

Some Effects of SAWDUST MULCHING of Pine Seedlings

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Demands for pine seedlings to reforest understocked acreages are increasing annually. To meet this demand, seedling production has been expanded by enlarging nursery capacity. However, the yield of plantable seedlings from each pound of seed sown has not materially increased during the past two decades. At present an average of 64 seed out of every 100 sound seed planted germinate. Of these, approximately 33 die during the growing season or are culled before shipment. Increasing the percentage of plantable seedlings from the seed sown would enlarge the potential production of existing nurseries without necessitating additional capital outlay.

Research on forest tree seedling production was begun in 1949 by the Agricultural Experiment Station of the Alabama Polytechnic Institute. One phase of the nursery research program that includes comparison of the effects of various mulches on germination, establishment, survival, growth and development of seedlings in the seedbed is reported here.

Seed of southern pines are customarily sown directly on the surface of the ground in flat seedbeds 4 feet wide. As protection for the seed and the seedbed, a mulch is applied immediately after sowing. The germination periods vary between 8 and 30 days, depending



FIGURE 1. Standard manure spreader, with added home-made metal hood, is used to apply sawdust mulch to slash and loblolly pine seedbeds in nursery tests.

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upon physiological condition of the seed and environmental factors.

When germination is completed, the mulch may be partially or completely removed, depending upon the nature of the material used. Burlap, heavy cotton fabric, sand, and pine needles are materials that have been most commonly used as mulches. Burlap and cotton fabric must be removed after an appreciable number of seed have germinated, but before germination is completed. Otherwise the earliest established seedlings will be smothered, or killed by soil fungi developing under the cover. Pine straw may be partially or completely removed when germination is completed. Previous study elsewhere has shown no important difference in germination in the seedbed or in the final yield of plantable trees that can be attributed to burlap, pine straw, or sand mulch.

Sawdust was tried at the Auburn nursery as a seedbed mulch for long-leaf, slash, and loblolly pine in 1951. The sawdust was left on the beds after germination. Observations indicated that germination was equal to or exceeded that obtained with pine straw. Incidence of chlorosis seemed slightly lower in beds mulched with sawdust.

PROCEDURE *for* EXPERIMENTS

1952. Loblolly and slash pine seedlings were grown on plots mulched with sawdust during the entire growing season and on plots that were mulched with pine straw during the germination period only. Plots covered with a mulch during the entire growing season are referred to as mulched plots. Plots from which the mulch was removed after germination are referred to as unmulched plots.

The mulched plots received an application of sawdust to an average depth of one-fourth inch immediately after sowing, and this mulch was maintained during the growing season. The unmulched plots were covered with pine straw during a 30-day germination

period, after which the pine straw was removed.

Soil surface temperatures were determined daily at noon from June 2 to October 19. Observations of the occurrence of chlorosis were made weekly from July 7 to October 20. Seedling mortality during the growing season was noted. Final survival percentages, seedling heights, and seedling diameters were determined at the end of the growing season.

1953. Loblolly pine seed were separated by screening into three size classes, large, medium, and small. Seed of each size were sown and subjected to three different mulch treatments, namely one-fourth inch sawdust, pine straw, and burlap. The pine straw and burlap mulches were removed after a 28-day germination period.

Germination determinations were based on 100 per cent counts of seedlings obtained from known numbers of seed sown.

RESULTS *of the* MULCH TREATMENTS

Surface soil temperature. Under a sawdust mulch, appreciably lower maximum surface soil temperatures occurred than where no mulch was maintained after the germination period. The sawdust mulch reduced fluctuations in surface soil temperatures. A decline in surface soil temperature from June to October for both treatments, based on 28-day averages, was regular and in the form of a straight line.

Seedling survival. A one-fourth inch sawdust mulch definitely reduces mortality of established seedlings of both species. Sawdust mulch was especially beneficial to slash pine. The mortality of slash pine on unmulched seedbeds in 1952 totaled 57.8 per cent. Only 24.4 per cent died on the plots covered with one-fourth inch of sawdust. For loblolly pine, the percentages

were 19.5 and 13.9, respectively (Figure 2).

