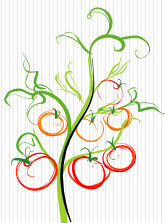



Tomato Diseases




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Entomology Department
Kansas State University




Outline

- Environmental Stresses
- Midwest Diseases
- Cultural Controls
- Chemical Controls






Environmental Stress




Which picture shows a disease?


- Nutrient Deficiency
- Weather
- Physiological Disorders


Blossom End Rot of Tomato




- Physiological disorder caused by calcium deficiency brought on by dry weather
- Certain varieties are more prone to damage
- Avoid excessive nitrogen fertilizer, and soil moisture fluctuations



Limit Environmental Stress




- Site selection: drainage
- Variety selection: resistance
- Scouting and Monitoring
- Recording keeping
- Remove diseased plants
- Maintain plant vigor



Tomato Diseases

- Virus
- Bacteria
- Fungi
- Nematodes



Viruses

TSWV:
Wilt, decline, death






Photo: Ned Towner


Ring spots





Veinal chlorosis



Mosaic & distortion



Mottling & distortion





UGA1327135

Alan N. Sparks, Jr., The University of Georgia, www.ipmnetgen.org

Vectors: whiteflies, aphids, thrips


Control of Viral Diseases



- Disease free plant material
- Monitor for thrips
- Resistant varieties


Bacteria

- spots
- wilts
- rots
- galls
- blights



Tomato Fruit with Bacterial Spot Symptoms

ipm.uga.edu/09/volume13/images/tomato_bacterial.jpg



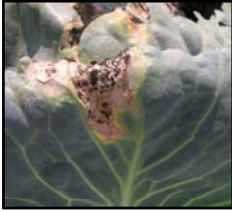
Bacterial Spot Bacterial Speck Bacterial Canker

Photo by Mohammad Bahadour


Bacteria

Pathogen spread:

- Rainsplash
- Vectors
- Seed
- Wind




Black rot cabbage, MSU




Bacterial Leaf Spot

Xanthomonas campestris

- 'Watery lesions' may have yellow halo
- Leaves yellow and drop
- Large, irregular spots
- Red fruit not affected
- Bacteria favored by cooler temps, high moisture
- 6 hours of leaf wetness



Tomato Fruit with Bacterial Spot Symptoms

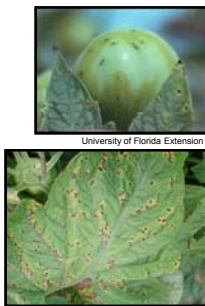


©T.A. Zitter

Bacterial Leaf Speck

Pseudomonas syringae


- Superficial black specks
- Large yellow halos on leaves
- Leaflet dieback
- Red fruit not affected
- Bacteria favored by cooler temps, high moisture
- 6 hours of leaf wetness



University of Florida Extension


Ontario Crop IPM

Nonchemical control of bacterial diseases



- Rotation from (tomato, eggplant, pepper) 2-3yrs
- Certified disease-free plant material
- Sanitize equipment in 10% bleach
- Control weeds
- Stake plants, space properly, mulch
- No overhead if possible
- Remove debris after harvest
- **Avoid working in wet field**

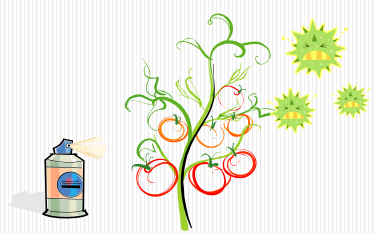
Chemical control of bacterial diseases



- **Copper sprays:**
 - Copper hydroxide (Champ, Kocide)
 - Copper sulfate (Cuprofix)
- Treatments begin 10-14 days after transplanting and continue at 7-10 day intervals

Actigard and Messenger (maybe accepted)

Plant defense activators rather than pesticide
May be more effective when used with other products. SAR= systemic acquired resistance



