

DIAGNOSING VEGETABLE PROBLEMS

Diane Alston and Marion Murray

Master Gardener In-Depth Plant and Pest Diagnostic Training
November 27, 2012





DIAGNOSING ARTHROPOD PESTS OF VEGETABLES

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)



662-0

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



Row cover

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

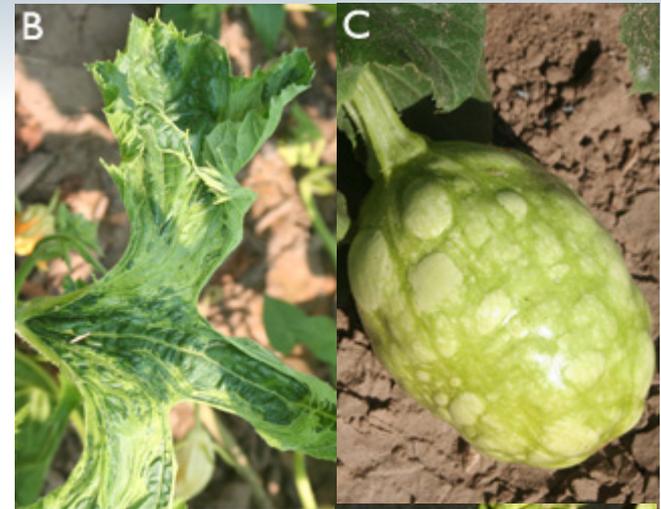


Vector viruses:
Green peach aphid
Potato aphid
Melon aphid

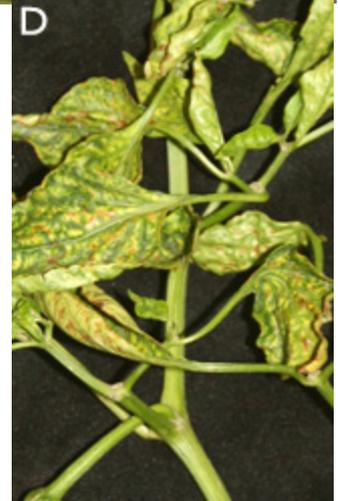
Tomato, pepper
Squash, pumpkin, melon,
cucumber

Diagnostics:
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



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”)

THRIPS

(ONION THRIPS & WESTERN FLOWER THRIPS)



