



Tomato Organic Management
and Improvement Project

Welcome to the webinar on organic tomato seed production!

- We'll be starting at the top of the hour!
- To ask a question, type in questions in the q and a box on your control panel and hit return. We'll be reading the questions aloud after the presentation is over.
- Find all upcoming and archived eOrganic webinars at <https://eorganic.org/node/4942>
- Download the TOMI tomato seed production guide at <https://seedalliance.org/publications/tomato-seed-production-guide/>
- The recording will be available on the eOrganic YouTube channel within 1-2 weeks




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Organic Tomato Seed Production: A Virtual How-to Training

Laurie McKenzie, Organic Seed Alliance
Jared Zystro, Organic Seed Alliance
Dan Egel, Purdue University



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Laurie McKenzie
Organic Seed Alliance




Jared Zystro
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Organic Tomato Seed Production








Climate, Isolation, Population, Roguing





Laurie McKenzie
Organic Seed Alliance



















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Climate

Most Ideal for Pollination, Fertilization, and Fruit Growth:

- Daytime temperature range 80-90° F / 26-32° C
- Nighttime temperatures above 60° F / 15° C
- Temperatures (above 90-95° F / 32-35° C) can negatively affect both pollination and fertilization
- Vulnerable to cold damage if nighttime temperatures are regularly below 50-60° F / 10-15° C
 - Pollen may not be produced, or if pollen reaches the female stigma and begins to grow a pollen tube during the day, it may abort and die when nighttime temperatures drop below 50-60° F / 10-15° C




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Climate

Most Ideal for Pollination, Fertilization, and Fruit Growth:

- Moderate to high relative humidity (RH) conditions
- 80-90% RH during the day
- 65-75% RH during the night

Humidity helps the temperatures stay warm throughout the evening and nighttime when significant temperature drops can be common in non-humid regions and environments.





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Climate

Parthenocarp

- Allows for fruit development under hot or cold conditions when pollen cannot function normally.
- Varieties with parthenocarp may produce early season fruit with little to no seeds, while producing fruit with more abundant seeds in the later, and warmer, months of the growing season.



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Maintaining Genetic Health and Resiliency

— Isolation and Population Size

- Tomatoes are primarily self-pollinating, but cross pollination can occur
 - Type, pollinator populations, stigma location
- Cross pollination can be more or less of a concern
 - Type of tomatoes (different, same, or similar market classes)
 - Intended use of the seed produced





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Isolation

Modern Tomato Varieties (varieties with round fruit and stigmas that are shorter than the anther cone):

Minimum distance for home use: 10 ft

Minimum distance for commercial production: 20 ft



Heirloom or Potato Leaf Varieties (varieties with lobed fruit and stigmas that extend beyond the anther cone):

Minimum distance for home use: 40 ft

Minimum distance for commercial production: 160-320 ft

***If growing multiple tomato varieties or types use the greatest isolation distance**



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Population Size

- Assess, retain or decrease the variety's *genetic variability*
- Genetic variability refers to genetic differences among plants in the same variety
 - Although two tomato plants may look the same and produce functionally identical fruit, they may have differences in their genetic makeup that express as varying degrees of tolerance to various biotic (i.e., pests and diseases) and abiotic stresses (i.e., drought, salinity, heat).





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Population Size

- Genetic variability allows a variety to adapt to changing conditions
- Planting of 100 plants vs 10 plants
 - Bad late blight infection
 - Plants survive in 100 plant planting
 - No plants survive in 10 plant planting
- Balancing odds and risk tolerance



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Population Size

- Saving seed from one or two plants each year will decrease the amount of genetic variability in the variety and increase the risk of loss in the future
- Produce and save seed from multiple plants to preserve sufficient diversity for continued reliable and robust production
- Always save seeds from healthy, robust plants. Do not save seeds from diseased and/or failing plants





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Roguing

- Removing inferior or atypical plants
- Helps eliminate the ill effects of accidental crosses, accidental mixing of seeds, or genetic mutations
- If you do not rogue, the variety will become more variable and deteriorate over time, showing more and more undesirable traits each season



