Insect Pests of Corn

• Divided into two categories
  – Above ground
  – Below ground
• Rescue treatments ineffective for below ground
• Must consider preventative approach
• Planting-time application of soil-applied insecticide
Insect Pests of Corn

- Below ground often referred to as Secondary Pests
- Wireworms, White grubs, Grape Colaspis
- Occasional pests with clumped distribution
- Difficult to scout for
- Preventative approach used to manage these pests
Insect Pests of Corn

• Western Corn Rootworm (WCR), Black Cutworms (BC), and European Corn Borers (ECB) considered top three insects causing economic yield losses in corn.

• Widespread use of Bt hybrids have removed ECB from the list, slowed issues with BC, as well as WCR.

• Resistance to a Bt protein (Cry3Bb1) was confirmed in IL in 2012 (long-term continuous corn). Reason for IPM (slow resistance)
Insect Life Cycles

• Complete Metamorphosis
  • 4 growth stages
  • The larva passes through molts
  • Food sources may or may not be the same for each stage of growth
Insect Life Cycles

The Life Cycle of a Monarch Butterfly:
- Egg
- Caterpillar
- Chrysalis
- Adult Butterfly
Insect Life Cycles

• Incomplete Metamorphosis
  • 3 growth stages
  • Nymph looks almost like adult
  • Usually exhibits same preference for food and habitat
Insect Life Cycles

Incomplete metamorphosis

1st moult

2ndstage nymph

3rd stage nymph

4th stage nymph

5th stage nymph

5th moult

1st stage nymph

hatching

eggs

5th moult

Insect Life Cycles
Insect Feeding Habits

Chewing

- Bites, tears, or pinches off parts of the plant
- Reduces photosynthesis sites
- Allows entry sites for diseases
Insect Feeding Habits

Piercing-sucking

- Punctures epidermis - removes fluids
- Interferes with metabolic activity
- Can vector diseases or leave toxins
Insect Feeding Habits

Lapping

- Laps sap or liquid (straw-like)
- Rasps the surface and sucks the exuded sap or blood (ouch!)
Insect Pests of Corn
Secondary Soil Insects

Wireworms

- Complete metamorphosis
- Damaging stage: Larva
- Live 2 to 5 years in soil
- Drill into seed or base of plant below soil line
- Wilted plants or dead whorls (reduced stands)
- Lay eggs in grass fields or small grain stubble
- Preventative only control option
Wireworm Bait Station

[Diagram of wireworm bait station with labeled soil layers: Bait, Loose Soil, Undisturbed Soil, Black Polyethylene, Clear Polyethylene]
Insect Pests of Corn
Secondary Soil Insects

Seed Corn Maggots

- Complete Metamorphosis
- Damaging stage: Larva
- Decaying residue or biosolids
- Preventative only control option
Corn Insects

White grub (annual and true)

- Life cycle: Complete metamorphosis
- Damaging stage: Larva
- I.D.: White with distinct bristles on the rear of the abdomen

![Eating roots](Image)

Two rows

Random
Corn Insects
Secondary Soil Insects

Grape Colapsis

• Life cycle: Complete metamorphosis
• Damaging stage: Larva
• Crop injury: Root hair feeding
Black cutworm

- Life cycle: Complete metamorphosis
- Damaging stage: Larva
- I.D.: Grayish-brown to black
- Crop damage: Cut young plants off at soil surface or below ground (hot and dry conditions)

Pheromone Traps - males
Corn Insects

Western corn rootworm

- Life cycle: Complete metamorphosis
- Damaging stage: Larva and adult
- I.D.: Adult - Yellow with black stripe
- Larva - White with 2-head appearance
Corn Insects

Fall armyworm

• **Life cycle:** Complete metamorphosis

• **Damaging stage:** Larva

• **I.D.:** Inverted “Y” on the head
Corn Insects

Corn leaf aphid

- Life cycle: Incomplete metamorphosis
- Damaging stage: Nymph and adult
- I.D.: Small bluish-green aphids
- Crop damage: Interference with pollination, plant stress
Corn Insects

