Mid-Atlantic Region CCA Exam

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Competency Area 3 – Management of Insects and Other Invertebrates

- Major Insect Pests of Field Corn, Soybeans, Wheat and Alfalfa
- Key Characters of Major Pests: life cycle; when damage occurs in season; damage symptoms; and alternative controls

Know factors that affect insect growth and development – e.g. crop growth; crop production practices; weather factors; natural controls

True Armyworm in Field Corn

Life Cycle

- Moths emerge in April
- Lay eggs on grasses
- Larvae feed on small grains and field corn then pupate in soil or under debris
- 3-4 generations/year
- Overwinter as partially grown larvae

Damage

- Larvae feed in late spring-early summer on early mid-whorl stage corn
- Attack small/seedling stage corn in no-till
- Do not damage growing point

Alternative Controls

- Avoid planting near small grains
- Avoid planting into no-till small grain cover crop
- Bt Corn – for small larvae only present at planting time/ not-till covers
Slugs in Corn
Life Cycle

- Overwinter as egg, immature or adult
- Feed on seedling corn leaves, young sprouts, and seeds

Damage

- Feeding occurs in spring when cool and wet on young (spike-3 leaf stage) corn leaves, sprouts, seeds
- Favored by no-till; surface residue; wet conditions; poor seed furrow closer

Alternative Controls

- Cultural practices
  - conventional tillage one season
  - min. tillage to reduce surface trash
  - starter fertilizer
  - trash cleaners

Stinkbugs in Field Corn
Life Cycle

- Egg, nymph (immature), adult
- Overwinters as adult in leaf litter or debris
- Move to wheat in April, then to corn in late spring

Damage

- Feeds on seedling plants
- Inserts mouthpart into stalk and growing point
- Causes deformed, twisted plants, wilting of new leaves and elongated feeding holes
- Most susceptible at spike to 4-leaf stage and corn no-tilled into wheat

Alternative Controls
- Plant early
- Tillage to reduce harborage/overwinter sites
- Good seed slot closure – prevent feeding below ground

**Northern & Western Corn Rootworm**

**Life Cycle and Life History**

- Overwinter as egg
- *Larvae* hatch mid-late May
- Feed on roots 3-4 weeks
- Pupate and males emerge first as early as late June
- *Adults* emerge late summer and lay eggs at base of corn plants

**Damage and Conditions Favoring Development**

- Damage by *larvae feeding on roots* in late May-early June
- Favored by continuous corn
- Favored by heavy soils

**Alternative Controls**

- Crop rotation still works
- No variants – beetles laying eggs in soybeans documented in our area
- No extended diapausing beetles – stay in soil 2 years documented in our area

**European Corn Borer in Field Corn (First Generation)**

**Life Cycle**

- Overwinter as *larvae*
- Pupate in spring
- Moths lay *eggs* on corn in whorls
- Peak larval activity in mid-June
- Second Generation: late corn and vegetables

**Damage**

- *Feeding* by 1st generation peaks in mid-June-affects translocation of nutrients
• Plants 18-24 inches in whorl stage most susceptible

**Alternative Controls**

• Avoid early planting,
• Genetically resistant varieties/ BT corn
• Natural Controls: Nosema; fungal pathogens
• Deep Plowing – must be done in an area
• Released Parasites: Lydella thompsoni; Trichogramma

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**Black Cutworm in Field Corn**

**Life Cycle**

• Overwinter as full grown larvae or pupae
• Moths emerge in March
• Lay eggs on weeds
• Larvae hatch and feed on weeds then corn (1 generation/year)

**Damage**

• Damage in late spring on spike to 5 leaf corn
• Leaf feeding/ Shredding
• Cut plants
• Feeds on growing point

**Alternative Controls**

• Avoid by minimum or no-till plantings
• Avoid late planting and poorly drained soils
• Early heavy growth of broadleaf weeds favors moth egg laying – early burn down with herbicides
• Limited activity with Bt corn – small larvae only

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**Seed Corn Maggot in Field Corn**

**Life Cycle**

• Overwinters in soil as pupae
- Flies emerge as early as February
- Prefer to lay eggs in moist, freshly plowed soil with decaying organic matter or manure
- Eggs hatch in 1-9 days
- Larvae active- as low as 40 degrees F

**Damage**

- Feed on seed content
- Death of seed or poor germination
- Occurs with cool, wet seasons and in highly organic soils

**Alternative Controls**

- Shallow planting in well-prepared seedbed to encourage quick germination
- Fall plowing of manure
- Early plowing of cover crops
- Complete plowing of cover crops

**Common Stalk Borer in Field Corn**

**Life Cycle**

- Overwinter as eggs on weedy plants (esp ditch banks)
- Larvae emerge in May, move to corn and move deep into whorls
- Moths emerge late summer

