CUTT

A Healthy Ecosystem

There is great potential for abuse of this product if turf managers use it indiscriminately, that is without regard to the likelihood of having damaging population of insects on treated areas some time in the future. For this reason Imidacloprid should be used before egg hatch only in those turfgrass areas that consistently have high grub populations.

Legal and Effective Early Season Grub Control

Turfgrass managers are becoming aware of the possible impact of the Food Quality Protection Act (FQPA), a new federal law governing pesticide usage in the United States. Turf managers ignored the FQPA, enacted to determine how much pesticide residue will be tolerated on agricultural products, because at first reading this bill seems to focus on agricultural commodities rather than turf. However, two provisions of this law may have profound effects on the availability of older organophosphate and carbamate insecticides that are traditional products used in turf insect management programs.

The first issue is that the cost of reevaluating older products falls not on the government but on the chemical companies that wish to manufacture and market these products. This reevaluation expense that may cost millions of dollars may not be economically feasible for pesticides that are not used on major agricultural commodities such as corn or cotton. Moreover, the EPA judges the impact of any one pesticide over all of the commodities it might be applied to including ornamental plantings. To protect their products to their largest markets, chemical companies may voluntarily give up registrations on minor crops to lower the overall usage of a particular product. Minor use insecticides, including many insecticides used primarily by the turf and landscape market, may not be unsafe but could be dropped by chemical companies for economic reasons.

The second issue is an acknowledgment of the suspected increased sensitivity of small children to pesticides. The EPA will most likely decrease the residue tolerance on all agricultural crops by a factor of ten to ensure the safety of children. Chemicals that were considered safe under the older guidelines may not pass the new, more stringent tolerances. Products that are not considered safe for major agricultural commodities might not be supported for registration for minor crop used by chemical companies.

Although turf managers are rightly concerned about the possible loss of insecticides that they have depended upon for may years for pest control, the Food Quality Protection Act provides for a streamlined (less costly and less delay) registration process for certain environmentally-friendly products. These products are considered compatible with IPM principles including biologically based products and new chemistries.

New Chemistries

Imidacloprid is a new chemistry, broad spectrum, long residual insecticide registered by Miles to control soil and crown inhabiting insects in turfgrass. This includes scarab grubs such as Japanese beetle, European chafer, Asiatic garden beetle, May and June beetles, Oriental beetle, northern and southern masked chafer, green June beetle and black turfgrass Ataenius and turfgrass inhabiting weevils such as billbugs and annual bluegrass weevil. Imidacloprid has low mammalian toxicity and carries a “Caution” label. This newly registered insecticide that has shown sufficient residual activity in turfgrass to control the fall brood of annual scarab grubs when applied the previous spring or summer.

There has been considerable debate among turfgrass entomologists about the use of insecticides such as Imidacloprid that are designed to be used before the size and damage potential of the insect population is known. That is, these produces are applied before insect eggs are hatched and many times, several months before they are laid. There is great potential for abuse of this product if turf managers use it indiscriminately, that is without regard to the likelihood of having damaging population of insects on treated areas some time in the future. For this reason Imidacloprid should be used before egg hatch only in those turfgrass areas that consistently have high grub populations.

Insect Growth Regulators

As part of normal growth and development, insects molt regularly. This process is governed by several natural hormones, which regulate the production of new chitin, destruction of old chitin, and the development from immature to adult. Insect Growth Regulators (IGR) are insecticides that interfere with the normal molting process. Some IGRs accelerate the molting process, while others signal the insect to remain in an immature stage. Halofenozide (Mach 2)