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Roguing

Rogue more than once

- Beginning of the season
 - Seedling vigor
 - Seedling emergence
- Later in the season
 - Off-type fruit
 - Weak or small plants
 - Fruit set
- Still later
 - Those most affected by disease
 - Seed yield



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Have Fun and Trust Your Instincts

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Organic Tomato Seed Production – Harvest, Cleaning and Storing

Jared Zystro
Organic Seed Alliance

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Harvest

- Harvesting when fully ripe
- Avoid cracked, diseased fruits
- Process soon after harvest to avoid rot from damaging seed



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Seed Extraction

- A wide range of extraction techniques
 - Forcing through screens



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Seed Extraction

- A wide range of extraction techniques
 - Forcing through screens
 - Four-by-four and bucket



Seed Extraction

- A wide range of extraction techniques
 - Forcing through screens
 - Four-by-four and bucket
 - Chipper / Shredder





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Seed Extraction

- A wide range of extraction techniques
 - Forcing through screens
 - Four-by-four and bucket
 - Chipper / Shredder
 - Millet Wet Seed Separator



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Seed Extraction

- A wide range of extraction techniques
 - Forcing through screens
 - Four-by-four and bucket
 - Chipper / Shredder
 - Millet Wet Seed Separator
 - Vine Thresher





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Fermentation

- Dissolves gelatinous covering on seed as well as flesh
- Key is time and temperature
 - 72 – 80°F (22 - 27°C)
 - 2 to 4 days



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Fermentation

- Dissolves gelatinous covering on seed as well as flesh
- Key is time and temperature
 - 72 – 80°F (22 - 27°C)
 - 2 to 4 days
- Stir twice per day to encourage separation and discourage mold



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Cleaning

- Rinsing and decanting:
 - Pour off until seed on bottom is seen
 - Add cool water
 - Stir
 - Allow to settle
 - Repeat until all pulp and light seed has been removed
 - Final rinse may include dilute bleach – Check with your certifier



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Cleaning

- Seed sluice
 - Long narrow, gentle slope
 - Baffles on bottom to catch seed
 - Add contents of fermentation vessel
 - Add water at moderate speed so heavy seeds are caught behind baffles and pulp flows out bottom
 - Once clean, add water at high rate to flush seed



Photo credit: Johnny's Selected Seed



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Drying

- Dry quickly
- Large quantities may be “pre-dried” in sacks in clothes drier with heat off
- Spread very thin on screens
- Amble air flow above and below seed
- Keep temperatures below 90° F (32° C)



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Post-dry cleaning

- Some lots may require additional cleaning after dry to remove skins or light seeds
- Box fans, small air screen cleaners and aspirators can be used



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Storage

- Cool, dry, and dark
- Minimum fluctuation of storage conditions
- Heat + Relative Humidity ≤ 100
- Clearly labeled
- Protection from pests
- Tomato seed will typically last 3 to 7 years in good storage conditions
- Germination and vigor decreasing over time



