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## EC79-1535 Integrated Pest Management : Insect Guide

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C.1 **Integrated  
Pest Management**

# INSECT GUIDE



## An Aid to Field Identification



Extension work in "Agriculture, Home Economics and Subjects relating thereto,"  
The Cooperative Extension Service, Institute of Agriculture and Natural  
Resources, University of Nebraska-Lincoln, Cooperating with the  
Counties and the U.S. Department of Agriculture  
Leo E. Lucas, Director

# CORN INSECTS



## Introduction

The IPM Insect Guide provides an essential, general and practical pictorial reference for agriculturists engaged in field identification work. The Guide should prove useful to consultants, scouts, advisors in state departments of agriculture and federal regulatory agencies, agribusiness representatives, elevator managers, county agents and specialists, vocational agriculture teachers, researchers and students.

The IPM Insect Guide should also result in wiser pesticide use through proper identification of insect pests and improved insect surveys.

Prepared by Lloyd W. Andersen, Extension Entomologist with cooperation of the Department of Entomology, Nebraska Cooperative Extension Service, Institute of Agriculture and Natural Resources, University of Nebraska, Lincoln, Nebraska.

## Corn Rootworms (adults):



**Western**



**Northern**

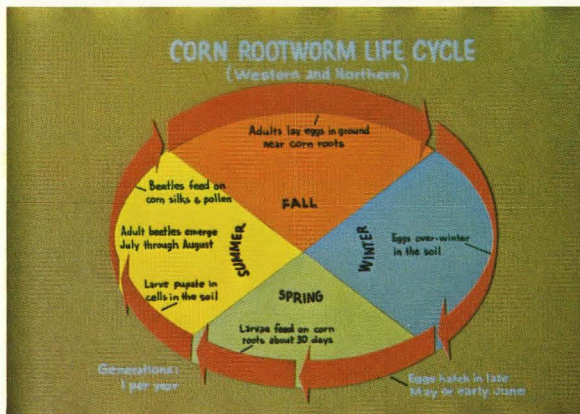


**Southern**



## Corn Rootworm Adults

Western corn rootworm, Northern corn rootworm, Southern corn rootworm (top to bottom). Western and northern corn rootworm beetles deposit eggs in late summer that overwinter in the soil. Their eggs must be exposed to an extended cold period before eggs will hatch. The southern corn rootworm deposits eggs in the soil in the spring and summer. Their eggs do not have to be exposed to cold temperatures and immediately begin to develop. This species apparently does not overwinter in Nebraska. Overwintering eggs begin to hatch in late May and continue to hatch for several weeks. The western corn rootworm is the most important and abundant species in Nebraska and is state-wide in distribution. The northern corn rootworm is limited to the eastern portion of the state.



**Corn Rootworm Life Cycle  
Western and Northern**

## Corn Rootworm (immature stages):



**Corn Rootworm Larva**



**Corn Rootworm Larva**



**Corn Rootworm pupa**

### **Corn Rootworm Larvae and pupa:**

After eggs hatch, the small larvae feed on roots of corn, burrow into and prune larger roots. The larvae of all three rootworms are similar in appearance—white with a dark brown head and a brown spot on the upper surface of the tail. When fully grown they are about  $\frac{1}{2}$  inch long.

Pupation of the corn rootworms begins in late June. Emergence of the adults can occur throughout the month of July and into August. Peak emergence is usually about the third week in July.

### **Types of Damage:**



**Foliage Feeding**



**Root Pruning**



**Silk Clipping**



### **Corn Rootworm Damage (adult and larva):**

Severe damage by rootworms can kill small plants; large plants under drought conditions may be killed due to loss of roots. Yield may be seriously reduced due to loss of roots and harvest losses may occur as a result of lodging. Usually the peak root damage occurs about July 1.

Severe chewing of silks before pollination can result in partially filled ears. Late silking fields are more likely to be damaged. Early silking corn is usually pollinated before large numbers of beetles emerge.

