FIRST-YEAR EVALUATION OF EXCELSIOR PADS ON LOBLOLLY PINE[1]

by

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Abstract. In the spring of 1988 I conducted a study to test the effects of excelsior pads on loblolly pine survival and growth. Two types of pads were used: American Excelsior Company TREGRO type 100 and 200.[3] Bare-root, 1-0 loblolly pine seedlings were mattock planted on April 14 and the pads installed on April 15. The study design was random pairs of treatment (with pad) and control (no pad) seedlings. An evaluation on May 5 showed inconsistent survival that was attributed to planting technique. Three people planted seedlings: two had survival rates of 95 percent while the survival rate for the third planter was 77 percent. Evaluation at the end of the growing season showed that the pads had no apparent influence on survival. Overall survival was 72 percent with pads and 71 percent without pads. The initial mortality was distributed evenly among treatments, so subsequent measurements were not biased. Nevertheless, seedlings with the type 200 pads were significantly taller than controls or type 100 seedlings. These results show: (1) there is no substitute for good planting technique to ensure seedling survival, and (2) type 200 TREGRO pads have a beneficial effect on seedling growth even under the severe drought conditions of 1988.

Additional Key Words: surface mining, reclamation, West Virginia.

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Introduction

Tree planting for surface mine reclamation has been on the decline since the passage of the Surface Mining Control and Reclamation Act (PL 95-87). The requirement for a herbaceous cover has introduced a competition factor that has all but eliminated tree planting. Many techniques have been attempted to alleviate this problem but none have been totally successful. Mulches have been used both on minesoils and other sites to enhance tree establishment and growth. In studying the use of black polyethylene versus mechanical cultivation on the establishment and growth of hybrid poplar, Bowersox and Ward (1970) reported that polyethylene gave equal results in a prolonged drought and improved both survival and growth in periods of normal rainfall or limited drought. Bark or wood-chip mulches were recommended by Vogel (1981) to aid tree establishment on minesoils. Slick and Curtis (1985) found that mulches also can reduce frost heaving of tree and shrub seedlings. In most reclamation plantings, however, the only mulches used are those that can be applied with a hydroseeder and application rates are too low to aid trees or shrubs.

In the spring of 1988, the American Excelsior Company provided us with TREGRO pads for test purposes. After examining them, we decided to purchase additional pads for use in a field experiment. The major attributes of the pads, as indicated in the promotional materials, are that the pads retard weed growth, aid in moisture retention around the trunk area, and minimize trunk damage by mowing equipment. Even though the pads are relatively expensive for major reforestation projects, it was felt that a knowledge of their capabilities would be helpful in defining problems associated with tree establishment on reclaimed surface mines and other disturbed areas.

Methods and Materials

A recently reclaimed surface mine in Raleigh County, West Virginia, was selected as the site for the test. Two types of pads were used: Type 100 and Type 200. The entire surface of Type 100 pads is enclosed in a white polypropylene netting. The netting has six (6 by 6) strands per square inch. The entire surface of Type 200 pads is covered with black 3/4x5/8-inch polypropylene netting. The downside surface has a geotextile fabric enveloped within the netting. Both types are available in two sizes, 3 by 3 and 4 by 4 feet. We used the 3 foot size. The pads are held in place with wire staples having 6 inch legs and 1 inch width. Nine staples were used per pad for anchorage. The T100 pads cost $1.65 each and the T200 pads cost $2.25. When cost of shipping and staples was added, individual costs were $2.15 and $2.75, respectively.

The planting medium consisted of a mixture of topsoil and subsoil. It was somewhat rocky and had a pH of 4.5 to 5.0. At the time of planting, the soil was moist.

One-year-old loblolly pine seedlings, averaging 15 to 20 cm in height, were mattock planted on the site on April 14, 1988. The

portion of the planting with loblolly pine consisted of four rows with a total of 402 seedlings. The area had been hydroseeded to a herbaceous mixture about 2 weeks before planting. Emergence of grasses and clover had just begun.

