Integrated Pest Management

• System or strategy
• Utilizes all methods of pest suppression
• Compatible
• Maintain pests below economically damaging level
  – Environmentally sound
  – Economically sound
IPM Tactics

Pesticides

Biological controls

Physical/mechanical controls

Cultural/sanitation practices

Texas Agricultural Extension Service
Biological Control in Vegetables

- Relatively fast growing annual crop
- Natural enemies may not develop
  - Especially early in crop development
- Natural enemies must come from adjacent areas or releases
- Maintain natural enemies with soaps, oils and *Bacillus thuringiensis*
Six spotted thrips

Western flower thrips
Predatory Mites
Seed corn Maggot

Adult

Larva
Control of Seed corn Maggot

- Small gray fly
- Maggot attacks germinating seeds or new transplants
- Problem only in cool conditions
- Destroy all residue and allow for residue decomposition
- Avoid cucurbitis after root or cole crops
- Preventative seed treatments
Crickets
Crickets

- Generally not an economic problem
- Damage from eating flowers can result in poor pollination
- Some fruit feeding, especially at full slip on cucurbits
- Control can be achieved by discing field post harvest or use of Sevin
Cricket Control in the Home

• Reduce outdoor lighting
  – Low pressure sodium vapor
  – Yellow incandescent
• Entry points caulked and sealed
• Insecticides
  – Baits
  – Liquids
Flea Beetles

- Small
- Adults have well developed hind legs
- Will eat small holes in leaves
- May feed on fruit below calyx
- Larvae feed below ground
Control of Flea Beetles

- Eliminate plant stress from diseases and moisture
- Organic control includes pyrethrins and rotenone
- Treat only when present on the fruit
- Chemical methods include Sevin, Thiodan and Lannate
Aphids

• Many different species

• Most common
  – Melon aphid
  – Green peach

• Damage characterized
  – Leaf distortion
  – Sooty mold
  – Virus transmission
  – Loss of vigor
  – Stunting
Control of Aphids

• Cultural control
  – Row covers prior to bloom
  – Silver reflective plastic mulches
  – Control weeds
  – Do not over fertilize
Control of Aphids (continued)

- Biological control
  - Many natural enemies including lady beetles, lacewings, syrphids and parasites
  - Use of oils and soaps
  - None prevent virus transmission but may reduce spread of the virus

- Chemical control includes Admire, Monitor, Lannate, Metasystox-R, Capture and Thiodan
Spider mites

Two spotted

Red carmine
Spider mites

- Four stages: Egg, six-legged immature, eight-legged immature, adult
- Sucking insect
  - Destroys chlorophyll
  - Stippling
  - Reduced yield and quality
- Short generation time
Control of Spider mites

• Biological control is good
  – Lady beetles, lacewings, pirate bugs
  – Thrips
  – Predatory mites

• Cultural controls
  – Minimize dust
  – Control watering practices (humidity)

• Chemical control is difficult
Beet Armyworm Egg Mass
Beet Armyworms

- Multiple generations
  - Primarily a foliage feeder but can feed on fruit
- Feeding is usually superficial
  - Single or closely grouped holes
  - Decay organisms enter wounds
Control Tactics for Beet Armyworms

• Sanitation is important
  – Remove alternative host sites
• Biological control is critical
  – Predators important in reducing egg numbers
  – *Cotesia marginiventris* reduces larval numbers
• Chemical control includes *Bt*, Lannate, Monitor
Cabbage looper Adult
Cabbage looper Egg
Cabbage Loopers

- Multiple generations
- Egg laid singly on leaf
- Damage characterized by
  - Skeletonization of leaf
  - Fruit feeding on surface
- Control rarely needed on cucurbits
Control Tactics for Cabbage Loopers

• Many natural enemies
  – Egg predators
  – *Trichogramma* spp
  – Viruses

• Chemical control includes *Bt*, Asana and Lannate
Cucumber Beetles

- Overwinter as adults
- Eggs deposited at the base of the plant
- Larvae can feed on stems and on the base of the plant
- Adults congregate in flowers
  - Chew holes in leaf
  - Scar runners
  - Scar young fruit
Control of Cucumber Beetles

- No cultural control options
- Biological control is limited
  - Tachinid fly
  - Rarely provides economic control
- Organic control includes pyrethrins and rotenone
- Chemical control includes Sevin, Asana or Thiodan
Leafhoppers

- Adults are green
- Eggs laid below the leaf surface
- Nymphs pale green, move sideways
- Sucking mouthparts
  - White stippling
  - Leaf yellowing
  - Green spots on fruit
  - Leaf drop
Control of Leafhoppers

- Prevent moisture stress
- Maintain 6 to 8 healthy, non-infested terminal leaves
- Row covers prior to bloom
- Destroy crop residue
- Rarely treat however easily controlled by a number of compounds
Liriomyza sativa
Liriomyza trifolii - Leafminers

- Many species present
- Adults lay eggs along leaf edges
  - Will also host feed
- Damage is by larvae
  - Feed between leaf tissue layers
- Damage characterized
  - White tunnels
  - Leaf drying
  - Reduction in yield
  - Plant loss
Leafminer larva  Leafminer tunnel
Control of Leafminers

• Many parasites are present
  – Spraying for other pests usually causes outbreak
• Prevent moisture and disease stress
• Row covers
• Monitor adults with sticky cards
• Chemical control includes Avid or Agrimek, Vydate, Monitor and Pounce or Ambush
False Chinch Bugs

- Small
- Various shades of gray
- Breeds in grassy areas
- Desiccates
False Chinch Bug Nymphs
Control of False Chinch Bugs

- Cultivate or burn adjoining grasslands
- Flooding can help, especially when nymphs are present
- Treat adjoining areas
- Chemical methods include Thiodan
Sap Beetles

- Adults are small
- Brown or black
- Eggs laid in fruit
- Damage occurs on fruit near maturity
- Also enter through other wounds
Control of Sap Beetles

- Become more of a problem late in the season
- Remove or disc nearby rotting fruit
- Minor pest so no insecticides registered
Stink Bugs

- Various color forms
- Sucking insects
- Multiple generations
- Damage includes
  - Growth distortion
  - Irregular surface
  - Internal spots
Control of Stink Bugs

- Monitor adjacent weedy fields and ditch banks
- No viable biological control
- Treat at egg hatch
- Chemical methods include Asana and Monitor
Squash Bugs

- Adults 0.5 inches
- Dark gray with orange abdomen
- Damage includes
  - Nymphs in clusters
  - Leaves droop
  - Leaves dry out
Squash bug Eggs

Squash bug Nymphs
Squash bug Damage
Squash Bug Control

• Cultural Control
  – Destroy crop residue
  – Reduce overwintering sites
  – Use of row covers
  – Tolerate high numbers

• Chemical control includes Asana and Thiodan
Squash Vine Borer
Control of Squash Vine Borer

• Cultural control
  – Rotation away from cucurbits
  – Destroy all crop residue
  – Natural control marginal with egg parasite

• Chemical control will work if applied early
  – Alternatives include Sevin and Thiodan