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# Northern Corn Rootworm Damage in First-Year Corn: A Review of the Situation in Iowa

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## **Northern Corn Rootworm Damage in First-Year Corn: A Review of the Situation in Iowa**

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Northern corn rootworm larvae occasionally damage fields of first-year corn in Iowa. Rootworms typically have a one-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 two-year life cycle. This two-year life cycle is called extended diapause because some of the eggs remain dormant in the soil for nearly two years before the larvae hatch. For instance, for the eggs that are laid in 1999, some larvae will hatch in 2000, but the remainder will not hatch until 2001.

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. Mike White, extension specialist-crops in Indianola, has documented problem fields in south central Iowa counties (Taylor, Adams, Madison, Decatur, Warren, Adair, Union) all the way to the Missouri border, while Virgil Schmitt, extension specialist-crops in Tipton, has observed the problem along the Jones/Cedar County line in eastern Iowa (see map).

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. Experimental plots in the fields were treated, both with and without a soil insecticide at planting, and replicated three or four times. Grain was machine harvested at the end of the season.

The price of corn, using the market-year average (which ranged from \$2.00-\$2.50 during 1988-1993), 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 yield increase in the treated strips that produced a profit that exceeded the cost of the insecticide. Based on these findings, even where lodging had occurred in the field two years earlier from northern corn rootworm, an economic return was gained in only one out of five fields by using an insecticide. The situation would be expected to be even less favorable now that insecticide costs have increased while the market value of corn has dropped below \$2.00 per bushel. Data from these large-scale on-farm trials strongly suggest that a soil insecticide is not profitable in most first-year cornfields.

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 two years later. In some fields, adult counts of three to four per plant resulted in high root injury ratings two years later. In other fields, adult populations of 14-17 per plant did not translate into significant root injury two years later. This discrepancy in adult beetle counts and subsequent root injury two years later is probably influenced by environmental conditions, such as extremely cold soil temperature during the winter and excessive moisture during hatching. These environmental influences can significantly decrease survival of rootworm eggs and larvae during the two-year period between egg laying and root feeding by the larvae.

### **Rootworm Management Options for First-Year Corn**

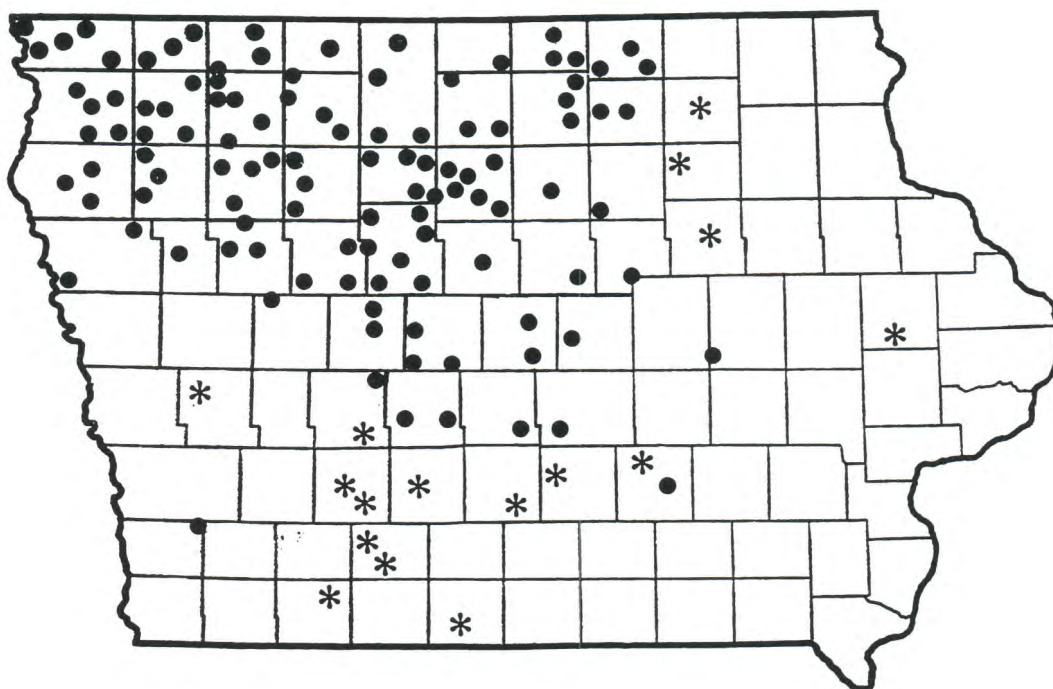
For farmers planting first-year corn in 2000, there are three management options to consider. These are ranked beginning with the most preferred option.

*Option 1.* Do not use a soil insecticide on first-year corn. If there was no lodging of corn during the 1998 harvest, an insecticide is probably an unnecessary expense. As stated above, the odds of gaining an economic return based on current corn market values are less than one in five, even in those fields where an extended-diapause problem has been documented.

*Option 2.* Use a soil insecticide at a reduced rate in first-year corn. This is recommended only if extensive lodging occurred in the field during 1998 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  $\frac{1}{2}$  or  $\frac{3}{4}$  rate of the soil insecticide, but examine ISU insecticide data before making this decision.

*Option 3.* Rotate out of corn for two years. This is probably the least desirable of the three options from an economic perspective. Most farmers will not want to keep corn out of a field for more than one year unless the field is in a rotation with small grains or alfalfa. However, a two-year rotation out of corn 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.



Areas of confirmed northern corn rootworm extended diapause in first-year corn. ● = 1987; \* = additional areas in 1999.