

Des Moines and Henry County field trials of corn rootworm beetle traps

Background

Damage caused by corn rootworms consistently decreases yields throughout the Corn Belt. Chemical treatment of rootworms can reduce damage and increase yields. However, excessive chemical treatment for corn insects poses a threat to the quality of Iowa's soil and water supply. An estimated 98% of the corn-on-corn ground in Des Moines and Henry Counties—where this project was located—is chemically treated for corn rootworms.

Earlier research into corn rootworm control identified a scouting technique that involved catching and identifying adult corn rootworm beetles on plants. This technique involved extensive training, was time consuming, and thus considered impractical by farmers.

Then, in the early 1980's, Jon Tollefson led a team of ISU entomologists in studies where the Pherocon AM sticky trap was used to catch corn rootworm beetles as an indicator of rootworm populations. The value of this scouting technique as an indicator lies with its ability to predict larval damage as well as the standard plant count method, but with lower time and training costs. Following that work, Henry County farmers evaluating the Pherocon AM trap in August 1990 indicated that 60% of the acreage scouted would *not* require soil insecticide application according to the threshold of 29 rootworm beetles per trap per week.

Another alternative to eliminating the use of the soil insecticide (in most cases) would be the rotation of corn with another crop. In Henry County, as in most parts of the Midwest, farmers perceive that the government programs, land values, and profit considerations do not encourage rotation. Until monoculture

corn production is changed, the corn rootworm sticky traps seem to be a viable alternative.

The current cost of soil insecticide on unscouted acreage is approximately \$14.50/acre. These input costs could be reduced by substituting management for chemical applications. For example, since about 40,000 acres of Henry County corn is planted with corn following corn, a 33% reduction of that acreage receiving soil insecticide would mean a \$191,400 savings of insecticide costing \$ 14.50/acre. The amount of insecticide entering the environment would be reduced by 105,600 pounds.

Successful techniques in promoting the adoption of this pest management technique with farmers were also of interest to investigators of this project. By conducting on-farm comparisons on a county-wide scale, farmers will see how simple and easy it is to use sticky traps. This demonstration was intended to provide firm evidence to the cooperating farmers and their neighbors that Pherocon AM is a practical alternative to blanket application of soil insecticide on corn-on-corn acreage.

Those benefiting directly from the results of this demonstration would include producers throughout the Corn Belt and the general public. A reduction of soil insecticide use could favorably alter the public's perception of chemical-intensive farming practices.

The specific objectives of this study were

- (1) to generate field trial yield comparison results indicating the economic effect of corn rootworm sticky beetle trap use in corn-on-corn acreage and
- (2) to document and demonstrate the use of corn rootworm beetle sticky traps by 200 Des Moines and Henry County producers.

Principal investigator

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Budget

\$7,968 for year one
\$6,985 for year two

Approach and methods

Twenty-five farmers participated in field scouting in 1991 in corn fields projected to be in corn production again in 1992. The fields were a minimum of 40 acres in size and contained one corn hybrid. Meetings were held to acquaint farmers with the process and the thresholds for not using an insecticide the following year. The yellow, unbaited Phercon AM traps were placed in the cooperating farmers' fields and monitored for four to five weeks, depending on the results. The traps work by determining the number of corn rootworm beetles on hand to lay eggs that would hatch the following year and cause root feeding damage on the 1992 crop. In 1992 those fields with high beetle counts were treated with an insecticide, which is the usual practice. The results of the summer scouting were presented to the cooperators along with guidelines concerning the need to use an insecticide on the corn field in 1992. Those producers with fields exhibiting low beetle counts had the option of not using an insecticide treatment.

Regardless of their decision, a check plot was left so that the validity of the decision could be monitored. During summer 1992 the plots

were rated for rootworm feeding damage. This was done by digging specimens **from both** the treated and untreated sections of the plot. The corn roots were then rated for the extent of damage from corn rootworm larvae feeding by using the Iowa 1-6 Root Rating Scale. The plants were randomly selected and dug with a spade. The roots were washed and rated:

- (1) No visible damage, or only a few minor feeding scars;
- (2) Some roots with feeding scars, but no roots eaten off to within 1.5 inches of the plant;
- (3) Several roots eaten off to within 1.5 inches of the plant, but never the equivalent of an entire node of roots gone;
- (4) The equivalent of one node of roots pruned off to within 1.5 inches of the plant;
- (5) The equivalent of two nodes of roots pruned off to within 1.5 inches of the plant; or
- (6) The equivalent of three or more nodes of roots pruned off to within 1.5 inches of the plant.

In the fall, all plot areas were yield checked at harvest; yield data and root ratings were then compared to the earlier year's scouting results.

Signs were placed in all cooperators' fields to show the areas where neighboring farmers could observe the technique as explained in a county-wide newsletter.

The 1992 activities were conducted on 16 of the original 25 plots. The reduction from 25 was caused in part by changes in the Agricultural Stabilization and Conservation Service (ASCS) program that caused some farmers to switch to soybeans from corn. In addition, some farmers forgot to leave check strips, and in other cases, some flag markers were destroyed. Roots from successful plots were rated in July, and yields were measured at harvest in the fall.

Findings

The 1991 results indicated that 44 percent of the plots monitored were candidates for not using an insecticide treatment in 1992.

The value of this sticky trap lies in its ability to predict corn rootworm larval damage as well as the standard plant count method, but with lower time and training costs.

