

Mr. McWilliams: Mike, just as a matter of interest, we keep a pictorial record of our stock each year, and that is just a sample. In each nursery, every year, we take pictures of our average planting stock, and it is not chosen by the nursery superintendent -- it is chosen out of the planting stock.

Chairman Webster: Our next subject, gentlemen, is the "Latest Developments in Weed Control," to be handled by Karl Lanquist. Karl is the Chief Nurseryman of the Mt. Shasta Nursery.

Mr. Lanquist: Well, you know, when I first came over here to this nursery, I thought maybe I knew something on this subject, but then looking over the area at this nursery, I don't feel quite as competent to put this weed control program over, because I couldn't see any weeds out here, although it might be they have been picking weeds for a month before we got here. We will never know about that.

HOT WAR ON WEEDS

by

Karl B. Lanquist

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The top few inches of the earth's crust is a veritable storehouse of weed seeds. Farmers of California spend more than fifty million dollars a year to fight the weeds, but even on lands that have been in rotation for 10 years there may be 3,000 weed seeds in each square foot of soil.

Science has come to the aid of the farmers with many chemicals and machine weapons for fighting the weeds. We have selective chemicals which will kill the broadleaved species, and those that will kill grass and leave the broadleaved weeds.

Oil sprays and other sprays can give a weedfree soil, but strangely enough, we cannot make up our minds whether it is best to grow the weeds and turn them under or kill all vegetation with oils. The problems to be weighed are water penetration and what is best for the soil and the crop.

We have learned to plant some of our crops in close rows, thus shading out many weeds.

We have been forced to seek every possible labor-saving source in order to compete with the rapidly rising cost of production. New chemicals used in controlling weeds, particularly the pre-emergence sprays, plus improved mechanization, have decreased labor costs about 66 percent in the last few years. Pre-emergence sprays have saved a tremendous amount of hand labor and have helped to reduce costs. We should not forget that practical crop rotation and cultivation of fallow areas are good practical weapons for weed control which are frequently overlooked.

The progress we have made in American agriculture through the use of chemicals is being threatened by fanatics who claim that chemical fertilizers and weed sprays poison the soil and leave spray residue on fruits and vegetables that are a menace to public health.

Despite the use of chemicals, the annual loss caused by insects is about four billion dollars; losses due to fungi and other plant diseases is another four billion dollars and weed damage about five billion dollars, a total of 13 billion dollars. Without the use of chemicals it would have been vastly more.

What are the facts about chemicals? The National Research Council states that there is no evidence that the consumption of foods resulting from the use of the new chemicals in crop production or in the processing of food has created mysterious disease epidemics, or endangered the health of the people, or poisoned the soil. Several attacks on chemicals have been made by "humus farmers" who glorify the utilization of organic fertilizers in the form of manure and compost; yes, even fish worms. These humus farmers have just about enough truth in their arguments to fool some of the people some of the time, but they have little effect on successful farmers. It is not my intention to belittle organics, but there are not enough organic fertilizers to do the job and they are more expensive to use. We have been faced with stepped-up production in our nurseries. Finances to do the job have been limited and it is believed that our production quotas could not have been met except for the use of chemicals for soil fertility and weed control.

Use of petroleum products as a selective herbicide has been practiced for several years. The products used are far from being standardized and are used for many other purposes, but they all kill weeds with various success. Sovasol, Varsol and Stanisol are trade names while Stoddard solvent, stove oil and mineral spirits are common names. It has been supposed that the aromatic content affects the herbicidal quality, but we really do not know. The aromatic quality or content varies from 10 to 75 percent.

Weed killers must be applied with caution taking into consideration weather conditions, size and condition of stock. Otherwise serious damage might occur to the crop. Rate of application varies with the product, but during the last few years it has been found that smaller applications at frequent intervals are more effective than large applications. About 10 to 15 gallons to the acre two to three times a week can be applied 5 to 6 weeks after sowing. Temperatures and humidity seem to be important factors as far as damage to the trees is concerned. Applications made when temperatures are between 75-80 and with high humidity are not apt to burn the seedlings as much as during days with higher temperatures and low humidity. Evening seems to be a good time to apply the weed killers. It is true that the weed kill is less during that time, but it is safer for the trees. Methods of application vary in different localities, but a power rig with fan type nozzles on the spray boom operated at pressures from 75 to 150 pounds per square inch is recommended.

