



Inorganic Compounds as Fungicides for Turf Disease Control

By Dr. Gayle Worf

In the classification of fungicides I shared with you earlier, I listed several inorganic compounds first. These included sulfur, copper, mercury, chromium and cadmium containing compounds. Inorganics were the first compounds used to control diseases (and insects). That's understandable, since organic chemicals are a product of innovations of modern chemistry dating back no more than 50 years ago. (When you reach my age, that seems rather recent!) With the recycling of concerns about modern pesticides, some say we should be dusting off these old compounds and giving them a second look.

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What about sulfur for turf? It's cheap, and it's liked by organic gardeners. There are several formulations. Elemental sulfur, which has been "micronized", or more finely ground, to enhance activity, is the most common form. Organic sulfur products have been manufactured to reduce phytotoxicity and to enhance penetration of fungal spores. And there's lime-sulfur, a really old timer still used occasionally as a dormant fungicide, and especially as an insecticide.

We've used elemental sulfur in the greenhouse for powdery mildew. We also included several sulfur formulations as additions to other fungicides in necrotic ring spot control trials in the early 1980's. We got some encouraging results upon occasion, but we also got injury with about the same frequency. We never could tame it. Sulfur, under the right circumstances can burn, especially if the temperature and humidity go up at the wrong time. And of course, Joe Vargas' recent work suggests continued sulfur applications may enhance black layer problems. So our feeling is that sulfur is best left to other uses, as a fertilizer when needed — but not as a turf fungicide.

Coppers are worse than sulfur for phytotoxicity on grass. One of the most dramatic photographs I have in my file was taken in 1981 in Kenosha County. It was of a home lawn in a cul-de-sac of new homes where necrotic ring spot was seemingly marching up the street, attacking all turf in its path. So one homeowner, anxious to be spared its wrath, went down to the local farm supply store, told his story, and was sold some potato fungicide material. It turned out to be copper sulfate, a compound of Bordeaux mixture. I suppose you could say the treatment worked, since NRS didn't develop. NRS does not attack dead grass!

Even coppers with safeners in them cause damage to corn, another grass plant. And at the rates we would have to use them, we'd soon accumulate enough in the soil to become phytotoxic, like some tobacco seedbeds which have been abandoned, for instance. So coppers are not a choice.

Cadmium and chromium-containing fungicides were quite important 30 years ago. They're especially good on dollar spot, and they enhance a good overall turf appearance. But they are alleged heart irritants and known carcinogens. They're banned in Wisconsin and one other state (California, I believe). I don't believe they should be used in today's agriculture.

That leaves mercury. Mercuries were the mainstay fungicides for greens use — winter and summer — from the 1920's until they got into trouble in the 1970's. After a see-saw battle which saw them totally banned, then reinstated, and finally limited to winter disease control on tees, greens and approaches, they remain with us for these purposes, since an August 26, 1976 EPA ruling. The more toxic and cumulative forms are the organic mercuries, ethyl and methyl mercury formulations, which were totally banned at that time. Although phenyl mercury (an organic formulation) remains, our primary use for serious snow mold situations are the inorganics Calo-clor and Calo-gran. These are mixtures of inorganic

mercurous ("insoluble") and mercuric ("soluble") chloride.

I'm told that the state of Michigan is now revisiting mercury's status, with an eye towards banning all forms of it. (Such concerns are contagious among states — will Wisconsin catch the concern from Michigan?) Their apparent concern has to do with its getting into surface and ground waters. That question was examined in the 1970's, but such data is never complete. Some work by Dr. Jack Lebeau at The Banff Springs golf course, which had treated annually with 6 ounces of mercuric chloride for about 35 years. After sampling by 6 and 12 inch increments to a depth of three feet, he found most of the mercury in the first 6 inches, 10 percent in the next 6 inches, and only trace amounts below. His conclusion, supported by sampling done elsewhere, was that even on well-drained golf greens mercury remains in the upper horizons and does not move into waters. The 25 foot barrier from greens to water required by the label should prevent contamination while applications are made.

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One reason we've continued to look at snow mold control alternatives is the specter of their ultimate loss. A lot of materials have some effectiveness. Perhaps they could be made more effective by "packaging" them in slower release units of some kind.

In summary, then, the inorganics and heavy metal-bearing organics have been replaced with present-day organics because the new products have: (1) extreme efficacy — much smaller amounts are required; (2) usually safer to crops; (3) probably safer to the environment and man; and (4) generally more degradable.

In another issue we'll continue our discussion on modern fungicides.