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Did northern corn rootworms lay eggs in soybeans?

by Marlin E. Rice and Jon J. Tollefson, Department of Entomology

During the summer of 2005, adult northern corn rootworms were abundant throughout Iowa. They were common in gardens during the midsummer, they frequented lights around buildings at night, and they were still common on early fall flowers such as thistle. But most surprising was the frequency at which large numbers were found in soybean fields.

This apparent increase in corn rootworms has created questions concerning the potential for injury, especially to rotated corn. With the spread of the extended-diapause northern corn rootworm (*Diabrotica barberi*) throughout Iowa, some of the concerns are justified. Our intensive, annual rotation of corn with soybeans has resulted in the selection of a northern corn rootworm strain that has a two-year life cycle. Some eggs laid in corn don't hatch the following growing season, but remain in diapause (a state of dormancy) throughout another summer and winter to hatch when corn is planted in the field nearly two years later (but see the exception below). The rotation-resistant northern corn rootworm seriously damaged rotated corn in northwest Iowa during the late 1980s and early 1990s. Since then this rotation-resistant behavior has spread throughout probably all of Iowa and has become prevalent enough to cause economic losses in corn rotated with soybeans in the northern half of the state.

Is northern corn rootworm behavior changing again?

The abundance of northern corn rootworms in soybeans could easily lead one to believe that a new problem is developing. It could be that adult northern corn rootworms are beginning to accept soybeans as a suitable site for laying their eggs, or it may indicate nothing more than an abundance of beetles are being found because more fields were scouted for increased threats from soybean aphids and bean leaf beetles.

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Northern corn rootworms feeding on soybeans sometimes chew "net-like" holes. (Marlin E. Rice)

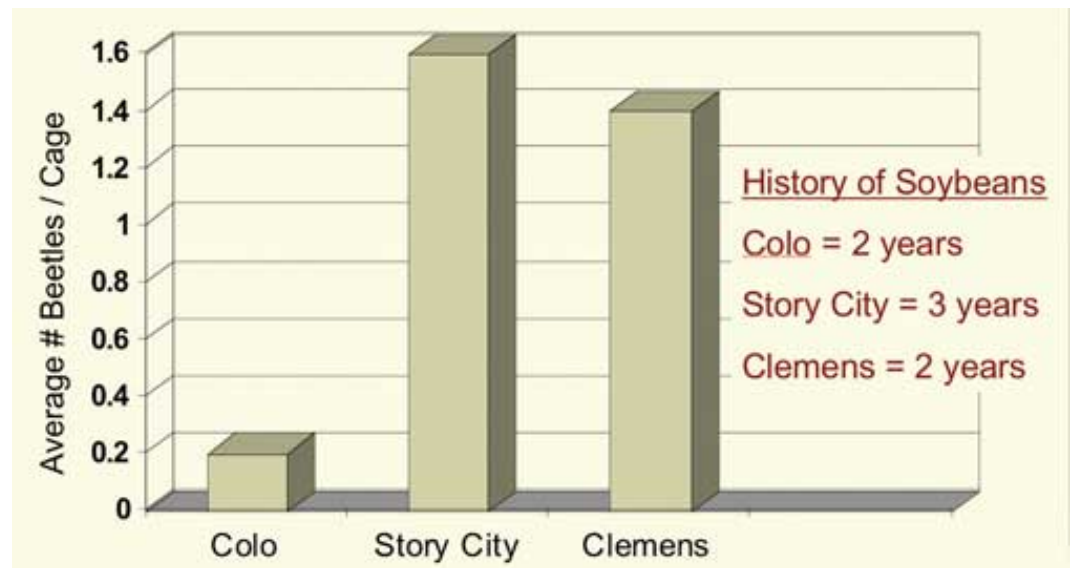
Doesn't northern corn rootworm in soybeans indicate eggs are being laid there?

No. Adult northern corn rootworms feed on a variety of plants in addition to corn throughout the summer. They are especially fond of pollen on certain flowers and the blooms of squash and pumpkin. Their presence in soybeans may indicate nothing more than they are feeding on leaves and pollen.

How can we know if northern corn rootworms are laying eggs in soybeans?

The easiest way to answer this question is to capture adult beetles emerging from the soil. They serve as a confirmation that eggs were laid there during a previous year. Because some northern eggs undergo extended diapause and don't hatch for nearly two years after they are laid, corn fields following long-rotation soybean fields are needed for experimentation. In 2005, emergence cages were placed in three corn fields that followed either a two-year or three-year soybean rotation. If any adults emerged in these corn fields, then theoretically they should have come from eggs that were laid in the soybeans during one of the previous two years. At the end of August, adult northern corn rootworms had emerged from each

of the three long-rotation corn fields (see figure).



Adult northern corn rootworms emerging from first-year corn following "long-rotation" soybeans in Iowa, 2005.

Did the experiments confirm that northern corn rootworms laid eggs in soybeans?

Not quite. Although the data certainly seem convincing, there is a subtle little twist to the story that prevents us from emphatically claiming that northern corn rootworms are laying eggs in soybeans. This twist is that some northern eggs undergo a "really long" diapause of three or four years before hatching. The proportion of eggs that hatch after this long time period is very, very small, and therefore, the number of adults surviving from these eggs would be very small. Also, it cannot be excluded as a remote possibility that the adults we captured were from eggs that diapaused three or four years.

How can we know if northern corn rootworms are laying eggs in soybeans?

We will expand our research in 2006 to include corn fields that follow either pasture-soybean plantings or long-rotation soybean fields (more than four years). If northern corn rootworms laid eggs in either of these field situations, then we should be able to confirm this suspected change in behavior.

If northern corn rootworms are laying eggs in soybeans, will it influence management decisions?

Probably. In addition to the extended-diapause eggs "holding over" two years in a rotated corn field, there could be the added load from eggs laid in soybeans the previous year. This would mean possibly more rootworm eggs than normally occur under the extended-diapause scenario. Also, it would eliminate the use of prolonged rotations to defeat extended diapause.

Stay tuned. We'll keep you updated when we have more research results to share.



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Adult northern corn rootworms on squash bloom. (Marlin E. Rice)



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Northern corn rootworms and bumble bee at thistle on September 17, 2005. (Marlin E. Rice)

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