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Marlin E. Rice  
*Iowa State University, merice@iastate.edu*

David Dorhout  
*Iowa State University*

Rich Pope  
*Iowa State University*

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EASTERN MOVEMENT OF THE WESTERN BEAN CUTWORM

Marlin E. Rice,
Professor
Department of Entomology
Iowa State University

David Dorhout
Graduate Research Assistant
Department of Entomology
Iowa State University

Rich Pope
Extension Program Specialist
Department of Entomology
Iowa State University

Introduction

The western bean cutworm, *Richia albicosta* (Lepidoptera: Noctuidae) is native to North America. It was first reported as a pest of Colorado pinto beans in 1915 and later, in 1954, it was identified as a pest of corn in southern Idaho. Since its discovery in the late 1800’s, it has slowly and steadily expanded its known distribution eastward from Arizona to southern Minnesota and central Iowa. The western bean cutworm was known to occasionally occur in western Iowa prior to 1970, but it was not until 2000 that an economically damaging population was found in field corn. Since then, it has become a recurring economic pest in western and central Iowa. In 2004, western bean cutworms were first collected in Illinois and Missouri.

Description

**Eggs:** Western bean cutworm eggs are nearly round with small ridges extending from the top to the bottom of the egg. Eggs are laid in tightly packed, irregularly-shaped clusters from 21 to 195 eggs. Occasionally larger clusters are found. An average cluster has 52 eggs. Eggs are white when first laid and turn dark purple a day or two before hatching.

**Larvae:** Newly-hatched larvae are a dull orange color with black heads, black pronotum (immediately behind the head) and 10 black spots on each body segment. Mature larvae have a broad, faint tan stripe along the back, gray sides, no distinctive spots and an orange head. The pronotum has two broad brown stripes (see photo). The brown stripes on the pronotum are a good characteristic to distinguish western bean cutworms from other corn caterpillars. Mature larvae are
about 1½ inches long. There are six, and occasionally seven, larval stages.

**Pupae:** Pupae are orange-brown in color, occur in the soil, and are rarely seen.

**Adults:** The adult moth is ¾-inch long and a mixture of brown, gray and cream colors. Each forewing has a broad, cream-colored stripe along the front edge of the wing. The forewing also has two distinctive markings; a small, light-colored circular spot just behind and halfway along the stripe, and a buff-colored, boomerang-shaped spot near the end of the stripe. The hind wings are light tan with no distinct pattern. There are several other species of moths that occur in the Midwest and which look similar to the western bean cutworm, but the circular and boomerang marks on the forewings are distinguishing features.

### Life History in Corn

In western Iowa, moth flight begins in late June, peaks in mid to late July, and ends during mid August (Table 1). The female emits a pheromone that attracts males for the purpose of mating. One to 5 days after mating, female moths begin laying their eggs on the upper surface of the topmost leaves, and especially the flag leaf. Moths are most attracted to cornfields with tassels just beginning to emerge for egg laying. Females average 407 eggs laid during their brief lifetime. Eggs hatch in five to seven days. Newly-hatched larvae feed on corn pollen and may migrate to adjacent corn plants. Eventually larvae move to corn ears where they feed on corn silks and the developing kernels. Each of the first five larval stages takes about 5-6 days to develop, with the 6th and 7th instars averaging seven and 10 days, respectively. Unlike corn earworms, western bean cutworms are not cannibalistic so several larvae may feed in the same ear. Six larvae per ear have been found in Iowa and 10 larvae per ear have been reported from Colorado. After larvae finish feeding they chew an exit hole through the cornhusk, crawl to the ground, and form a chamber three to eight inches deep in the soil. Here the prepupal stage overwinters. The following spring the pupae are formed and the adults emerge in early summer. There is one generation a year.

Soil type in Nebraska has influenced western bean cutworm populations. Sandy soil tended to have greater populations compared to clay soils. Apparently soil type affected the ability of adults to emerge from their pupal cells.

