

# Milky Spore Disease for White Grub Control

Late summer and early fall of 1977 found white grubs, mostly Japanese beetle larvae, in large numbers in many golf course fairways. Depending on the course and even the location on the course grubs feeding on turf roots ranged from just a few per square foot up to 75 per square foot. Extent of turf damage varied from minor to severe depending on the number of grubs, vigor of the turf, amount of water available to the grass and eradication treatments used.

Superintendents with the problem tried several avenues to kill the grubs and reduce damage. Results were sporadic—some worked others didn't. These were emergency measures to stop the problem. Many superintendents are looking for ways to prepare for and prevent the problem another year.

First let's look at the life cycle of white grubs. These are mostly young of Japanese beetles but young of other kinds of beetles may be found. With Japanese beetles the adult female lays clutches of six to ten eggs an inch or two deep in turf. Egg laying occurs primarily in July. Hatch begins about ten days after egg laying. Grubs in moist soil survive easily. Under drought conditions some newly hatched grubs may not live. Feeding on turf roots begins immediately while grubs grow rapidly during August and September. Damage to turf will show during this time with most damage in areas lacking sufficient water and with highest grub populations.

As soils cool in late September and during October grubs migrate downward in the soil. Most overwinter about 18 to 24 inches deep. Freezing or soil dryness

during winter seems to have little damaging effect on grub populations. During April and May the grubs migrate upward to feed on grass roots. With good turf growth and adequate moisture turf damage is seldom noticed in spring. Grubs' appetites are not large in spring. Larvae pupate in June to emerge as adult Japanese beetles from mid-June through early July.

Controlling this pest in the soil takes primarily two forms. They are non-residual contact insecticides and biological control. The labeled use of Chlordane has now been withdrawn and this long used insecticide can no longer be recommended. Three other materials can be used as contact insecticides—thy are Diazinon, Dursban, and Dylox or Proxol. Diazinon is available as a granular and liquid while Dursban, Dylox or Proxol are liquids to be diluted and applied as a spray. All must be irrigated well into the turf immediately after application. With the liquids if they dry on the grass or become dried in a thatch layer less will reach the soil to be effective against grubs. After drying, irrigation will move much less into the soil than if water is applied before the spray dries. This makes success with these materials sporadic. Granular Diazinon can be watered in effectively. None of these materials gives an immediate kill—it may be two or three weeks before dead grubs are found.

The biological control agent, milky spore, is receiving more attention since the long residual material Chlordane cannot be used. This is a bacterial disease

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## Milky Spore Disease

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organism which attacks only white grubs. It is harmless to man and other animals as well as other soil organisms.

Milky spore powder is made by injecting white grubs, Japanese beetle grubs, with the disease. It is an obligate disease organism and cannot be grown on artificial media in a laboratory. After allowing the milky disease organism to develop within bodies of grubs they are killed, refined by drying and grinding before diluting the residue with an extender—usually talc powder. This powder is then used to treat soils in turf areas for grubs. It is applied at the rate of one teaspoonful each four feet

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in a grid pattern four by four feet. At this rate ten pounds of milky spore dust is required per acre. Placement of a quantity of the dust in a small spot is needed to assure grubs feeding through the spots will ingest a sufficient quantity of the disease. After becoming infected with the disease, contaminated grubs continue to feed for a short time leaving more of the disease in their droppings. When the grub dies the soil at that spot is contaminated with the disease organism. In this way the initial treated spot is enlarged by six or eight inches with milky spore disease. Grubs ingesting the disease organism never mature to adult beetles. Depending on when the grubs ingest the disease organism determines the amount of feeding it does before dying. However, grubs infected with milky spore disease feed slowly and do not cause serious turf damage.

Milky spore disease is permanent in the soil. As long as it isn't moved about in major construction it remains in the soil surface. A good way to apply the milky spore dust is with a two-pound coffee can attached three or four inches from the end of a broom handle. With holes punched in the can, the milky spore dust in the can and using the stick like a cane, walking over fairways men can apply the preventative agent. A little trial is needed to get the right number and size of holes in the can and how hard to tap the broom handle to get the suggested ten pounds per acre applied.

Depending on the closeness of spots when milky spore dust is applied and the level of grub infestation it will take three to five years for the organism to completely infest the surface soil. If high levels of grubs appear contact insecticides may be needed to prevent serious turf damage. Milky spore treatments can be made anytime the soil isn't frozen. The dust should not be broadcast or mixed with other materials for application.

For golf courses treatment of critical areas may be the best approach. Areas subject to drought, where irrigation doesn't reach, intensive use areas where turf is under more pressure and in areas surrounding trees and shrubs which attract large numbers of beetles may be selected for treatment. Some report sprays to suppress adult Japanese beetles has helped reduce grubs—this may work on more isolated courses but may not if your fairways are surrounded with areas where adult beetles have good food supplies.

Some superintendents are going on a planned program to apply milky spore to a given acreage each year until all fairways are treated. Treatment of approaches, collars and roughs will depend on the individual need. They certainly would be secondary in importance.

The topic of milky spore for white grub control is one which superintendents may wish to discuss more fully at a future time. It is one which economics and effective control demand careful consideration.

Reg Traband

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