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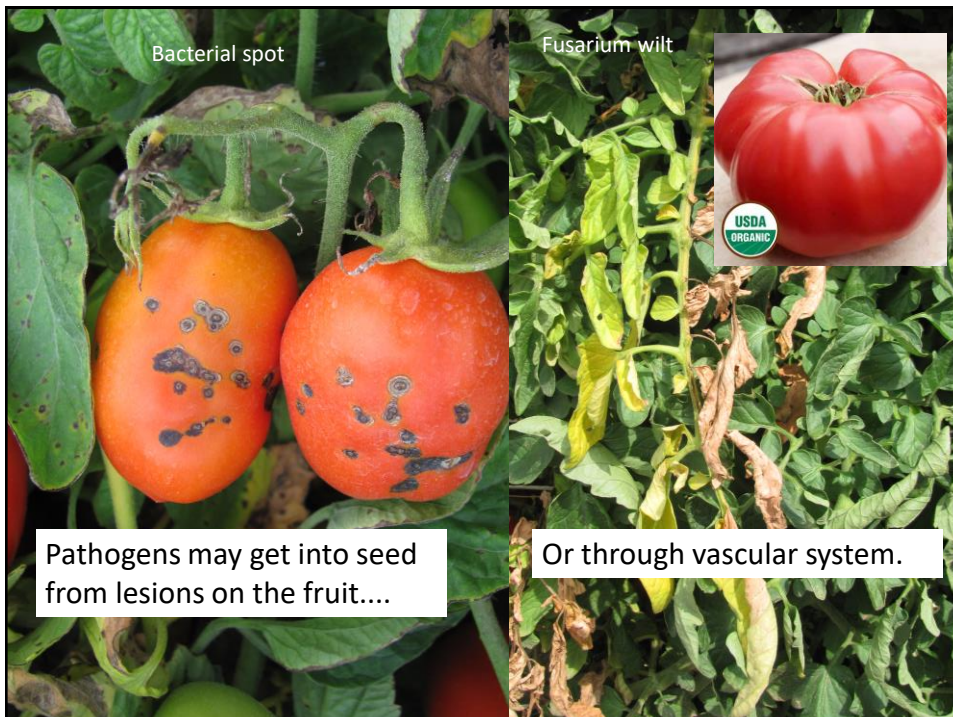
How to avoid saving diseased seed





Dan's top tomato seed borne diseases of tomato

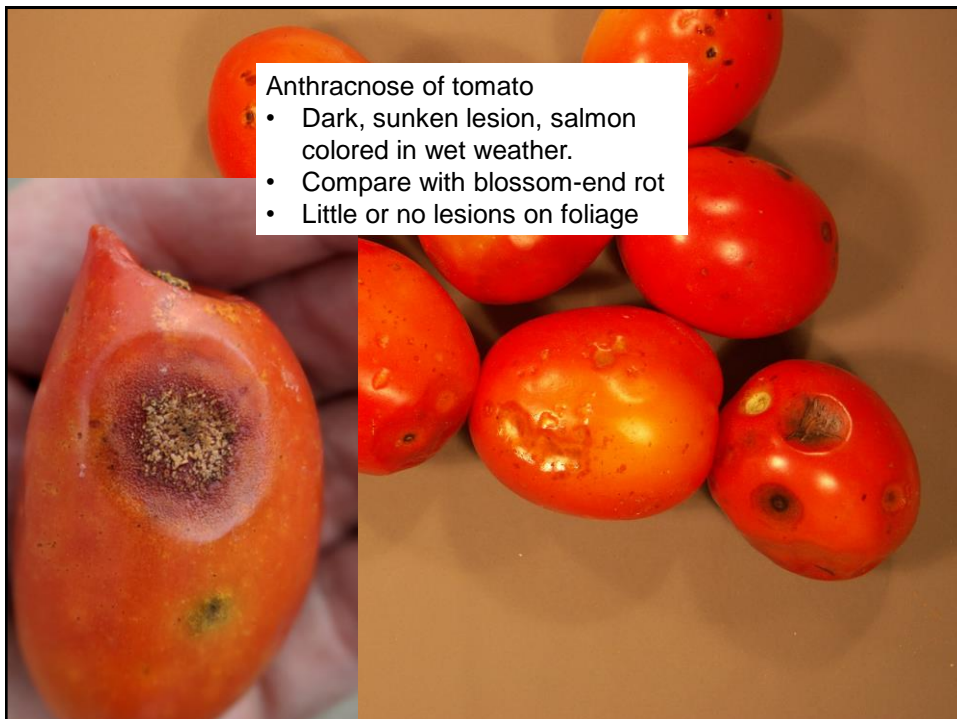
Disease	Pathogen	Symptoms	Location of pathogen on seed
Anthracnose	<i>Colletotricum sp.</i>	Sunken lesions of fruit	External
Bacterial canker	<i>Clavibacter michiganense</i>	Fruit, vascular system	External, internal
Bacterial speck	<i>Pseudomonas syringae pv. tomato</i>	Scabby lesions on fruit	External
Bacterial spot	<i>Xanthomonas spp.</i>	Scabby lesions on fruit	External
Fusarium wilt	<i>Fusarium oxysporum f. sp. lycopersici</i>	Wilt, vascular discoloration	Internal