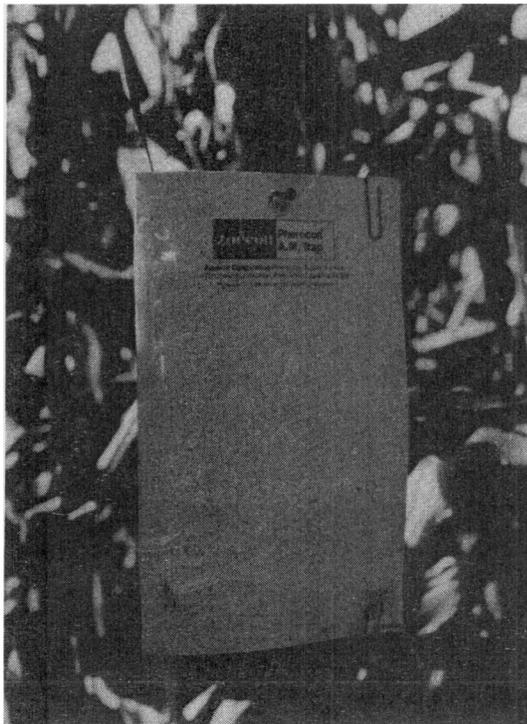


Table 1 summarizes the beetle counts, yield differences, and economic costs and returns for the 16 cooperators who were able to follow the project through to completion. The plots that show no yield information were those from which flag markers were lost after the root ratings were taken but before harvest. When costs and returns are figured on the various plots, the following chart shows the profit potential that was associated with the use of an insecticide on second-year corn. Six of the nine completed plots showed a negative return for the use of an insecticide.

Table 1 Insecticide profitability analysis data.

Cooperator	Sticky trap count	bushel diff.	Price/bushel	"Insecticide Cost	Profit
21	8.5	+12.8	\$2.00	\$14.44	+\$11.16
12	2.0	-3.01	\$2.00	\$14.44	-\$20.46
03	1.0	+5.44	\$2.00	\$14.44	-\$3.56
23	2.0	+6.46	\$2.00	\$14.44	-\$1.52
25	22	+7.77	\$2.00	\$14.44	+\$1.10
19	99	No yield information			
15	4	+3.06	\$2.00	\$14.44	-\$8.32
17	7	No yield information			
18	6	-1.81	\$2.00	\$14.44	-\$18.06
22	14	+9.97	\$2.00	\$14.44	+\$5.50
13	3	No yield information			
06	2	No yield information			
20	28	No yield information			
16	4	-1.6	\$2.00	\$14.44	-\$17.64
02	10	No yield information			
24	10	+7.08	\$2.00	\$14.44	-\$28

Counter 15 G in 30-in. rows

The two years encompassed by this project did not show very high general levels of corn rootworm beetle pressure. Trap catches were low in 1991, and root feeding damage in 1992 was generally light. Yields were consistently higher on the treated plots where trap counts were highest, but not by much. Some of the difference could be due to field variations. Root ratings on plots with low 1991 trap counts were consistent with the insecticide checks on those plots.

Implications

A major problem encountered was the discovery of differences in beetle catches by trap

types (additional types were used in other locations) that cast doubt on the threshold levels that had been previously used to determine treatment levels. Despite the difficulty encountered with the actual threshold values that are used in the decision-making process, the project was successful in transmitting a concept and process to farmers. The occurrence of catching both large and small numbers of beetles does not pose a difficult decision for the farmers. The problem is that when moderate numbers of beetles are caught, the farmer is unsure of whether to use the insecticide the following year. By using the traps, the farmer has at least narrowed the range of percentages instead of always applying an insecticide as insurance for possible problems. Further research will help to better identify the insecticide as insurance for possible problems.

The project greatly increased area farmers' interest in the IPM process. The project reflected a decrease in the amount of insecticide applied to the plot area at an increased profit to the farmer. These plots were unreplicated because the main objective was demonstration, not research. Research is underway in other parts of the state to refine the threshold levels and determine how to optimize the sticky trap as a tool in IPM.

This project had a significant impact on the geographic area as well as on individual farmers. More farmers became aware that scouting techniques are available as an alternative to using only preventive chemical treatments. One of the more significant barriers to the adoption of the practice is the lack of time that the farmers perceive they have to do the scouting. The lack of qualified people to hire to perform the work was a further complication. Two of the project cooperators told the investigator that in the two years of the project they saved \$4,500 and \$6000 respectively because of this project. This means that lower amounts of chemicals have been used.

Although additional research is underway to determine the exact thresholds at which insecticide treatments are necessary, no follow-up work on this project will be pursued until these thresholds are re-evaluated. Programs de-

signed to help develop a source of commercial scouting services for farmers would also be useful.

Education and outreach: As a demonstration project, this work was covered in publications such as *Iowa Farmer Today* and *Successful Farming*. In addition, many local farmers were reached beyond the participating core group. Scouting newsletters were sent to more than 1,000 farmers. Demonstrations of the trapping procedures were conducted at four area field days; total attendance exceeded 200 persons. Two meetings were

held for cooperators to explain the program as it progressed.

This project also benefited from the cooperation of various agencies and individuals. ISU Extension contributed housing, computer use, and personnel time to help locate cooperators; ISU also provided guidance (from entomologist Marlin Rice) on planning and implementation of the project. The ASCS and Soil Conservation Service offices in Henry and Des Moines Counties helped to locate the cooperators. The Model Farms Demonstration Project (see p. 1 of this volume) presented results from this project in four stops at its field days.

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