### Table 1. Three-year blacklight captures of western bean cutworm adults in western Iowa. Woodbury County, IA, 2002-2004.

<table>
<thead>
<tr>
<th>Year</th>
<th>First capture</th>
<th>Peak capture</th>
<th>Last capture</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>June 28</td>
<td>July 13</td>
<td>August 11</td>
<td>12,739</td>
</tr>
<tr>
<td>2003</td>
<td>July 10</td>
<td>August 1</td>
<td>August 17</td>
<td>244</td>
</tr>
<tr>
<td>2004</td>
<td>July 5</td>
<td>July 23</td>
<td>August 10</td>
<td>531</td>
</tr>
</tbody>
</table>
Damage to Corn

Newly-hatched larvae will feed in one of two places depending on the stage of corn development. In pretassel-stage corn, the larvae will penetrate the flag leaf and feed on pollen in the developing tassel. In corn that has tasseled, larvae will feed on shed pollen, eventually moving to the silks. Extensive feeding on the silks during pollination may result in incomplete kernel set.

The corn ear is the primary feeding site for larvae. Larvae enter the ear by chewing through the husk or the silks. Unlike corn earworms, which restrict most of their feeding to the ear tip, western bean cutworms feed on developing kernels in both the ear tip and the middle of the ear. This injury to developing kernels can result in constricted and deformed ears. One larva per corn plant at dent stage will reduce yields by approximately 3.7 bushels per acre and estimates from Colorado indicate yield reductions of 30-40 percent. In addition to this loss of grain, ears may be invaded by ear molds, further reducing the yield quality at harvest.

Movement East and South

Prior to 2000, the western bean cutworm was considered to be rare in Iowa and economic damage (i.e. exceeding the economic threshold) had never been reported. The first significant damage was observed in 2000 in a cornfield at Holstein. This western Iowa field had approximately 95 percent of the ears heavily damaged. Two years later, larvae or their damage could be found in most western Iowa counties and adult moths were being collected in blacklight traps in central Iowa. In 2004, pheromone traps were placed throughout eastern Iowa including counties bordering the Mississippi River. Adult moths were collected in every trap placed in eastern Iowa (Figure 1) and now the insect is expected to occur in every Iowa county.

In addition, pheromone traps were placed for a single night on July 14, 2004 in northern Missouri and west-central Illinois counties near Iowa. Western bean cutworm adults were trapped in Warren County, Illinois and Harrison and Putnam counties in Missouri. These captures are the first documented occurrence of this insect in these two states and represent a significant southeastern movement of the insect from its previously known distribution.

Figure 1. Reported distribution of western bean cutworm in Iowa, Illinois and Missouri in 2004.
Scouting

Scouting can be initiated by using either degree days or trap catches. Degree days (base 50°F) for 25, 50 and 75% adult emergence are 1319, 1422, and 1536, respectively. Adult populations also can be monitored using a blacklight trap or a commercial brand (i.e., Scentry®) western bean cutworm pheromone. A common trapping procedure is to cut out windows on the upper half of a plastic one-gallon milk jug. The pheromone is suspended inside the milk jug and then filled with a 4:1 mixture of soapy water and anti-freeze that kills and preserves any captured specimens. The trap can then be placed on a post 3-4 feet high near a cornfield.

Start scouting western bean cutworm eggs in corn based on trap catches or 50% predicted adult emergence. Inspect the upper 3-4 leaves on 20 consecutive plants at five locations. Hybrids in different stages of development or different leaf characteristics (upright vs. open) should be scouted separately as adult moths may be more attracted to one hybrid than the other. A nominal threshold recommended by the University of Nebraska is 8 percent of the plants with an egg mass or young larvae found in the tassel. A simple economic threshold that considers the value of corn and the cost of the insecticide application is shown in Table 2. The values in this table, based on research conducted at the University of Nebraska, assume 3.3 percent survival of the eggs.

