WEED CONTROL IN CONIFER NURSERIES

by
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The continuous rising wage scale at the close of World War II soon made weed control the most costly project in raising nursery stock. Both power and hand cultivation was used for many years to help reduce hand weeding; however, it did not eliminate it. These high costs forced nurserymen to find other methods for controlling weeds.

New discoveries and developments in weedicides have greatly reduced the cost of growing conifer nursery stock. During the war, and early post war, years various petroleum industries and chemical companies came to our rescue and helped in developing the use of various petroleum and chemical weedicides. A few of these chemicals such as 2-4D compounds and ammonium sulfamate proved to be good weed killers, but they killed the trees as well. Various petroleum products were introduced under such trade names as Stanisol, Sovasol, Varsol, Shell Weed Killer and Stoddard solvent. One of the later chemicals introduced was Iscoweed Killer, commonly known as allyl alcohol.

To my knowledge there have been no new weedicides introduced the past two years. However, improvements and techniques have been made in the use of the weedicides previously introduced. Nurserymen in all parts of the country have been conducting experiments continuously seeking improvements in methods of application. Nurserymen should not be misinformed in thinking mineral spirits are a 100 percent solution for controlling weeds in conifer nurseries. There are certain species of weeds and stages in the life cycle of other species that mineral spirits are not effective unless applied in such heavy quantities that they will kill the trees also. The maximum value of weedicides for efficient weed control is entirely up to the nurseryman except for the presence of weeds that are resistant to oil sprays. Even application at the proper time of day, weather conditions and size of the weeds are important factors for good results.

Mineral Spirits

The original oil spray introduced for weedicide purposes was common No. 1 stove oil. It proved fairly satisfactory but was soon replaced with solvent type mineral spirits. The solvent type oil was much easier to apply and more uniform in grade than stove oil. The solvent type oils contain a higher aromatic hydrocarbon content than stove oil. The hydrocarbon content apparently is the governing factor in the killing power of the oil.

The various solvent type weedicides commonly sold as Sovasol, Stanisol, Varsol and various others apparently give about the same results. These mineral spirits are all similar to Stoddard solvent which is a product manufactured for use as a cleaning fluid in dry cleaning establishments. The solvents are refined according to certain specifications and the chemical properties are quite constant. Stove oil varies considerably in chemical properties from one delivery to another.

There are other patented weedicides sold by various oil companies such as "Pentox No. 1" and "Pentox No. 2" refined by the Standard Oil Co. of California

and "Shell Weed Killer" refined by the Shell Oil Co. These products are refined especially for weedicides.

Methods of Application

Most of the experimental work, being done the past two years, was directed at methods of application and the desired amount to apply. Previous experiments had already separated the mineral spirits that were harmful to conifer seedlings from those that were not.

The method of application is quite important in order to get a uniform kill of the weeds. Faulty or improper spray equipment may kill the weeds in portions of the bed and leave narrow strips of weeds untouched. This condition increases the cost of weed control, because another spraying will be necessary to kill the remaining weeds.

Experiments at Savenac have proven that single and double coverage in one application does not always give a 100 percent kill. Single coverage is when the spray nozzles are so placed on the boom that the spray from one nozzle will not overlap that of the next nozzle. The double coverage is placing one nozzle close enough to the next so that the spray from each nozzle will lap over half of the spray from the next one. Should one of the nozzles clog momentarily in either case there will not be sufficient coverage to kill the weeds in that strip. By using two booms or placing the nozzles close enough together on one boom so that the bed is covered by four sprays the chance for a miss is very slight.

When using one boom for a four spray coverage every other nozzle should be offset to form two rows, so that one set will spray slightly in front of center and the other set slightly back of center. When using this type of boom one nozzle can plug and there is still sufficient spray to kill the weeds. In placing this many nozzles on one boom it is necessary to use small sized nozzles to keep from applying too much spray. The small nozzles will give a finer fog type spray which is more effective in killing weeds and less oil comes in contact with the soil.