Pads were installed around the seedlings on April 15. Trees in each row were paired. Then a pad or no pad treatment was randomly assigned to the first member of each pair. There were 201 pairs: 102 with T200 pads and 99 with T100 pads. One person, working alone, installed the pads in 7 hours.

Results

An inspection of the planting on May 5 showed that 45 seedlings (11 percent) had died. Much of the initial mortality appeared to be planting error. There were 34 dead seedlings in the row planted by one person and 7 and 4 dead in rows planted by two others. This initial mortality is not related to the presence or absence of TREGRO pads, but does re-emphasize the need for care in planting seedlings.

Evaluation of the planting in mid-September showed that mortality had increased to 28 percent. The ratio of dead trees by planter remained about the same as recorded in May. There were, however, 72 T200 pairs and 40 T100 pairs intact for analysis. Average height of the T200 seedlings was 36 cm and the average height of controls was 25 cm. In the T100 treatments, average height of seedlings with pads was 25 cm and 21 cm without pads. Table 1 shows survival and height by treatments.

A "t" test for paired observations was used to compare the heights of treated versus untreated seedlings. In the analysis of the T200 data, a "t" value of 9.73 at 71 df showed a highly significant difference between the average height of seedlings with pads compared to those without pads. The difference in average heights with the T100 pads was significant at the 0.01 level ("t" value of 3.1 at 39 df).

The difference in average height of controls in the two groups suggests they might be from different populations. However, it is impossible to compare two groups statistically. This difference also might be related to the tree planter. By chance, 70 percent of the T100 pairs were planted by the person with the low survival record. Raw data showed that the average height of controls by planter was 25.6 cm (n=46) and 24.3 cm (n=45) higher survivals and 21.7 cm (n=31) lower survival. These data were based on control seedlings whether or not the treated partner survived.

It is interesting to note that the average height of the T100 seedlings is the same as that of T200 controls. Grass growing through the T100 pads suggests there may have been a competition factor with this type of pad. However, all of the control seedlings were growing in grass, and an analysis of the T100 treatment showed a significant difference between heights of seedlings with pads and controls. Therefore, it appears that height might also be related to planter.

Table 1.--First-year survival and height of loblolly pines treated with T100 and T200 excelsior pads.

Treatment	No. seedlings planted	Percent survival	Average height (cm)
T100 pads	99	61	25
Control	99	61	21
T200 pads	102	83	36
Control	102	81	25

The cost of an established control seedling for the two "better" planters, if we can assume a seedling is established at the end of one growing season, was 25 cents. For the other planter, it was 33 cents. Thus, it would cost $40 more per acre to obtain 500 established seedlings using the third planter. Add to this, lost volume due to a slow start and the long-term financial loss could be substantial. In this study, the cost of a 1-year established T100 seedling was $4.17 compared with $3.79 for a T200 seedling.

Precipitation during the 1988 growing season was far below normal. Monthly rainfall totals and departures from normal (NOAA 1988) were: April: 2.70 inches, dep. -0.89; May: 2.98 inches, dep. -0.88; June: 2.31 inches, dep. -1.51; July: 4.56 inches, dep. +0.10; August: 1.90 inches, dep. -1.78. Thus, reduced moisture no doubt placed the seedlings under additional stress.

Conclusions and Discussion

Neither type of pad had much effect on seedling survival. However, survival was strongly influenced by the ability of the tree planters. This shows that even under adverse conditions (planting on minesoil and abnormally dry weather), tree seedlings have a much better chance of becoming established if they are handled properly.

The pads did have a positive effect on seedling growth, the T200 pads showing the strongest influence. The geotextile fabric in these pads retarded weed growth and conserved moisture that resulted in an average additional height growth of 11 cm.

On the basis of early results obtained in this study, the T200 pads show an advantage over both T100 pads and control seedlings in enhancing height growth. The cost of these pads, however, must be considered for large-scale plantings. They appear to be better adapted to landscape use than reforestation.

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