Effects of Posttreatment Irrigation on Control of Japanses Beetle Larvae in Turfgrass

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With an understanding and knowledge of the biology of the Japanese Beetle (JB) (Coleoptera: Scarabaridae) grub, we can better understand the relationship between insecticide application and irrigation to improve the efficiency of grub control. One sees hope in the control of this insect that seriously effects the growth of healthy turfgrass. In fact, many golf course superintendents and professional lawncare managers throughout Indiana regard the JB grub as one of the most serious insect pests on turfgrass.

The JB grub is often difficult to control. Control is still a problem not fully understood by researchers and professionals. There have not been any definitive studies reported to determine reasons for the apparent reduced effectiveness of insecticides. Shortened insecticide residual activity, lack of rainfall or proper posttreatment irrigation, thick thatch, poor application accuracy and technique, formulation used, and the microbial breakdown of the insecticide have been suggested as possible causes (Baker, 1986).

In order to approach the problems of reduced activity it is best to understand the biology of this insect and the environment in which it lives. The JB grub normally proceeds through one life cycle per year. The adult emerges in June or July, feeds upon the upper surface of the foliage of mainly nonturf plants, chews out the interveinal tissue, and skeletonizes the foliage (Fleming, 1972). Although the adult JB does cause damage, the grub inflicts the most severe damage to turf because it feeds upon the root system. Root system injuries threaten the life function of the turfgrass, causing weakening and death to the plants.

The cycle proceeds with adult beetles laying eggs in July or August. In August or September, the first instars (commonly found in the thatch layer) emerge. These instars feed on turfgrass roots for two to three weeks mainly in the thatch layer. The most damaging stages are during the second and third instar grubs (Vittum, 1986). These two stages feed on the roots and the thatch in the thatch/soil interface (Niemczyk, 1987). The grubs at these two stages continue feeding throughout the fall and then migrate vertically to maintain a position below the frost line during the winter. As the soil warms in the spring the grubs return to the root zone and feed for four to eight weeks before pupating. The pupal stage lasts seven to ten days, after which the adults emerge to renew the grub's cycle (Vittum, 1986).

When grubs are present in the thatch or thatch/soil interface, irrigation is recommended in order to move the insecticide to the soil surface. Research illustrates that application of the insecticides to a turf area with a definite thatch layer results in little or no leaching of the active ingredient into the first 2.5 cm of soil regardless of the amount of irrigation applied (Villani and Wright, 1988). This evidence present brings forth the question of how the insect acquires a lethal dose of insecticide. Significant amounts of residues leaching through the thatch to enter the thatch/soil interface or even the soil is highly unlikely (Niemczyk and Krueger, 1987). Questions are now being raised on how do these insects actually come in contact with or ingest the insecticide residue. (cont'd. page 14)

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When irrigation is applied after application of insecticides (as recommended on many pesticide labels), a positive result is the washing of the insecticide off of the leaf blades (Villani and Wright, 1988). A large amount of water need not be applied. As little as 0.4 inches of water may be sufficient to wash the insecticide off the leaf blades and into the thatch area for contact with the insect. This washing of the insecticide off of the blades will help in the prevention of photodegradation of the compound. Analysis of the isazofos (Triumph) treatment followed by irrigation illustrated that 96-99% of the residues were found in the thatch. The insecticide residues measured in the thatch layer were significantly lower in the unirrigated plots than those irrigated immediately after treatment (Niemczyk and Krueger, 1987). The washing also helps to prevent human and animal contact with the toxicants, therefore causing less future environmental concerns.

Other results of irrigation include the movement of the JB grubs upward through the soil into the thatch layer as water is added. This places the grub in the layer with the greatest concentration of the insecticide. As the thatch and soil dry, grubs move down in the soil profile. The JB grubs will move downward or upward from regions of low soil moisture to regions of higher soil moisture (Villani and Wright, 1988). This research illustrates that if irrigation is applied at the correct time, in correct proportion and with the correct amount of insecticide, the control of the grub will be more effective.

A movement of the JB grub downward can dramatically affect the efficiency of the control. A movement of just as much as one centimeter (0.4 inches) downward can keep the grub out of the pesticide layer, thus causing inadequate control of the Japanese Beetle grub. Also, the position of the grub in the profile can play an important role in the depth used when sampling for the insect.

Temperature also plays a critical role in the movement of the grubs. JB grubs feed in the upper soil profile in a stable warm temperature and move downward with the onset of cooling and return to the surface as soil temperatures increase (Villani and Wright, 1988).

In conclusion, one must understand that in order for the control of the JB to be successful the following procedures must be considered and followed: It is essential to be aware of the biology of the JB grub, the developmental stages, the timing of and the correct amounts of water and insecticide required in order to control this insect effectively in turfgrass.

References Cited

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Chris Berry received his B. S. degree in Plant Protection, with emphasis in weed science in 1987. He worked two years with the Plant Pathology Department and is currently pursuing a M. S. degree in the Department of Entomology. His work entails preparing demonstration plots for use of the Diagnostic Research and Training Centers for training of agribusiness people in field diagnosis. Mr. Berry will be working on a project that entails infield testing of different soil insecticides for corn and turf to determine the concentration of insecticide at which control is no longer obtained.