European corn borer

- **Life cycle:** Complete metamorphosis
- **Damaging stage:** Larva
- **ID:** Flesh-colored with reddish-brown head
- **Crop damage:** Stalk tunneling causing damage to vascular tissue
European Corn Borer
European corn borer

Field received 1 pass from Airplane spraying seed field by mistake. Difference in insect infestation obvious!
Corn Insects

Grasshopper

• Life cycle: Incomplete metamorphosis
• Damaging stage: Nymph and adult
Corn Insects

Stalk borer

• Life cycle: Complete metamorphosis
• Damaging stage: Larva
• I.D.: Larva - Brownish with dark purple band around middle
• Crop damage: Aggressive stalk tunneling
Corn Insects

Western Bean Cutworm

- Life cycle: Complete metamorphosis
- Damaging stage: Larva
- I.D.:
- Crop damage:
Insect Pests of Soybeans

- Considered Occasional Pests
- Commonly defoliators
- Pod-feeding can also occur
- Aphids and Spider Mites remove sap (plant stress) and may be the vector for some plant viruses
Soybean Insects

Bean leaf beetle

- **Life cycle**: Complete metamorphosis
- **Damaging stage**: Adult
- **I.D.**: Black triangle behind head
- **Crop damage**: Defoliation and pod-feeding
- **Vector** for Bean Pod Mottle Virus
Soybean Insects

Japanese beetle

- **Life cycle:** Complete metamorphosis
- **Damaging stage:** Adult
- **I.D.:** Round, green and brown beetle
- **Crop Injury:** Defoliation
Soybean Insects

Grasshoppers

- **Life cycle:** Incomplete Metamorphosis
- **Damaging stage:** Nymph to Adult
- **Crop Injury:** Defoliation
Soybean Insects

Aphid

- **Life cycle:** Gradual metamorphosis
- **Damaging stage:** Nymph and adult
- **Identification:** Small yellow aphids with distinct black cornicles (tail pipes)
- **Note:** No other species of aphids colonize soybeans
Soybean Insects

Two-spotted spider mite

- **Life cycle:** Gradual metamorphosis

- **Damaging stage:** Nymph and adult

- **I.D.:** Small parasite located on underside of leaves produces a webbing
Alfalfa Insects

Alfalfa weevil

- **Life cycle**: Complete metamorphosis
- **Damaging stage**: Larva and adult
- **Larva**: Legless, yellowish-green with white stripe down back;
- **Adult**: Small brown snout beetle
Alfalfa Insects

Potato leafhopper

- **Life cycle:** Gradual metamorphosis
- **Damaging stage:** Nymph and adult
- **I.D.:** Light green wedge-shaped insect
- **Crop injury:** Reduce crop quality and vigor
Wheat Insects

Aphids

- **Life cycle:** Gradual metamorphosis
- **Damaging stage:** Nymph and adult
- **I.D.:** Greenbug, English aphid and bird cherry-oat aphid
- **Crop Injury:** Reduce crop vigor and can be vector of some wheat viruses
Wheat Insects

Armyworm

- **Life cycle:** Complete metamorphosis
- **Damaging stage:** Larva
- **ID:** Larva has orange-white border stripes on each side
- **Crop damage:** Defoliation. Number of larva feeding in mass where name comes from
Wheat Insects

Cereal leaf beetle

- **Life cycle:** Complete metamorphosis
- **Damaging stage:** Larva and adult
- **I.D.:** Slender, shiny metallic insect
- **Crop Damage:** Defoliation
Insect Management and Tactics

- Should use IPM
- Insecticides should only be used after other tactics have been explored
- ETs should be reached before use of insecticides
Insect Control Options

• **Non-chemical**: Usually inexpensive and do not cause undesirable side effect in the environment

• **Cultural**: Reduction of pest densities through changes in farming practices or by avoiding situations that favor an increase in pest numbers.
  
  – Crop rotation
  – Planting resistant genetics
  – Tillage
  – Time of planting and/or harvest (alfalfa)
Insect Control Options

- **Biological:** Reduction of pest populations by means of living organisms

- **Applied biological control:** Predators, parasitoids, or disease pathogens are introduced artificially into an ag ecosystem.

