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EVALUATION OF METHODS OF CONTROLLING SOIL-INHABITING INSECT PESTS OF TURF

Control of the insect pests that inhabit the soil presents the greatest challenge to the turfgrass manager now and in the future. This is true because the target usually lives and feeds under thatch. For this reason, it is important that the pesticides reach the target pest immediately after application. We have learned through research and much experience that this is not easily accomplished with the methods and materials presently labeled.

Pesticides currently labeled for control of certain soil-inhabiting insect pests of turf include these: chlorinated hydrocarbons—chlordane; organo-phosphates—diazinon, chlorpyrifos (Dursban), and trichlorfon (Dylox, Proxol); and milky disease bacteria spore.

Milky Spore

Milky disease, *Bacillus popilliae*, is still an effective means of controlling Japanese beetle grubs. In addition to occurring naturally, dust containing spores of the bacterium can be artificially distributed to effect control. In order to be effective, infection of larvae must take place for some years after application. Yearly infection and death of larvae multiplies the spores and helps distribute them through the soil. In order for reinfection and further distribution to occur, the presence of the some larvae in the turf must be tolerated. However, once distribution is accomplished, control is provided for many years.

One discouraging note. Recent work in Connecticut indicates resistance to milky disease (i.e., low infectivity in the larvae) may have made its appearance.

Chlorinated Hydrocarbons

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.

Organo-phosphates and Water Requirements

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 organo-phosphate (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 penetration is accomplished is water; either irrigation or rainfall. This immediately presents a problem on golf courses and other turf areas without irrigation systems, unless research develops new ways of getting the insecticide to the target pest.

The Thatch Barrier

Another major factor related to the effectiveness of the O-P insecticides currently registered is that **they do not move 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, and *Ataenius*) conducted in Ohio from 1971 to 1976 (Table 1) have shown that when liquid or granular formulations of diazinon are applied to turf at 5.5 to 6 lb. AI/acre (active ingredient per acre), 90% or greater control is achieved.

Applications of liquid chlorpyrifos at 2 and 4 lb AI/acre gave an average of 69 and 74% 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 (Table 2). Granular diazinon at 5.5 to 6 lb AI/acre gave 69 to 74% control and chlorpyrifos at 2 and 4 lb AI/acre 21 and 26% respectively. Liquid formulations of diazinon at the same rate gave 52 to 60% control and chlorpyrifos 51 to 63%. The experiments and general field experience have shown that granular diazinon in low concentration formulations provides better control than the liquids.

Insecticide Bound to Thatch

The reason for reduced effectiveness of soil insecticides was investigated through laboratory experiments conducted at the OARDC. 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 adsorbed. Indications are that this is a physical-chemical binding which is not reduced by extensive aeration.

Though the tendency for trichlorfon (Proxol or Dylow) 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.

Timely Irrigation Important

While the performance of organo-phosphate insecticides is reduced by thatch, proper and timely use of water increases the probability of obtaining the most control possible from the treatment. This is reflected on the labels of liquid products currently registered for grub control in turf. Some labels recommend using 15-30 gal. of spray per 1,000 sq. ft. 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 spray treatments.

New Insecticides

In view of absorption and problems of inconsistent control with 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 (Table 2) have shown both to be very effective against grubs under heavy 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 1978 or 1979.

Credit - Old Dominion G.C. Supt. Assn.
H. D. Niemczyk - Dept. of Entomology

POPCORN ON MY TREES?

Trees infested with Cottony Maple Scale are easily spotted since they will have white popcorn-like masses on the twigs, branches and limbs. In addition, while feeding on the foliage, the young scale crawlers secrete a sticky substance called honeydew and creates a sticky mess. A sooty mold grows on the honeydew often causing the foliage and bark to appear black.

The eggs hatch in May and June. The young emerge, feed on the leaves during July and August and then move onto limbs covering themselves with a waxy protective layer. Severe infestations on limbs can kill branches or sometimes the entire tree. Fortunately, cottony maple scale infestations are often reduced by natural enemies such as parasitic insects.

To control the scale, spray with MALATHION. Use 50 to 57 per cent malathion, per gallon of water. Apply this spray to the infested tree foliage in July or early August.

Dormant oils can also be used but should be used while the tree is dormant and temperatures are suitable. In addition, follow all directions and precautions on the label.

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