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

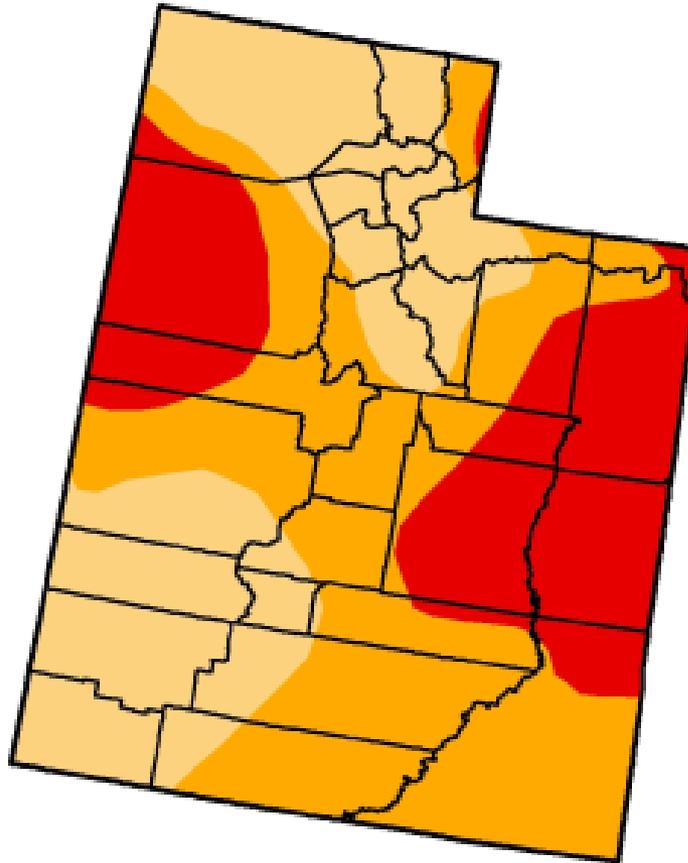
Infection foci & spread



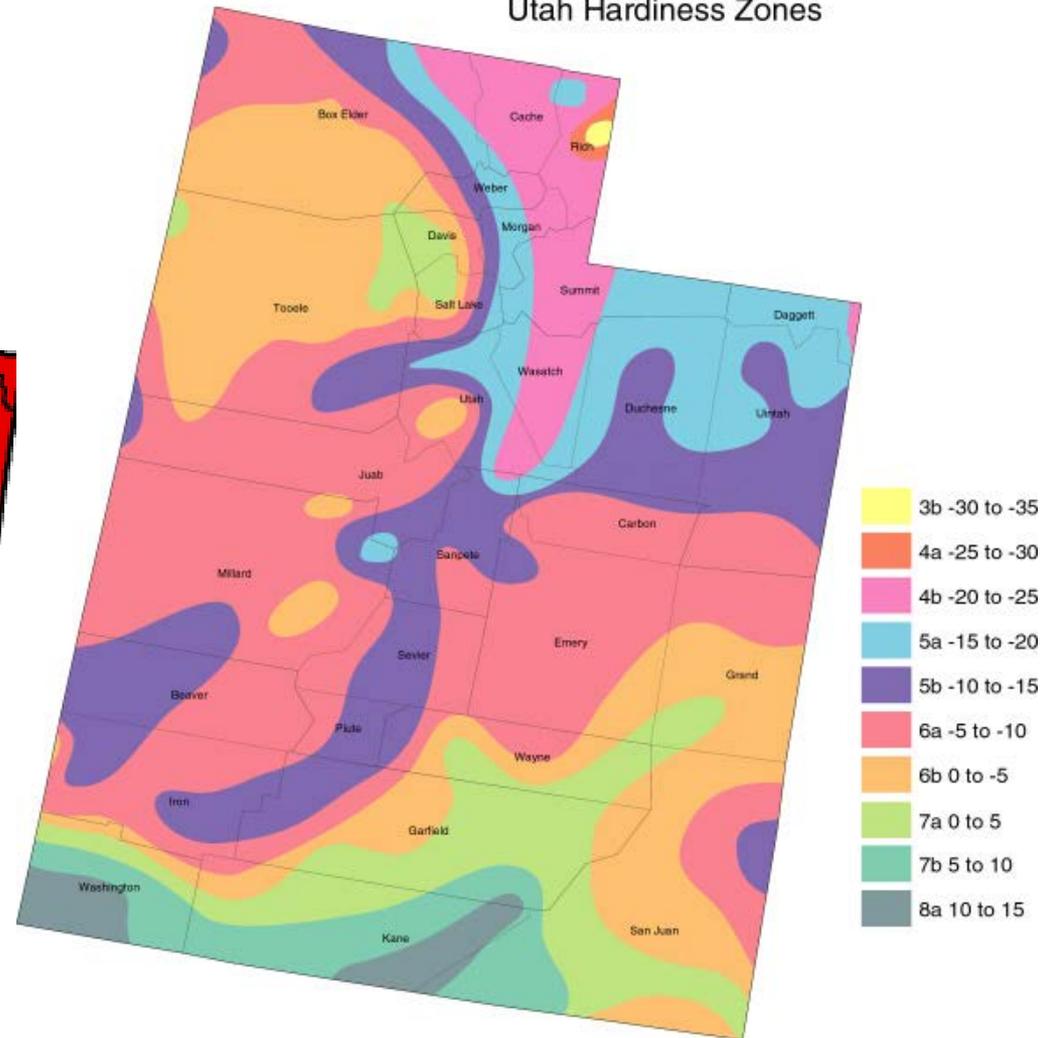
