

DR. WEISER: It's a paraffin like material, its rather hard to dissolve without dissolving it in hot alcohol first and then in water.

MODERATOR LEACH: Unfortunately Mr. Wagner ran into some mechanical difficulties at home and is not able to be with us. However, Bill Curtis, president elect of the International has kindly consented to give Mr. Wagner's paper. This reminds me of the fellow who gave up smoking because he feared cancer — he took to chewing toothpicks and died of Dutch Elm Disease.

BILL CURTIS: Before I begin I should point out that the C and R nursery is located in Wenatchee, Washington and they have entirely different growing conditions, I think, than many of you people do here, at least entirely different from what we have in Western Washington and Western Oregon.

PRE-EMERGENCE WEED CONTROL IN NURSERY STOCK

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It is a real pleasure to be here with you to-day to discuss a common problem which we all seem to have, WEEDS. As it is the nurserymen's most costly problem, we are all searching for ways to bring down the high cost of weed control. In the spring of 1961 we at C & O Nursery decided to do something about it, and tried using Chemical weed control in our ornamental stock. I am here to-day to tell you of some of the experiences we have had in the last four years.

The term pre-emergence when in reference to weed control means an application of chemicals after planting but before emergence of weeds. The selection of the chemical to be used for pre-emergence weed control will depend on whether it is being used or applied as a direct or an over all spray on lining out stock. Certain sprays cannot be used on liners even if it is directed at the base of the plants, without taking some chance of producing some injury. But the same chemical may be used quite safely as a granual applied in dry form when the foliage is dry, with good results. We have selected Simazine as the chemical in our operation and we are using it exclusively for the time being as it has performed very well in tests made at one of the state experiment stations. Pre-emergence treatments seemed the best method to use in our case. Most weeds are much easier to kill about the time they germinate and it is very important to kill them before they get established.

In pre-emergence applications of Herbicides a thin film of chemical is applied on the surface of the soil which will prevent growth of young weed seedlings. They are killed before they even become visible. We apply the herbicide as an over all spray and find this the easiest and most accurate way of application as it is very simple and can be accomplished with little difficulty. This brings us to the equipment to apply the herbicide. The

sprayer must be in excellent condition as we cannot afford any breakdown during the actual application of the chemical. It could prevent an even distribution of the herbicide and could even result in crop damage. Exact calibration must be done to determine the gallons of water sprayed per acre. The amount of chemical to be used depends mostly on the type of soil and stock it is used on. We have realized by using chemicals in our weed control program that when properly used it is one of the best money savers that has been introduced to the nursery business in many years. The days of weeding and hoeing by hand are fast disappearing.

Any material that will kill certain types of plant growth while allowing others to grow is dangerous if carelessly used. When using any of the materials on the market to-day it will certainly pay to follow the manufacturers' recommendations. With this in mind we sprayed our one-year established stock with very good results and no injury to the plants. But our big problem still remained. As we are using great amounts of manure previous to planting our new liners, this gives us a bumper crop of weeds but the manufacturer says to use this herbicide on established stock only. Now in order to find out what will happen if we disregard the manufacturer's warning, we did so in spring of 1962 and sprayed immediately after planting and one heavy watering. We used the same rate of chemical as we used on the one year old stock. No sooner did we finish spraying when hot and windy weather set in and heavy irrigation was needed, but we did not realize until too late that we had leached some of the herbicide down to the root zone. Bringing herbicides in contact with young roots is inviting trouble, which we got, but learned a great deal by it. The results were as follows:

1. Weed control excellent
2. Three species of plants a total loss
3. Pines and spruces were badly burned but came out of it during the growing season. The remaining plants suffered only minor damage but came out of it quickly.

With the lesson we learned by this we knew we were nearer our goal of two sprays. The first spray immediately after planting and the second the following year instead of spraying the second and third years after planting. We are using the same rates in both applications, 2½ lbs. actual per acre in our area and type of soil. We find two sprays over a two year period works fine in our case, a third application is not needed as we have from 50 to 60 percent control left the third year, from the previous two applications. The soil surface is partly covered the third year by the plants and would not make spraying practical. I would now like to sum up our method in using herbicides in the nursery:

We have adopted the pre-emergence over all spray program, spraying once a year in the spring only. Fall spraying we find not practical as there is great danger in run off and heavy con-

centration could result in the lower part of the field. We have built a boom for our 100 gallon Hardie sprayer. The boom is 12 feet wide and 40 inches above the ground with four Tee Jet nozzles No. 6502. The nozzles are aimed directly between the rows with a four foot spread near the soil surface, but no overlap is tolerated. With this equipment we are able to achieve a very even distribution of the chemical. We are now using 2½ lbs. of actual herbicide in 60 gallons of water per acre. As I have mentioned, the importance of an even distribution of the material is essential or real trouble will quite possibly develop.

Before spraying, the soil surface must be clean and free of all weeds at the time of application. To get good control reduce cultivating to a minimum in order to keep the herbicides in the upper level of the soil. Pre-emergence will control most all germinating weed seeds but will not control established weeds and certain perennial weeds such as quackgrass, artemesia and others.

