HORT325: Vegetable Crop Production

Insect Management

Loss from Insects (and diseases & weeds)

• Reduced Yields
• Reduced Quality
• Increased Production & Harvesting Costs
• Increased Expense Through Control Measures

Goal of Insect Management

• Maximum control at minimal "cost"
  – "Cost" should include possible harm to environment
• Maximizing control requires recognizing onset of problem
  – Early infestations require less drastic control measures
  – Need to understand the biology of the insect
Insect Life Cycles

- Complete
  - Four distinct stages:
    - Examples of these insects are beetles and moths
- Incomplete
  - Hatch from eggs into tiny nymphs that resemble the adult stage
  - Many insects in this category have piercing, sucking mouthparts and suck juice from plants (also grasshoppers)
  - Adults have fully developed wings; nymphs cannot fly

Insect Injury to Plants

- Injury by Chewing Insects
  - Visible chewing on plant parts; include moths & beetles
- Injury by Piercing-Sucking Insects
  - Wounds generally invisible, but other symptoms visible
- Injury by Internal Feeders
  - Entry wound generally invisible; exit wounds may be large
  - What growth stage would you target control of these insects?
- Injury by Subterranean Insects
  - Some or all of their life-cycle may be below ground
  - chewers, sap suckers, root borers and gall insects

Insects as Disseminators of Plant Diseases

- Discovered in 1892 that honeybees spread fire blight bacteria between fruit trees
- Now known that more than 200 diseases are spread by insects (mostly viruses)
- How?
  - Creating an entrance wound
  - Transporting the disease organism on or in their body, and delivering the organism on or in the plant
  - Serve as an essential host for a portion of the life cycle of the disease causing organism
Beneficial Insects

• “There is no doubt that the greatest single factor in keeping plant-feeding insects from overwhelming the rest of the world is that they are fed upon by other insects”
• Considered in two groups:
  – Predators
    • Larger & Stronger than prey
  – Parasites
    • Smaller & Weaker than host, host survives at least for a time
• Any control measure should consider impact on beneficial insects

Control Measures

• Soil Insects
  – wireworms, white grubs, fire ants, cutworms, seed maggots and the sweet potato weevil
  – Often soil insects, especially cutworms, are common in uncultivated soil sites that have had grass and weeds growing the previous season
  – Controlling soil insects is much easier if done prior to planting

Control Measures

• Chewing Insects
  – Many chewing insects have a complete life cycle (except grasshoppers); therefore, depending on species, there may be one or two damaging stages
  – Control of chewing insects is basically twofold:
    • Monitor for eggs and small larvae that begin to feed
    • Monitor for the adults and control them when necessary
  – Control of these insects is important in the early infestation of the plant
Control Measures

• Sucking Insects
  – aphids, stink bugs, squash bugs, leafhoppers and spider mites
  – Usually attracted to the most succulent part of the plant
  – Major disease vectors
  – Control is easiest to obtain soon after the insects hatch from eggs

Pest Control with a Minimum Use of Chemicals

• Overuse of pesticides has a number of adverse effects:
  – Food products may contain unsafe pesticide residues if improperly treated with pesticide
  – Beneficial insects, earthworms and birds may be harmed or killed along with harmful insects if pesticides are carelessly used
  – Each time producers spray, they expose themselves to the possibility of inhalation or absorption of the toxin
  – Careless use of pesticides near water may contaminate water supplies
  – Misuse of pesticides can lead to the development of chemical resistance in the target pest
  – The use of pesticides can lead to outbreaks of secondary pest species

Non-Chemical Insect Control

• Resistant Plant Cultivars
• Cultural Practices
• Mechanical Control Methods
• Biological Control Methods
  – *Nosema locustae* (Protozoan)
  – *Trichogramma* wasp
  – Green lacewings
  – Praying Mantis
  – Lady beetles
  *Biological control methods require a certain pest population to maintain the population of biologicals*
Chemical Insect Control

- **Natural Insecticides**
  - Pyrethrum (flower extract), Nicotine (tobacco extract), Sabadilla (seed extract), Rotenone (root extract), *Bacillus thuringiensis* (bacterial extract), Safer's Insecticidal Soap®
- **Synthetic Insecticides**

Rules for Insecticide Application

- Only use registered products and follow label
  - Regardless of whether it is “natural” or “synthetic”
- Apply insecticides based on close field monitoring
  - Apply early during infestation
- Rotate insecticides to avoid build-up of resistant insects
- Select insecticides and application timing to minimize damage to non-target organisms
- Should be part of an Integrated Pest Management (IPM) program that includes all available methods for control