DIAGNOSING DISEASES OF VEGETABLES

UTAH: ENVIRONMENTAL STRESSES

Drought Conditions



Utah Hardiness Zones





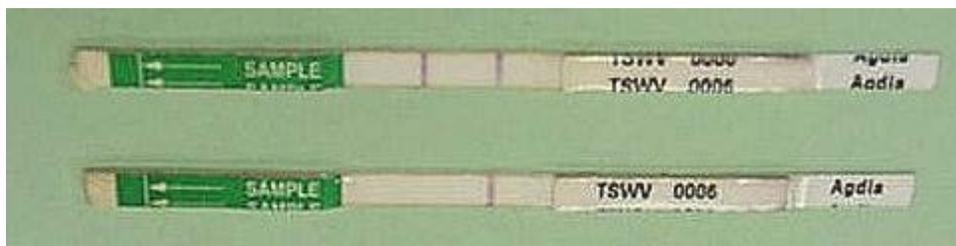
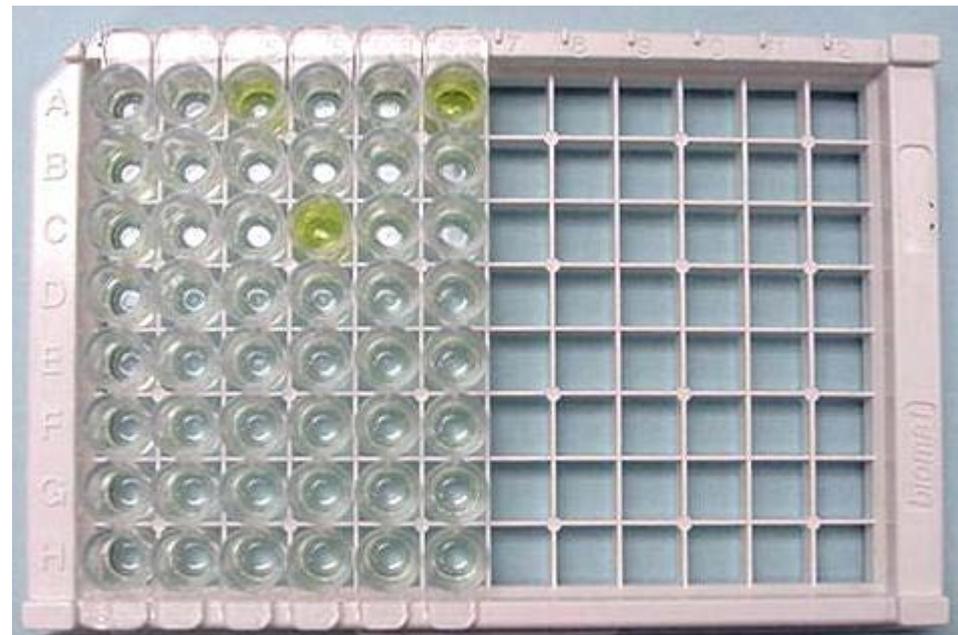




