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HANS HESS: Our next speaker this morning is Ralph Shugert who will talk about *Phomopsis* blight.

CONTROL OF PHOMOPSIS BLIGHT IN JUNIPERUS VIRGINIANA SEEDLINGS

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One of the most serious plant diseases of *Juniperus virginiana* is Phomopsis blight (*Phomopsis juniperovora*). In our seedlng operation at Plumfield Nurseries, *Juniper virginiana* is a valuable crop, since we drill one hundred pounds of seed each year, and take off about one hundred and fifty thousand seedlings, 2-0 and 3-0, annually.

Anyone who has grown an extensive amount of *Juniperus virginiana* is well acquainted with cedar blight. I have never seen seed beds of this species that have not been infected with this insidious fungus to some extent. This particular fungus has the disconcerting characteristic of attacking the growing tip of the evergreen, thus necessitating a good spray program throughout the growing season.

Over the years the Plains nurseries, including Plumfield, have tried several fungicides but the control has not been satisfactory. For many years Bordeaux mixture was used, and this was followed by a material called Special Semesan, which is no longer manufactured. In the late 1950's Puratized Agricultural

Spray (Phenyl mercury triethanol ammonium lactate) was first used in the control of Juniper blight with good success. To determine the effectiveness of P.A.S. (Puratized Agricultural Spray) a series of tests was conducted by Dr. Glenn Peterson, Plant Pathologists with the U.S. Forest Service. These tests were held in cooperation with Plumfield Nurseries and the Out State Testing Program of the Plant Pathology Department, College of Agriculture, University of Nebraska. The tests that Dr. Peterson reported on, in the Plant Disease Reporter (Vol. 44, No. 9) September 15, 1960, were made to test the efficacy of P.A.S. and three other fungicides for the control of Phomopsis blight. Tests were made in 1-0, 2-0, and 3-0 seed beds with nine sprays during the summer on the two and three year beds, and six applications on the one year beds. In addition to P.A.S., at the rate of one and one-half pints per fifty-five gallons of water; the other fungicides used were Kromad, Cyprex at 0.2 pound per ten gallons of water, and Actidione at 1.6 ounces per ten gallons of water. The dosage on both Cyprex and Acti-dione was reduced after several applications to 0.1 pound and 0.11 ounce per ten gallons of water respectively. The results of these 1959 tests showed that all the fungicides used reduced Phomopsis blight when compared to the check. Both Cyprex and Actidione showed toxicity, and P.A.S. was far superior to the other fungicides used, particularly in the 2-0 seedling beds. Also the P.A.S.-treated plants averaged nearly two and one-half times more weight than the checks. Blight incidence in the 3-0 beds from the experimental bed and in other beds throughout the nursery was very light. Treatments did not significantly influence the amount of blight in these 3-0 beds.

Following the tests of 1959, another comprehensive series of tests was conducted in 1964. The purpose was to determine what rate of P.A.S. would be most effective against Phomopsis blight, and whether control could be improved if spreader-stickers were used. Also it offered an opportunity to test some new fungicides. All the experimental beds were sprayed weekly, from May 19 through September 11, 1964. Tests were conducted on both 1-0 and 2-0 beds. Materials used and treatments with rates per one-hundred gallons of water, were as follows: P.A.S. at 2 pints, 1½ pints, and 1 pint; P.A.S. at the above rates with triton B-1956, 3 ounces; P.A.S. at the above rates with Plyac at 3 ounces. Both Triton and Plyac are spreader-stickers. The new fungicides tested were Difolatan at one pound; Brestan at one-half pound; D.A.C. 2787 at one and three-quarter pound; Polyram at one pound.

These 1964 tests conducted by Dr. Glenn Peterson, were reported in Vol. 49, No. 6 of the *Plant Disease Reporter*. The tests concluded that good control was obtained with P.A.S. in both 1-0 and 2-0 seed beds, and the most effective rate was two pints per one hundred gallons of water. It is to be noted here that very good results were obtained with P.A.S. at the other two rates used also. The other fungicides used did not provide

satisfactory control, and the addition of spreader-stickers to P.A.S. did not improve the fungus control. In fact, it was quite apparent that the seedlings treated with P.A.S. plus a spreader-sticker had a marked color change—a yellowing of the seedlings. The average blight incidence for all P.A.S. treatments in 1-0 seed beds was 3.2% compared with 34.8% for non-treated plants. In the 2-0 beds, P.A.S. averaged 9.9% as against 49.5% for non-treated plants.

As a result of Dr. Peterson's tests in 1959 and in 1964, we are presently using P.A.S. at the rate of two pints per one hundred gallons of water, on all of our *Juniperus virginiana* seed beds. This includes all 1-0, 2-0, and 3-0 seedlings. We start our spray pogram in mid-May and religiously adhere to a weekly program. This past year we sprayed every Wednesday, and if we encountered rain on that day the spraying was completed the following day. It is my contention that weekly spraying of *Juniperus virginiana* seed beds is mandatory if you are going to bring off vigorous, thrifty seedlings. Anytime you have a crop of over one hundred thousand of anything, it will behoove you to do anything and everything in your power to insure that crop.

Quite frankly, I don't like the cost factor of P.A.S. When purchased in case lots its cost is $12.00 per gallon, which we apply every week to cover our beds. This cost plus seven man hours at $1.60 per hour, plus tractor-sprayer cost, plus overhead, certainly have added to the cost of producing this species. You compensate for this by increasing the price of the plants to give the proper profit margin. As best as I can determine our spraying cost annually — for *Juniperus virginiana* only — is $4.40 per thousand seedlings. This is based on a production of one hundred and fifty thousand seedlings, and using realistic equipment and overhead cost percentages. Like other growers of this species, we are hopeful that a fungicide will be available someday that will be less expensive, and not have to be applied weekly.