Fungi

- Many kinds of symptoms
- Most fungi spread by spores

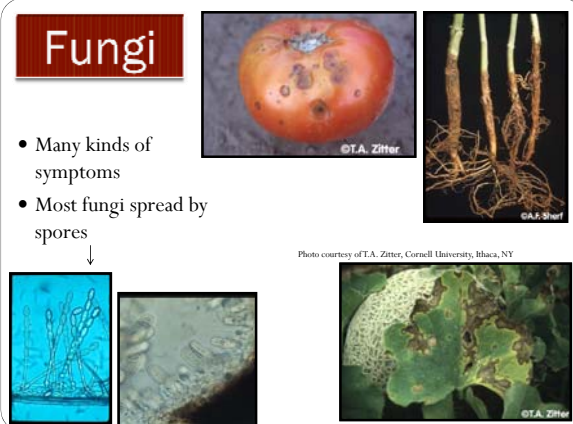



Photo courtesy of T.A. Zitter, Cornell University, Ithaca, NY

Septoria Leaf Spot


Septoria lycopersici

- Common in Midwest
- Plants appear wilted
- Progressive over season, from lower to upper leaves
- Fungus overwinters in field debris
- Favored by warm temps, high humidity, rainfall
- Weeds




Early Blight *Alternaria solani*

- More severe in fields cropped continuously to tomatoes
- Progressive over season, from lower to upper leaves
- Defoliation
- Can affect stems and fruit
- Fungus overwinters in field debris
- Favored by warm/hot temps, high humidity, rainfall




U of MN Plant Disease Clinic



Clemson University: Bugwood.org



Septoria Lesions

- black fruiting bodies



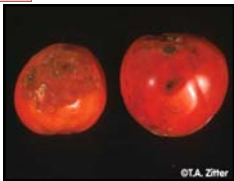
Early Blight Lesions

- target shaped

Antracnose fruit rot *Colletotrichum*


- Survives in crop debris
- Symptoms
 - Occurs on ripe fruit
 - Small, slightly depressed sunken spots
 - Small, black specks form in the center of the spots
 - Greatly reduces shelf life




G.T.A. Ziffer

Fusarium Wilt *Fusarium oxysporum*


- Leaves turn downward, droop
- Discolored vascular tissue
- Discolored roots
- Defoliation
- Favored by warm
- Soil-borne fungus
 - must rotate
 - resistance




ohioline.osu.edu



apsnet.org

 <p>Heirloom Variety</p>	<p>Tomato midseason, midsize</p> <p>Resistant Heirloom Variety</p>
<p>Tomato beefsteak</p> <p>Heirloom Variety</p>	<p>Tomato midseason, midsize</p> <p>Resistant Hybrid Variety</p>

Nonchemical control of fungal diseases



- Rotation from (tomato, eggplant, pepper) 2-3yrs
- Certified disease-free plant material
- Control weeds
- Maintain appropriate fertility= maintain vigor
- Stake plants, space properly, mulch
- No overhead if possible
- Remove debris, deep plow or remove and destroy

Biological control of fungal diseases



- ***Bacillus subtilis* (Serenade)**
- ***Bacillus pumilis* (Sonata)**

For suppression begin applications when plants are 4-6 inches tall. Repeat on a 5-to-7-day interval or as needed.

Chemical control of fungal diseases



- **Copper- and sulfur-based products are the only labeled chemical fungicides allowed in certification programs**
- **Check with certifier for approval**
- **Start spray program before disease appears!**

Root Knot Nematode *Meloidogyne species*



- Yellowing, stunting, wilting
- Galls
- Soil dwelling
 - resistance
- Secondary infections



Photo by Mary Ann Hansen



nematology.umd.edu

Recommended Rotation

- Grasses/Brassicas= tolerant
- Onion= resistant
- Fallow during hottest season

Summary

Plant Diagnostic Laboratory
Extension Agronomy
4032Throckmorton Hall
Kansas State University
Manhattan, KS 66506-5504
Phone (785) 532-5810

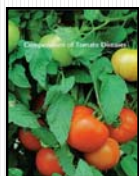
- Limit environmental stress and maintain vigor
- Preventative strategies: sanitation
- Contact:

Dr. Megan Kennelly
Extension Pathologist
Kansas State University
785-532-1387 , kennelly@ksu.edu



Thank You....Questions?

www.nysaes.cornell.edu/pp/resourceguide



www.shopapspress.org



muextension.missouri.edu/explore/