UPPDL DIAGNOSTIC PRACTICES



- ① utahpests.usu.edu/uppdl
- ① Culture fungi, bacteria
- ① ELISA for viruses



DISEASES - POTATOES, TOMATOES, PEPPERS

BACTERIAL LEAF SPOT

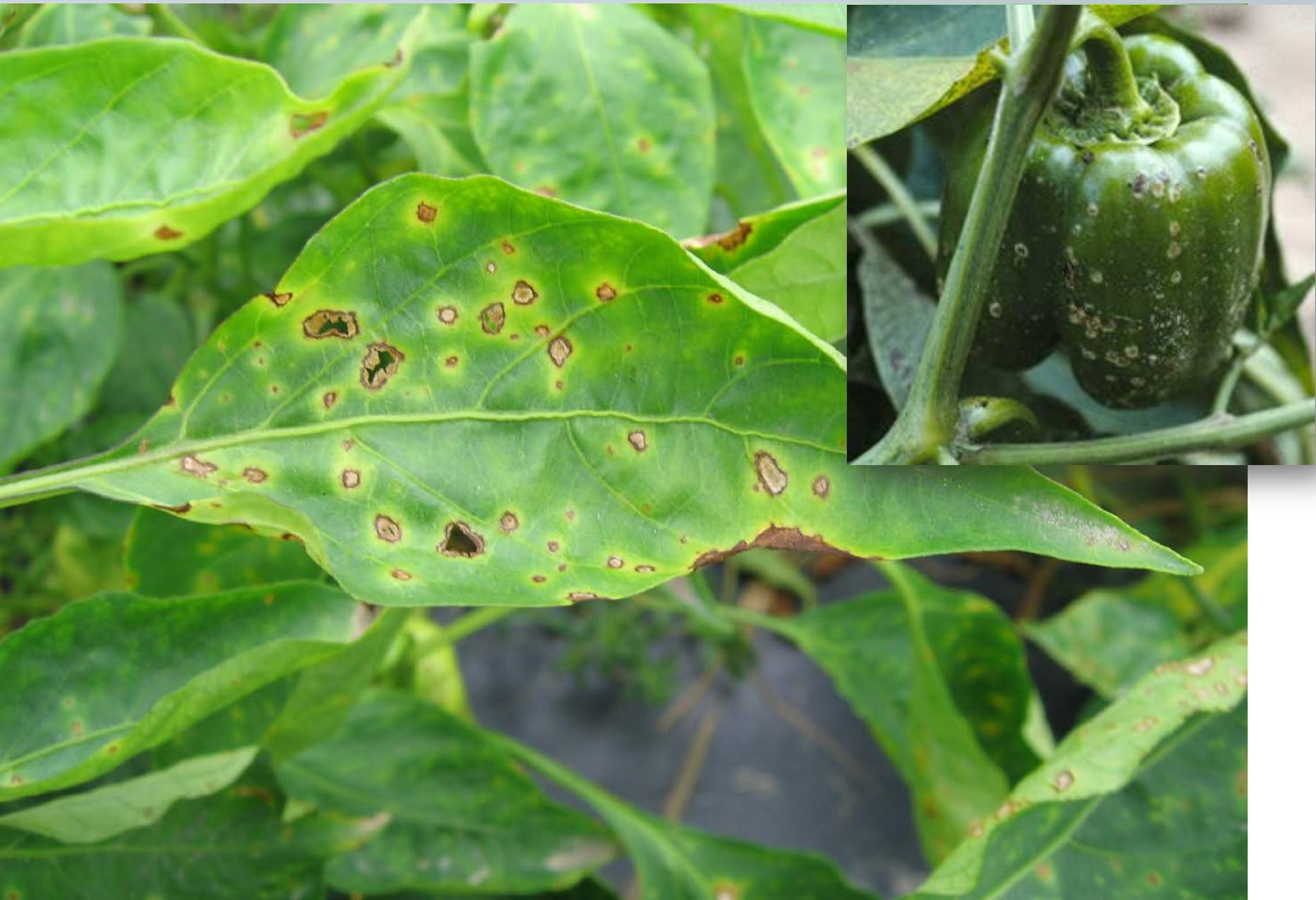
- ◎ *Xanthomonas campestris*
- ◎ Occasional on tomato and peppers
- ◎ Overwinters on crop debris or is introduced on seed or transplants
- ◎ requires warm, moist conditions



BACTERIAL LEAF SPOT



BACTERIAL LEAF SPOT



EARLY BLIGHT OF TOMATO/POTATO

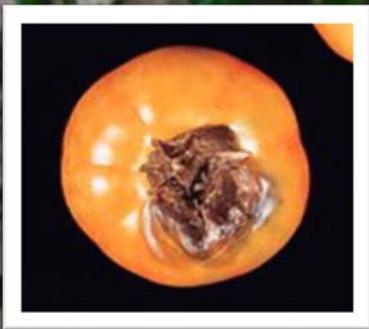


- ◎ *Alternaria solani*
- ◎ common on tomato and potato
- ◎ overwinters on infected crop debris
- ◎ requires warm, moist conditions
- ◎ older foliage affected first

