Overview

- Insects corn pests in Nebraska overview
- Focus on key insect pest in Nebraska
  - Identification
  - Time of occurrence/Life Cycle
  - Distribution
  - Injury caused
    - Scouting
  - Management
  - Current status
Black cutworm - Occurrence

Season: April to early June - From emergence to V8

Two generation a year, only first one cause damage

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Black cutworm - Occurrence

Season: April to early June - From emergence to V8
Migrate from South – Does not overwinter in NE

Black cutworm – Life cycle

- April to May – Arrive from South
- Mid April to May – Lay eggs
- Late April to Mid June – Larvae
- Late May to early July – Pupae
- Early July to Mid August – 2nd generation

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Black cutworm - Distribution

Eastern Nebraska, but are found west of the 100th meridian, which runs through Dawson County.

Black cutworm – Plant Injury

- Early stages “Shot holes”
- Later stages cut plants or burrow into base of plants
- Drilling into V6-V8 stage plants can kill growing point
- Look at base for cutting
  - Cutting mostly above ground in wet soil, mostly below ground in dry soil
Black cutworm Scouting Management

Scout fields early for Injury

- Lay eggs early spring vegetation
- Moth flight (early spring)

Scouting Corn:
- Leaf damage
- Cut stalks
- Wilted plants
- 3-5% damaged

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Black cutworm Scouting Management

Scout fields early for Injury

- Lay eggs early spring vegetation
- Moth flight (early spring)

• Early detection is essential
• Treat if damage exceeds the threshold
• Post emergence rescue treatment recommended
• Cutworms are 1 inch or less in length
  • longer than 1 inch likely are to pupate

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Black cutworm – Field Conditions

Cutworms can occur in any corn field:

- Corn following soybeans that had an abundance of winter annual or perennial weeds
- Fields with heavy vegetative cover during the early spring
- Fields planted into sod or legume pastures
- Tillage practices that allow plant residues or weeds to remain in spring

Dingy cutworm - Occurrence

Overwinters in Nebraska
Usually the first to damage corn in the spring.


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### Cutworms - Differences

<table>
<thead>
<tr>
<th>Dingy Cutworm</th>
<th>Black Cutworm Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.</strong> Overwinter as small larva in Nebraska</td>
<td><strong>1.</strong> Migrates to NE</td>
</tr>
<tr>
<td><strong>2.</strong> Many crops (flooded and weedy areas)</td>
<td><strong>2.</strong> Many crops (flooded and weedy areas)</td>
</tr>
<tr>
<td><strong>3.</strong> Cause less damage than black cutworms</td>
<td><strong>3.</strong> Cause more damage than dingy cutworms</td>
</tr>
<tr>
<td><strong>4.</strong> Feed primarily on leaves</td>
<td><strong>4.</strong> Feed on leaves and cut stems</td>
</tr>
</tbody>
</table>

In most cases, treatment for dingy cutworms is not justified unless extensive feeding accompanies poor growing conditions.

---

### Ear Feeding Lepidopteran

There are four lepidopteran pests that you may encounter feeding on corn ears in NE:

1. European corn borer (*Ostrinia nubilalis*)
2. Western bean cutworm (*Striacosta albicosta*)
3. Corn earworm (*Helicoverpa zea*)
4. Fall armyworm (*Spodoptera frugiperda*)

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There are four lepidopteran pests that you may encounter feeding on corn ears in Nebraska:

- Corn earworm
- Fall armyworm
- Western bean cutworm
- European corn borer

Ear Feeding Lepidopteran – Egg placement on plant

Please note that materials in this document/presentation may be copyrighted. Contact the author for information.
ECB: Underside of leaves, often in the middle third of plant (1st gen prefers tall, early-planted corn; 2nd gen prefers pollinating corn)

FAW: On immature leaves (late-planted fields are at greater risk)

WBC: Top side of leaves in the upper third of plant (prefers late whorl stage corn prior to tasseling)

CEW: On fresh silks

Ear Feeding Lepidopteran – Egg placement on plant

Katherine Swoboda

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WBC: Top side of leaves in the upper third of plant (prefers late whorl stage corn prior to tasseling)

WBC: Dome-shaped

Caution:

Stink bug eggs

Barrel-shaped

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**Ear Feeding Lepidopteran – Life cycle**

