Chemical Control Of Phomopsis Blight Of Junipers: *a search for new methods*

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Phomopsis juniperovora Hahn causes a devastating disease of seedlings and transplants of *Juniperus virginiana, J. scopulorum,* several other *Juniperus* species, and some species in the genera *Cupressus, Thuja,* and *Chamaecyparis (3, 7, 11)* 2. If uncontrolled, this fungus can cause complete losses of seedlings in nurseries. Eastern redcedar infected in the nursery has low survival rates when outplanted *(5, 8).* Susceptible trees established in landscapes are rarely killed by this fungus, but infection results in unsightly plants.

No effective methods for controlling this disease in nursery beds by non-chemical means are known; thus fungicides must be relied on. Early attempts at control using Bordeaux mixture or lime-sulfur were unsuccessful (2, *4, 13, 14).* Slagg and Wright *(12)* in 1943 reported that Special Semesan (a mercury fungicide) was much more effective than Bordeaux mixture and other fungicides commonly used at that time. Subsequently, phenyl mercury fungicides were found to be highly effective in tests conducted in Rhode Island (1, 6) and in Nebraska *(9, 10).* Such fungicides, for example, Puratized Agricultural Spray and Merbam, have been widely used to control Phomopsis blight in juniper seedling beds (table 1).

Current severe restrictions on use of mercury fungicides prevent the use of phenyl mercury fungi

TABLE 1.—*Mercury fungicides that have been tested for effectiveness in controlling* Phomopsis juniperovora *blight of junipers*[1]

Fungicide	Ingredient
Calo-Clor	mercurous chloride + mercuric chloride
Dupont Mercury	[organic liquid No. 4523-64].
MF-260	phenyl mercury acetate
Merbam[2]	phenyl mercury dimethyl dithiocarbamate
Mercuran	phenyl mercury dimethyl dithiocarbamate + thiram + malachite green
Morsodren	methyl mercury dicyandiamide
Panogen	methyl mercury dicyandiamide
Phenmad	phenylmercury acetate
Puratized Agricultural Spray[2]	phenylmercury triethanolammonium lactate
R1-F3	phenmad + a nonionic sulfactant + urea
Special Semesan	hydroxy mercurichlorophenol + hydroxy mercuricresol
Tersan OM	bis (dimethylthiocarbamoyl)disulfide + hydroxy mercurichlorophenol

[1]These fungicides have all proved effective.

[2]In wide use for control of Phomopsis blight until recent restrictions.

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[2]Numbers in parentheses refer to literature cited, p. 4.

cides for control of Phomopsis blight. The literature revealed no effective non-mercury fungicide. Thus we are faced with finding a satisfactory substitute for mercury fungicides by further testing. Table *2* was formulated to help by listing those compounds that have already been proved ineffective.

The fungus causing Phomopsis blight readily infects new growth of junipers. Therefore, junipers are susceptible throughout the growing season. Accordingly, protective fungicides need to be applied frequently (usually weekly) -a very expensive procedure. To obtain control by limited applications, systemic fungicides will likely be required. Thus it would be desirable to include fungicides which have systemic activity, such as benomyl, in tests for control of Phomopsis blight of junipers.

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TABLE *2.-Non-mercury fungicides that have been tested and proved ineffective in controlling* Phomopsis juniperovora *blight of junipers'*

Fungicide	Ingredient
Actidione RZ (Wk-34)	cycloheximide + pentachloronitrobenzene
Bordeaux Mixture (8-8-100)	copper sulfate & lime
Brestan	triphenyltin acetate
Captan	N[(Trichloromethyl)thio]-4-cyclohexene 1,2-dicarboximide
Cuprocide	cuprous oxide
Daconil 2787	tetrachloro isophthalonitrile
Dichlone	2,3-Dichloro-l,4-naphthoquinone
Difolatan	N[(1,1,2,2-tetra chloroethyl)sulfenyl]-cis 4-cyclohexene-l,2-dicarboximide
Dithane M-45	coordination product of zinc ion + manganous ethylenebis (dithiocarbamate)
Dodine (cyprex 65-W)	n-dodecylguanidine acetate
Dyrene	2,4-dichloro-6- (0-chloroanilino)-s-triazine
Fermate	ferric dimethyldithiocarbamate
Kromad	calcium sebacate, potassium chromate, malachite green, auramine, thiram
Lime-Sulfur	calcium polysulfide-thiosulfate complex
Malachite Green	copper carbonate
Morpholine Sulfanilate	
Polycide	alkyl arsine oxide
Polyram	ammoniates of [ethylenebis (dithiocarbamate)] zinc; ethylenebis[dithiocarbamic acid] bimolecular + trimolecular cyclic anhydrosulfides and disulfides.
RI-OSF	oxyquinoline sulfate
Sodium Sulfanilate	
Spergon	tetrachloro-p-benzoquinone
Thiosan	tetra methyl thiuram disulfide
V-523	methyl arsine oxide
Wettable Sulfur	elemental sulfur
Zineb	zinc ethylenebis (dithiocarbamate)