- Parasitic wasps considered a successful example

- Microbial insecticides (Bt products)
Predators

- Insect predators kill pests by direct attack.
- Common in field and forage crops
- Large number in field indicates possible natural control
Assassin Bugs

• Life Cycle: Complete Metamorphosis
• Beneficial Stages: Nymphs and Adults
Bigeye Bugs

- Life Cycle: Complete Metamorphosis
- Small and their front legs are modified for grasping prey
- Use their piercing, sucking mouthparts to prey on small insects, eggs and mites (both nymphs and adults)
Damsel Bugs

• **Life Cycle:** Complete Metamorphosis

• Thin bugs about 1/2” long with adult and nymph differing with the formation of wings on adult

• Piercing-sucking mouthparts that inject a toxin and suck out body fluids

• Feed on aphids, insect eggs, and larvae of many insects
Green Lacewings

• Also called Aphid Lions
• The larvae stage of lacewing flies
• Small, grayish-brown alligator-shaped larva with sickle-like mandibles used to suck body fluid from prey
• Feed on aphids, thrips, mites, insect eggs and small caterpillars for two to three weeks
Ground Beetles

• Adults are dark, shiny and somewhat flattened growing to lengths up to 3/4” long

• Larvae have a large head with well-developed jaws for catching and holding prey. They are light tan to black in color, have 3 pairs of true legs and 2 soft projections on the tail.

• Important predators of black cutworm and other soft-bodied insects
**Lady Beetles**

- Larva is soft-bodied and alligator-shaped. Newly hatched larva is gray or black with no bright markings. Older larva has bright yellow markings.

- Both stages feed mainly on aphids with the larva eating 11-25/day and the adult eating 16-56 per day.
Minute Pirate Bug

- Feed on spider mites, aphids, small caterpillars, and insect eggs
- This is the gnat-like insect that bites humans
Other Beneficials

- Predaceous Stink Bugs
- Soldier Beetles
- Spiders
- Syrphid Fly Larvae
- Parasitoids: Parasitic insects that develop as larvae in or on the host insect. Usually kill host by consuming all or part of host’s body
- Parasitic Wasps – an example
Insect Pathogens

- Insect pathogens are occasionally responsible for suppressing outbreaks of pest insects.
- Fungi are the most important group spreading through an insect population rapidly during wet seasons.
Chemical Insect Control

• When insecticides are properly used they can be an integral part of an insect management program.
• Decision to use insecticides should be based upon scouting and Economic Thresholds
• Overuse not economically or environmentally sound
• Total eradication of insect not a desired outcome
• Contact poisons
• Systemic insecticides: Absorbed by plant and moved to other parts
Chemical Insecticides

- **Organophosphates:** Synthetic organic compounds that contain phosphorus. Lorsban (chlorpyrifos), malathion, Penncap-M (methyl-parathion), Aztec (tebupirimphos), Counter (terbufos)

- **Carbamates:** Synthetic organic compounds derived from carbamic acid. Sevin (carbaryl)

- **Pyrethroids:** Synthetically produced compounds closely related to pyrethrum, a botanical insecticide

- **Nicotinoids:** Chemically related to the toxin, nicotine, found in tobacco (Poncho, Cruiser, Gaucho) commonly applied to seeds
Chemical Insect Control

- Soil-applied insecticides: Applied before planting, at planting (band or in-furrow) or post-emerge
- Foliar-applied Insecticides: Usually applied to control insects feeding on above-ground crop tissues
- Usually applied in response to economic infestation
- Seed treatments: Used to control many secondary pests, such as wireworms and seedcorn maggots
Insecticide Performance

- No insecticide provides 100% control
- No insecticide will kill all insects
- Application mistakes frequently responsible for failures. Proper placement important
- Environmental conditions may alter effectiveness of insecticides
- Moisture may affect performance
- pH of the soil and/or water may affect performance
- Resistance and enhanced microbial degradation
Insect Control with Transgenic Hybrids

- Transgenic corn hybrids contain genes of Bacillus thuringiensis that enable the plant to produce an insect-specific toxin (Cry proteins)
- Producers are encouraged to use non-Bt hybrids as a part of a fully integrated approach to pest management.
- Utilizing an IPM approach, resistance development to a Cry protein, or insecticide, can be prevented or delayed