<table>
<thead>
<tr>
<th>Overwintering behavior</th>
<th>Generations per year in NE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ECB</strong> Overwinters as larvae in corn stalks and pupates in the Spring</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>*Can have &gt;2 in warmer climates</td>
</tr>
<tr>
<td><strong>WBC</strong> Overwinters as pre-pupa in the soil</td>
<td>1</td>
</tr>
<tr>
<td><strong>CEW</strong> Overwinters as pupae in the soil, but not in NE. Migrates from south each year</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>*Can have &gt;2 in warmer climates</td>
</tr>
<tr>
<td><strong>FAW</strong> Same as CEW</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>*Can have &gt;2 in warmer climates</td>
</tr>
</tbody>
</table>

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**Ear Feeding Lepidopteran – Distribution**

**ECB:** *Statewide*, anywhere corn is grown; wide host range, also attacks other corn varieties

**CEW:** *Statewide*; wide host range, also attacks other corns, sorghum, soybean, fruit & vegetable crops

**WBC:** *Statewide*, but most common in central and western regions in areas with continuous corn or sandy soils; also attacks dry beans

**FAW:** *Statewide*, but most common in the east; wide host range, also attacks other corns & sorghum

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# Ear Feeding Lepidopteran – Injury Symptoms

<table>
<thead>
<tr>
<th>ECB</th>
<th>CEW</th>
<th>FAW</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st gen: Whorls and surrounding leaves with a “shot-hole” appearance</td>
<td>1st gen: Defoliation</td>
<td>1st gen: Damaged ears, usually contain one larva</td>
</tr>
<tr>
<td>2nd gen: Ear shanks, stalks, and cobs with feeding damage and entry holes</td>
<td>—</td>
<td>2nd gen: Damaged ears, side entry holes and potential secondary fungal infection</td>
</tr>
<tr>
<td>WBC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ears, may contain multiple larvae, side entry holes, and secondary fungal infection</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Ear Feeding Lepidopteran – ECB Scouting

**1st gen:**
- Begin scouting during the moth flight, egg-laying, and early hatching period
- 20 to 25 corn whorls, 4 locations in each field
- Percentage of damaged plants and the number of live larvae
- Average number of live larvae per damaged plant

**2nd gen:**
- Begin scouting when second moth flight appears, green silks & shedding pollen fields
- 10 plants, 5 locations in each field, count egg masses
- Economic threshold of 25-50% of plants with an egg mass is exceeded and corn is at blister stage or earlier

1st gen ECB scouting spreadsheet; *Extension Circular 3018*
2nd gen ECB scouting spreadsheet; *Extension Circular 1584*
### 1st gen ECB scouting spreadsheet; *Extension Circular 3018*

### 2nd gen ECB scouting spreadsheet; *Extension Circular 1584*

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Location 1</th>
<th>Location 2</th>
<th>Location 3</th>
<th>Location 4</th>
<th>Location 5</th>
<th>Treated or Not Treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Number of egg masses</td>
<td>Number of egg masses</td>
<td>Number of egg masses</td>
<td>Number of egg masses</td>
<td>Number of egg masses</td>
<td>Treatment Decision</td>
</tr>
</tbody>
</table>

#### Treatment Decision

1. **Treatment is recommended if 5-8% of plants are infested with eggs or larvae**
2. **If corn is at milk stage before eggs are laid, no treatment is needed**

---

### Ear Feeding Lepidopteran – WBC Scouting

- 10 plants in 5 or more parts of each field
- Examine surface of top corn leaves for egg masses and the tassel, leaf axils, and ear tips for young larvae
- Treatment is recommended if 5-8% of plants are infested with eggs or larvae and if corn is at least 95% tasseled
- If corn is at milk stage before eggs are laid, no treatment is needed

**WBC Speed Scouting app is available**
Ear Feeding Lepidopteran – CWE/FAW Scouting

**CEW**
- Examine silks for eggs and eartips for small larvae during the green silking period
- Treatment is not usually economically justified for field corn
- Seed corn, popcorn and sweet corn may require treatment

**FAW**
- Scout late-planted fields as they reach V5-V8
- Select 20 consecutive plants in a row in 4 locations, look for live larvae
- Thresholds are based on levels defoliation and the potential for larvae to enter the ear

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Ear Feeding Lepidopteran Management Recommendations