**Damage**

- Feeds from spike to 4 leaf
- Larvae feed deep in whorl and then bore into stalks
- Feed on the growing point eventually boring into stalk

**Wireworms in Field Corn**

**Life Cycle**

- Overwinter as larvae
- Five year larval life cycle
- **Adults** emerge in summer – click beetles
- Very responsive to moisture gradients in soil

**Damage**

- **Feed on seeds** as well as the growing point of young plants
- Appears as missing plants in field/ wilting or death of terminal shoots
- Problem in cool, wet springs; fields that were grassy or weedy the previous year

**Alternative Controls**

- Summer plowing of fallow fields
- Crop rotation away from small grains
- ??????

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**Fall Armyworm in Field Corn**

**Life Cycle**

- Migratory pest, moths found in our area in June
- Moths lay eggs on later planted corn
- **Larvae** feed in the whorl of pretassel stage corn in August
- Larvae most active early morning and late evening

**Damage**

- Numerous **ragged holes**
- May prevent formation of normal ears
- General a problem in silage corn

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**Grasshoppers in Soybeans**

**Life Cycle**

- Egg, nymph, **adult**
- Overwinter as eggs/nymphs
- 3-4 generations per year
- Move out of ditch banks into fields
Damage

- Defoliates plants as seedlings or later in season
- Can feed on pods
- Dry weather favors grasshoppers
- High populations: field edges; no-till plantings behind small grains

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**Green Cloverworm in Soybeans**

**Life Cycle**

- Egg, larvae, pupae, adult
- Moths lay eggs on underside of leaves starting in late June
- Larvae first detected in July and peak mid-Aug

**Damage**

- Window Boxes – for small larvae
- **Irregular Holes between main veins** – larger larvae

**Alternative Controls**

- Fungal pathogens play major role in control
- Natural Enemies

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**Spider Mites in Soybeans**

**Life Cycle**

- Egg, larvae, nymph, adult
- Adults overwinter in weedy and non-crop areas
- Move into crops as temperatures increase
- Development favored by hot, dry weather
- Populations generally explode during bloom

**Damage**

- **Yellow discoloration**
Stunted Plants
- Feed on cell contents
- First detected on field edges but can balloon into fields

**Alternative Controls**

- Natural Predators
- Weather Conditions favoring pathogenic fungi

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### Mexican Bean Beetle in Soybeans

**Life Cycle**

- Overwinters as adult
- Adults lay eggs in early planted fields
- **Larvae feed**, then pupate on plants (3 generations/year)

**Damage**

- Larvae defoliate early planted full season and double crop beans
- Hot dry weather reduces populations

**Alternative Controls**

- Trap crops
- **Parasitic wasps**
- Predaceous stink bugs
- Weather factors

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### Corn Earworm in Soybeans

**Life Cycle**

- Overwinters as pupae (in soil)
- Moths migrate from south, lay eggs on corn
- **Larvae** feed, pupate
- Moths emerge and move to soybeans in August
Damage

- Young larvae feed on terminal leaves, flowers, pods
- Older larvae feed on pods and developing seeds
- Mainly a pod feeder

Alternative Controls

- Mostly a problem in late-planted, open canopy fields
- Natural fungal pathogens – wet and humid conditions
- Natural Enemies- no released parasites

Stinkbugs in Soybeans
Life Cycle

- Overwinter as adults and become active in spring on wild hosts
- Lay eggs in fields in late June but generally a problem late in the season

Damage

- Mechanical injury to seed
- Can transmit a disease organism
- You seed damage = greater yield loss; late season infestations reduce oil content and germination of seeds

Bean Leaf Beetle in Soybeans
Life Cycle

- Overwinters as an adult beetle
- Active in April-early May
- Larvae feed at base of stem or on roots
- Adults present again in late July-August

Damage
- Prefer young plant tissue
- **Pod damage** – rarely on developing bean
- Generally problem on early planted beans; defoliation and reduced stands

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**Alfalfa Weevil in Alfalfa**

**Life Cycle**

- Overwinters as adult and egg
- Larvae feed on leaves 3-4 weeks
- Pupate on plant or on ground (1 generation/year)

**Damage**

- Larvae feed on leaves in late March-early April
- Pest of 1st cutting and sometimes regrowth for second cutting

**Alternative Controls**

- Resistant varieties
- Early cutting
- Biocontrol: natural enemies/diseases
- Winter grazing
- Flaming

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**Potato Leafhopper in Alfalfa**

**Life Cycle**

- Egg, nymph, adult
- Adults migrate by wind arriving in late April
- Develop from egg to adult in 3 weeks when conditions favorable