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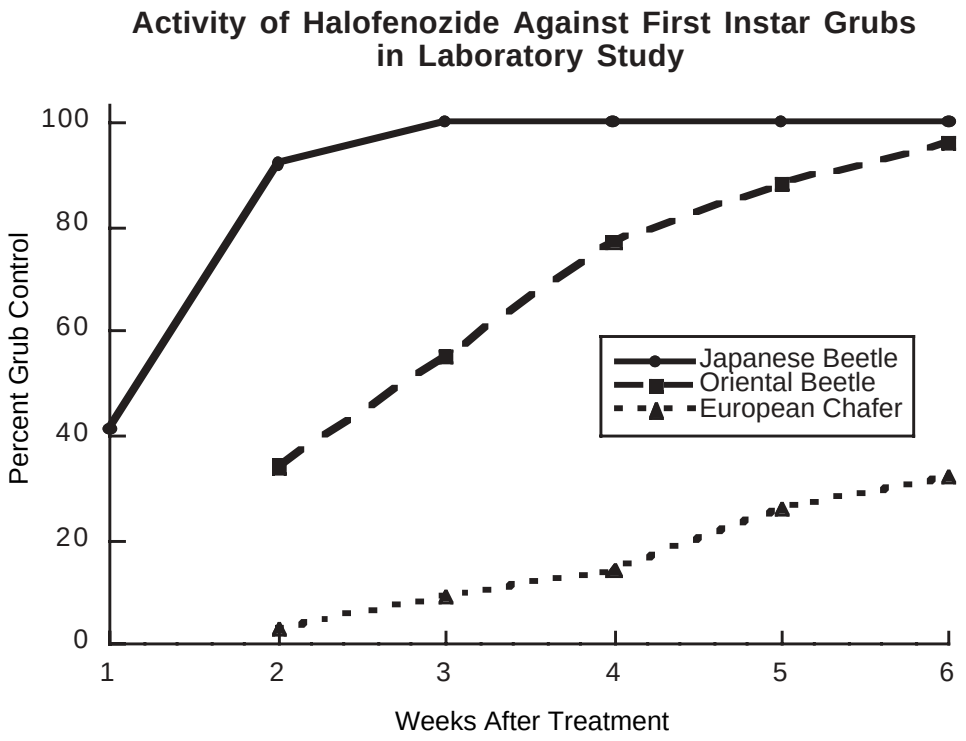
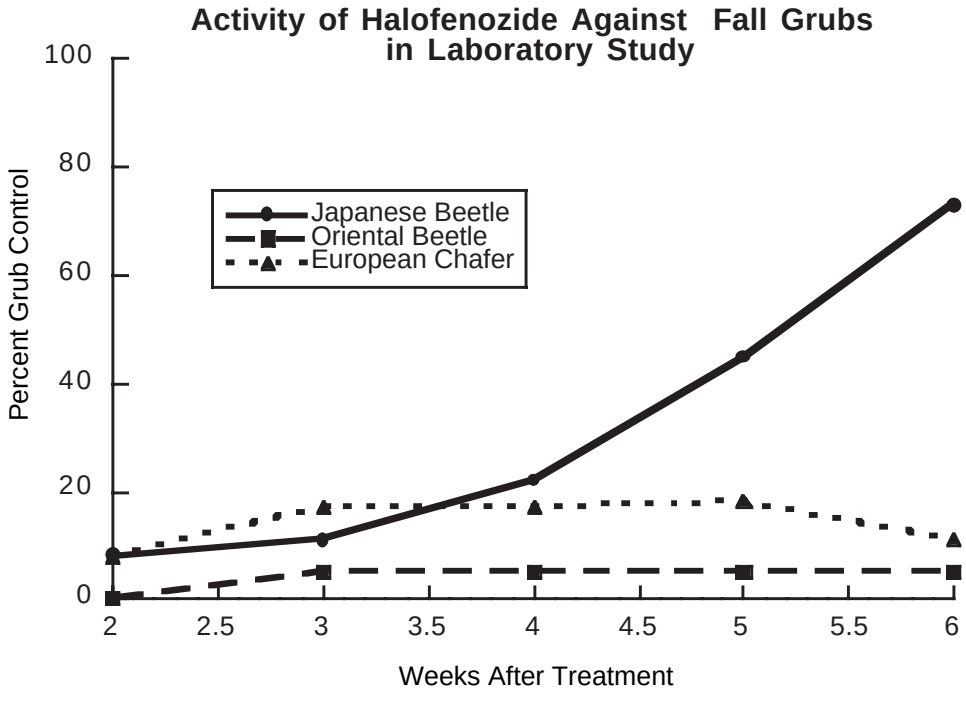
Figure 1



The use of an IGR on scarab grub populations late in the fall as they prepare to move down into the soil for winter as well as the application to grubs in late spring as they prepare to pupate is ill advised for this reason.

These studies also suggest that Japanese beetle grubs are more sensitive to Halofenozide, followed by oriental beetle and then European chafer.

Figure 2



Grub age and size did not affect the activity of Halofenozide against European chafers, as all stages tested appeared relatively insensitive to this product.