The most effective pressure for applying the spray seems to vary by different users. Nurseries throughout the state of New York and in the southeast find 50 to 120 pounds sufficient for applying the solvent type mineral spirits. Tests at Savenac show that effectiveness of the spray decreases at pressures of less than 250 pounds.

For spraying small areas the back pack pressure garden sprayers work very effectively. There is a tendency to apply too much oil with the hand sprayer. This type sprayer operates on from 40 to 100 pounds pressure which is not sufficient to break the droplets up as fine as is possible with higher pressures. This type of sprayer is handy for spraying the weeds in paths and around end of beds.

It is important that a good spray nozzle be used in order to get a uniform coverage. There are various nozzles that have proven satisfactory such as the Monarch and TeeJet fan type. Both of these nozzles are machine cut so they throw a smooth, even spray.

Oil control of weeds on conifer beds should not be attempted in any great amount without the use of a good power sprayer. The oil saved by the power sprayer

and the results obtained over hand spraying will soon pay for a good sprayer. Any power sprayer that will maintain a constant pressure ranging from 50 to 300 pounds is satisfactory.

Rate of Application

Mineral spirits will kill all plant life if enough is applied. Each nursery must make sufficient tests to determine the correct application required to kill the type of weeds present and yet not burn the conifer seedlings.

The rate of application depends upon the climatic conditions, species of weeds, size of weeds, and age of trees. The younger the weeds at time of spraying, the lighter the application that is required for a maximum kill. Some species of weeds are easily killed with a light application when young or mature while others are easily killed with a light application while young but are hard to kill, even with a heavier application when they are mature.

The rate of application varies throughout the country from 25 to 120 gallons per acre. Good results have been obtained at Savenac for controlling weeds in seed beds with 30 to 40 gallons per acre and 50 to 70 gallons per acre in transplant beds. A certain rate of application will work well in one section of the country but may be harmful to the trees in another section.

The speed at which the spray rig travels over the bed is important in determining the amount of spray applied per acre. Each nursery must determine this by figuring the output of the nozzles and the feet per minute travelled by the sprayer.

Results with Different Materials

Mineral Spirits

Tests throughout the country show very little difference between the solvent type mineral spirits. Apparently they are very closely related in chemical composition. Tests at Savenac show that there is more danger of burning the conifers by too heavy an application of the solvent type sprays than from the stove oil used a few years ago.

The Standard Oil Co. produces selective weed killers sold on the market as Pentox No. 1 and No. 2. Pentox No. 1 is a mild mineral spirit which is used on the more susceptible weeds and where there is danger of harming the crop being treated. Tests at Savenac proved this product was less harmful to young conifer trees than was Stoddard Solvent, but less effective on the weeds. Pentox No. 2 is more severe and is recommended for the control of more resistant species of weeds such as quack grass, dandelions, etc.

The Shell Oil Co. produces a weed killer which, according to a representative from the company, would be too strong for use on conifer seedlings. However, it may be very effective for controlling weeds in vacant areas.

2,4-D

The 2,4-D weedicide sold under various trade names has become a widely used weed killer. It is selective in some respects as to the types of weeds it will kill, but conifer seedlings are very susceptible. This weedicide definitely has its place in eradicating weeds around vacant areas where susceptible weeds are a problem. It definitely should not be used on conifer seedlings of any age.

Ammonium Sulfamate

This substance, sold on the market as "Amate," is very effective for killing weeds around buildings and vacant areas, but should not be applied to conifer seedlings. It is applied as a soil and plant drench. Treated soil will remain sterile for at least one year after application.

T C A

This chemical, introduced a few years ago by the Dow Chemical Co., has proved to be one of the best herbicides yet tried on quack grass, Johnson grass, and Bermuda grass. Tests at Savenac in 1950 show that treatments of around 100 pounds per acre of 90 percent TCA in 140 gallons of water is very effective on controlling quack grass.