It is generally accepted that oil sprays can be used safely on most of our conifers, especially the pines, but we must proceed with caution on species like spruce, larch and the white pines. Oil sprays cannot be used on broadleaved crops. It has been found in some localities that stove oil has been toxic to pine and they developed a chlorotic condition, and the growth was retarded. High soil fertility is a very important factor as far as injury to the crop is concerned. Vigorous seedlings have a greater tolerance to weed killers.

With the present situation as it is, it is well for the user to try to use only one product in order to learn just what to expect from the product and to know how to handle it for the best results.

The safest method to control weeds is to treat the beds before sowing with pre-emergence sprays. This procedure is relatively new and is well adapted for use in coniferous nurseries large or small. There are two products that have been tried with success; they are Methyl bromide and Allyl alcohol. Methyl bromide is a very toxic gas, but it is quite easy and foolproof to apply if one follows the manufacturer's directions. The gas comes in cylinders containing up to 175 pounds, also in one-pound cans.

The rate of application can be varied by using a special measuring dispenser. Method of application is simple: The seedbeds are prepared. The moisture condition of the soil should be high. Temperatures should be over 50 degrees F. for best results. Bed area is covered with a gas proof tarpaulin and the gas injected under the cover. The covering should remain in place for about 24 hours to permit the gas to penetrate the soil. The tarp is then removed and the soil is allowed to aerate for about 48 hours. A period of from 5 to 8 days should elapse before seeding is done in order not to damage the crop. Trial has indicated that treatment at the rate of one pound per 100 square feet resulted in a fairly weed-free seedbed. It was noted in the eastern nurseries that the treatment might have some fungicidal properties, but indications are not at all conclusive.

Methyl bromide is well adapted for smaller nurseries or in greenhouses where its use might be more practical and economical than on a large scale operation. It has not been used widely in large operations. Its use entails elaborate preparations and the cost per acre is rather high: \$355.

Allyl alcohol is a double bonded alcohol. Its formula is $CH_2=CH-CH_2OH$. This alcohol is also very toxic to living tissues and should be handled with care, but it is very safe and easy to use if handled in the proper way. The set-up and procedure followed at the Mount Shasta Nursery for applying the alcohol is simple. A barrel of alcohol is loaded on a pickup truck and a common barrel pump inserted in the bung opening. The pump is fitted with a plastic hose about 6 feet long. There is also an injector barrel which is fitted with a screw top and holds about 40 gallons of fluid. This injector barrel is also loaded on the truck close to the alcohol barrel. The injector barrel is fitted with two $\frac{1}{2}$ -inch hose connections one at the bottom and one near the top. Two plastic hoses each about 10 feet long are connected to these fittings and they in turn are fitted to a venturi tube. The venturi tube is fitted to the overhead lines by means of unions. The venturi tube is about 18" long and is made of cast aluminum. The irrigation water is now turned on and the injector barrel filled with water to a level that leaves space for the amount of alcohol to be applied. The water is then turned off and the operator submerges the hose from the alcohol barrel into the water in the injector barrel, and pumps in the required amount of alcohol. The hose is removed and the top to the injector barrel screwed on. Irrigation water is then turned on and the valves to the venturi are opened which starts the operation of application. It takes about one-half hour to treat one-half acre.

The operator wears a miner's gas mask when he is actually handling the chemical, and always has a pail of clean water handy for washing his hands. The use of rubber gloves is not recommended nor soap for washing the hands. There is in reality very little contact with the solution, and the fumes from it are not bad because the operator does not need to be near the injector when the solution is injected. If one should happen to get some of the solution on the hands, it is much better to wash it off in clean water than to use soap. Gloves will only imprison the fumes. I would like to emphasize the statement that it is very safe to handle, and there is no reason to be afraid of the Boogey man.

Application is made at the rate of about 10 gallons of alcohol to the acre and this treatment keeps the weeds down to a minimum. This rate of application kills about 95 percent of the weeds. For best results soil temperatures should be 70 degrees or over at time application is made. The treatment is very effective at high temperatures, and consequently more economical. The soil should receive a heavy irrigation right after the treatment, as the fluid kills as it penetrates, weeds and weedseeds alike. It costs about \$30 to keep one acre weedfree. The operation is a one-man job.

