

with Stoddard Solvent. Weak, chlorotic seedlings are sometimes more susceptible to damage than the weed growth on the same seedbed. Then the whole process is reversed--seedlings are killed and the weeds remain when sprayed at the normal rate.

Damage to seedlings sometimes occurs late in the season when secondary needles are fully developed. It is this damage in the form of a needle and growing-tip burn which may cause arrested growth and weakened stock.

It is best to spray the seedlings when the foliage is dry, especially if secondary needles are common. Severe needle droop resulted from needle burning near the fascicles where droplets of water had collected.

It is important that the oil be applied evenly and at a predetermined rate. This can be done only with a power sprayer traveling at a uniform rate of speed. Hand applications proved to be very unsatisfactory because it is not possible to make an even distribution of the oil over the surface of the seedbed.

#### THE USE OF GIL SPRAYS FOR THE CONTROL OF WEEDS IN CONIFEROUS NURSERIES IN NEW YORK

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The annual production of the two New York State Nurseries is 40 million seedlings. This requires that one hundred thousand 4 X 12 seedbeds, or about 85 acres, are in nursery trees at any one time. The use of oil sprays is the routine manner of weed control, supplemented with some hand weeding. In the 4 years, 1947-1950 inclusive, large quantities of oil spray have been used -- approximately 15,000 gallons per year.

The year 1946 was one of experimentation, and relatively few beds were treated. The results were so favorable that large scale operations were used in 1947 and subsequent years. While some risk was taken in such large scale use, it seemed necessary in light of the unusual population of weed seed in the ground, due to the necessary neglect during the war period.

The results of these early tests and experience through 1948, have been published in mimeograph form and distributed widely throughout this and other countries. In addition two papers were published by the Northeastern Weed Control Conference, in 1949 and 1950 on the subject. The most complete paper published under date of March 1, 1949, is still available for distribution.

While the above papers give the details, it is well to present here some of the more important practical results in methods of application:

1. For best results, application should be made frequently. While it seems unnecessary to spray when few weeds are in evidence, experience has shown that best results will come from frequent spraying by the calendar, say every 10 days regardless of the apparent weed situation. The small, almost invisible weeds are very readily killed by light applications. As an administrative matter supervisors may have difficulty getting the foreman on the ground to spray this often, since there seem to him to be so few weeds present.

2. In general the more often the spraying is done the less need be applied at one time, since light application will more readily kill the very small weeds. The lesser the amount applied, the lesser too is the danger of tree damage. The number of applications per season then may be as many as 8 or 10, with rates varying from 20 to 40 gallon per acre per application.

3. Even distribution can be made only with some powered mechanical sprayer. Hand application is not satisfactory. The spray boom and nozzles must be in proper adjustment at all times, in order to do a good job. Individual nozzle sprays which either overlap or fail to lap result in an unsatisfactory job.

4. The greatest handicap of the weather element is the wind. Even a light wind causes losses of material and generally an uneven and unsatisfactory result. To offset this element the work may have to be done also at irregular hours, namely early morning or evening. Also the equipment should be of sufficient capacity to cover acres quickly. A tractor sprayer with an 18 foot boom and traveling at 2 miles per hour, can cover 3 to 4 acres per hour. This allows extra time for refueling. In New York the spray pumps draw the oil directly out of the attached oil drums. No exchange of liquid is necessary, therefore, in the refueling operation.

5. It is important that a consistent, uniform, and known product be used. In recent years there appears to be a gradual increase in the aromatic content in these naphthenic spray oils, and it is well to be informed as to the analysis of the product.

6. Detail records of spray application are necessary for control purposes. An extra man who aids the tractor driver during refueling can well spend the rest of the time checking the performance of the sprayer and make detailed notes on the operation. He should record the number of gallons actually applied per acre or seedbed unit, the condition of the weeds and trees at the time, and weather conditions.

The importance of "control" in the application of the oil sprays to coniferous seedbeds must be emphasized. If one is working in the dark

unsatisfactory results may be experienced. This "tool" when properly used in the hands of the nurseryman can greatly reduce the cost of weeding as well as increase the number of plantable trees.

## CIL SPRAY WEEDING AS APPLIED TO FOREST NURSERIES IN PENNSYLVANIA

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During the summer of 1950 the Pennsylvania Department of Forests and Waters conducted experiments at the Mont Alto Nursery on the use of mineral spirits for weed control, similar to those conducted by Cossitt and Eliason.

Materials used in the tests consisted of two dry cleaning fluids; Sovasol #5, made by the Socony Vacuum Oil Co.; and Esso Weed Killer #35, a product of Standard Oil. The tests were conducted on two species, white and red pine, planted in the spring of 1950.

Applications at the rate of 40, 60, 80, 100, and 120 gallons per acre were made using hand sprayers of the type used around the house to apply insect sprays. Test plots were 80 sq. ft. in area.

All plots were sprayed at least twice during the summer and those plots treated with the lighter applications (40 and 60 gal. per acre) were sprayed three times. When the first application was made, between June 16 and 20, many seed coats still remained on the seedlings but no apparent injury resulted.

A good weed kill was obtained on all except the Esso 40 gal. per acre white pine plot. The poor control on this plot was due to the fact that the weeds were too large when the first application was made and consequently the weeds were not killed and soon overran the plot. This emphasizes a point of extreme importance in the use of mineral spirits, namely, that weeds should not be allowed to get too large before being treated.

It was difficult to tell whether any of the seedlings were killed by the sprays. Seedling counts made for this purpose showed some mortality on untreated as well as treated plots, which was probably due to drought. No permanent injury was observed. Seedlings on the treated plots had a chlorotic appearance and the tips of many of the needles appeared burned. This condition was very slight or almost non-existent on the areas sprayed with the lighter applications but became more apparent as the volume of oil per acre was increased. Three or four weeks after spraying the