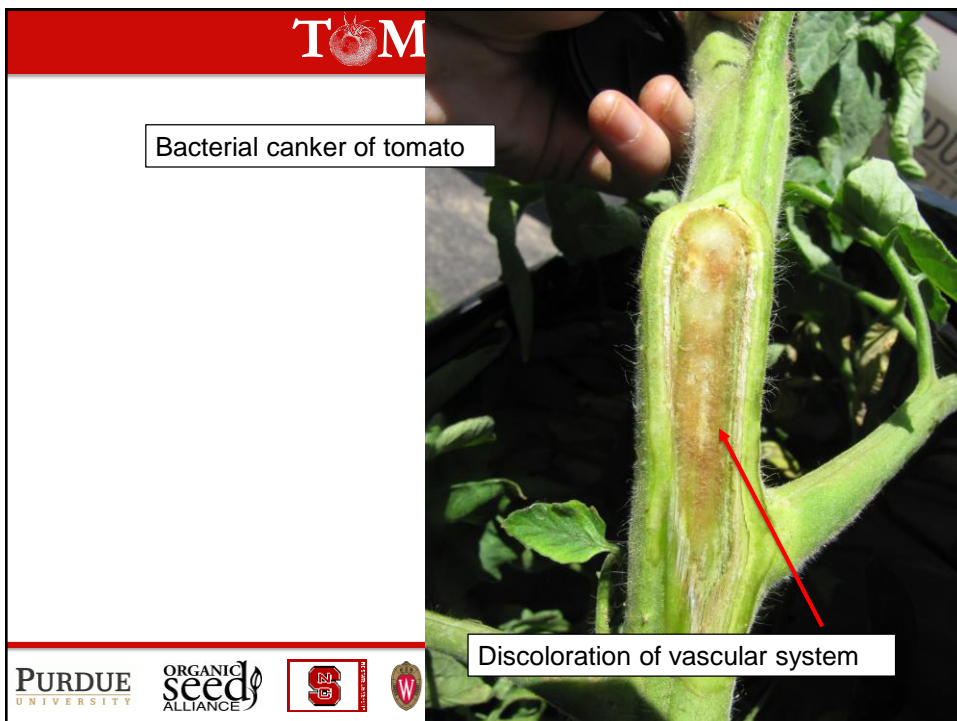
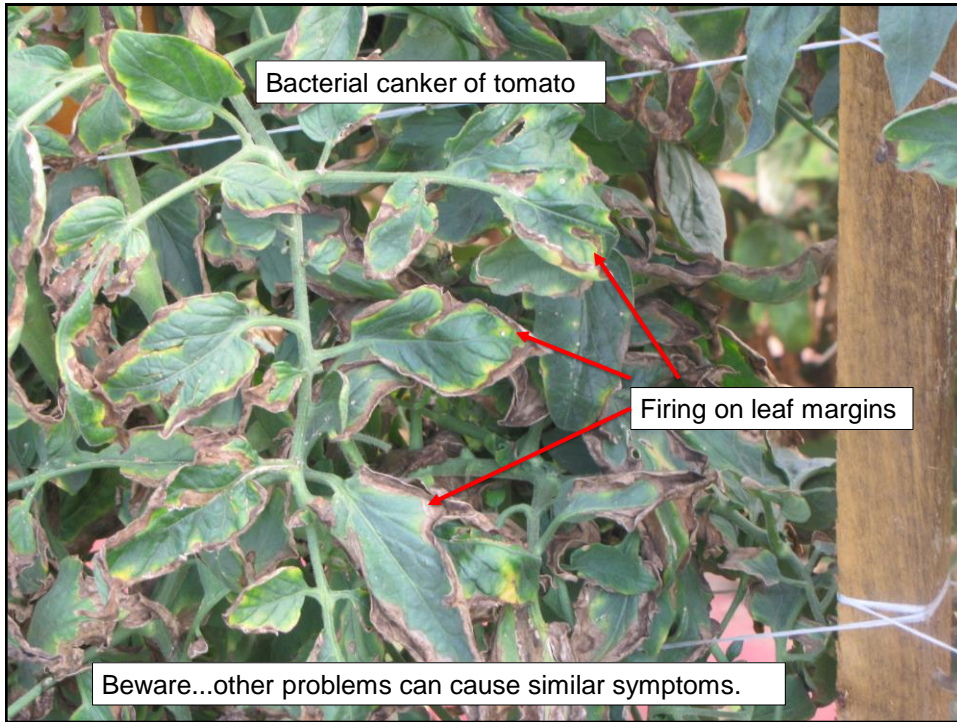


