ANIMAL REPELLENTS EFFECTSON SOILS, TREES, AND TREE STORAGE

by

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INTRODUCTION

In the midfifties, a few forest tree nurseries started for the first time to spray nursery stock with chemical repellents to protect planted seedlings from animals. Since that time, this practice has been greatly expanded, and today, most nurseries use repellent chemicals to some extent.

At present, TMTD (tetramethylthiuram disulfide) and ZIP (zinc dimethyl-dithiocarbamate-cyclohexyl amine) are the only available repellents. Because of their vital role in forest regeneration and in order to be able to use them more effectively and safely, it is essential to have a basic understanding of the effect of these chemicals on the soils and on the trees.

REPELLENT EFFECTS

On nursery soils.--Mechanical spray equipment causes addition of variable amounts of the spray formulation to seedbed soil. The proportion varies according to the tree species sprayed, age of seedlings, and stocking of beds. Normally, about 25 percent of the repellent reaches the soil, but the amount may reach 70 percent or more on poorly stocked beds and when true firs are sprayed.

Recently, persistence of TIED and its effect on activity of soil microflora in general and nitrifying micro-organisms in particular were investigated in soils from the Webster and the Greeley nurseries in western Washington (4). Results of this study showed that TIED was broken down in both soils; rate of breakdown depended on initial concentration of the chemical and action of soil micro-organisms. In addition, TMTD strongly inhibited respiration and nitrification, but these effects were only temporary since the micro-organisms recovered in time as TMTD was broken down in the soils.

Stability and effects of ZIP in soil have not been investigated. It is suspected, however, that the ZIP, which resembles TIED chemically, would decompose in soil in a manner similar to that of TMTD, but with the liberation of zinc. Amounts of zinc equivalent to those which could be released from one ZIP application were not harmful to Douglas-fir in Webster soil (1). In addition, it does not seem likely that zinc from ZIP could all be released at the same time or that repeated applications of ZIP could cause buildup of zinc in the soil to toxic levels under present rotation regimes of forest tree nurseries. However, it is advisable to determine effects of ZIP in individual nursery soils before the treatment can be used safely.

On trees.--Effects of TIED and the zinc compound (without the other ingredients of the repellent formulations) on seeds and plants have been investigated. TIED inhibits survival of Douglas-fir seedlings (6), modifies normal development and shape of mycorrhizae of Monterey pine (2), and decreases photosynthesis of some lower plants (3.). The zinc compound has little effect on germination and root development of radish and benefits root development of Douglas-fir (2).

However, when these chemicals are used as repellents, they are applied to the shoots and may reach the roots in amounts and formulations different from those used in the above-mentioned reports. Under these conditions, there are no data in the literature indicating serious undesirable effects. TIED and ZIP repellent formulations, therefore, are considered nonphytotoxic to forest tree seedlings, even when applied at rates much higher than those recommended. (Unpublished data on file at the Forestry Sciences Laboratory, Olympia, Wash.)

On tree storage.-When outplanting is delayed by adverse weather or other conditions, repellent-treated seedlings must be stored in the cold until needed. Recently, growth and repellency of TMTD-treated 2-0 Douglas-.fir seedlings were investigated after storage at 35° F. for 21 days (5). Results of this investigation showed that for both fall (October) and spring (April) treatments, survival, height growth, needle appearance, and date of bud burst of TIED-treated seedlings were only slightly different from those of untreated trees. However, cold storage caused a high loss of TMTD from the treated seedlings and consequently much reduction in their repellency. Possible reduction of seedlings' repellency, therefore, would be the only reason against cold storage of TMTD seedlings.

There is no information on the effect of cold storage on TMTD-treated seedlings of species other than Douglas-fir or on ZIP-treated trees of any species. In these cases, effects of cold storage would probably be similar to those reported for Douglas-fir since all conifers have waxy needles and because ZIP and 'I= are chemically related and their formulations contain the same adhesive. However, research should be carried out to positively evaluate storage effects in each case.

CONCLUSIONS

Under normal nursery conditions, spraying dormant planting stock with repellents at the recommended rates appears to be safe for both nursery soils and trees. However, additional research is needed to: (1) determine persistence and effects of ZIP in different nursery soils; (2) evaluate effects of cold storage on ZIP-treated seedlings; (3) reduce loss of repellent from treated seedlings after cold storage; and (4) develop new spray equipment to minimize loss of repellent to nursery soils.

LITERATURE CITED

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Question: Were seedlings stored in bags or bundles?

Answer: In totally enclosed bags.

Question: Has anyone done anything on a better adhesive?

Answer: The Denver people did some testing for about a year. Three or four tests with different adhesives were made about a month ago.

Question: Do you think the repellents could take the moisture out of the plant? Ponderosa pine when sprayed during periods of low humidity seem to be dried out.

Answer: I can't see how it would dry out the plant. Do the trees survive as well? Is the application heavy?

Response: I don't think the trees survive as well. The recommended amount is applied.
