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A PRELIMINARY STUDY OF THE DETERIORATION OF ALDER AND DOUGLAS-FIR CHIPS IN OUTDOOR PILES

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In the fall of 1952, E. E. Matson of the Pacific Northwest Forest and Range Experiment Station learned that the Fir-Tex Insulating Board Company of St. Helens, Oregon was considering mixing alder with Douglas-fir chips for outside storage. Since alder heartwood is more susceptible to decay than that of Douglas-fir, the question arose whether mixing the two might hasten the decay of the Douglas-fir chips. It was then suggested that the Division of Forest Disease Research should be consulted. This led to the establishment of some outdoor small scale tests in late October 1952. Preliminary results indicate that mixing the chips does not hasten decay of Douglas-fir during a one-year period.

The Tests

Two conical-shaped chip piles, about 6 feet high and 6 feet in diameter were set aside for sampling. One pile consisted of 100 percent red alder chips and the other was a mixture of two-thirds alder and one-third Douglas-fir chips. An additional source of 90 percent Douglas-fir and 10 percent alder chips of the same age was also available for sampling. Beginning in November 1952 several samples of chips were taken from deep within each pile every month for a year. The chips all were about 1/8-inch thick, but they varied in width from 1/4 to 1-1/2 inches, and in length from 1/2 to 3 inches.

After the chip samples were collected an attempt was made to culture any stain and decay fungi that might be present. Colormetric pH determinations were also made. Finally the chips were oven dried to determine moisture content.

1/ Acknowledgment is hereby made of the cooperation and assistance of Mr. P. N. Vance of the Fir-Tex Insulating Board Company.

Results

The alder chips had a pH of approximately 4.5 at the start of the test and showed a slight increase to pH 5.0 by the end of one year in bulk pile. The Douglas-fir chips were slightly more acid, the pH being about 4.0 and 4.5 at the start and conclusion of the test, respectively. In these tests differences in acidity, therefore, do not appear important in limiting the development of decay.

The moisture content of the chips increased considerably after 2 or 3 months in the pile (figure 1); but moisture variations thereafter apparently were not directly related to current precipitation, and the moisture content remained uniformly high. The mixed pile containing 67 percent alder and 33 percent Douglas-fir chips gave the most uniform moisture readings. It is evident that the moisture conditions in each pile were favorable for the development of decay and wood staining fungi throughout the test period. Therefore, any variation in the occurrence of decay was most probably related to differences in decay resistance of the wood species or to factors other than insufficient moisture.

The first sign of decay was found five months after the test began, in the pile containing 100 percent alder chips. From the fifth month on, the number of alder chips with decay increased steadily until at the conclusion of the tests, most of the chips in the interior of the pile showed decay (figure 2). Chips in the outer part of the pile had very little decay after one year, owing primarily to drying. The major decay was white rot. All attempts to isolate the decay fungus failed, mainly because the thin chips were completely penetrated by staining fungi. The principal staining fungus in alder was a robust species of Graphium, which quickly over-grew and suppressed the wood-rotting fungus in culture but which had no apparent effect on inhibiting decay of the alder chips within the pile.

After six months, decay was found in only a few alder chips in the pile consisting of a mixture of two-thirds alder and one-third Douglas-fir; no decay of the Douglas-fir chips was found in this pile even after one year. The alder chips in this mixed pile did not show a steady increase in decay, and by the end of the test relatively few chips were decayed. It appears, therefore, that mixing alder with Douglas-fir chips slowed down the deterioration of the alder without speeding decay of the Douglas-fir chips. Again, the white decay from alder was not successfully isolated.

In the pile containing 90 percent Douglas-fir, no decay was found during the test. It was easy, however, to isolate a species of Graphium from Douglas-fir chips. This was a different species than the Graphium isolated from alder. Almost invariably Trichoderma mold was also abundant, particularly in the early isolations from Douglas-fir. Since Trichoderma is known to have anti-biotic properties, it may have accounted for the limited decay of alder mixed with Douglas-fir chips. In the more than

100 isolations from decaying alder chips taken from the pure alder pile, only once was Trichoderma associated with the decay. On the other hand, approximately 25 percent of the early isolations from Douglas-fir developed Trichoderma.