### **Lodging of Corn:**



**Lodging of corn (early)**



**Lodging of corn (late)**



**Lodging of corn (wind)**

### **Lodged Corn:**

Lodging and "goose-necking" is typical following rootworm damage. Plants with damaged roots are easily blown over.

Strong winds and herbicide injury can also cause goose-necking of corn.

### **Gravid Western Corn Rootworm:**



**Gravid Corn Rootworm**



**Gravid Corn Rootworm**

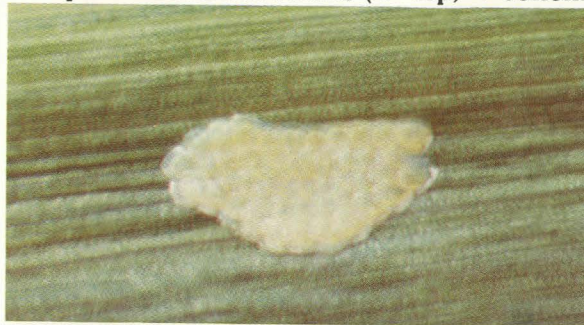
## Gravid Corn Rootworm

Control of corn rootworm adults to reduce the number of larvae the next season may not be as reliable as soil insecticides because precise timing of control is essential, and more than one application of an insecticide may be necessary. If this method is used, it should be under the supervision of trained pest management personnel. To have a reasonable chance of success, control should be applied when there is an average of one rootworm beetle per plant and 10 percent of the female beetles have mature eggs.

## European Corn Borer:



European Corn Borer Adults ( ♂ top, ♀ bottom)



Egg Mass

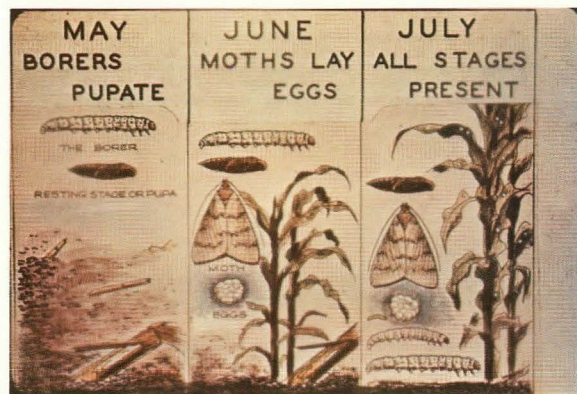


European Corn Borer (hatching)



## European Corn Borer:

Corn borers spend the winter as larvae in corn stalks and numerous other plants. First brood moths emerge in May and June and lay eggs on early planted corn. Eggs are laid in masses of small, flat, overlapping eggs on the undersides of leaves. Larvae feed in the whorl and burrow into stalks after they are about half grown. Second brood moths appear in late July to September. They prefer to deposit eggs on late corn.



European Corn Borer Life Cycle

## European Corn Borer— 1st generation feeding damage:



Foliage Feeding



Shot Holes



Feeding Damage on Stalk

### Feeding Damage:

The need for insecticide treatment for first brood is determined by examining early planted corn. Treat if borers cause slotholes in: 1) 50 percent of dryland corn plants, 2) 35 percent in irrigated corn, 3) 25 percent in popcorn or 4) 10 to 15 percent on seed fields. Heaviest first brood borer activity is expected in earliest planted fields or fields planted to susceptible varieties. If borers have entered the stalks, control is impossible.