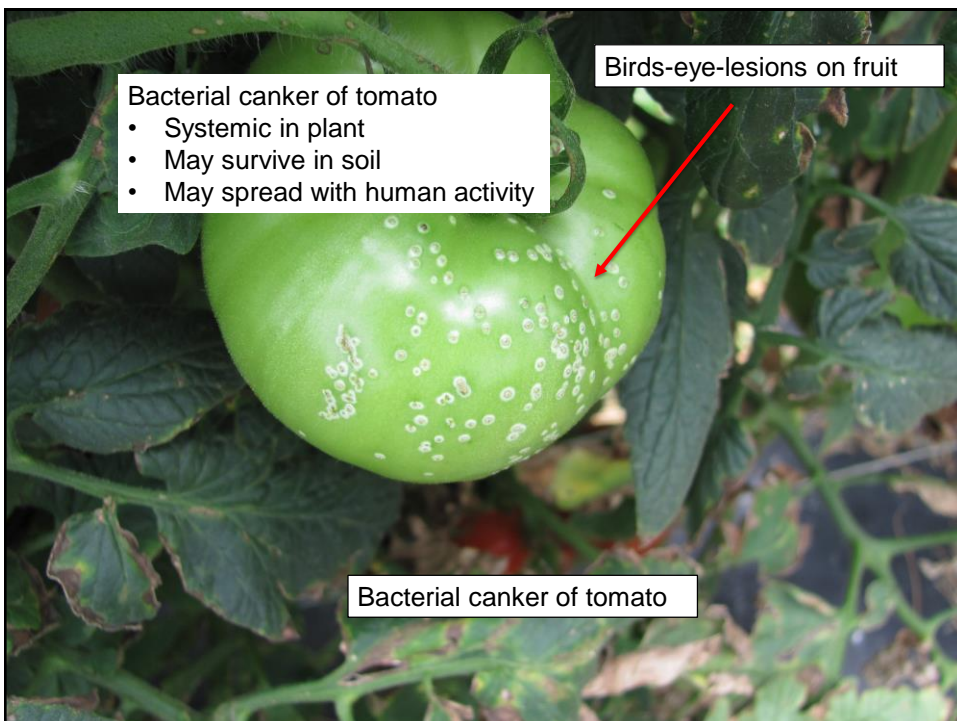
Pathogens may get into seed
from lesions on the fruit....