Conclusion

This pilot test is not regarded as conclusive. Chips stored in larger test piles or in tests initiated during the summer, might show different rates of decay. However, on the basis of these preliminary outdoor storage tests it appears that mixing alder with Douglas-fir chips is not undesirable.

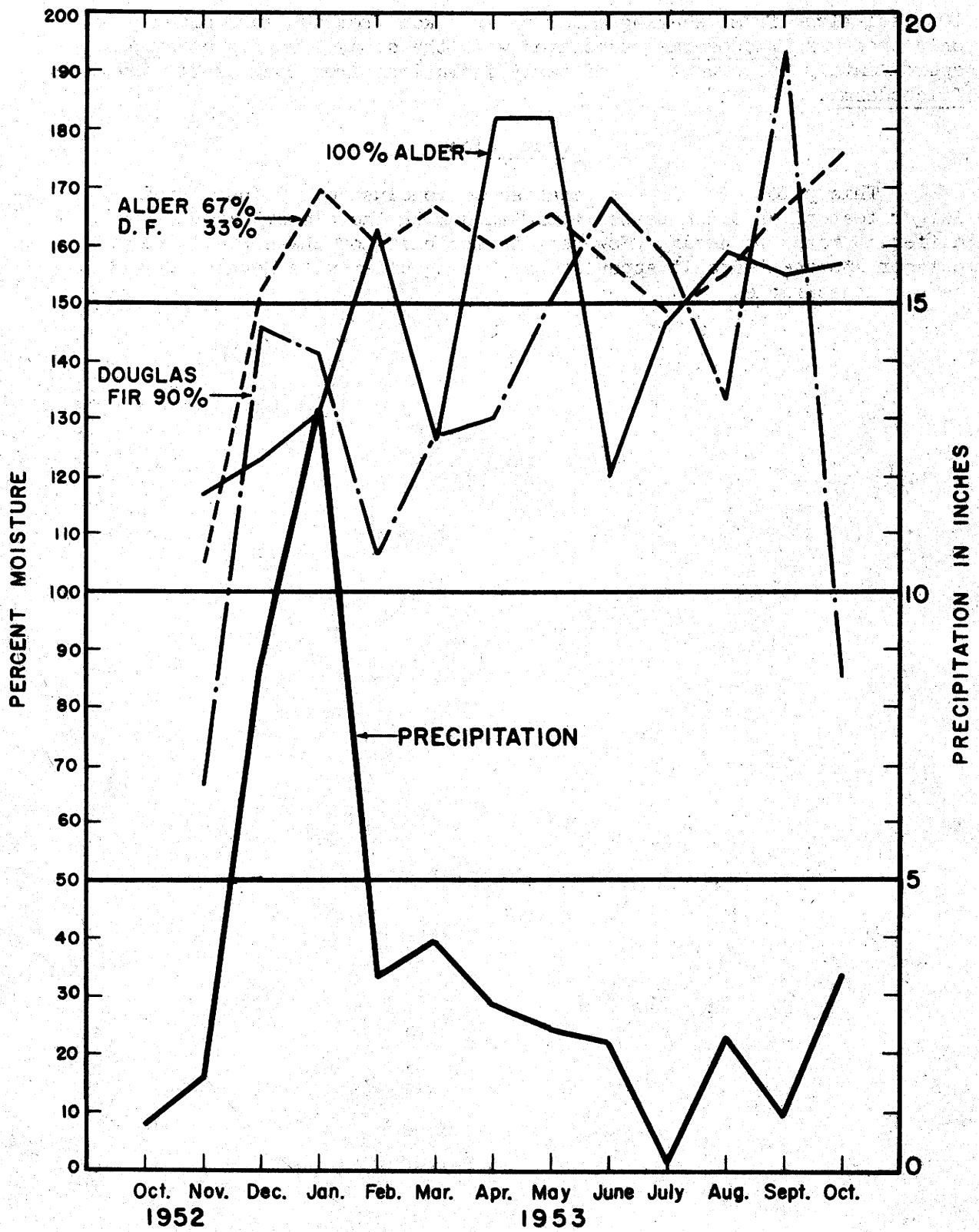

Figure 1.--Monthly moisture content of chip samples in relation to precipitation.

Figure 2a.--Alder chips (natural size) at start of test, no decay.

Figure 2b.--Alder chips showing decay after one year in 100 percent alder pile.