Supporting Leopold Center IPM research through on-farm trials and demonstrations

Abstract: The efforts of the Leopold Center Integrated Pest Management (IPM) Issue Team were augmented and advanced through collaboration with Practical Farmers of Iowa (PFI). Using a program of on-farm research, demonstrations, and farm field days, the project evaluated two methods that refine IPM by providing biological control options and/or more precise information about effective (as opposed to gross) pest infestation levels. Biological controls of alfalfa weevil and European corn borer were tested.

Background

IPM has become an accepted approach to managing crop pests in Iowa. Often IPM options are limited by ignorance of pest dynamics and beneficial insect and epizootic management. Biological responses have been documented elsewhere; this project focused on implementation of two IPM practices on Iowa farms by Iowa farmers. To become part of farmers’ sustainability arsenal, the techniques must prove economical and within the capability of Iowa farmers to use.

Integrated Pest Management (IPM) controls for the alfalfa weevil were one of the elements studied. This weevil does not often reach economically damaging levels in Iowa because it is preyed upon by parasitic wasps and a fungus (Zoopthora) that only recently began infecting the weevil population. But some years the wasps are not prevalent or the growing conditions are unfavorable for the fungus, so the possibility of a weevil outbreak still exists. In order to monitor activity of this beneficial fungus, live weevil larvae are captured and sustained long enough to see how many are infected. Scientists do this routinely, and if farmers could learn to use the same methods, they could accordingly adjust their use of published treatment thresholds. With better knowledge of this epizootic, a farmer may save the expense of applying insecticide and avoid a potentially destabilizing assault on the balance of pests and beneficials in the field.

Another technology investigated was the use of Trichogramma wasps as biocontrols for second brood European corn borer. This is a common practice in Europe, but little used in the United States. Consequently the technology is relatively expensive and not yet well adapted to U.S. equipment.

The objective of the project was to extend these biological control options for IPM in alfalfa and corn and to communicate these findings to the farm public.

Approach and methods

The investigators worked with several members of PFI from around the state. IPM Issue Team members met with the farmer cooperators in Ames during the winter and then weekly with farmers during May and June, the period when alfalfa weevils and second generation corn borers were active. Team members and ISU entomologists taught the producers about alfalfa stem sampling methods (to determine weevil pressure), sweep net sampling protocols (to capture larvae for raising), and as well as techniques of rearing captive weevil larvae. Farmers must be proficient in these practices if they want to use information about Zoopathora to refine treatment thresholds. Both the farmers and ISU personnel kept their own scouting records in order to evaluate farmers’ ability to use these surveillance techniques.
In the alfalfa weevil test component of the project, team members worked for two years with three families who raise alfalfa and are PFI members. *Trichogramma* control of corn borer was tested with farmers growing high-value (organic and transitional) corn, where conventional treatment options might be unavailable and extra management and production expense might be justified by price premiums. Two farm families who are members of PFI cooperated with the team.

Outreach and demonstration were major components of the project. Information was disseminated through field days, publications, meetings, and involvement of neighbors of the cooperators in local "interest groups." In spring 1995, a meeting was held at each alfalfa weevil and corn borer testing site to introduce the project and IPM concepts to the neighbors of each cooperator. Many producers in their wider group of neighbors later came to field days. Interest groups were formed around corn borer IPM cooperators as well.

**Results and discussion**

Results showed good correspondence between ISU and farmer-collected data. In 1995, farmers did not always understand exactly how data was to be recorded. One farmer reported data overall for the collection period rather than tallying weekly totals. In addition, ISU entomologists raised captured larvae on uncontaminated greenhouse-grown alfalfa, while producers fed alfalfa from their fields that contained some level of *Zoopathora*. The field-grown alfalfa was the better choice of feed because it was more representative of the farm environment.

The methodological differences were resolved in 1996. Alfalfa weevil larvae from both locations died of disease; mortality was particularly high on one farm. At both locations, scientists and producers independently arrived at similar numbers for alfalfa weevil population densities. Producer evaluations of disease were slightly higher than those of ISU staff. Producers were recording deaths from all diseases combined, whereas the scientists were able to use microscopic examination to distinguish *Zoopathora* related fatalities from other mortality causes. In any event, the total mortality figure would be the most important information for IPM management needs.

On-farm evaluation of *Trichogramma* wasps showed that they successfully parasitized larvae of the European corn borer. On a treated plot at New Melleray Abbey (near Dubuque) in 1996, the IPM Issue Team measured a 74 percent parasitism level in corn borer larvae, compared to zero parasitism in the untreated...
plot. In the other three site-years for this component of the project, corn borer numbers did not reach a level sufficient to justify releasing the parasites.

Participating farmers were capable of accurately measuring both alfalfa weevil infestations and the prevalence of disease (and parasitism) in the weevil population. Thus it may be practical to adjust economic infestation thresholds based on farmer assessment of the health of the alfalfa weevils. In years when weevils pose a threat, this information will save producers the expense of unneeded insecticides and generate environmental benefits as well.

Findings from this project led to further IPM research. Issue team members observed that the strips of alfalfa left uncut as reservoirs for Zoopthora also attracted alfalfa weevil and potato leafhopper adults after the rest of the field was harvested. The researchers wrote a successful $75,000 project proposal to the USDA’s North Central Region Sustainable Agriculture Research and Education (SARE) program to investigate the management of uncut alfalfa field borders as reservoirs for insect pathogens.

The Trichogramma-based control method proved effective, but too costly (at $40/acre) to be widely adopted at present. Markets for organic corn are not yet as well developed as those for organic soybeans. This will change when national standards are established for organic beef. If corn premiums reach proportionality with soybean premiums, Trichogramma control of European corn borer will become economically practical. If demand for the use of the parasitic wasp grows in this country, unit costs are likely to decrease as well.

The project demonstrated that Iowa farmers are capable of using advanced IPM techniques. It also showed that local “interest groups” and field days are effective multipliers of an outreach effort, especially in cooperation with an in-place sharing network like that of PFI.

**Education and outreach**

Each year the project was promoted at four farm field days. Attendance was 261 in 1995 and 236 in 1996, for a project total close to 500. Also, the project was featured in an article in *Iowa Farmer Today* and in the PFI quarterly newsletter.

The use of “interest groups” as a mechanism for spreading the benefits of participation to a wider audience will be useful to PFI in the future as it extends information from its on-farm research network.

At each field day, attendees were invited to register at the event and those who did so received a follow-up questionnaire. During 1995 and 1996, 104 people returned evaluations. They indicated that they had traveled an average distance of 51 miles one way to attend the event and 27 percent of them said they were PFI members themselves. They gave a 3.4 rating (on a scale of 1-low and 4-high) to the field day that they attended for effectiveness in communicating information presented. Forty-six percent of farmers attending responded that as a result of the field day they were considering changing a farming practice in some way.