<table>
<thead>
<tr>
<th>Bt Traits</th>
<th>Important Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ECB</strong></td>
<td>1. Consult appropriate NebGuides when deciding to treat for either generation</td>
</tr>
<tr>
<td>Cry1Ab, VIP3A, Cry1F, Cry1A.105, &amp; Cry2Ab2</td>
<td></td>
</tr>
<tr>
<td>*Consider planting locally-adapted, high-yielding varieties with ECB resistance</td>
<td></td>
</tr>
<tr>
<td><strong>WBC</strong></td>
<td>1. Scout Cry1F fields if reduced efficacy has been observed in the area (e.g., SW &amp; central NE) 2. Consider treating if thresholds are exceeded</td>
</tr>
<tr>
<td>VIP3A or Cry1F* traits</td>
<td></td>
</tr>
<tr>
<td>*Note that the efficacy of Cry1F has decreased in some areas</td>
<td></td>
</tr>
<tr>
<td><strong>CEW</strong></td>
<td>VIP3A, Cry1F, Cry1A.105, &amp; Cry2Ab2</td>
</tr>
<tr>
<td><strong>FAW</strong></td>
<td>VIP3A, Cry1F, Cry1A.105, &amp; Cry2Ab2</td>
</tr>
</tbody>
</table>

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Corn rootworms - Occurrence

Northern corn rootworm

Western corn rootworm

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**Corn rootworms - Occurrence**

Overwinter as eggs
Hatch in May, feed on roots
Emerge early July

**WCR Resistance in Nebraska**

Aldrin, Dieldrin
Heptachlor
Chlordane, Endrin, HCH-gamma
Carbofuran, Carbaryl, Parathion-methyl
Bt proteins: Cry3Bb1 & mCry3A
Bifenthrin
Bt: Cry34/35

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Confirmed WCR Resistance to Cry3Bb1

Some level of WCR resistance to Cry3Bb1 and cross-resistance to mCry3A detected from one or more fields per shaded county in UNL lab bioassays.


Bt Resistance: Nebraska Situation

• Greater than expected corn rootworm injury (NIS >1) in Cry3Bb1 fields during 2011-2015
  – Initially Northeast & Southwest NE
  – More recently, Central NE also
• Cry34/35 still works well in most of NE, but problem fields do exist

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So, how do we manage rootworm?

- This is not a “what is the best single trait or insecticide” situation.
- A rootworm management solution is required that incorporates IPM and IRM principles.
  - Refuge compliance, field scouting, long-term planning, using knowledge of the region and field history to make decisions
- Use of multiple tactics and rotation of tactics is key to slowing resistance.
  - Crop rotation, planting effective Bt traits, cautious use of insecticides for adult or larval control, biological control

**Goal:** Limit rootworm economic injury & limit the evolution of resistance

<table>
<thead>
<tr>
<th>Corn Rootworm-Targeting Bt Proteins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cry3Bb1</td>
</tr>
<tr>
<td>Cry34/35Ab1</td>
</tr>
<tr>
<td>mCry3Aa</td>
</tr>
<tr>
<td>Cry3Bb1 x Cry34/35Ab1</td>
</tr>
<tr>
<td>mCry3Aa x Cry34/35Ab1</td>
</tr>
<tr>
<td>mCry3Aa x eCry3.1Ab</td>
</tr>
</tbody>
</table>

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Managing Resistance

- Cry3Bb1 problem field previous years
- What should I plant this year?
- Go to your Handy Bt Trait Table

The Handy Bt Trait Table for U.S. Corn Production

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Stink Bugs - Occurrence

17 species found in Nebraska

Green Stink Bug
- Bright green color

Brown Stink Bug
- Yellow/tan color

One spotted Stink Bug
- Brown spots

Red-shouldered Stink Bug

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Stink Bugs - Occurrence

17 species found in Nebraska

Brown Stink Bug

One spotted Stink Bug

Yellow/tan color
Brown spots

Stink Bugs – Life Cycle

Overwinter
Wooded Grass Borders
Cover Crops

Mate

Lay Eggs

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Stink Bugs – Injury and scouting

- Early season
  - Kill small plants
  - Tillering
  - Repeating pattern of holes

Thresholds
- 5% damaged
- SB present
- >10% infested
- Corn less than 2ft tall
**Stink Bugs – Injury and scouting**

- **Late season**
  - Aborted kernels
  - Banana ears

**Thumbnails**

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Insect corn pest Nebraska

- Corn earworm
- Fall armyworm
- Western bean cutworm
- European corn borer
- Northern Corn rootworm adults
- Western Corn rootworm adults
- Dingy cutworm
- Common stalk borer
- One spotted stink bug
- Brown stink bug
- Green stink bug

April, May, June, July, August, September

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Further information

https://entomology.unl.edu/extension
https://cropwatch.unl.edu/

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Thank you!

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  @justinmcmchan
  @KyleKochUNL

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