The question of upsetting the functioning of the microflora and microfauna is very remote, and I am sure soil scientists will agree on this point. It might be a temporary upset, but the soil will rapidly be reinoculated.

It was feared that treatment might kill the mychorrizae in the soil at the Mount Shasta Nursery, but on the contrary, formation of mychorrizae has improved, and consequently seedling growth has improved.

I would like to summarize our finds and recommendations in just a few words. Weeds can be efficiently controlled by a 3-step method: Proper soil rotation, cultivation of fallow areas, and pre-emergence treatments, using allyl alcohol, methyl bromide or perhaps other tested chemicals. This method is absolutely harmless to the crop and the soil, and probably the most effective one in nurseries with overhead irrigation. Oil sprays and other chemicals, sprayed directly on the crops, greatly reduce weeding costs, but they are very selective and must be used with care. They are most effective when the weeds are small. Yes, weeds are indeed a mighty foe, and the control of them is an expensive battle. But properly used, our investments in chemical weed weapons pay a greater return than one can realize.

Mr. Adams: We have used the allyl alcohol for the last couple of years now at our Davis Nursery, and I think we must have 5000 seeds to the square foot, rather than 3000, because we tried 10 gallons to the acre the first year, and on the acre, I think we put in 300 man-hours hand weeding. So this year we doubled the concentration and I think we only put in 30 or 40 hours weeding. We put ours on with a pump. Now with your venturi, can you control the concentration? Can you use this venturi for fertilizers? Can you vary your concentration?

Mr. Lanquist: Yes, we use it for liquid fertilizers also. You know, I might explain the way we do this. (Draws diagram on blackboard.)

Mr. Adams: How do you know what your concentration is that you are putting in?

Mr. Lanquist: Well, what we do, you see, is load in about 4½ or 5 gallons in the containers, because we know that this overhead pipe is 400 feet long and it covers 25 feet on each side of the seed bed, so we figured we would treat half an acre in about half an hour. What we do is run the water through first to get it started, and it is really amazing the flow at the end and the flow here is pretty constant. It does not vary too much because we can see that in our weed kill. Now the only thing is, what we have trouble with at the time is high wind, and it might blow one way or the other, and we lost some killing effect on some areas.

Mr. Adams: Then can you measure your concentrations of fertilizer?

Mr. Lanquist: Yes, the same way. It works very well. I believe that venturi cost me, when I had it made, let's see now -- \$60.00 -- but they can make it much cheaper now.

Mr. Adams: You put one in each sprinkler?

Mr. Lanquist: No, we used one for all of them.

Mr. Adams: You move it along?

Mr. Lanquist: Move it along as we go.

Chairman Webster: You just measure out the amount of fertilizer you want to put on the area covered by a given sprinkler line and you run that through. When that goes through, you have an even distribution on the given area and then you let the water continue running and soak it in.

Mr. Adams: In other words, the actual concentration you put on doesn't make too much difference?

Chairman Webster: Not a particle of difference as long as it is properly watered in.

Mr. Corson: It might be of interest to this group here to know that the Special Awards Committee in Washington has just made Karl a monetary award for the work he has done in research with allyl alcohol weed control.

Mr. Lanquist: You know, I never was so surprised in my life, because you know a fellow never figures that he is going to ever get anything like that, so I was really surprised, and I sure appreciated it. I say, "Thanks, Uncle."

Chairman Webster: Thanks very much, Karl. We will have your paper recorded in the minutes with the others.

(The Chairman then introduced the next speaker, Homer Ward.)

Mr. Ward: Mike asked for a short paper, and that is what it will be. I think he set me up here just before lunch because he knew I would make it short.

THE USE OF TERRALITE IN SEED STRATIFICATION
AND GERMINATION TESTS

by

Homer S. Ward

Terralite is the brand name for a particular grade of Vermiculite. Vermiculite is mica that has been ground to a desired grade and expanded to by a special heat process to create sponge-like particules of mineral that are neutral, sterile, very light in weight, and is capable of rapid water absorption through capillary action. After a few rather quick tests and trials, the State Division of Forestry has adopted its use in all seed work at the Capitol State Forest Nursery.