Injection as an Alternative to Surface Application of Turfgrass Insecticides

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The use of pesticides on turfgrass has recently become a highly publicized and controversial issue. Of the various groups of pesticides routinely applied to turfgrass, insecticides are the most toxic to humans, pets, and wildfife that frequent turfgrass. Recent hearings sponsored by the Environmental Protection Agency (EPA) determined that Diazinon, an insecticide frequently used on turfgrass, was responsible for the death of many Brandt geese on a Long Island golf course. Further investigation revealed that goose-kills were reported in association with Diazinon application to turfgrass in nearly every state in the Union (Anonymous 1986). As a result of the hearings EPA recommended that Diazinon be banned from use on turfgrass. The potential for human and wildlife exposure to insecticides on golf courses, home lawns and recreational turf indicates a need to develop an alternative method to the surface application of toxic insecticides to turfgrass. The most toxic turfgrass insecticides are applied for control of beetle larvae (Japanese beetle, etc.) that live in soil below the thatch layer and feed on grass roots. Because the dense organic layer of thatch frequently found on well maintained turfgrass binds most insecticides and physically prevents the penetration of water soluble insecticides (Harris 1972, Niemczyk et al 1977, and Sears and Chapman 1974), the recommended application rates for control of grubs are much higher than those rates recommended for control of soil insects on vegetable or field crops[1]. Little or no information is available on the efficacy of insecticides injected below the thatch layer (Niemczyk et el 1977). However, if soil insecticides could be injected below the thatch layer of turfgrass, people and pets would not be directly exposed to the insecticides, and perhaps application rates could be significantly reduced. Previous research on turfgrass injectors has been limited to the development of machinery to inject DBCP for control of nematodes in Florida turfgrass. Two types of nematicide injectors were developed privately in Florida: a coulter slit injector, and a modified Ryan Greens Aire-WG-24 hollow tine airfier (Dickson, 1972). Neither piece of equipment seems practical for routine use on golf courses or other well maintained turfgrass. The coulter injector cuts slits in the turfgrass that would not be acceptable to most turf managers, while the Ryan Greens Aerifier moves too slowly to be used on golf fairways and recreational turfgrass. It may be possible to develop a machine that injects insecticides into turfgrass in a manner acceptable to professional turf managers. However, the concept of insecticide injection must first be evaluated to determine if the potential benefits justify research and development of injection equipment.

[1]Recommended rate of Diazinon 14G for control of corn rootworm is 3-6 lbs/A while recommended rate for control of white grubs in turfgrass is 43 lbs/A.

In September, 1986 a preliminary test was conducted to determine the potential of soil injection for grub control in turfgrass. Oftanol 2I was applied through a hand injector pump at a depth of 0.5 to 1.0 inches below the thatch layer. The density of injection sites was varied so that the injection holes were 6, 12, or 18 cm apart. The volume of insecticide solution injected into each hole was varied such that the rate of insecticide applied per acre was the same for all treatments. The rate of Oftanol applied was 4 oz per 1000 ft^2 in 4 gal. water per acre for all treatments (Table 1).

All treatments were replicated five times with approximately 0.2 in. of water applied immediately after Oftanol application. The number of live grubs remaining were counted in each plot four weeks after treatment.

Results of this test suggest that insecticide injection at close intervals (6cm) yields better control than surface application (Table 2). When injection holes are spaced 12cm apart a level of control comparable to surface application was obtained. Injection sites spaced 18cm apart did not provide adequate control.

Results of this preliminary study indicate that soil injection is worth investigating as an alternative method of applying insecticides for control of scarabaeidae larvae in turfgrass. Designing and developing a practical method of injecting insecticides into turfgrass will be a challenge. However, results from this preliminary test justify initiating a research program to develop a method of injecting turfgrass insecticides.

Table 1. Treatments in insecticide injection experiment.

1. Six cm grib (63 injection holes, 0.6 ml Oftanol per hole).
2. Twelve cm grib (20 injection holes, 1.9 ml Oftanol per hole).
3. Eighteen cm grib (12 injection holes, 3.1 ml per hole).
4. Surface application of Oftanol.
5. Control

Table 2. Control of Japanese beetle larvae with surface applied Oftanol and soil injection at three different injection site densities. The same amount of Oftanol 2I (37.8 ml) was applied to each plot regardless of treatment. Percent control was calculated by comparison to control plots in each of the four replication blocks. Treatments followed by the same letter are not significantly different at p=.05.

Application Method	Number of Injection Sites per Plot	Percent Control
Surface application	--	39.4[a]
Injection	63	59.6[a]
Injection	20	42.0[a]
Injection	12	15.5[b]

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