Iscoweed

This weed killer, formerly called Isco AA, is more commonly known as allyl alcohol and is manufactured by the Innis, Spedin Research Laboratory. This product is applied as a drench prior to sowing. It is very effective for killing the seeds in the soil. This chemical is very toxic to humans and must be handled according to directions. If used properly, it can be applied without danger. One method to eliminate the danger in using it is to apply through the overhead sprinkling system.

Karl Landquist, from Region 5, reports good results with 4½ gallons of allyl alcohol mixed with 52 gallons of water for treating one-half acre. The minimum soil temperature should be 70 degrees F. High soil temperatures are important for best results. Lower soil temperatures require a larger rest period after treatment. A rest period of ten days is recommended for temperatures of 70 to 75 degrees F.

Effect of Weather Conditions

The proper weather condition is important when applying mineral spirits. Some sections of the country recommend cloudy weather for best results and others recommend clear weather. Tests at Savenac indicate cloudy weather is a little better for killing weeds but is more harmful to the conifers. Some nurseries indicate damp weather is the best time to spray or irrigate just ahead of the treatment. Tests at Savenac indicate it is dangerous to spray when the conifers are wet.

Spraying should not be attempted on windy days. Heavy evaporation will waste the spray and the coverage is often uneven. Tests at Savenac show the optimum weather condition for applying mineral spirits was at a temperature of 80 to 90 degrees, 25 percent humidity, and no wind.

Effect of Mineral Spirits on Various Weeds

The secret of controlling weeds in conifer beds with mineral spirits is to spray the weeds when they are small. Every day, after the weed germinates, requires a heavier application. Nearly all weeds are susceptible to mineral spirits if sprayed within a few days after germination.

A few of the weeds at Savenac that are easily killed both large and small are sand spray, mutton grass, sour grass, lambs quarter and pig weeds. Some of the weeds that are fairly easy to kill when small but quite resistant when older are dandelions, clover, mustards, cheat grass, wild strawberry, and fan weed.

One outstanding result of the use of oil sprays for controlling weeds is the immediate results. The weeds take on the appearance of a frost-killed plant within a few minutes after spraying. Within a few hours they wilt down and usually in 24 hours the plant is dead.

Costs

There is no comparison between the cost of controlling weeds with weedicides and the cost of control by hand labor and cultivation. Comparisons show that mineral spirits will reduce weeding costs 50 to 80 percent over hand weeding, even including the cost of supplemental hand weeding. At Savenac the greatest value is received in the transplant beds. Including cost of oil, equipment and labor, the cost per thousand trees has been reduced to 5¢ or less as compared to 50¢ to 75¢ for hand weeding.

The mineral spirits will cost from 20 to 28 cents per gallon. The cost of application will vary from $2 to $6 per acre when applied with a power sprayer pulled by a tractor, including two operators.

Problem?

Nurserymen should not feel that weedicides are a 100 percent solution to controlling weeds in conifer nurseries. The big question now is, will there be an increase in resistant strains of weeds which have been held in check by other weeds that are now easily killed with weedicides? This is already showing up some at Savenac and could become a problem.

Mr. Isaac: You mentioned 2-4D as a weed killer. It killed the alder, but did not affect the conifers.

Mr. Augenstein: For blister rust, 2-5D for currant eradication is a stronger solution of chemical. It can be used, but we burned some conifers. Out in the field this 2-4D will not go to the ground. Aerial spray on brush is rather slow; it will not go down in very far.

Mr. Haddock: 2-4D killed all the lodgepole, but did not affect the spruce.

Mr. Augenstein: I would recommend the 2-4D.

Mr. McDaniel: What kind of machine is used for spraying?

Mr. Augenstein: Trailer-type orchard spray. I don't like to use the tractor type. It is hard to get in and out of beds, but it is better to use the trailer. We like to have the tractor available to use for something else and will not tie it up. You have to clean out the spray before it is used for anything else.

Mr. Isaac: Do you find the spray nozzle will wear out?

Mr. Augenstein: We did not with the disc type. We notice no wearing. I think the cost of sprayer will more than pay for itself and the amount of oil used.

Mr. Adams: What age do you spray your beds?

Mr. Augenstein: Right after germination.

