

Research Thrusts

Genetics, Behavior, and Resistance to Control Among Pests of Corn

Insect pests of corn continue to evolve in ways that frustrate pest managers. Recently, a western corn rootworm variant that is resistant to crop rotation has appeared in the Midwest. Rotation-susceptible rootworm adults lay eggs only in cornfields in the fall of the year. If soybeans are planted in these fields the next year, the rootworm larvae, which cannot survive on soybeans, will starve to death once they hatch in the spring. Because rotation-susceptible rootworm adults do not lay eggs in soybean fields, very few corn rootworm larvae are found in these fields the following spring. Therefore, corn planted into soybean fields has not required treatment with soil insecticides. This is of substantial economic benefit to the grower. However, rotation-resistant rootworm adults lay numerous eggs in soybean fields in the fall. The next spring, corn rootworm larvae hatch and infest corn. In areas where the rotation-resistant variant exists, corn rotated with soybean has suffered extensive rootworm damage.

The Neal lab is investigating this problem with the goals of:

- **Developing a diagnostic marker to differentiate the rotation-resistant from the rotation-susceptible rootworm,**
- **Developing strategies for controlling the rotation-resistant rootworm, and**
- **Identifying new methods of control.**

Developing a Diagnostic Marker to Differentiate the Rotation-Resistant from the Rotation-Susceptible Rootworm

Rootworm control is most easily achieved with an in-furrow insecticide used at time of planting. But growers need to know whether they should treat their corn with an insecticide in the first place. Making the wrong choice can lead to the expense of an unnecessary insecticide application or to severe crop damage. Currently, the most reliable method of monitoring the problem is for growers to place traps in soybean fields. However, the accuracy of this method in predicting rootworm populations is limited. We are developing genetic markers for corn rootworm using the AFLP technique of DNA fingerprinting. A fingerprinting technique will assure growers as to the presence or absence of the rotation-resistant variant in their area. The DNA fingerprinting will also be an important diagnostic tool for researchers who are trying to characterize the behavioral traits that have led to rotation-resistant rootworms.

Developing Strategies for Controlling the Rotation-Resistant Rootworm

We are evaluating a number of strategies simultaneously. These include evaluation of soybeans for resistance to feeding by adult rootworms and the effect on egg lay, as well as novel control measures for treating adult insects and chemicals that affect the timing of egg hatch. We will test transgenic corn varieties with resistance to rootworm once they become available.

Identifying New Methods of Control

A number of basic biology studies are underway to better understand host location and acceptance by rootworm larvae crawling through the soil, factors that influence nutrition and host plant suitability and diapause.

Sammons, A. E., C. R. Edwards, L. W. Bledsoe, P. J. Boeve, and J. J. Stuart. (1997) Behavioral and feeding assays reveal a western corn rootworm (Coleoptera: Chrysomelidae) variant that is attracted to soybean. *Environ. Entomol.* 26: 1336-1342.