### Second Generation (Tassel and Stalk Damage):



Early tassel Feeding



Tassel Damage



Stalk Damage

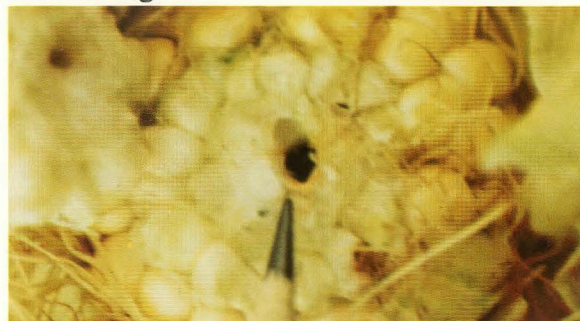


### **Tassel Damage:**

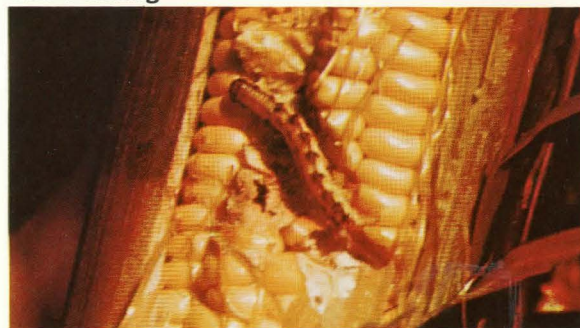
Tassel feeding, dropped ears and stalk breakage can, if extensive, result in substantial reduction in yield.



**Silk Damage**



**Cob Feeding**



**Kernel Feeding**



### Ear Damage:

Feeding on silks, kernels and cobs results in yield loss, quality impairment and dropped ears.

### Second Generation (shank and stalk damage):



Shank Damage



Stalk Damage



Stalk Damage

### Shank and Stalk Damage:

Excessive shank damage can result in dropped ears.  
Broken stalks may result if stalk feeding is severe.

### Overwintering of European Corn Borer:



Overwintering Sites



Pupae of ECB



Resting Site for ECB Moths



### Overwintering of European Corn Borer:

Broken stalks on the ground provide excellent overwintering sites for European Corn Borer. Stalk chopping, disking and clean plowing of corn field destroy large numbers of larvae.

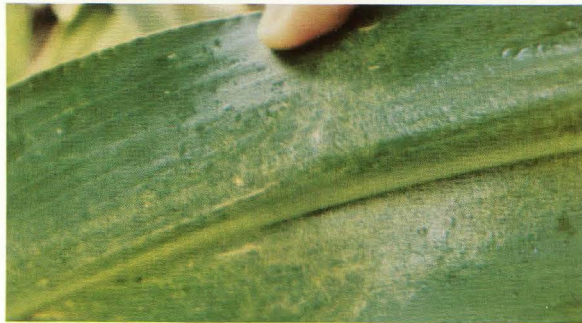
Pupation of overwintering ECB occurs during the latter part of May.

Once the moths emerge, they spend the daytime chiefly on weedy and grassy plants in the margins of fields. On warm, humid, calm evenings they fly into corn fields and lay their eggs. These first moths of the year are attracted to the tallest or most advanced corn.

### Spider Mite Damage:



Individual Colonies



Damage Along Midrib



Drying of Corn Leaf



## Spider Mite Damage:

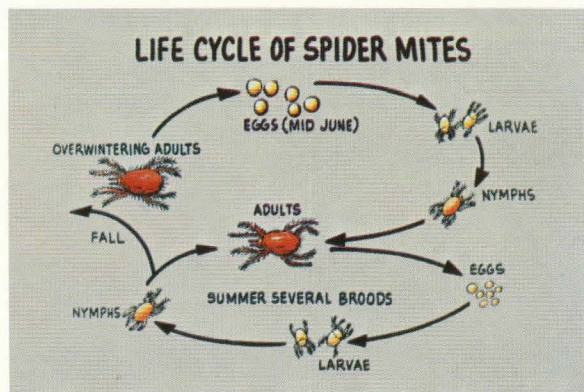
Begin examining the undersides of the lower corn leaves for small individual colonies at about the third growth stage of corn (12th leaf stage).

If there are fewer eggs than adults present in a colony, the colony is not considered very active and, hence, control decisions can be delayed.

