

Kansas Corn Rootworm Areawide Management Program Using Semiochemicals

Corn Rootworms are the most serious insect pests of corn in the Midwest. Each year, several million acres of corn are treated with soil insecticides to reduce losses by protecting corn roots from the feeding of these pests.



In Kansas, the Western Corn Rootworm (WCR) is the primary rootworm species found in most corn fields. In early spring, larvae hatch from eggs that overwinter in the soil. Larvae feed on corn roots until late June when they begin to pupate. Adults emerge in July and usually remain in corn fields feeding on pollen, silk and foliage. Egg



laying occurs from late July through September. Since corn rootworm beetles spend most of their time in corn fields, they usually only have been pests in continuous corn.

Crop rotation is commonly used to manage corn rootworm infestations. This method works well for an individual field especially if the field can be rotated to a different crop each year. Corn rootworm larvae do not damage other crops and eggs usually only are laid in corn fields. However, if corn is grown in a field for multiple years, and rotation is only considered once high numbers of adult beetles are detected, these fields can provide a source of infestation for neighboring fields, since beetles can move from field to field during the egg-laying period.

Growers wanting to manage rootworm damage in continuous corn fields have traditionally used soil insecticides. These insecticides protect the roots in the treated zone but they do little to reduce beetle numbers. Thus, treatments are often needed on an annual basis.

Another method to manage corn rootworm is adult beetle spraying. This technique aims at killing beetles before they have a chance to lay their eggs.



This management practice can be very effective at controlling corn rootworm, but depends on an effective beetle scouting program and, until recently, required using large amounts of conventional broad spectrum insecticides.

Recent studies by the USDA in South Dakota have been aimed at developing another approach to the adult beetle control program. The goal is to achieve better rootworm control while reducing the overall usage of insecticides.

Objectives of the Study

The objectives of this study are:

1. To determine if an areawide management approach can reduce the overall beetle populations and the need for insecticide applications.
2. To develop and evaluate systems to monitor adult western corn rootworm emergence and abundance.
3. To evaluate a semiochemical-based bait insecticide (Slam) for the areawide management of adult western corn rootworm.
4. To evaluate the impact of Slam applications on other pests and on beneficial insect populations.
5. To examine the economic changes resulting from an areawide management program.

One component of the USDA program involves a shift in philosophy or management strategy. The idea is to manage rootworm beetles over a wide geographic area rather than on a field-by-field basis. This strategy seeks to reduce the chance of one or two untreated fields in an area producing enough beetles to infest other nearby fields. Preliminary data indicate that a smaller percentage of the fields in the management zone eventually need to be treated, since fewer eggs are laid and, thus, fewer beetles develop.

The second component of the USDA rootworm management program is to use a semiochemical that triggers the beetles to feed on the insecticide rather than relying on accidental insecticide contact. This helps reduce the amount of insecticide needed to control the beetles. Semiochemicals are natural compounds that affect the behavior of insects. The semiochemical being used in this research is “cucurbitacin,” which is found in vegetables such as cucumbers, squash, pumpkins, melons and gourds. Rootworm beetles are genetically predisposed to eat cucurbitacin whenever they encounter it. By mixing a small amount of insecticide with cucurbitacin, the beetles are forced to eat the insecticide, greatly reducing the amount of toxicant needed to control the beetles. The product being used in these trials is called Slam, which is a commercially available mixture of cucurbitacin and the insecticide carbaryl (Sevin).

The Kansas areawide management program was initiated in 1996 with a start-up grant from the USDA. During that year, a site for the project was selected and a protocol was developed for evaluating areawide semiochemical control of rootworm beetles for the next four growing seasons.

After evaluating potential sites in southwest and northeast Kansas, a study site near Scandia in Republic County was selected. The study site consists of a 16-square mile area of intense irrigated corn production that is being closely monitored and sprayed when necessary to control rootworm beetles. In addition, there is a 4-square mile area in the adjacent township that will be used as a check area where beetle numbers will be monitored, but

farmers will employ traditional rootworm management practices.

The USDA grant is paying for the labor, materials and some of the corn rootworm treatment costs. The program is being coordinated by research and extension faculty from Kansas State University. Farmers participating in the program have signed letters of agreement that allow the project staff access to their fields and permit their fields to be treated, if adult numbers exceed threshold levels.

The primary goal of the program is to evaluate the effect of areawide management on western corn rootworm populations. Records will be kept during the project to determine if the number of acres requiring treatment changes during the life of the project. It is hoped that by keeping beetle numbers low throughout the management area that fewer larvae will be produced the following year and that the numbers of adults emerging will decline over time.

Another goal of the project is to test the efficacy of Slam for controlling the rootworm beetles. Efficacy will be determined by both monitoring adult beetles in treated fields and by checking for rootworm larval damage the following year.

In addition to evaluating the areawide management concept and the efficacy of Slam for controlling the rootworm beetles, a very important part of the program



will be to evaluate various adult rootworm monitoring techniques. The standard procedure for monitoring rootworm beetles has been to count beetles on the corn plants. However, this is very time consuming and numbers can be affected by weather, time of day and experience of the individual doing the counting.

Another method of assessing beetle numbers is to use beetle traps. As part of the areawide rootworm management program, we are testing several types of



beetle traps to determine if a more accurate method of assessing beetle numbers can be established. Traps offer the advantage of monitoring beetle activity over several days, thus, averaging out daily variations and reducing the effects of sampling differences among scouts. However,



additional data are needed on the most effective types of traps and lures, on the numbers of traps needed per field and on their placement within a field to adequately monitor beetle populations. Thus, research is being conducted as part of the areawide management program to establish guidelines for using traps to monitor beetle populations and to reach management decisions.

Several other studies are being planned in conjunction with the main thrust of the project. Beetles are being tested to determine their baseline susceptibility to carbaryl and other insecticides so that we can monitor the potential for insecticide resistance development. Beetles are being monitored in neighboring soybean and sorghum fields to determine if they are possibly laying significant numbers of eggs in these fields, as has been reported in some areas of the northern corn belt.



If the data derived from this project show advantages for areawide rootworm management, the next step will be to educate corn growers in other areas of the state. Towards this end, we hope to monitor grower acceptance of the program and document the changes that will need to be made in current scouting and management practices in order to expand usage of the areawide management concept. In addition, we hope to develop documentation and training materials needed to promote this practice in other areas.

For more information on the Kansas Rootworm Areawide Management Program, contact Gerald Wilde at (785) 532-4729 or check our website at http://www.oznet.ksu.edu/pr_ramp/

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