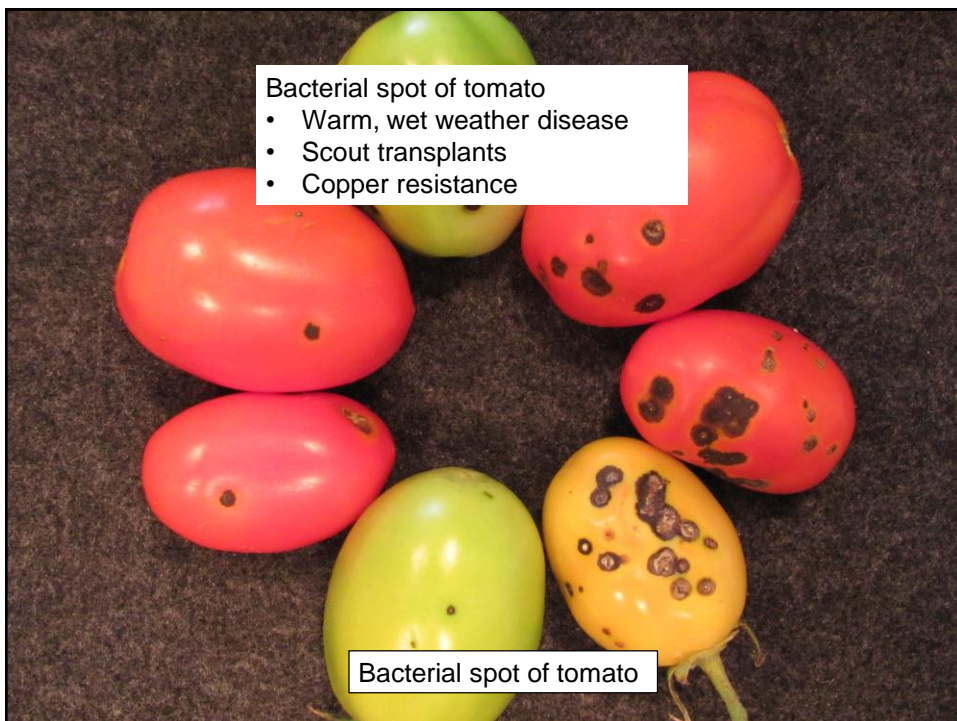
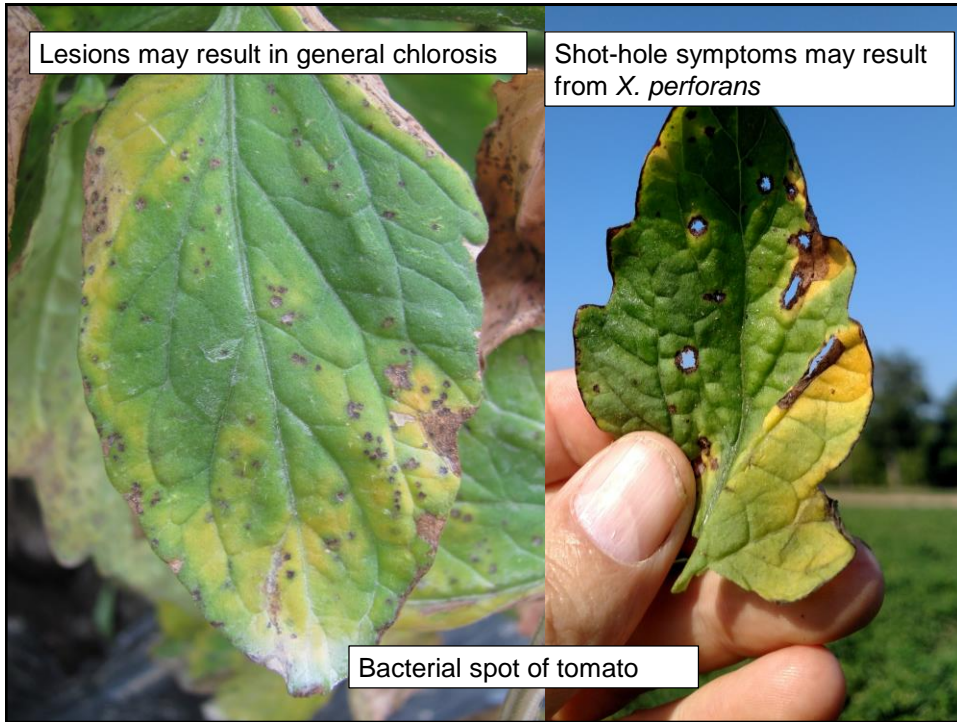
Or through vascular system.

