence is better under Hydromulch, Turfiber, or Cellin when no heavy rains occur between sowing and seedling emergence. Pine straw mulch is superior when heavy rains do occur.

In a previous study (*1*), sawdust and pine straw were significantly better than Hydromulch as mulch on nurserybeds sown with slash pine. In that study, 150 seeds were sown in each of three replicate blocks at three planting depths under each mulch material. A large-scale test of the findings was needed under normal nursery conditions. This paper reports the results of such a test, which included 39 seedbeds (≥ 520 feet long) in each of two Georgia nurseries (≥ 3.7 acres).

Methods

In spring 1980, seeds of both slash (*Pinus elliottii*) Engelm var. *elliottii*) and loblolly (*P. taeda* L.) pine were sown on seedbeds at the Georgia Forestry Commission's Walker Nursery (13 beds of slash, 26 beds of loblolly). Only loblolly pine seeds were sown at the Georgia Forestry Commission's Morgan Memorial Nursery. A Whitfield seeder was used in both nurseries to plant eight drills across each 4-foot-wide bed. All seedbeds were mulched with pine straw, Hydromulch[1], or Turfiber[2]. Chopped pine straw was applied in both nurseries to a depth of one-half inch, and the other two mulches were applied at 1,600, 1,800, and 2,000 pounds per acre. In both nurseries, seedling emergence was estimated on one randomly located 1- by 4-foot plot on each 100 linear feet of bed. Plots were observed at weekly intervals from the sowing date until emergence reached a plateau (4 weeks at Walker and 5 weeks at Morgan Nursery) and then at biweekly intervals until emergence was complete (8 weeks).

At the Walker Nursery one drill and at the Morgan Nursery two of the eight drills on one side of the Whitfield seeder were adjusted to plant at a depth between one-eighth and one-quarter inch, while the remaining drills were planted at or near the surface. Half of the more deeply planted drills were located on the right sides of the beds and the remainder on the left sides of the beds. Differences in seedling emergence because of depth of planting were determined by comparing counts in the deep-planted drills with counts in the surface-planted drills on the opposite side of the seedbeds. Germination was recorded for each drill to determine if drill location in relation to bed edges affected seedling emergence. The study design was a split plot with three replicate blocks at each nursery.

In Great Southern Paper Company's Nursery near Cedar Springs, Ga., two seedbeds of slash and two seedbeds of loblolly pine were also sown in the spring of 1980 and mulched with Cellin[3] or Hydromulch at 1,500 pounds per acre. Approximately 4 months after sowing, seedlings were counted on eight randomly selected 1- by 2-foot areas on each bed. The study was a randomized complete block design with two replicates (ignoring species).

[1]Hydromulch is a trademark of Conwed, 332 Minnesota St., St. Paul, MN 33101, and is a wood-fiber material.

[2]Turfiber is a trademark of Superior Fiber Products Company, 1201 65th St., Baltimore, MD 21237, and is a wood-fiber material.

[3]Cellin is a trademark of Cellin Manufacturing Company, P. O. Box 1707, 70 Industrial Blvd. West, Valdosta, GA, and is a ground newsprint material.

Results and Discussion

Pine straw was inferior to Hydromulch or Turfiber for seedling emergence in the Georgia Forestry Commission's Morgan Nursery, but not at the Walker Nursery in 1980 (table 1). Seedling emergence was essentially unaffected by the rate of mulch applied, and Cellin and Hydromulch were equally effective. These results contrast with those found in 1979, when pine straw was superior to Hydromulch (1). In the 1979 study, heavy rains washed seeds from beds shortly after sowing. In 1980, heavy rains did not occur shortly after planting.

Even so, seedling establishment was better where the bed surface was lowest because seeds moved towards lower areas (table 2). Heavy rains shortly after sowing would probably have reduced total seedling establishment, obliterated drills, and caused an accumulation of seedlings in low bed areas. Use of pine straw mulch probably would have minimized these problems. Numbers of seedlings on the bed edges frequently decline if sowing is succeeded by heavy rains before emergence. Thus, seedbeds should be level with respect to field slope and with a slight center depression to help prevent seeds washing off bed edges.

Table 1.—*Effects of rate and kind of mulch on pine seedling establishment in each of three Georgia nurseries during 1980*

Mulch	Application rate	Seedling establishment, final number per ft[2]		
		Walker Nursery	Morgan Nursery	Great Southern Nursery
Pine straw	1/2 inch	27.6a[1]	26.8a	—[2]
Turfiber	1,6001bs/acre	30.4ab	38.8b	—
Turfiber	1,800 Ibs/acre	35.0b	37.4b	—
Turfiber	2,000lbs/acre	31.8ab	38.4b	—
Hydromulch	1,6001bs/acre	31.4ab	35.0b	36.2a[3]
Hydromulch	1,800lbs/acre	32.0ab	40.2b	—
Hydromulch	2,000lbs/acre	29.8ab	40.6b	—
Cellin	1,5001bs/acre	—	—	34.6a

[1]Within columns, means followed by a common letter do not differ significantly at the 0.05-level according to Duncan's multiple range test.

[2]– = data not available.

[3]Hydromulch was applied at 1,500 pounds per acre at the Great Southern Nursery.

Deep planting reduced seedling establishment slightly in 1980 when rains did not wash seeds off the bed surface (table 3). Again, however, this treatment reduces seed washing from the bed surface when heavy rains occur shortly after sowing (*1*).

For southern pine nursery personnel, then, the choice of mulching material and planting depth should be based largely on expectation of heavy rain in the month after seeds are sown.

Table 2.—*Effect of seedbed drill location in relation to bed edges on seedling establishment in each of two Georgia nurseries in 1980*

Drill location	Seedling establishment, final number per ft2	
	Walker Nursery	Morgan Nursery
1[1]	29.0[2]	35.0b
2	29.8a	33.4a
3	31.6ab	38.2bc
4	31.0ab	40.4c
5	31.6ab	40.2c
6	30.8ab	35.8ab
7	31.4ab	34.0
8	33.6b	37.0bc

[1]Drills 1 and 8 are on the outside edges of the beds and drills 2 through 7 are, consecutively, those between. At the Walker Nursery, drill 1 was located on the highest and drill 8 on the lowest side of the bed. At the Morgan Nursery the bed center was the lowest point on the beds.

[2]Within columns, means followed by a common letter do not differ significantly at the 0.05-level according to Duncan's multiple range test.

Table 3.—*Effect of planting depth on seedling establishment in each of two Georgia nurseries in 1980*

	Seedling establishment, final number per ft^2	
Planting depth	Walker Nursery	Morgan Nursery
Surface	32.6a[1]	37.0b
1/8 to 1/4 inch	29.8a	33.8a

[1]Within columns, means followed by a common letter do not differ significantly at the 0.05-level according to Duncan's multiple range test.

If heavy rains are likely to occur, pine straw offers advantages, as does sowing slightly below the soil surface. These treatments will reduce seed washing. If no heavy rains occur, however, slightly to moderately higher seedling emergence can be expected from beneath wood-fiber mulches. If a wood-fiber mulch is chosen, 1,600 pounds per acre are sufficient.

Literature Cited

1. Rowan, S. J. Planting depth and seedbed mulch affect germination of slash pine seeds. Note SE-292. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station; 1980. 3 p.