**Damage**

- Nymphs and adult feed on 2nd and 3rd cutting alfalfa
- **Severe damage** also done to spring seeded alfalfa
- Pest during hot, dry seasons
Alternative Controls

- Early cutting
- Fungal Pathogens
- Resistant Varieties – Hoppergard

Blue Alfalfa Aphid
Life Cycle

- Egg, nymph, adult
- Occur in March-April – same time as pea aphid

Damage

- Damage to 1st cutting alfalfa
- Plants stunted
- Associated with spring black stem disease

Garden webworm in Alfalfa
Life Cycle

- Egg, larva, adult
- Overwinter as pupae, moths emerge in spring feed and larvae attack alfalfa in August

Damage

- defoliation and webbing

Alternative Controls

- cutting to reduce food supply and expose webs to natural predation

Aphids in Wheat
Life Cycle
• Egg, nymph, adult
• Overwinter as eggs or adult females
• More of a problem in early plantings
• Favored by mild winter and cool, dry spring

Damage

• Damage in fall (first 60 days after planting): vector BYDV, greenbug aphid injects toxin and get dead plants
• Damage in spring: Grain fill, dead plants, blased heads

Alternative Controls

• Natural parasites and predators
• Fungal Pathogens

True Armyworm in Wheat
Life Cycle

• Moths emerge in April
• Lay eggs on grasses
• Larvae feed then pupate in soil or under debris
• 3-4 generations/year
• Overwinter as partially grown larvae

Damage

• Larvae feed on leaves in early May
• Young larvae on upper leaf surface
• Older larvae- leaf blades
• Last instar does most of the feeding
• Heads clipped when all leaves consumed

Cereal Leaf Beetle in Wheat
Life Cycle
- Overwinter as adult
- Emerge March, lay eggs for 2-3 weeks
- Larvae feed for 3 weeks, pupate
- Adults emerge and feed on corn

Damage

- Larvae first feed on stem leaves
- Reduce Photosynthesis
- Move to flag leaf in late April-early May
- Most important defoliator

Alternative Controls

- Early planting
- Introduced parasites
- Weather factors – late winter warm up followed by cool early spring

Grass Sawfly in Wheat
Life Cycle

- Adults emerge in April
- Lay eggs on leaf margins until early May
- Larvae enter soil in mid-June for summer diapause (prepupal) stage

Factors Influencing Insect Population Growth, Decline and Management Decisions
Cultural Practices

- No-Till Favors: slugs, stinkbugs, cutworms, seed corn maggot and cutworms in corn; grasshoppers in soybeans
- Planting Date: late planting favors stinkbugs, cutworms and fall armyworm in corn; late planted wheat more susceptible to cereal leaf beetle; late planted, open canopy soybeans more susceptible to corn earworm

Environmental Factors
Hot, Dry Weather: increases spider mites and grasshoppers in soybeans; decreases Mexican bean beetle in soybeans
- Cool wet weather: increase slug and seed corn maggot in corn
- High Humidity and Moisture: fungal pathogens of alfalfa weevil, green cloverworm and corn earworm

Crop Growth

- Alfalfa less than 12 inches tall = more susceptible to weevil and leafhopper damage
- Blooming Soybeans: spider mites
- Open Canopy Soybeans: corn earworm

Importance of Beneficial Organisms

- Alfalfa weevil: released parasites, fungal pathogens
- Aphids in Wheat and Alfalfa: predators, parasites and fungal pathogens
- Green Cloverworm and Corn Earworm: natural enemies and fungal pathogens
- Mexican Bean Beetle: parasitic wasps and predacious stinkbugs

Beneficial Organisms

- Predators: Feed directly on pest, consume prey
- Parasites: lay eggs in pest, larvae develop in pest
- Pathogens: fungi, bacteria and viruses

Mode of Action of Insecticides

- Contact – enters body wall by direct treatment of insect or treated surfaces
- Stomach – ingested and acts on digestive system
- Fumigant – absorbed through tracheal system as a gas
- Systemic – translocated through vascular system of plant, killing insect after feeding on host

Types of Pesticides

- Organophosphates and Carbamates
- Pyrethroids
- Chloronicotinyls – imidiachlorprid
- Naturallytes: Spintor
- Insect Growth Regulators
- Biopesticides:
  - Bts
  - insecticidal soaps
  - Neem tree extracts

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**Botanicals**

**Insecticide Resistance**

- Definition of Resistance: population no longer controlled with insecticides used at previously efficacious rates
- Resistance is inheritable, genetically linked trait
- Requires a lot of selection pressure
- It is not induced by low dosage habituation during life of an insect

**Factors Favoring Development of Resistance**

- Over dependence on insecticide
- Continued use of a single insecticide
- Continued use of insecticides with the same mode of action