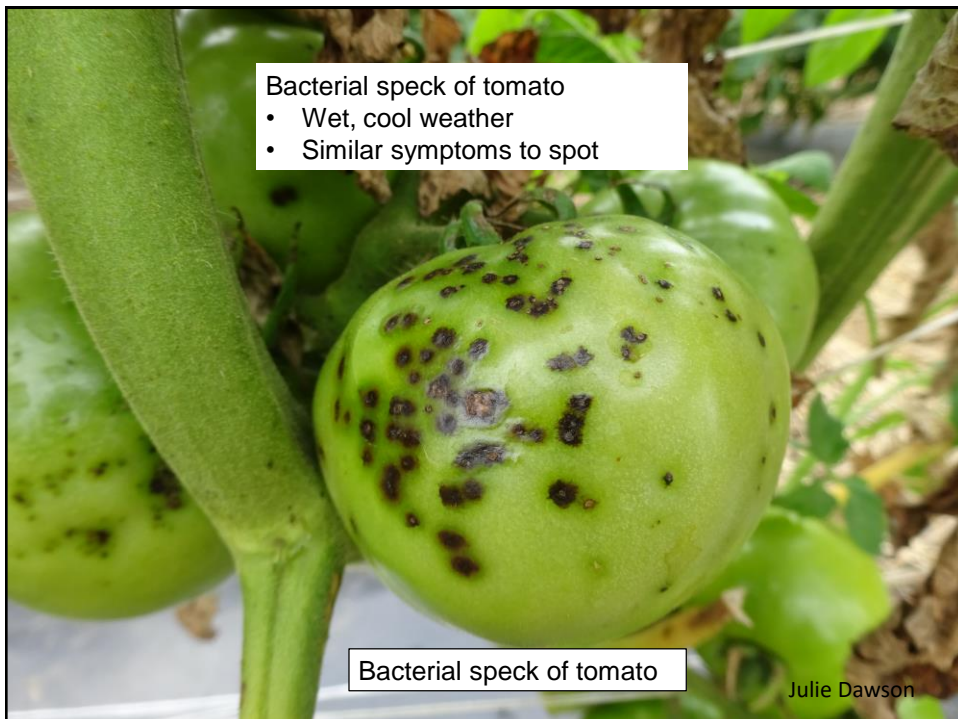
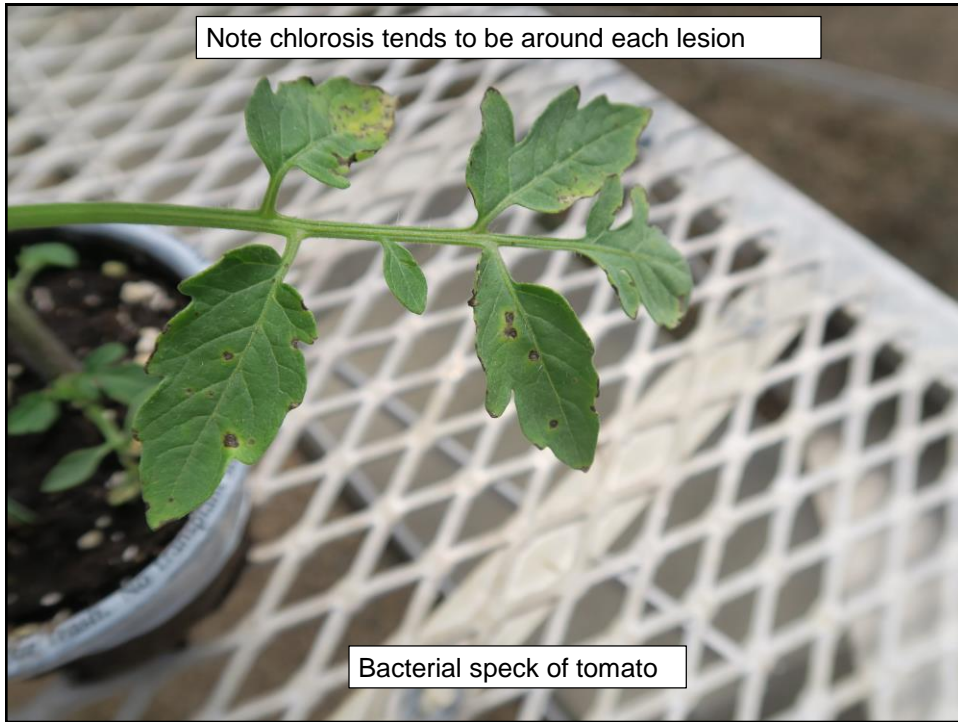
The usual suspects

