

# THATCH:

## a barrier to control of soil inhabiting insect pests of turf

by Dr. Harry D. Niemczyk

*Thatch is a major factor limiting the effectiveness of insecticides in controlling soil inhabiting insect pests of turf.*



*Timely irrigation is the key to obtaining the maximum control of grubs and other insects that feed on turf roots. Irrigate before spray dries.*

**T**hatch—the tightly bound layer of living and dead roots, stems, leaves, and stolons of grass that forms under turf — has been found to decrease significantly the effectiveness of insecticides now used to control soil inhabiting insect pests of turf. The influence of thatch, discovered in recent Ohio studies, came to light only after federal restrictions were imposed on the use of traditional insecticides.

For the past 25 years, the chlorinated cyclodiene insecticides, aldrin, dieldrin, heptachlor, and chlordane, have been used successfully to control the soil-inhabiting insect pests of turf. Generally, a single application of one of these insecticides provided control for several years. However, actions taken by the Environmental Protection Agency (EPA) over the past few years have eliminated heptachlor, aldrin, and dieldrin for this purpose. Current hearings concerning chlordane indicate that it may meet the same fate.

If, in fact, this use of chlordane is cancelled, how can the turfgrass manager control soil-inhabiting insect pests of turf? The obvious answer is a shift to the organophosphate (O-p) insecticides which are



Insect pests such as Japanese beetle grubs, below, top, and bluegrass billbug larvae feed in and under thatch. Some insecticides are bound to the thatch before they reach the target.



currently labeled for this purpose, diazinon, chlorpyrifos (Dursban), and trichlorfon (Dylox or Proxol). This sounds easy, however, there is more to it than a mere shift to another material.

### High water requirements

First, when the chlorinated cyclodiene insecticides were used, there was no great urgency to water the treatments in; eventually, they worked their way into the turf and soil. With the O-P and new carbamate insecticides there is a distinct urgency to move these materials to the target pest immediately.

These insecticides have characteristically short residual activity (a month or less). The most important medium through which the insecticide reaches the target pest is water; either irrigation or rainfall. This immediately presents a problem on golf courses and other turf areas without irrigation systems.

### The thatch barrier

A second and major factor related to the effectiveness of the O-P insecticides currently registered is that *they do not move freely through thatch*. This layer, which is tightly intermingled between the layer of green vegetation and the soil surface, is common in golf course or home lawn turfgrass.

Many experiments on control of various species of grubs (Japanese beetle, northern masked chafer, billbug, *Ataenius*) conducted in Ohio from 1971 to 1976 have shown that when liquid or granular formulations of diazinon are applied to turf at 5.5 to 6 pounds AI/acre (active ingredient per acre), 90 percent or greater control is achieved. Appli-

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cations of liquid chlorpyrifos (Dursban®) at 2 and 4 pounds AI/acre gave an average of 69 and 74 percent control, respectively. However, when these two insecticides, in either liquid or granular form, were applied at the same rates to turf with 0.5 inch or more thatch, the percent control achieved was sharply reduced. Granular diazinon at 5.5 to 6 pounds AI/acre gave 69 to 74 percent control and chlorpyrifos at 2 and 4 pounds AI/acre, 21 and 26 percent, respectively. Liquid formulations of diazinon at the same rate gave 52 to 60 percent control and chlorpyrifos 51 to 63 percent. The experiments and general field experience have shown that granular diazinon, in low concentration formulations, provides better control than the liquids.

The reason for this reduced effectiveness was investigated through laboratory experiments conducted at the Ohio Agricultural Research and Development Center, Wooster. The results confirmed that most of the insecticide was being adsorbed (bound) to thatch and thus, did not reach the target. Of the two insecticides, diazinon and chlorpyrifos, the latter was the most readily ab-

sorbed. Indications are that this is a physical-chemical binding which is not reduced by extensive aerification.