Early Season Grub Control

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is the first of a novel classes of compounds with unique mode of action that interferes with the normal insect molting process by mimicking the action of the natural insect molting hormone ecdysone. High doses of these IGR products typically cause rapid insect mortality, while sublethal effects include rapid maturation to the adult stage, larvae showing deformities, and larvae undergoing additional larval molts instead of changing to pupa. Specific IGR products have shown activity against scarab grubs, cutworms and sod webworms.

Insect growth regulators typically require ingestion for optimum activity so it is important that the target insect is actively feeding when they are applied. The use of an IGR on scarab grub populations late in the fall as they prepare to move down into the soil for winter as well as the application to grubs in late spring as they prepare to pupate is ill advised for this reason.

Laboratory Data

Laboratory studies suggested that early larval stages are susceptible to insect growth regulators. However, there is a fairly wide range of activity among closely related insects such as different species of scarab grubs. For example, Figure 1 shows the cumulative mortality of small, first instar (just after they hatch from the egg) Japanese beetle, oriental beetle, and European chafer grubs placed in soil with Halofenozide applied at a rate of 3 ppm. Notice that there is rapid mortality of Japanese beetle grubs starting at week 2, with 100% Japanese beetle mortality occurring 3 weeks post treatment. By comparison, oriental beetle grub mortality was reduced and delayed, with final cumulative mortality at 6 weeks reaching 98%. First instar European chafer grubs appeared to be relatively insensitive to Halofenozide with cumulative mortality not exceeded 25% over the duration of the study.

Figures 2 and 3 show the results of identical laboratory studies against large third instar grubs in late fall (Figure 2), and again in early spring (Figure 3). These studies also suggest that Japanese beetle grubs are more sensitive to Halofenozide, followed by oriental beetle and then European chafer. Older, larger grubs of all three species appear less sensitive to Halofenozide than are first instar grubs. This difference may be less critical against Japanese beetles where grub mortality ultimately reaches 100%, however, notice that significant mortality is delayed and fall grubs may move down into the soil to escape the cold and spring grubs to pupate (see mortality at 3 weeks).

Third instar grubs appeared much more tolerant of this growth regulator than first instar oriental beetle grubs making early application of Halofenozide critical for reasonable control. Grub age and size did not affect the activity of Halofenozide against European chafers, as all stages tested appeared relatively insensitive to this product.

In the Field

Laboratory studies while interesting can only be used as a guide to what might be expected in the field. Field studies were conducted in New York (M. Villani), Rhode Island (S. Alm), and Connecticut (R. Cowles) against Japanese beetle, oriental beetle, European chafer, and Asiatic garden beetle grubs in turfgrass plots. These plots were treated with a 1 lb./acre rate Halofenozide and a field rate of Imidacloprid in mid June (about 1 month before grub eggs could be expected to hatch in the plots), mid July (just as grubs were hatching from their eggs) and mid August (the conventional application time when a mixture of first, second, and third instar grubs might be expected in the plots. Figure 4 is a summary of the effect of application timing and grub species on the field activity of these two products.

Notice that high Japanese beetle grub mortality was recorded using either Halofenozide or Imidacloprid at all three application dates. Imidacloprid was also effective against oriental beetle regardless of application timing. There was a slight but significant decrease in European chafer mortality at the August application date when compared with early application dates. Our research suggests that for these three grub species early applications of Imidacloprid while convenient may not have minimal impact on success if grubs are feeding on the surface. The early or late applications of Halofenozide were somewhat less effective than applications timed with egg hatch. As in our laboratory studies Halofenozide provided marginal reduction of European chafer grubs regardless of application date.

Asiatic garden beetle grubs were tolerant of application of Imidacloprid at the field rate with