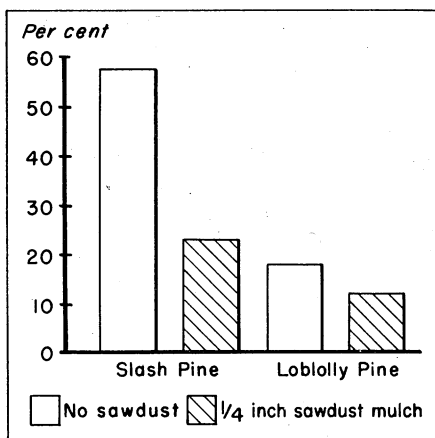


FIG. 2. Seasonal mortality percentages of slash and loblolly seedlings in unmulched 1/4-inch sawdust mulched nursery beds.

The highest mortality rate in both species occurred during June and July. Since mortality was not associated with differences in surface soil temperature, and since the watering schedule and other operations were similar over the entire project, no definite reason for the differences in survival can be assigned. Two possible explanations may be: (1) the longer availability of water under a continuous mulch; and/or (2) a decrease in sand-splash against the stem and needles and consequently a reduction in fungus infections.

Seedling heights and diameters.

One quarter-inch mulch sawdust did not influence height or diameter growth of surviving seedlings of either species. Slash pine seedlings were taller and markedly larger in stem diameter than were the loblolly pine seedlings.

Chlorosis. It was strongly indicated that one quarter-inch sawdust mulch reduced occurrence of chlorosis.¹ Chlorosis averaged 0.02 per cent weekly in the mulched plots as compared to 0.44

per cent weekly in the unmulched plots. Chlorosis first became noticeable about July 7. It disappeared after August 25 and did not reappear.

Chlorotic symptoms occurred in no regular pattern on either mulched or unmulched plots. Generally, chlorosis was more pronounced and persisted longer on the unmulched plots.

An association of chlorosis with changes in surface soil temperature was apparent.² Chlorosis was most pronounced when surface soil temperatures were highest. However, the association is not strong enough to justify using surface soil temperatures as a predictive factor for chlorosis.³

Slash and loblolly pine seem equally susceptible to chlorosis.

Germination. Germination percentages under pine straw and burlap mulches were, for all practical purposes, identical.

In 1952, germination was approximately the same under the sawdust and pine straw mulch. In 1953, germination under one-fourth inch sawdust mulch was 8.7 per cent higher than under burlap and 9.3 per cent higher than under pine straw.

Seed size. As was to be expected, germination percentage of loblolly pine seed was directly proportional to seed size. Large seed had the highest germination percentage and small seed the lowest.

PRACTICAL APPLICATIONS

In the practical use of sawdust, two difficulties may be encountered. (1) If seedbeds are not level, it is difficult to apply sawdust over the beds to a uniform depth. (2) Heavy rains or strong winds may wash or blow some of the sawdust from the beds, particularly from the outside drills. These difficulties can be partially eliminated by mak-

¹.01 Probability level.

².05 Probability level.

³r²=23.72%.

ing the beds level, keeping the sawdust moist, and using windbreaks.

CONCLUSIONS

For many nurseries, the use of sawdust as a mulch on loblolly and slash pine seedbeds appears to be highly desirable. Sawdust is frequently more readily available than pine straw and it is cheaper than burlap. Germination under sawdust is as good as or better than that obtained under burlap or pine straw.

Maximum surface soil temperatures are materially lower under a one-fourth inch sawdust mulch than under no mulch.

Chlorosis seems to be less prevalent in seedlings mulched with one-fourth inch of sawdust than in those growing in unmulched beds.

A materially higher percentage of survival of loblolly and slash pine seedlings is obtained by maintaining a one-fourth inch sawdust mulch on the seedbeds throughout the growing season than with unmulched surfaces.