Table 2. Economic injury levels (eggs per plant) for western bean cutworm in corn at dent stage. 1

<table>
<thead>
<tr>
<th>Corn value ($/bu)</th>
<th>$8</th>
<th>$10</th>
<th>$12</th>
<th>$14</th>
<th>$16</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2.00</td>
<td>33</td>
<td>41</td>
<td>49</td>
<td>57</td>
<td>65</td>
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<td>$2.25</td>
<td>29</td>
<td>37</td>
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<td>57</td>
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<td>$2.50</td>
<td>26</td>
<td>33</td>
<td>40</td>
<td>46</td>
<td>52</td>
</tr>
</tbody>
</table>

1 Modified from Appel et al. 1993.

Management—Insecticides

Timing of an insecticide application is critical. If the tassel has not emerged when the larvae hatch they will move into the whorl and feed on the developing pollen grains in the tassel. As the tassel emerges, the larvae will move down the plant to the green silks and then into the silk channel to feed on the developing ear. Once the larvae reach the ear tip and enter the silks, effective control with an insecticide will be difficult to achieve. The University of Nebraska recommends that if an insecticide is needed, time the application so that 90-95 percent tassel emergence has occurred. Or if the tassels have already emerged, the application should be timed for when 70-90 percent of the larvae have hatched. Remember that eggs that are dark purple will hatch in a day.

If an insecticide application is needed, cornfields should be checked for the presence of spider mite colonies. If mites are found, select a product that does not stimulate mite reproduction. Products that contain permethrin (Pounce, Ambush) or esfenvalerate (Asana) have been associated with increased mite reproduction. Other products labeled for western bean cutworm control on corn include Capture 2EC, Lorsban 4E, Penncap-M, Sevin XLR Plus, and Warrior 1EC.
Genetically engineered corn is available with control against several insect species (Table 3). Only corn with the Bt protein Cry1F offered in Herculex I hybrids has the potential to control western bean cutworms. However, a review of web-based data, presentations at scientific meetings, and field observations suggests that Herculex I may provide control only in the range of 70-90 percent. More research is needed to fully understand the performance of Herculex I in a variety of field conditions, insect populations and corn hybrids.

Table 3. Pest control spectrum of Bt corn for Lepidoptera.1

<table>
<thead>
<tr>
<th>Product</th>
<th>Event</th>
<th>Gene</th>
<th>Western bean cutworm</th>
<th>European corn borer</th>
<th>Corn earworm</th>
<th>Armyworm</th>
<th>Fall armyworm</th>
<th>Black cutworm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herculex I</td>
<td>TC1507</td>
<td>Cry1F</td>
<td>C</td>
<td>C</td>
<td>S</td>
<td>NL</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>YieldGard</td>
<td>Mon810</td>
<td>Cry1Ab</td>
<td>NL</td>
<td>C</td>
<td>S</td>
<td>NL</td>
<td>S</td>
<td>NL</td>
</tr>
<tr>
<td>YieldGard</td>
<td>Bt11</td>
<td>Cry1Ab</td>
<td>NL</td>
<td>C</td>
<td>S</td>
<td>NL</td>
<td>S</td>
<td>NL</td>
</tr>
</tbody>
</table>

1As stated by seed industry literature. C=control, S=suppression, NL=not labeled.

The Future

The western bean cutworm is firmly established as a pest of field corn in Iowa. Its movement into eastern Iowa and Illinois was unexpected, yet not surprising, considering the adaptive ability of many pest insects to expand their range. Whether the insect will become a significant pest in eastern Iowa field corn can only be answered in the future. Fortunately, growers have two tools at their disposal—scouting combined with proper insecticide timing or transgenic corn hybrids—to help manage the western bean cutworm should it reach economically damaging levels in field corn.

Acknowledgments

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References


and Urban Entomology 17: 213-217.

