

## TESTS OF DEER AND RABBIT REPELLENTS ON PLANTED LOBLOLLY PINES IN EASTERN MARYLAND

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Cottontail rabbits and deer sometimes cause appreciable damage to young loblolly pines on the Eastern Shore of Maryland. Although the extent of this damage varies greatly in different years and locations, it is common enough and severe enough to cause concern among foresters. It generally is restricted to 1-year-old seedlings; older seedlings usually are not injured unless the shoots are small and succulent after previous clipping or from growing in the shade.

This animal damage is most important in new plantations. Large numbers of natural seedlings also are clipped, of course; but natural stand regeneration seldom is seriously hampered because enough seedlings for adequate stocking usually escape injury. Plantations, however, do not include a surplus of seedlings that can be sacrificed without detriment to stocking density. Moreover, plantations represent a definite investment in a future forest crop, so any interference with the development of that crop assumes economic importance.

Most plantation damage occurs among 1-0 seedlings shortly after fall or early-winter planting; sometimes, by spring, practically every seedling in a planting may be clipped off. Although most of such clipped seedlings will sprout and recover, growth is set back by a year or two, and the form of some seedlings is adversely affected.

Since most clipping occurs during the months immediately after planting, it would seem that an effective, reasonably durable repellent applied at planting time would prevent much of this damage. To investigate the practical possibilities of such treatment, the Maryland Department of Forests and Parks and the Northeastern Forest Experiment Station cooperated in 1958 and 1959 in testing four repellent formulations.

### Study Methods

The four repellents tried were-

1. Copper carbonate-asphalt emulsion, similar to that recommended by Wakeley (1954). This was prepared by adding 1 pound of copper carbonate (Corono Chemical Division, Pittsburgh Plate Glass Co.) to a mixture of 1.5- pounds of Flintkote C-13-HPC asphalt emulsion and 5 quarts of water.
2. A formulation similar to the 10-percent TMTD (tetramethyl thiuram disulfide) recommended by Besser (1957). This was prepared by mixing 1.5 pints of du Pont's Arasan 42-S, 2 pints of Rohm and Haas Rhoplex AC-33, .25 ounce of Methocel (from State College Laboratories), and 4.5 pints of water.
3. Tat-Go, a product of O. E. Linck Co., 1 part of which was mixed with 2 parts of water. This is also a TMTD repellent.
4. A formulation of ZAC (zinc dimethyl dithiocarbamate cyclohexylamine complex) similar to the 10-percent one recommended by Besser. This was prepared by mixing 1 gallon of Z.I.P. (20 percent of which was ZAC), 3.2 pints of Rhoplex AC-33, .25 ounce of Methocel, and 4.8 pints of water.

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Each repellent was applied to the tops of seedlings in two ways: by dipping and by spraying. For dipping, seedlings were treated in convenient-sized bunches; for spraying, which was done with a small, compressed-air sprayer, seedlings were placed in a transplant board. After all applications, excess repellent was allowed to drip off, and the seedlings then were spread out so the tops could dry (roots were covered with wet sphagnum moss). When tops were nearly dry, the seedlings were bundled in moss to await planting, which was done within the next 2 days. Seedlings were similarly treated and planted in November of both 1958 and 1959.

Four areas were included in the study, three in 1958 and one in 1959. All four had been wooded for many years, but most of the cover had recently been eliminated by summer burning or disking, and poisoning of hardwoods. In 1958 the areas were relatively open and in the early stages of restocking to pine. On the three areas planted in 1958, severe rabbit damage had occurred the previous winter. In 1959, no area showing severe rabbit damage during the previous year could be located, so the only area used was one showing recent damage by deer.

Each 1958 area contained three contiguous blocks; the 1959 area, four contiguous blocks. Each block included 10 rows of 25 trees per row, one row for each treatment plus two rows of untreated trees, in a random arrangement. Rows were roughly 6 feet apart, and trees were planted about 6 feet apart in the rows. Volunteer trees that might be confused with the planted ones were removed.

## Results

Apparently the rabbit population dropped drastically between 1957 and 1958 on the Eastern Shore. Only 2 percent of the untreated seedlings were damaged, with little difference among the three areas even though they were several miles apart.

Less than 1 percent of the treated seedlings were clipped, but the 2-percent damage among untreated ones was so low that no definite conclusion about efficacy of the treatments was warranted.

In the 1959 test all four repellents reduced the overwinter animal damage to fall-planted pines. Twenty-four percent of the untreated seedlings were clipped (mostly by deer), compared to 0 to 8 percent of the treated seedlings. In this test the specially mixed TMTD formulation was slightly less effective than the other repellents: for both application methods combined, 5.5 percent of the TMTD-treated seedlings were clipped, as compared to 1 or 2 percent for the other three repellents.

Some of the repellents reduced seedling survival. In the 1958 tests, dipping in copper carbonate-asphalt emulsion reduced survival by about 10 percent; in the 1959 test three treatments--dipping and spraying with copper carbonate-asphalt emulsion, and dipping in ZAC--caused reductions of 10 to 15 percent.

Similar damage from the same materials has been reported by others. Besser (1957) mentioned 15-percent seedling mortality in an Arkansas trial after dipping 1-0 loblolly pines in ZAC. In a Mississippi study, spraying loblolly pines with copper carbonate-asphalt emulsion before planting increased mortality by 41 percent, but in this instance the damage apparently was greatly increased by leaving the treated seedlings baled for several days prior to planting. Burns (1960) implies that little damage would result if the same material were used for on-site applications by top-dipping or spraying.

The commercial product Tat-Go had no apparent effect on seedling survival in our tests, and it provided as good protection as any of the other repellents. This material, as Besser mentions in a recent unpublished progress report, is easily sprayed and possesses remarkable adhesive qualities. Besser also rates TMTD repellents such as Tat-Go as being highly effective against rabbits and moderately effective against deer.

It remains yet to be demonstrated on the Eastern Shore whether Tat-Go or any other repellent formulation will effectively protect 1-0 pine plantations against rabbits when populations of these animals are at high levels. However, in the light of our limited experience and Besser's reports, Tat-Go apparently has fewer disadvantages, and generally more to recommend it, than any of the other materials tried in the Eastern Shore study.

#### Literature Cited

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