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Figure 3

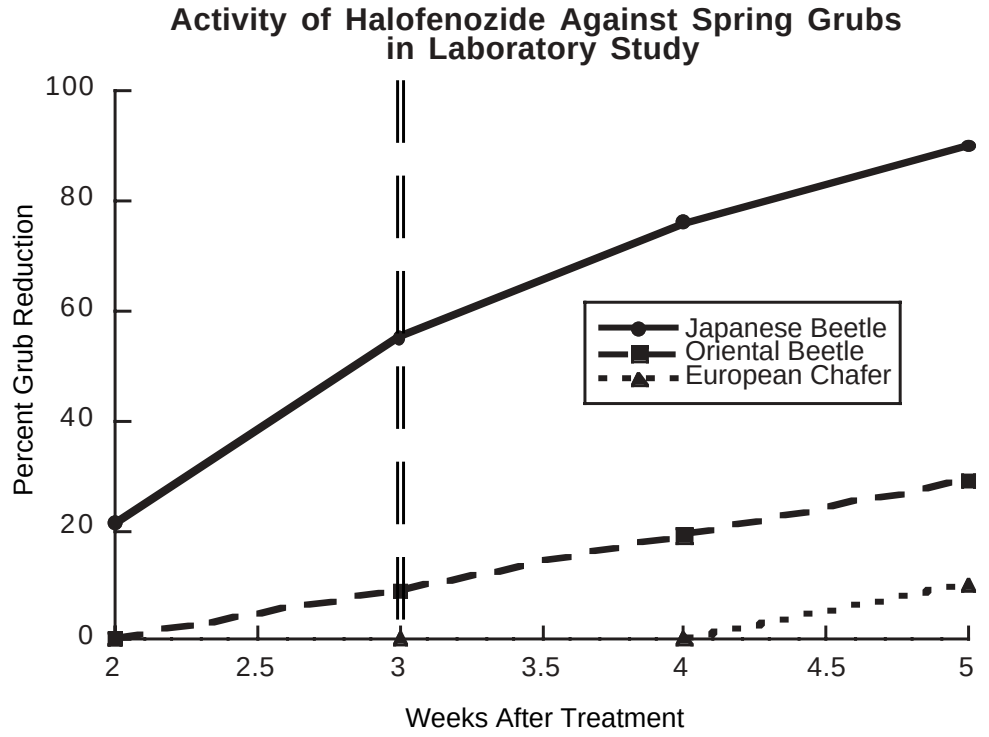
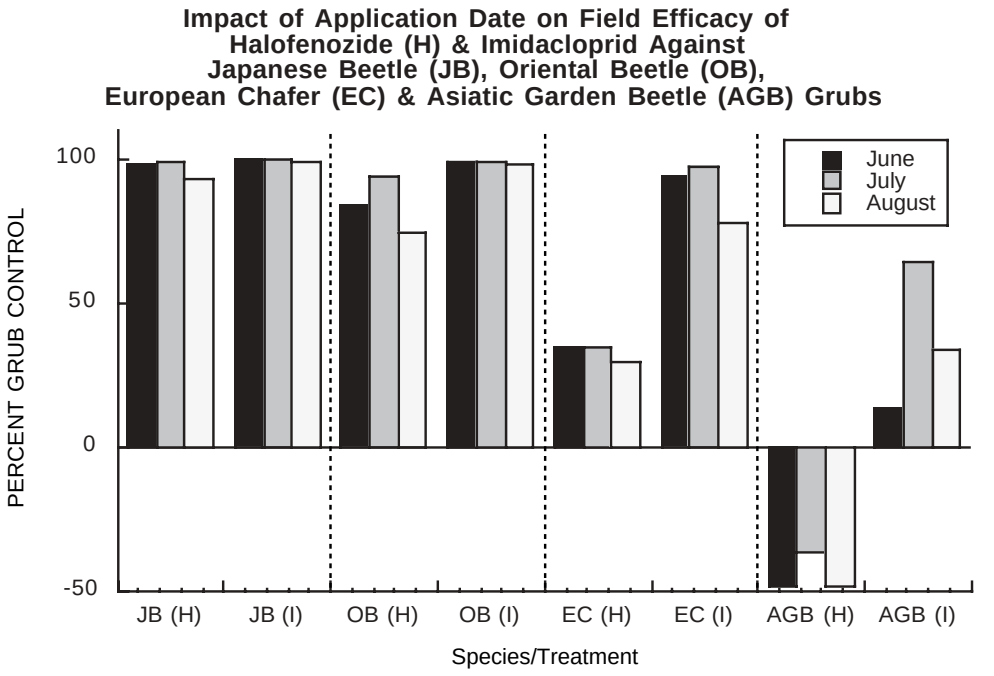


Figure 4



marginally adequate control when applied at egg hatch and poor control when applied in June or August. Plots in which Halofenozide was applied actually had 35-48% more Asiatic garden beetle grubs than did surrounding untreated plots. This unusual situation may have occurred if Halofenozide was not toxic to Asiatic garden beetles but reduced other grub species in the Halofenozide plots thus reducing competition for grass roots. Alternatively predators and parasites that reduced Asiatic garden beetle grubs in untreated plots may have been reduced in plots treated with Halofenozide and Imidacloprid.

Michael G. Villani

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