A TEST OF WOOD FIBER PADS AS A SEEDBED MULCH

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Newly planted seedbeds, especially fall sown ones, are often covered with a mulch. These mulches serve a number of purposes--protection from wind and water erosion, retention of moisture, prevention of frost heaving, retardation of weed growth during the pregermination period, and reduction of premature germination in the spring. A variety of materials have been used, with burlap, straw, and pine needles probably the most common. None of these has all the properties that a nurseryman desires in a mulching material.

Recently a company in Cloquet, Minn., has been experimenting with loose pads of sulphite wood fiber as a mulch that might permit germinating tree seeds but not weed seeds to emerge through it. The low price of such material would allow the nurseryman to leave it on the seedbeds where it would eventually disintegrate after having served its purpose. Fungicides, insecticides, and fertilizers could be incorporated during the fabrication of the pad to increase its utility.

Tests of these pads in nurseries in a number of regions gave contradictory results. In some tests, the tree seedlings did successfully penetrate the mulch; in others they did not. Because of these conflicting results, the Lake States Forest Experiment Station was asked to set up a test in the greenhouse under controlled conditions to determine the effect of four densities of sheets upon germination and emergence of conifer seedlings.

Methods

Flats of silica sand, 10 inches square and 3 inches deep, were autoclaved and sown with 4 species; jack and red pines and white and black spruces, 1 species in each of the 4 drills. Each flat was then covered with one of the four densities of mat being tested, with the control left uncovered. This test, using 5 flats, was repeated 4 times to give a total of 20 flats. The seeds were sown to give a calculated density of 50 seedlings per row. Spruce seeds were cold soaked to overcome dormancy; no treatment was needed for the pine.

All flats were watered frequently to maintain god conditions for germination of the seed. Greenhouse temperatures fluctuated about 70 F., with somewhat higher temperatures on sunny days.

Germination and emergence were recorded at frequent intervals. In the control flats, counts were made of the seedlings as they emerged above the level of the sand. In the flats covered with mats, a seedling was counted as having emerged when it had penetrated the mat and was completely free from the main body of it. At the conclusion of the experiment, the mats were removed and those seeds that had germinated but whose seedlings were still under the mat were counted. A count of the seed that did not germinate was not needed because the seeds in each row had been counted carefully before planting.

The mats had the following characteristics:

Mat	Weight per cu. ft.	Thickness
	Pounds	*Inches*
A	3.16	0.162
B	1.86	.163
C	.96	.142
D	.75	.141

The lightest mat was extremely thin and appeared to be penetrable by *very* small seedlings. The heaviest one apparently was too strong to be broken even by vigorous seedlings.

The test began February 17 and ended 2 months later after it was evident that no additional changes in the results would occur.

Results

Surprisingly, the pads were not easily dampened by the water so that it was not until the sixth day of twice-daily watering that the heaviest pads were soaked through with water. The heavier pads actually supported the water on their surfaces without becoming wet. The manufacturer reported that this was due to the nature of the binder used. The thinnest pad, although the fibers were slow to wet, allowed the water to pass through to the sand beneath. As the flats had been well watered before mulching and the pads were effective in slowing evaporation, this difference in wetting did not affect the germination of the seed. Statistical analysis of results corroborated this conclusion.

Germination started March 1, 2 weeks after the start of the test, and judging by the ridges produced under the pads, germination in all flats occurred at about the same time. Germination in the control flats was completed by March 16, but the test was continued until April 21 to see if the pads would deteriorate and permit additional emergence of the seedlings imprisoned below the pads.

In all cases, the pads were strong enough to be self-supporting between the ridges raised by the rows of germinating seed, although some tearing of the lighter sheets occurred with watering. No such tears appeared in the heaviest sheet.

When emergence was poor, some mold appeared in the rows of jack pine, but not in the other species. However, germination tests run with the jack pine showed vigorous growth of molds, which probably started on the cracked and broken seeds that were present in the jack pine seed lot but not in the other species. These molds resulted in the destruction of some of the jack pine seedlings and probably introduced slight errors in the count of the seedlings at the end of the experiment.

Table 1 shows that the heaviest pad, A, did not permit a single seed to penetrate; no tears occurred in this pad even though it was raised well above the surface of the sand by the hypocotyls of the germinating seeds.

TABLE 1.--Total germination and emergence of conifer seeds

Pad	Red pine		Jack pine	
	Plants emerging	Total germination	Plants emerging	Total germination
A	0	208	0	230
B	4	215	3	226
C	47	202	90	261
D	141	214	214	270
Control	217	217	233	233
	White spruce		Black spruce	
A	0	381	0	182
B	2	394	0	195
C	56	379	42	233
D	138	369	93	207
Control	360	360	189	189

Pad B was also very resistant to penetration with only a very few seedlings, 1 percent of those germinating, coming through. Some tearing of the pad occurred where it was suspended between the rows of seedlings. However, the pad did not rupture along the rows, but between the rows when watered. Apparently, the weight of the water and its softening effect upon the pad combined to cause the rupture. This tearing, because it was between the drills, did not allow the seedlings to escape.

Slightly over 20 percent of the germinating seeds emerged above the second lightest pad, pad C. This weight material tended to rupture along the rows as the seedlings pushed upward against it, rather than to become suspended between the rows and then rupture. However, with many of the seeds, the pad conformed to the shape of the uplifted seed or hypocotyl and cupped the growing tip so that the pad could not slip free from the seedlings.

As expected, the lightest pad allowed the largest percentage of germinating seed to emerge. About 55 percent of the seedlings grew through pad D. Generally, this pad adhered to the wet sand with sufficient tenacity to break as the seedlings pushed against it. However, the thicker portions of the pad presented enough resistance to prevent emergence, giving patchy stocking of the drills.

The upper surface of the pads compacted and became horny with alternate wetting and drying, which added to the difficulty of penetration.

Conclusion

These tests indicated that the wood fiber pads supplied did not allow the germinating seeds to emerge in sufficient numbers to make the pads a desirable mulching material. Even the lightest pad, which would be difficult to place on a seedbed because of its low tensile strength, lowered the percentage of seeds which emerged. Germination was not influenced by the pads.

Further investigations, with modifications of this type of material, will be continued by the company in an effort to develop a mulch with the desired properties.