In conclusion, I would like to acknowledge the excellent scientific approach that Dr. Peterson used to perform these tests. I am also grateful for the use of his data and conclusions. We are indeed fortunate to have a Plant Pathologist of his magnitude in Nebraska. This again points out a situation that has been discussed many times at our Plant Propagator Society meetings, the importance of communication between the professional nurseryman, the Universities, and related governmental agencies. We all travel the same rocky road . . . by working together we can make this road much smoother.

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MARTIN VAN HOF: Ralph, I think you have made a mistake. Did you say at one point that the cost was $44.

RALPH SHUGERT: No, I said the cost per thousand seedlings was $4.40.

MARTIN VAN HOF: Our pathologist from the University of Rhode Island has worked with us in Newport County on Juniper Blight or *Phomopsis*. Now it is too bad that none of them are here, but we do have some representatives from the University. I wonder if they could give us any data on that work?

RALPH SHUGERT: Martin, I have received through the very good fortune of being on the Rhode Island Nurseryman's mailing list, the article on Phomopsis Blight that was printed in your Trade Association Newsletter. Dr. Peterson has seen it also. Now the results you had in Rhode Island did not work in Nebraska. We did not get Phomopsis control with the material you were using in Rhode Island. We couldn't understand why or what the reason was that the Rhode Island Station was not using PAS (Puratized Agricultural Spray) in some of its tests and I didn't bother to write them. I have the reports of these papers, the reprints from the Plant Disease Reporter which I'll be glad to give you to take back and use.

MARTIN VAN HOF: From last year?

RALPH SHUGERT: I have all of them.

MARTIN VAN HOF: '64 and '65 too?

RALPH SHUGERT: Right.

DON CATION: Ralph, have you tried any other mercury beside puratized? There are 4 or 5 of them, one of them is fixed which is in a powdered form and to get the same strength you, I forget what it is, an ounce or something like that per gallon, which is just a little cheaper. We did work with the various mercuries against scab and they are all fairly equally effective against apple scab.

RALPH SHUGERT: No sir, Mr. Cation we did not. The reason as to the new fungicides tried in the 64 tests, Dr. Peterson wrote to all the chemical manufacturers explaining what the purpose of the test was going to be. It was going to cost both the Out State Testing Bureau and the Nursery a fair amount to conduct the test. He received several replies from chemical companies stating that some of the mercuries they had on the market were not recommended for control Phomopsis. This may be because there were not enough tests out. While we did get tremendous results from Cyprex on cherry leaf spot, the tests on *J. virginianum* just did not do the job. No better than Bordeaux. I'm optimistic enough to believe there will be a fungicide out that we can apply that is going to be longer lasting.

DR. REISCH: Ralph, how prevelant is that disease in your area on landscape material?

RALPH SHUGERT: It is not severe. But the disease is in all nurseries and quite frankly it is more apparent in the federal

nurseries — we don't have state nurseries in Nebraska. And the incidence of the Federal Nurseries is bad enough in seed rows that a million and three quarters *J. virginianum* seedlings were destroyed. Now we don't find it too bad, just in isolated plots. Here again, Dr. Peterson's theory is that if plants are spaced wide enough apart, and you don't have this high concentration of plants as in the seed bed or the seed row the problem is reduced. It is very, very, minor in landscape work.

CASE HOOGENDOORN: Now you talk about *Phomopsis* blight in *Juniperus virginiana.* Do you also get that in Hetzi, Pfitzer or any other varieties?

RALPH SHUGERT: Mr. Hoogendoorn, I noticed in a Rhode Island paper they listed a bunch of host plants susceptible to this blight. I have never witnessed it in Nebraska or anything except *J. virginiana.* We also grow quite a few *J. scopulorum* from seed — almost as much *J. scopulorum* as we grow *J. virginiana* and I've been told that I don't have to spray the *J. scopulorum.* Very rarily do you ever see it get it. If the disease which shows up is *Phomopsis,* I have a type of insurance program and spray the 2-0 beds, but only two-zero. And even though the disease is light in 3-0 *J. virginiana* beds, again it is an insurance policy, we also spray the 3-0 beds. No, I have never seen it, sir, on any other than *J. virginiana.*

HANS HESS: Our final paper this morning is by R. E. Odom and W. J. Carpenter, Jr. on endogenous auxins and the rooting of cuttings. The paper will be presented by Dr. Odom.

ENDOGENOUS ACIDIC AND NEUTRAL AUXINS AND THE ROOTING OF CUTTINGS[1]

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Environmental and internal factors influence initiation of roots on stem cuttings. Indole auxins have been shown to be a major internal factor in root initiation. Other essesntial chemical substances have been found, but all require the presence of auxins.

The presence of and changes in endogenous indole auxins in bases of several species of herbaceous and woody cuttings during rooting were determined. The five herbaceous species were *Alternanthera bettzickiana* 'Aurea Nana,' *Coleus blumei, Chrysanthemum morifolium* 'Dawn Star,' *Pelargonium hortorum* 'Pink Cloud,' *Dianthus caryophyllus* 'Alaska.' Those species root readily but their root emergence varies from approximately 2 to 15 days. The two woody species studied were *Pyracantha coccinea lalandi,* which is somewhat erratic in rooting, and *Carya illinoensis,* which is considered a nonrooter.

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