Mr. Adams: Know of anything that can be used in broad leaves?

Mr. Augenstein: Not in seedling stock, but the Clarke-McNary nursery has some information on that. I see no reason why you can't use this as the oil will not affect the plant too much. The plant may defoliate some, but it should come back.

Mr. Adams: When seedlings are about one inch high, we get a heavy weed start.

Mr. McDaniel: If the soil is loose, oil spray will kill weeds you cannot see. It will kill the weed seed one-quarter inch deep.

Mr. Augenstein: We had a stand of grass coming on the beds. We sprayed that and we killed a lot of it. Our big weed problem is on transplant beds. We got very little weed seed germination on the seedling beds covered with sand. We had a half-inch covering of sand. We don't get too much tree seedling mortality if we spray when weeds are small.

Mr. McDermitt: It doesn't seem to me that it would be practical to use oil spray on young, soft, succulent stock.

Mr. Deffenbacher: We started spraying our stuff just before the seedlings emerged. Then we sprayed as the seedlings cracked the soil. It gets 85 to 90 percent of weeds then. We waited from five to six weeks after this first spraying and then sprayed the seedlings stock. We wait until the Douglas fir needles are well established and then apply second spray.

Mr. McDermitt: Sinox got 100 percent kill by using oil. This weed killer must be applied before the seedings emerge. It will last about four weeks, but before that time we put our mechanical weeder in and took everything.

Mr. Deffenbacher: If you oil spray the grass when it is young, it will retard its growth and it will kill the grass. If it will not kill, it will stunt the weed which will not germinate.

Mr. McDermitt: I think each nursery has its own problems. I think we have a little different situation from those on higher ground. That has a good deal to do with soil. I tried Stoddard solvent and killed all the trees.

Mr. Lemmon: You are working with Douglas fir and Jim Augenstein with pine.

Mr. Augenstein: No, we have Douglas fir too. We can burn some of our trees too. One day we forget to change the size of nozzle. Then we had machine trouble and we burned the needles on the 2-2 stock. It is possible to burn the needles.

Mr. McDaniel: On spraying your seed beds as seedlings have emerged, it takes close watching. When we think the seedlings are old enough to spray, then we wait a day or two and maybe a week until the seedlings are further along. We use a rule that after 90 percent of seedlings have put on their second needles, we can safely spray.

Mr. Lemmon: What time of day?

Mr. Augenstein: Our spraying is between ten and three when the sun is out.

Mr. Adams: Karl, what about your allyl alcohol?

Mr. Landquist: I do not know if anyone has tried allyl alcohol. When I came I got some of that dope, so we bought several barrels. We have used it for three years at the nursery. I got it on my skin and was in bed for two days. It's expendable. We figured a way to dilute it. We have a 50-gallon barrel on a slide and fill it with 40 gallons of water and one barrel of alcohol and put a barrel pump in and use a gas mask. We put the hose into the water and then put about 10 gallons of alcohol in the water. We have a pumper pump it into the overhead tank. If you put on 45 pounds pressure, you will want to use 48 pounds on your pump. Costs $20 to make it up. I believe one man treated one-half acre in about 20 minutes, 40 minutes to treat an acre. We used it for three years and have no ill effects on the soil. It seems to have been beneficial to the soil. It also kills the weed seeds. The soil has to be at least 70 degrees temperature. You can treat the soil in the fall just before you put in the cover crop. When your soil temperatures are 80 to 90 degrees or so, you can sow your cover crop about three or four days after that. If you treat your soil at a temperature of 70, you have to wait ten days. The seed kill is probably 90 percent. On a windy day the wind will blow the solution away. It is really effective and safe to handle. I would use nothing else.

Mr. Augenstein: Zinc sulphate was also used in the Savanac nursery. It has to be put on 24 hours after sowing the tree seed or it will kill the seeds. After chemical analysis, we decided not to use it any more.

Mr. McDermitt: We get 95 percent kill with sinox. That will hold us from four to six weeks as far as weeds are concerned. The grass is our main problem.

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