Watering newly planted stock that has been sprayed must be handled very carefully. Over head irrigation is the only practical spray in areas with little rainfall like ours. I would like to point out that if herbicides are used as a pre-emergence the action can be greatly affected by conditions such as soil moisture, rain fall, temperature, soil type, weed species present and other factors. It would therefore be impossible to suggest weed control treatments that could be safely used in various sections of the country. In 1963 - 1964 we had real good results with 80 to 90% of all germinating weed seeds controlled in 3 - 4 months and a somewhat lower percentage for the remainder of the growing season. This year the first weeds appeared the latter part of September. We are now able to control our weeds in 5 man hours to the acre per month and this includes spot hoeing of some perennial weeds that may show up.

To-day the growers of nursery stock realize the necessity of reducing operational costs. Chemical weed control therefore can not be overlooked as a money saver. Unfortunately the use of plant growth regulators for weed control is still very young and every grower should get all the information possible and compare it with his needs. Due to many reasons no one can or should make any definite suggestions other than to share his own experience gained by using herbicides in his operation.

There are many chemicals on the market to-day and it would be unfair to say that one is better than the other. As I have worked with only one chemical, I believe the more you know of a certain product the better and safer are the results. So until something more promising comes along, we will continue with the chemical we have been using in the last four years (80% W Simazine). The per acre cost for treatment comes to approximately \$16.00 for material and labor in our operation.

I am glad that there are growers who are very cautious about going into a new program of this sort on a large scale.

However we are far past that stage and I am convinced that chemical weed control is an important part of the nurserymen's production practices at the present time. There are five points we must bear in mind:

1. Timely application of an adequate amount of herbicide to weed free soil will prevent or interfere with seed germination and seedling establishment.

2. Follow recommendations and precautions in regard to the crop and operation.

3. Realizing herbicides are not an easy way out of an accumulation of perennial weeds.

4. Applying the chemical when the weed seeds absorb water and begin to germinate will give the best possible control.

5. Proper application techniques are important for effective control, but also for crop safety and economy.

Calibration of Spray Equipment

For most sprayers calibration is a simple but necessary procedure. With any given sprayer one must determine the volume output of the sprayer at the speeds and nozzle pressures to be used in application. This is accomplished by the following procedure: **FILL THE SPRAYER TANK WITH WATER, DRIVE 660 FEET WITH THE SPRAYER OPERATING AT THE SAME SPEED AND NOZZLE PRESSURE AS WILL BE USED IN ACTUAL PRACTICE. MEASURE THE AMOUNT OF WATER REQUIRED TO FILL THE TANK, THEN COMPUTE THE VOLUME OUTPUT IN GALLONS AS FOLLOWS:**

$$= \frac{\text{Gallon required to refill tank} \times 66}{\text{Spray width in feet}}$$

The desired output can be attained by varying the speed, nozzle size and pressure.

100 Gallon Hardie sprayer

1 cylinder Wisconsin

Plungers 1½"

Pressure can be reduced as low as 50 lbs.

BRUCE BRIGGS: I might mention that he has quite a dry condition there and might be comparable to the middle states such as Nebraska and Iowa. This makes a difference and must be considered in weed control. In the west side of Washington, we have a lot more rain and the results in some ways are different.

CARL WILSON: I can see the advantages of weed control in the field, but what do you do with containers? I have not found any manufacturer that knows how to handle this problem.

BRUCE BRIGGS: This is one of our big problems — the control of weeds in containers. About five years ago there was some work at the Experiment Station in containers. At that time they ran a whole spectrum of herbicides. The best results was the granular simazine applied at the rate of about 2½ pounds of the material (80%) or 2 pounds actual. But he did

receive some damage. There were three or four products that looked good. I am curious to see if anyone has had some experience, one of these is combination with nitrogen and in the West it looks real good. We have run Chloro I.P.C. and a lot of these others, we still found IPC wouldn't do it because it worked by breakdown by the root system. We received injury and finally did without it.

JOHN ROLLER: I am sure someone here has some experience with Dacthal and Casaron. Dacthal is very safe for container plants, however, it's rather expensive material and short lived. We've had less experience with Casaron, but it looks like it might be good, either as a spray or as a granular.

BRUCE BRIGGS: We have tried both of those materials. One thing we objected to Dacthal was too short a life. This is our problem because in containers it's not a matter of weeds in the mix, you can sterilize this. It's a matter with the blow in with us, the weeds that come in the next fall. And this is the problem we have to fight. Maybe this isn't true here. With the other product, Casaron, it looks good, but with us it hasn't done any more than simazine. It is not as toxic, you can use it on a broader basis of plants. We did have some trouble with this year on some things such as *Daphne cneorum*. We feel it needs a lot more research. We are still holding on to simazine.

ROBERT DEWILDE: Just a comment on this weed control in containers; if you will attend the round table discussion on weed control, I'll give you a solution for weed control in containers that we feel is quite satisfactory. It will last you at least three years control with no problems.

MODERATOR LEACH: Our next speaker this afternoon is Dick Bosley, from Bosley Nurseries who is going to give us a slide tour of California container nurseries.

SLIDE TOUR OF CALIFORNIA CONTAINER NURSERIES

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In April 1965 I spent 4 days in California visiting some of the larger container growing nurseries. I would like to share some of the things I saw with you.

The first stop was at the Oki nursery in Sacramento. Mr. George Oki, who is well known to the Society through the many papers he and his Production Manager, Mr. Kubo, have presented, was a most gracious host. Their organization is divided into two companies, (1) the Sacramento Nursery, which is the growing organization and, (2) Oki Nursery, which is the sales firm.

While we were in the office we looked at the IBM punched card data processing equipment that Oki Nursery has been using for several years for the routine accounting functions of order writing, invoicing, accounts receivable, accounts payable, and