## Spider Mites:

Spider mites are carried by winds from grasses and other weeds to corn fields. They may also overwinter in fields on debris from the previous year. Once on corn plants they lay small, round, pearly eggs on the undersides of the lower leaves which hatch in three to four days. The young mites resemble the adults the increase in size by shedding their skins. It takes about 7 to 10 days before the mites mature and begin to lay eggs. Usually all ages of mites and eggs are present and there is an overlapping of broods during the growing season. Early in the season mites will be viable as colonies consisting of an adult female and several immature offspring.

Economic thresholds for this pest are: if one (1) lower leaf is dead due to the presence of mites and active colonies are present on leaves up to the ear leaf. Consideration should be given to the stage of development of the ear before applying controls.



**LIFE CYCLE OF SPIDER MITES**

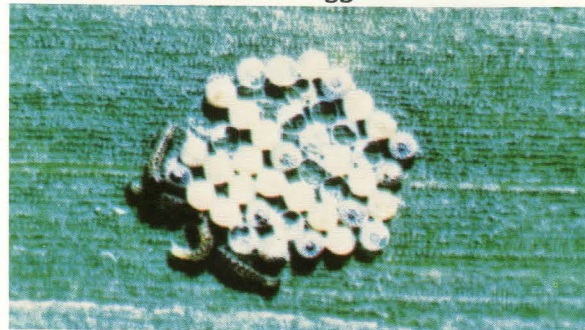
## Western Bean Cutworm



Western Bean Cutworm Adult



Western Bean Cutworm Eggs



Western Bean Cutworms Hatching



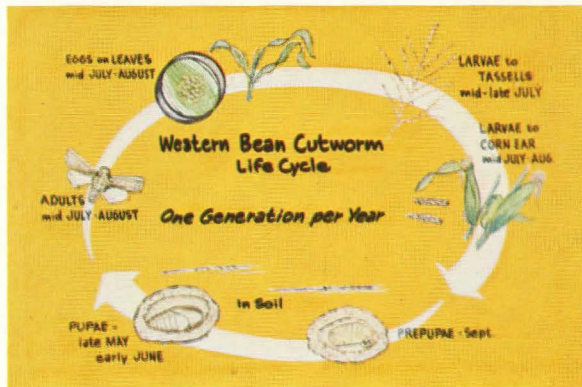
## Western Bean Cutworm:

The western bean cutworm, originally a pest of field beans in Nebraska, has become a serious pest of field corn. It occurs in areas of the panhandle, southwestern and central Nebraska.

The cutworm passes through five stages of development: egg, larve, prepupa, pupa and the adult moth.

Western bean cutworms overwinter as prepupae. In May and early June they change to pupae. About July 1, the moths begin to emerge from the soil. The main flight of moths usually is between July 10 to 25. Females lay their eggs shortly after they emerge. The majority of larvae feed until the middle or end of August. When mature, cutworms enter the soil and change into the prepupal stage to overwinter.

The eggs, about the size of a pinhead, are laid in masses of about 40-90 on the upper surface of upper leaves. When first laid eggs are pearly white, but gradually turn bluish-black before hatching (4 to 7 days). Newly hatched larvae often congregate in the developing tassel while it is still enclosed in the whorl. As the tassel emerges the larvae begin moving toward the silk and kernels.



Life Cycle of Western Bean Cutworm

## Western Bean Cutworm Larva:



Western Bean Cutworm Feeding on Tassel



Western Bean Cutworm Feeding on Ear



Western Bean Cutworm  
cervical shield stripes

### **Western Bean Cutworm:**

Mature Western Bean Cutworm larvae have a dark thoracic shield with three cream color lines. Corn Earworm larvae have no marking on head but have a net-like pattern on head and inverted "Y" sutures on head capsule.

Holes bored into husks by western bean cutworm.

