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Is Milky Spore Disease any Better for Grub Control Than the Parasitic Nematodes Mentioned Last Week?

by Art Drysdale

by **Art Drysdale**

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Art Drysdale, a life-long resident of Toronto and a horticulturist well known all across Canada, is now a resident of Parksville, British Columbia on Vancouver Island, just north of Nanaimo. He has renovated an old home and has a new garden there. His radio gardening vignettes are heard in south-western Ontario over two radio stations: Easy 101 FM out of Tillsonburg at 2 PM weekdays and CD98.9 FM out of Norfolk County at 11:40 AM weekdays.

Art also has his own website at <http://www.artdrysdale.com>



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Above, just one example of the prolific white grub that causes so many homeowners grief as raccoons and squirrels dig for them. If you've heard about milky spore disease as a 'cure', you'll want to read on! Below, 'Eddie's White Wonder' is considered the best of the flowering dogwoods out here in British Columbia. They are in full bloom now. Is anyone trying this zone 7 plant in Ontario? Author photos.



This past week Hans Lehman of Nobleton, Ontario e-mailed saying "Just like to know if you know about milky spore grub control, and if they can be found in the Toronto area."

Certainly I do know about milky spore disease, which has been recommended for five or more years as a control for grubs. As with the nematodes mentioned last week, milky spore disease is another so-called natural control that comes highly recommended, yet once you start checking it out, you find that there isn't a lot of scientific evidence to back up the claims made for the product.

The following is typical of what is said about milky spore disease: "Milky spore (*Bacillus popilliae*) is a non-toxic way to control grubs. Commercial milky spore dust is made by inoculating beetle grubs with the disease and then extracting the spores, which resemble dust or powder when dry. The spores can be applied any time except when the ground is frozen or a strong wind is blowing. Grubs become infected when they feed on the thatch or roots of grass where the spores have been applied. As the infected grubs move about in the soil, die and disintegrate, they release one or two billion spores back into the soil. This spreads the disease to succeeding generations of grubs. If the conditions are right [my emphasis], grub population high and feeding vigorously, and soil is at least 210 C (700 F) and very moist, the disease can spread through the grub population in a week or two. In general, however, the disease should not be thought of as a quick knockdown insecticide. It may take a season or two before it has a substantial impact. It can remain effective for a decade."

However, not all reports are so optimistic. Here's a sample from south of the border: "The bacterial milky diseases, *Bacillus popilliae* Dutky and *B. lentimorbus* Dutky, have been quite effective at controlling grubs in certain areas of the eastern United States. The spore count must build up for two to three years to be very effective. During this time you should not use an insecticide against grubs that are needed to complete the bacterium cycle. There is some recent data that suggests that these bacterial diseases may not be performing well in certain areas. This may be due to reduced virulence, soil conditions or grub resistance. More commonly, different white grub species have displaced the Japanese beetle grubs. In Ohio and Kentucky, test trials have not produced satisfactory results. Additional experiments are needed to determine the lack of efficacy of milky spore disease in these soils."

Also, as mentioned last week for nematodes, if these products are so wonderful, how is it that no large companies, in either the U.S. or Canada, offer them?

And, consider the following (2001) comments, on both nematodes and milky spore disease, made by Hannah Fraser, Ontario Ministry of Agriculture, Food and Rural Affairs, entomology horticulture program lead: "White grubs are attacked by parasitic soil nematodes, fungal pathogens, bacteria, parasitic wasps and flies, birds and mammals. Parasitic nematodes (*Heterorhabditis* spp., *Steinernema* spp.) are microscopic organisms that can kill white grubs; however, their survival in cool soils is limited, thus requiring annual re-application. Nematodes also require moist soils [my emphasis again], as they are highly sensitive to desiccation. In tests on turf in Ontario conditions, nematodes did not provide effective control of white grubs. The bacteria causing "milky white spore" (*Bacillus popilliae*) has been used against larvae of the Japanese beetle, with mixed results."

In addition to that report from Ontario, consider this short statement from the Government of Nova Scotia: "You may have heard of 'milky spore disease,' used as a biological control for Japanese beetles. Unfortunately, the product is not effective on the white grubs in Nova Scotia."

Perhaps the most revealing and interesting comments on this topic came from professors C. T. Redmond and D. A. Potter in a 1995 issue of the *Journal of Economic Entomology* (88: 846-854), "Lack of efficacy of in-vivo and putatively in-vitro produced *Bacillus popilliae* against field populations of Japanese beetle (*Coleoptera: Scarabaeidae*) grubs in Kentucky. It read as follows: "Until recently, milky spore disease, *Bacillus popilliae* Dutky, has been for sale under at least two trade names. Injecting healthy grubs with the disease produced commercial products.

".....at present these products are no longer available [and] the ability to use this bacteria effectively to control Japanese beetle grubs in the field is questionable. Like other native milky diseases attacking root-feeding grubs, *B.*


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popilliae infects Japanese beetle grubs when they consume bacterial spores while feeding on roots in the soil. These spores germinate in the gut from where bacteria invade the rest of the grub and kill it over a period of several weeks. At the end of this process, the grub's blood becomes filled with billions of white spores that give the normally clear blood a milky white appearance. Because viable spores persist in the soil, introducing the spores into a population of Japanese beetle grubs can spread the disease and ultimately control the grub problem.

"Although lasting control of high grub populations (>10/ft²) have been reported within one to three years after applications of a commercial preparation, control in the field has been variable. Researchers at the University of Kentucky tested commercial preparations to examine causes of this variability. Laboratory tests using [one commercial product] showed that the formulation was moderately infective with 39-44% of grubs becoming infested. Large-scale field tests conducted in plots with pre-existing Japanese beetle infestations failed to link milky spore disease to lower grub populations during the 3½-year study. Small plots, artificially infested with grubs, and laced with milky spore disease according to manufacturer recommendations also failed to reveal disease symptoms over a 17-month period. Finally, grubs infected with milky spore disease were found to consume the same quantity of roots as uninfected grubs.

"In summary, milky spore preparations were found to be ineffective when used according to label directions in the field. Reports of success by previous researchers were limited to very high infestations of grubs where other stresses may have increased their susceptibility to diseases. The only good news to report is that the commercially produced milky disease spores were able to infect grubs in the laboratory. The challenge that remains is to figure out how to get it to work in the field."

Finally, The use of milky spore disease against the Japanese beetle grub has been the subject of research and debate for decades. Mike Klein, research entomologist with the U.S. Department of Agriculture Research Service at the Ohio Agricultural Research and Development Center in Wooster, Ohio has been looking at it for a quarter century.

"Milky spore disease, first researched in Virginia, provided some amazing results in initial testing after its discovery. Part of the reason for its high activity back then, said Mike Klein, was that it was tested on highly infested plots. Unfortunately, the disease has not been nearly as effective in controlling smaller levels of infestation that still damage turf. In addition, keeping populations of milky spore disease significant and viable has also been a challenge.

"Despite the difficulties, Mike Klein said that work will continue on finding the best fit for milky spore disease as a Japanese beetle grub control product."

So there you have my comments on milky spore disease. In addition to all these negatives, to answer the original question, availability of the product is almost non-existent in Canada. Even the organic websites offer no help! My advice: forget about these products and concentrate on what is known to work such as GrubOut mentioned last week. And by the way, I went a little overboard in recommending watering in after the hose-end application of GrubOut last week. If it's applied to a wet lawn (not difficult this year!) with a ready-to-spray applicator, there is NO further need to water it in.

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