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



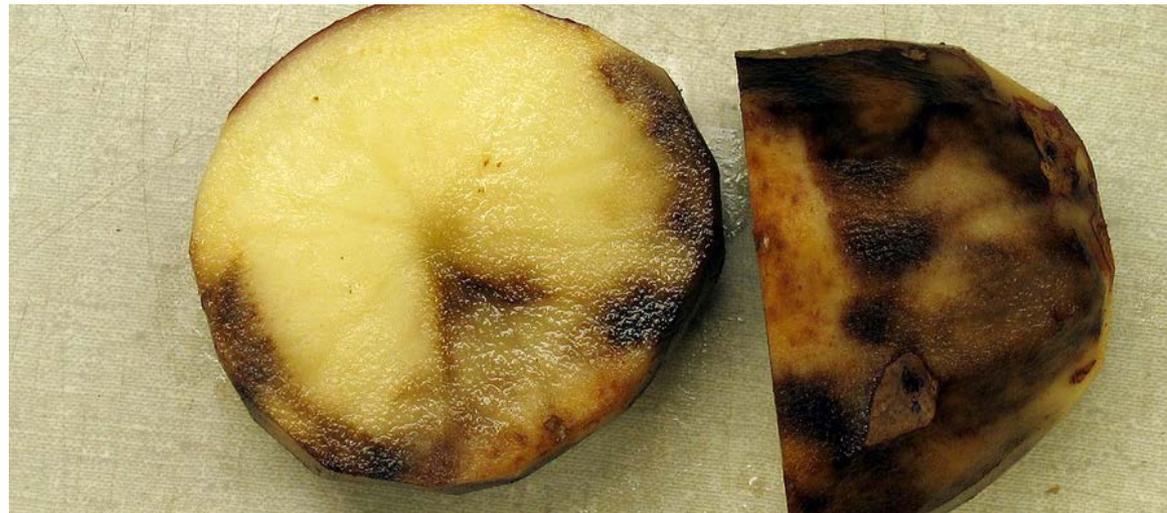
LATE BLIGHT - TOMATO



LATE BLIGHT



LATE BLIGHT





**Bacterial Leaf
Spot**



Early Blight



Late Blight

POWDERY MILDEW

- ① *Leveillula taurica*
- ① affects all solanaceous weeds and crops, tomato, pepper, eggplant, potato
- ① does not overwinter in northern Utah; reintroduced on transplants or winds
- ① needs moderate temps, humidity
- ① common, but only debilitating in greenhouses



POWDERY MILDEW



VERTICILLIUM WILT

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



“potato early dying”

VERTICILLIUM WILT



VERTICILLIUM WILT VS TOMATO RUSSET MITE



5365933

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





**Crown/Root
Rot**



Verticillium Wilt

DISEASES - CUCURBITS

POWDERY MILDEW

- ① *Podosphaera xanthii*
- ① very common on melons, pumpkin
- ① overwinters on plant debris
- ① needs warm, humid conditions
- ① noticeable after full vine growth; early to mid-August



POWDERY MILDEW



FUSARIUM WILT

- ① *Fusarium oxysporum*
- ① overwinters in soil debris for many years
- ① melons, squash, pumpkin
- ① needs cool soil temps, moderate moisture, and high soil pH for severe disease
- ① at higher temps, infections occur, but plants become stunted instead of wilting



FUSARIUM WILT



FUSARIUM WILT



FUSARIUM WILT



VIRUSES









April-May

June

July

August

September

October

Damping-off,
Poor emergence

Fusarium, Leaf Spots, Bacterial Cankers

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

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