Mature western bean cutworms leave their feeding sites and burrow into the soil around the corn plants. At depths from 3 to 9 inches in the soil, they construct earthen cells. The prepupae and pupal stages are spent within these cells. The prepupae are about one-half the length of the mature worm. The pupae resemble the pupae of many other cutworms.

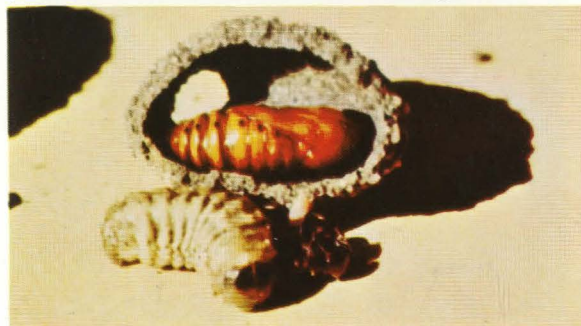
### **Western Bean Cutworm:**



**Head capsule of Western Bean Cutworm**  
**Corn earworm—Fall Armyworm**



**Western Bean Cutworm—ear damage**



**Western Bean Cutworm**  
**Prepupa—pupa—pupal cell**



### **Western Bean Cutworm Larvae:**

Young cutworms are dark brown with faint diamond-shaped markings on their backs. Newly hatched larvae often congregate in the developing tassel before it emerges from the whorl. As the larvae grow, they change to a lighter color and by maturity are grey to pinkish brown. When nearing maturity, three short, cream color stripes appear on the dark cervical shield behind the head.

### **Black Cutworm**



**Black Cutworm Adult**



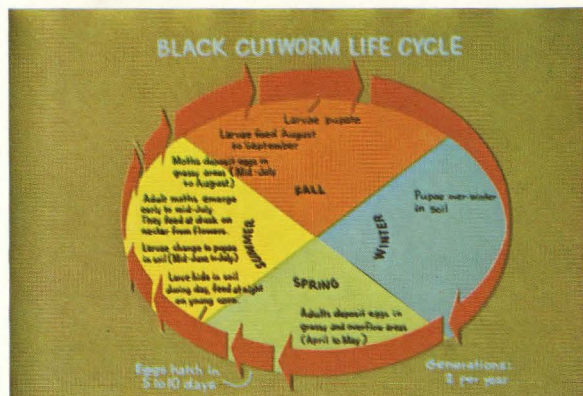
**Black Cutworm Damage**



**Black Cutworm Damage**

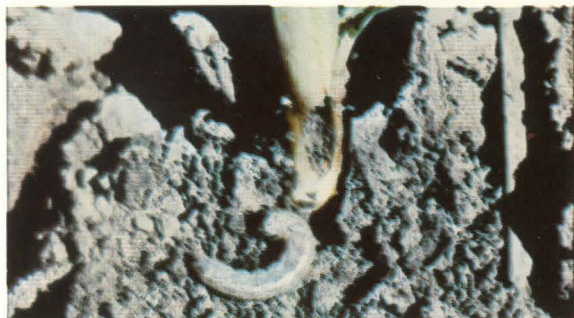
## Black Cutworm:

In Nebraska there are two broods per year. Pupae overwinter in the soil, adults emerge in early spring and deposit eggs in grassy and overflow areas (April and May). Eggs hatch in 5 to 10 days, larvae hide in the soil during the day and feed at night on young corn. The larvae change to pupae in the soil about mid-June to early July. Adults emerge from these pupae in early to mid-July. They feed on nectar from various flowers. Moths deposit eggs in grassy areas from mid-July to August. These larvae change to pupae to overwinter.



**Black Cutworm Life Cycle**

## Black Cutworm:



**Black Cutworm (late damage)**



**Black Cutworm (late damage)**

## **Black Cutworm:**

The black cutworm is most common in low, poorly drained and grassy spots of fields. Cutworms work chiefly at night and cut seedling plants at or just below ground level. Larger plants are sometimes injured by cutworms chewing into stalks at or just below ground level.