Though the tendency for trichlorfon (Proxol® or Dylox®) to be adsorbed is much less than that of diazinon and chlorpyrifos, its performance in controlling soil inhabiting pests has ranged from poor to excellent. The reasons for this variability are not known.

Our knowledge concerning the specifics of insecticide movement through this dense mat of organic matter called thatch is almost nonexistent. Much is known about the factors related to movement of insecticides through soil, but not through thatch. The intricacies and characteristics of insecticide movement through thatch must be better understood if we are to continue having controls in the future for pests that live under it.

## Key: timely irrigation

While the performance of O-P insecticides is reduced by thatch, proper and timely use of water increases the probability of obtaining the most control possible from

Table 1. A summary of grub control tests in Ohio — 1971-6.

Insecticide	Formulation	Thatch		No Thatch		
		Rate lb AI/A	No. Tests	Avg. Percent Control	No. Tests	Avg. Percent Control
Diazinon	2G	5.5-6	(7)	74	(5)	93
"	5G	5.5-6	(4)	69		
"	50 WP	5.5-6	(2)	60		
"	4 EC	5.5-6	(11)	52	(2)	90
Chlorpyrifos (Dursban®)	0.5 G	2.0	(2)	21		
"	0.5 G	4.0	(3)	26		
"	2 EC	2.0	(4)	53	(3)	69
"	2 EC	4.0	(4)	63	(2)	74
"	4 EC	2.0	(4)	51		
"	4 EC	4.0	(2)	58		
Trichlorfon (Dylox-Proxol®)	80 SP	8.0	(4)	68	(1)	78

Table 2. Binding characteristics of insecticides on turf-grass thatch.

Insecticide	Units (mg) thatch required to bind 50% of insecticide applied
Chlorpyrifos (Dursban®)	4
Diazinon	75
CGA-12223	300
Trichlorfon (Dylox® - Proxol®)	500+
Bendiocarb	640+

the treatment. This is reflected on the labels of liquid products currently registered for grub control in turf. Most labels recommend using 15-30 gallons of spray per 1,000 square feet. This volume may be impractical for the turf manager or operator of a lawn care firm, but it is required for optimum performance.

If less than the recommended volume of spray is applied, the treatment should be irrigated with 1/2-inch or more of water immediately after application. Sprays of these relatively short-lived insecticides should not be allowed to dry before irrigation is applied. A good time to make applications is when the turf is still wet. Some golf course superintendents have achieved fairly good control by applying the insecticide sprays during a rain. Granular formulations must also be watered in but the need is not as immediate as it is for the spray treatments.

### New insecticides

In view of adsorption and problems of in-consistent control with some currently registered products, what does the future hold for control of soil inhabiting insect pests? Our best answer rests with the two experimental insecticides, one an O-P and the other a carbamate, which control grubs in spite of thatch. The former is a product of the CIBA-GEIGY Corporation and the latter of Fisons Corporation. Extensive field tests have shown both to be very effective against grubs under thatch. Laboratory tests indicate their effectiveness is due to the fact that they are not adsorbed onto thatch. These compounds are short residual insecticides and will also require the timely irrigation or rain very soon after application. Early projections indicate that one or both of these materials may be available for commercial use by the spring of 1978. □

Table 3. Summary of tests with the new experimental insecticides for control of grubs under a turfgrass thatch - OHIO - 1973-76.

Insecticide	Formulation	Rate lb AI/A	No. Tests	Avg. Percent Control
CGA-12223	1 G	1.0	(4)	88
"	1 G	2.0	(3)	96
"	5 G	1.0	(3)	76
"	5 G	2.0	(2)	99
"	4 EC	1.0	(3)	81
"	4 EC	2.0	(1)	98
"	2 EC	1.0	(4)	56
"	2 EC	2.0	(3)	87
Bendiocarb	76 WP	1.0	(6)	78
"	76 WP	2.0	(4)	81
"	5 G	1.0	(2)	66
"	5 G	2.0	(3)	84

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