DIAGNOSING VEGETABLE PROBLEMS

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Master Gardener In-Depth Plant and Pest Diagnostic Training
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2 Primary Injury Types:
Chewing
Sap-sucking
**Corn Earworm**

- **Corn:** caterpillars feed on new silks & ear tips; reduce pollination & damage ear tips; allow entry of molds & attract other insects (sap beetles, earwigs)

- **Cultural control:** Early crops avoid injury (silk before mid July)

- **Protect young silk:** difficult to control worms once inside ear tip

- **Chemicals:** carbaryl, permethrin, pyrethrin, neem oil, oils applied to silks (reapply every few days)
TOMATO HORNWORM

- LARGE green caterpillars with white stripes & horn on tail
- Feed on tomato, eggplant, potato
- Consume large amounts of foliage and buds in a short time period
- Remove by hand
- Chemicals: Bt (Dipel, Thuricide), spinosad, many others
- Parasitic wasp – white cocoons on caterpillars
CABBAGE WORMS

- Two species: Imported cabbage butterfly, Cabbage looper (moth)
- Caterpillars chew large holes in leaves; produce abundant frass (poop)
- Bt (Dipel, Thuricide), spinosad (Success, Entrust) – very effective
- Row cover fabric – cover plants to prevent egg-laying

Cabbage butterfly (above) and cabbage looper (below)
Leafminers in Leafy Veggies

- Adults – Small flies
- Larvae – White to cream maggots
- Winding trails on leaves, white blotches
- Scout regularly, >1 mine/leaf
- Natural enemies (Paper wasp)
- Row covers
- Spinosad (Success, Entrust) insecticide
SQUASH BUG

- Adults & nymphs suck sap from plant leaves, stems & fruit
- “Sudden wilt” – disruption of xylem vessels
- Congregate in plant debris under plants
- Cultural controls: Remove garden debris in fall, nearby woodpiles or other protected sites (adults over winter)
- Hand pick or destroy eggs & nymphs
- Chemicals: spray when first detect nymphs, drench undersides of leaves & stems
  - kaolin clay (Surround), malathion, carbaryl, neem oil
**APHIDS (MANY SPECIES)**

**ONLY SOME VECTOR VIRUS DISEASES**

**Vector viruses:**
- Green peach aphid
- Potato aphid
- Melon aphid
- Tomato, pepper
- Squash, pumpkin, melon, cucumber

**Diagnistics:**
- Aphids noticed in early summer
- Virus symptoms often develop later

**Non-persistent virus transmission**

**Watermelon mosaic virus (B & C)**
**Pepper mottle virus (D)**
**Alfalfa mosaic virus (not shown)**
Leafhoppers (Many species)

Beet Leafhopper

More severe in So UT

Diversity of host plants

Beet Curly Top Virus

Tomato, pepper, beet weeds (Russian thistle), ornamentals, many vegetables

Infected seedlings die before flowering

Older plants: yellow, stunted

Leaves: twisted, thickened, purple veins

Fruits: ripen prematurely

Non-persistent virus transmission (brief feeding – infections “spotty”)
Tomato spotted wilt virus

Broad host range: veggies, weeds, fruits, ornamentals

Symptoms:
- stunting & yellowing
- fruit color distortion (ringspots)
- leaf necrosis
- plant dieback

Infected seedlings!

Onion thrips & Western flower thrips

Persistent virus transmission
Infection foci & spread
DIAGNOSING DISEASES OF VEGETABLES
UTAH: ENVIRONMENTAL STRESSES

Drought Conditions

Utah Hardiness Zones
utahpests.usu.edu/uppdl
Culture fungi, bacteria
ELISA for viruses
DISEASES – POTATOES, TOMATOES, PEPPERS
**Bacterial Leaf Spot**

- *Xanthomonas campestris*
- Occasional on tomato and peppers
- Overwinters on crop debris or is introduced on seed or transplants
- Requires warm, moist conditions
BACTERIAL LEAF SPOT
Early Blight of Tomato/Potato

- *Alternaria solani*
- common on tomato and potato
- overwinters on infected crop debris
- requires warm, moist conditions
- older foliage affected first
EARLY BLIGHT

Key symptoms:
- bulls-eye spot on older leaves with yellow halo
- black, sunken spot on stem end of fruit – but fruit not normally affected in Utah
Late Blight

- *Phytophthora infestans*
- tomato, potato
- only occasional in Utah
- overwinters on plant debris or introduced by wind-blown spores
- needs cool, moist conditions
LATE BLIGHT
Bacterial Leaf Spot  Early Blight  Late Blight
**Powdery Mildew**

- *Leveillula taurica*
- affects all solanaceous weeds and crops, tomato, pepper, eggplant, potato
- does not overwinter in northern Utah; reintroduced on transplants or winds
- needs moderate temps, humidity
- common, but only debilitating in greenhouses
**Verticillium Wilt**

- *Verticillium dahliae*
- occasional problem under no crop rotation
- pepper, tomato, potato, eggplant
- needs cool, saturated conditions

“potato early dying”
SOILBORNE ROOT ROTTING FUNGI

- *Pythium, Phytophthora, Rhizoctonia, Fusarium*
- difficult to distinguish among them without culturing
- on seedlings: “damping off”
- common in overwatered gardens and greenhouses
Root Rots
DISEASES – CUCURBITS
**Powdery Mildew**

- *Podosphaera xanthii*
- Very common on melons, pumpkin
- Overwinters on plant debris
- Needs warm, humid conditions
- Noticeable after full vine growth; early to mid-August
Fusarium Wilt

- *Fusarium oxysporum*
- overwinters in soil debris for many years
- melons, squash, pumpkin
- needs cool soil temps, moderate moisture, and high soil pH for severe disease
- at higher temps, infections occur, but plants become stunted instead of wilting
Fusarium Wilt
Fusarium Wilt
Viruses
Fusarium, Leaf Spots, Bacterial Cankers

Late blight, Powdery mildew, Viruses, Wilts, Nutrient Deficiencies

Damping-off, Poor emergence

Post-harvest rots
Vegetable Disease Management

- Crop rotations (1-5 yr)
- Mulching to reduce splashing of spores onto foliage
- Drip irrigation
- Fungicides
  - Bordeaux mixture
  - Botanicals (garlic spray, neem oil)
  - Copper compounds
  - Potassium bicarbonate
  - Sulfur