ALLYL ALCOHOL FOR WEED CONTROL IN FOREST NURSERIES

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Chemical weed killers have been a boon to forest nurserymen in these days of high labor costs. So far mineral spirits have been the most useful herbicides in conifer nurseries, but they have some drawbacks. It appears that mineral spirits may damage young conifers during the first 10 to 30 days after their emergence from the soil. Some species, such as white spruce, are sensitive even longer. Others, such as larches and most broadleaf species, do not tolerate mineral spirit sprays. Therefore, there is need for some other chemical which will control weeds but not harm the tree seedlings.

Allyl alcohol ($CH_2 = CH - CH_2OH$) gives promise of being the chemical needed to round out weed control. It is a colorless, moderately volatile liquid of a rather pungent odor which mixes readily with water. It kills weeds in the seed stage. Trials by the lake States Forest Experiment Station showed promising results when allyl alcohol was applied to conifer seed beds in the spring before seeding.

However, there is a serious disadvantage in the use of allyl alcohol. It is a lachrymatory, flammable, hazardous substance. In fact, one manufacturer has withdrawn the product from the market because of hazards in its use. Containers must be kept closed and away from heat or flame. Workmen must take care to avoid spillage, concentration. of vapors, breathing of fumes, or contact of the alcohol with the skin. Rubber gloves, aprons, and anti-splash face masks are recommended by manufacturers for those handling this chemical. Application of the material through the overhead irrigation system appears to be the safest procedure in safeguarding personnel because all laborers can be cleared from the area being treated. If applied by acid cart it is best to treat beds when there is a wind at about right angles to the bed direction, and to work upwind.

Preliminary tests were begun on June 9, 1947 at the Eveleth Nursery in northern Minnesota. Red pine seed beds were treated with 2.3 to 9.3 gallons of allyl alcohol per acre in weak solutions ranging from .08 to .34 percent. A week later, a similar test was made at the Hugo Sauer Nursery at Rhinelander, Wisconsin using a one percent solution of the chemical. Seeding was done one week and three weeks respectively after treatment.

Counts made at Eveleth on July 31 showed that the treatment had reduced the number of weeds 36 to 73 percent below that shown by untreated plots, the strongest solutions giving the greatest benefit (table 1). At Rhine-

lander a practically complete kill of the weeds resulted. Moreover, the density of, pine seedlings an treated plots was greater-by about 30 percent at Eveleth and 6 percent at Rhinelander. This suggests a beneficial effect of the alcohol in. controlling damping-off fungi. Although it killed weed seeds of several species, the alcohol was particularly effective on common purslane and Indian chickweed, both very troublesome at the Eveleth Nursery.

Table 1. - Effect of Spring Treatment of Allyl Alcohol on Weed and Red Pine Seedling Density

(Eveleth Nursery - Summer 1947)

Allyl Alcohol Treatment		Average Weed Density Per Square Foot[1/]	Average Seedling Density Per Square Foot[1/]
Concentration	Dosage Per Acre		
(Percent)	(Gallons)	(Number)	(Number)
0.08	2.33	9.5	38.6
0.17	4.65	9.6	40.0
0.25	6.98	5.6	44.8
0.34	9.30	4.1	40.2
None	None	15.0	31.8

These small scale tests were confirmed by treatments applied to entire beds of jack pine and red pine at Rhinelander in Ray 1948. In one trial, 10 gallons of allyl alcohol per acre were used, in solutions of 1, 0.5, and 0.2 percent. Two months later, the weed stand was 65, 30, and 19 percent, respectively, of that in untreated beds [2]. Where the dosage was 20 gallons per acre at 0.2 percent strength, weeds decreased 89 percent. As in the 1947 tests, the stand of tree seedlings was appreciably better in treated beds.

Application of allyl alcohol prior to fall seeding at Eveleth proved much less effective than spring treatment, probably because of soil temperatures being too low for maximum weed seed 1,111, and recontamination of the beds by weed seeds blown about during the winter months.

1/ Based on five replications each treatment.
2/ This apparently anomalous result evidently arose from the greater depth of penetration (3 inches) of the weaker. solution which was applied in 5,000 gallons per acre as compared to 1,000 gallons per acre of the stronger solution (penetration less than, 1/2 inch).

Dosages of about 10 to 20 gallons of allyl alcohol per-acre , diluted 1 to 500 (0.2 percent): would appear satisfactory under most conditions. However, if the soil is moist, less water should be used. Treatment of small plots can be made with hand sprinklers; on large-scale operations, the solution can be applied with low-pressure sprayers, acid carts, or even overhead irrigation systems.

Before applying the alcohol solution, the beds should be leveled. After treatment 7 to 10 days should elapse (more in cool weather) before seeding the conifers to minimize danger of residual toxicity. Once the soil is treated, it should be disturbed as little as possible to avoid bringing to the surface untreated soil laden with weed seed.

In bulk, allyl alcohol costs about $3 per gallon and the cost of application is around $5 to $10 per acre. Hence, one treatment previous to spring seeding will keep beds quite free of weeds for a period of 4 to 8 weeks at a cost less than one-half that of hand weeding.