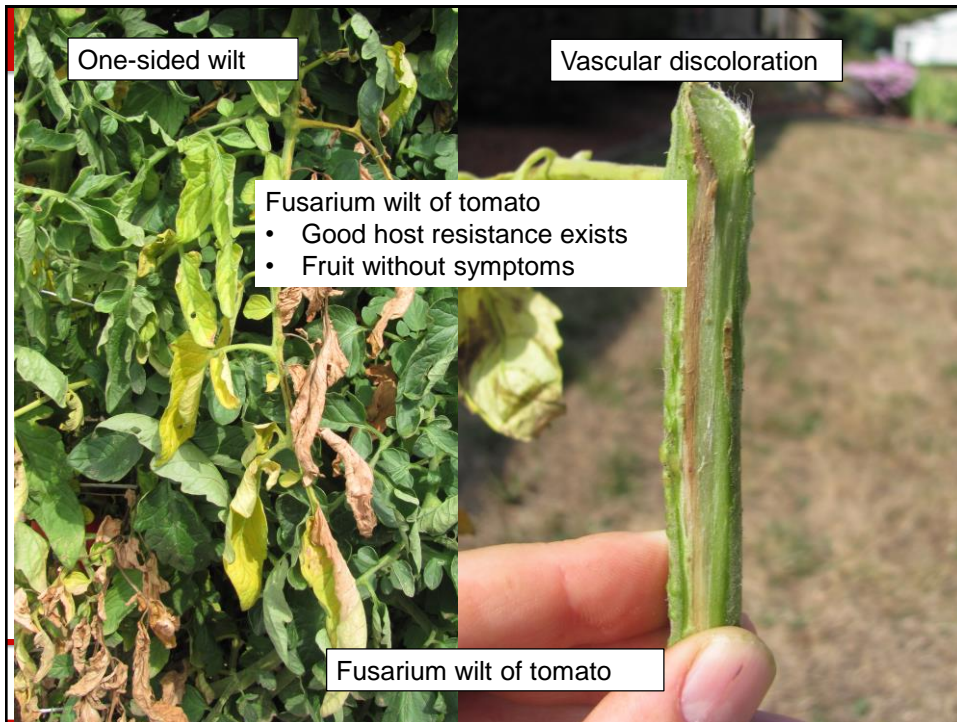














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Can you name these tomato problems?



Blossom end rot









Late blight



Anthracnose

- Late blight
- Blossom end rot
- Anthracnose

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Got diagnosis?



Blossom end rot
• Calcium deficiency



Late blight
• May not overwinter



Anthrachnose
• Residue/seed borne



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Non-chemical disease management

- Host resistance
- Exclude pathogens
 - sanitation
- Cultural controls
 - Crop rotation





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Chemical control--hints

- Copper products slows disease progress of many diseases
 - Copper resistance in bacterial spot?
- Biological control?
 - *Gliocladium catenulatum* Strain J1446 (e.g., PreStop) slows disease progress of early blight.
 - Be careful about mixing biocontrol products with copper or peroxide products.



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When to use peroxide products (e.g., Oxidate, Jet-Ag)?

- Better for bacterial than fungal diseases.
- Use frequently--no residue.
- If use with copper, read label carefully.



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Induced resistance products

- Turn on plant defenses.
- Relatively new/not well understood
- *Bacillus mycoides* isolate J (e.g., Lifegard) with bacterial spot of tomato?



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Tomato seed treatment

- Heat treatment 122F for 25 min
- Two water baths
- Be careful!
- Surface sterilization?



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Tomato Seed Production Guide - Organic Seed Alliance





🔗 seedalliance.org/publications/tomato-seed-production-guide


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Questions?

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- Learn more about the TOMI project at <https://eorganic.info/tomi>

