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Corn rootworms and lodged first-year corn

Marlin E. Rice

Iowa State University, merice@iastate.edu

Jon J. Tollefson

Iowa State University, tolly@iastate.edu

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Corn rootworms and lodged first-year corn

Abstract

Northern corn rootworm larvae occasionally damage fields of first-year corn in Iowa. Rootworms typically have a 1-year life cycle and rotating corn with another crop has been a very successful management strategy to prevent lodging and yield loss from this insect. Unfortunately, some populations of the northern corn rootworm have successfully adapted to the corn-soybean rotation and now have a 2-year life cycle. This 2-year life cycle is called extended diapause because some of the eggs remain dormant in the soil for nearly 2 years before the larvae hatch. For instance, for the eggs that are laid in 1999, some larvae hatch in 2000, but the remainder will not hatch until 2001.

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INTEGRATED CROP MANAGEMENT

Corn rootworms and lodged first-year corn

Northern corn rootworm situation

Northern corn rootworm larvae occasionally damage fields of first-year corn in Iowa. Rootworms typically have a 1-year life cycle and rotating corn with another crop has been a very successful management strategy to prevent lodging and yield loss from this insect. Unfortunately, some populations of the northern corn rootworm have successfully adapted to the corn-soybean rotation and now have a 2-year life cycle. This 2-year life cycle is called extended diapause because some of the eggs remain dormant in the soil for nearly 2 years before the larvae hatch. For instance, for the eggs that are laid in 1999, some larvae hatch in 2000, but the remainder will not hatch until 2001.



[1] Northern corn rootworm.

During the past 10 years, extended diapause problems have been more frequent in the northwestern quarter of the state (north of I-80 and west of I-35). Recently, the problem has become more common in southern Iowa and Mike White, extension specialist-crops, has documented problem fields in south central Iowa counties (Taylor, Adams, Madison, Decatur, Warren, Adair, Union) all the way to the Missouri border.

Although extended diapause is widespread, very few fields are economically damaged by northern corn rootworm. Between 1988 and 1993, Paul Kassel and Joel DeJong, extension specialists-crops at Spencer and Sioux City, respectively, helped collect yield data from 59 first-year cornfields that had lodging from northern corn rootworm. Fields were treated in strips, both with and without a soil insecticide at planting. Machine harvests were collected at the end of the season. The price of corn, by using the market-year average, and the cost of insecticide at \$12 per acre were used to calculate the economic benefit of treatment. Only 20 percent of the fields had a profit where the yield increase in the treated strips exceeded the cost of the insecticide. Based on these findings, even where lodging had occurred in the field 2 years earlier from northern corn rootworm, an economic return was gained in only one out of five fields by using an insecticide. These are very poor odds and strongly suggest that a soil insecticide is not necessary in most first-year cornfields.



[2]

Farmers evaluating a lodged cornfield caused by extended diapause from northern corn rootworms.

What makes a management decision more difficult is that extended diapause cannot be predicted with a high degree of reliability. We examined northern corn rootworm adult populations and found that there was not a good relationship between adult beetle counts one summer and the amount of corn root injury 2 years later. In some fields, adult counts of three to four per plant resulted in high root injury ratings 2 years later. In other fields, adult populations of 14-17 per plant did not translate into significant root injury 2 years later. This discrepancy in adult beetle counts and subsequent root injury is probably influenced by environmental conditions, such as soil temperature and moisture, that affect survival of rootworm eggs and larvae during the 2-year period between egg laying and root feeding by the larvae.

Western corn rootworm situation

All documented lodging problems from rootworms in Iowa have been caused by the northern corn rootworm, that is, until this year. Now the western corn rootworm has started to show signs of damaging first-year corn in northeastern Iowa.



[3] **Western corn rootworm beetle.**

For a couple of seasons prior to 1999, Brian Lang, extension specialist-crops from northeastern Iowa, has been reporting that a grower near Decorah has had corn lodged that was planted after soybeans. To determine if this was the result of corn rootworms infesting rotated corn, 12 cages were placed in the grower's cornfield this year that had been soybeans the previous year. The cages covered 18 inches of row, extended midway to the row on either side, and determined if there were rootworms emerging from the soil in that field. Brian placed the cages in the field on July 13 and checked them three times until they were removed on August 10. An average of 14 western and 1.5 northern corn rootworms was caught in the traps. Relating these catches to other fields where we also have counts of adult beetle numbers per plant, these numbers are equivalent to slightly more than two beetles per plant. Feeding from rootworm larvae did not cause serious injury to the field this year. Brian reported that the field was a "typical cornfield with occasional minor goose-necked plants among normal plants."

The capture of both northern and western corn rootworm adults in the field indicates that rootworms are present in northeastern Iowa that are not controlled by crop rotation. If we found rootworms in the rotated corn, we were expecting to capture northern corn rootworms, indicating the presence of extended diapause. But the presence of westerns in this field indicates that we now have the same situation that has been documented in central Illinois where western corn rootworms are laying eggs in soybeans. This is the first documented case of western corn rootworms emerging from rotated corn in Iowa. One Illinois entomologist developed a computer model that predicted that this variety of western corn rootworm that lays eggs in soybeans should not reach eastern Iowa until 2000 or 2001. Because the adult beetles caught near Decorah were predominantly westerns, either the Illinois strain moved west faster than predicted or the routine rotation of corn and soybeans in northeastern Iowa has developed its own population. When Illinois reports the results of this summer's survey, we will know if the infestation resulted from faster-than-expected dispersal. Until then, it would be wise for growers to watch for localized areas of lodged plants within

their rotated corn because it may indicate the presence of rootworms, either the extended diapause northern or the western that lays eggs in soybeans.

Rootworm management options for first-year corn

If you will be planting first-year corn in 2000, then there are three management options to consider.

- **Option 1.** Do not use a soil insecticide on first-year corn. If there was no lodging of corn during the 1998 or 1999 harvest, an insecticide may be an unnecessary expense. As stated above, the probability of getting a yield return that exceeds the cost of the insecticide is only about one out of five, even in those fields where an extended-diapause problem has been documented.
- **Option 2.** Use a soil insecticide in first-year corn. This is recommended only if extensive lodging occurred in the field during 1998 or 1999 or if adult beetle counts exceeded three or four per plant during that year. Adult count information is probably not available for most fields, so the amount of lodging that was noticed during harvest may be the best indicator of a potential problem in 2000. Consider using a 3/4 rate of the soil insecticide, but examine ISU insecticide data before making this decision.
- **Option 3.** Rotate out of corn for 2 years. This is probably the least desirable of the three options from an economic perspective because most farmers will not want to keep corn out of a field for more than 1 year. However, it is a biological solution that will eliminate the northern rootworms from a field.

Fields where a rootworm problem has not been observed are at low risk from lodging. Development of a significant problem in any field may take many years and is influenced by rotation schemes, environmental factors, and genetics of the corn rootworm. If large areas in a field were not lodged, then using a soil insecticide for corn rootworm management does not make good economic sense.

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