

Tomato Diseases, Part Two: Bacteria, Viruses and Nematodes

Welcome to the second installment of our three-part tomato disease series. If you're just now joining us, the first article can be found [in the newsletter archive](#) on the Tulsa Master Gardeners [website](#). [Last month](#) we covered the most common and destructive cause of tomato disease - fungi - and how to prevent, recognize and control the spread of [wilts, blights, foliar diseases, and fruit and soil rots](#).

Tomato diseases caused by bacteria, viruses and nematodes will be this month's focus. While not as common as fungi, bacteria, viruses and nematodes can be destructive and are generally more difficult to control.

Cultural and Chemical Controls

Cultural practices involve selecting disease resistant varieties and disease-free transplants, a proper growing site, irrigation and maintenance techniques, crop rotation and sanitation...all for the purposes of providing optimal growing conditions and disease prevention. [OSU Fact Sheet HLA-6431, Cultural Control Practices](#), explains these recommended techniques.

Not every common disease can be prevented and may require chemical treatment to control. Your OSU Extension Office educators can be a source of recommendation. Please remember to always read the label when using chemicals.

Bacterial Diseases

A single bacterium introduced into a garden through infected seed or transplants can reproduce and colonize quickly, aggressively absorbing a plant's nutrients. Bacteria are disease-causing (pathogenic) microorganisms that populate plant surfaces, soil, neighboring plants and weeds and crop debris. Wind, water splash, insect movement, and any other activity around the infected areas can cause further spread and more persistent and severe disease outcomes.



Bacterial spot (*Xanthomonas euvesicatoria*)

- Attacks stems, leaves and fruit, develops in rainy and humid areas
- Spread by infected transplants, infected seed, diseased debris and activity in wet periods (see how to disinfect seed [here](#))
- Symptoms start with spotting (similar to Septoria leaf spot), then yellowing and death of lower leaves, progressing up the stem until all foliage dies. Spotting on green and ripe fruit occurs.
- Start with clean seed, remove diseased debris, rotate crops, use drip irrigation and a bactericide spray program

Bacterial spot on tomato by Edward Sikora, Auburn University, Bugwood.org

Bacterial speck (*Pseudomonas syringae* pv. *tomato*)

- Attacks stems, leaves and fruit, symptoms similar to bacterial spot
- Look for spotting to start on green fruit only
- Favored by cooler temperatures and high humidity
- Like bacterial spot, spread by infected transplants, infected seed, diseased debris and activity in wet periods (see how to disinfect seed [here](#)).
- Symptoms start with spotting, then yellowing and death of lower leaves, progressing up the stem until all foliage dies.
- Manage like bacterial spot: start with clean seed, remove diseased debris, rotate crops, use drip irrigation and a bactericide spray program



"Bacterial speck of tomato"

by [Plant pests and diseases](#) is marked with [CC0 1.0](#)

Bacterial canker (*Corynebacterium michiganensis*)

- All parts of the plant are affected; leaves, stems and fruit
- Seed and transplants carry the bacteria, harbor in diseased debris and are spread by irrigation splash, wind-driven rain and movement near and around the plants
- Lower leaves infect first with scorched appearance
- Younger plants infected early wilt and die
- On fruit look for telltale "birdseye" $\frac{1}{8}$ - $\frac{1}{4}$ " brown spots with white halo
- Whitish cankers on leaf petioles and stems may not always be apparent
- Crop rotation (non-nightshade family), [clean seed](#), [transplants](#) and tools
- Bactericide spray program is ineffective and not recommended



Bacterial canker of tomato by
The NYSIPM Image Gallery

Bacterial wilt (*Ralstonia solanacearum*)

- Plants wilt and die rapidly without any other symptoms
- Plants infected through root contact with infested soil.
- Diagnosed by observing infected stem in water: look for a white, cloudy slimy stream as bacteria is released from stem into water
- Disease can be devastating and control difficult
- Remove and destroy damaged crops immediately
- Start with clean, fresh soil, seed and transplants
- Spray programs ineffective and soil fumigation only partially effective



"Tomato: Bacterial wilt (Pathogen: *Ralstonia solanacearum*)" by Scot Nelson

Pith necrosis (*Pseudomonas corrugata*)

- Not very common foliage disease in Oklahoma greenhouses and fields, supported by high humidity, low nighttime temps, and high levels of nitrogen fertilization
- Disease affects leaves and stems only
- Wilting and yellowing of sections of plants occur just as the first fruit cluster matures
- Long brown cankers appear at the infected branch base, hollowing out the pith on the inside
- Adventitious roots surround cankered areas, and disease does not worsen beyond these symptoms
- No control strategies recommended as much is still unknown about the source and progression of the disease



Pith Necrosis
Joey Williamson, © 2018 HGIC, Clemson Extension

Virus Diseases

Plants may be exposed to viruses through open wound contact with infected sap, or by the feeding of transmitting insects, called "vectors". These tiny particles multiply quickly after entering the plant. Odd color markings on fruit and leaves, abnormal or stunted growth, low fruit production and death are common symptoms.

In Oklahoma, virus diseases are difficult to control, and therefore can be problematic for tomato growers. Insecticidal sprays are mostly ineffective as destroying the vectors after they have transmitted the virus through feeding does nothing to prevent plant infection.

Control strategies vary by disease and may include using resistant varieties (where available) symptomatic plant removal and insect deterrent/exclusion planning,

Alfalfa mosaic (Alfalfa mosaic virus)

- Tomato plants grown in proximity to alfalfa fields have greatest exposure
- Transmitted by aphid insect vectors and mechanically through activity
- Symptoms are strong yellow patterns on newer foliage
- Fruits turn brown and split
- Prevent by locating tomato plantings away from alfalfa fields (old or new)
- Recognize and remove symptomatic plants immediately to avoid mechanical spread



UC IPM Pest Management Guidelines:
Tomato UC ANR Publication 3470

Curly top or western yellows disease (Beet curly top virus)

- Disease is cyclical in occurrence and can be isolated or widespread
- Transmitted by beet leafhopper insect vector, tied to migratory patterns of insect
- Symptoms begin as upper leaves turn pale green and curly, spreads throughout plant and new growth stops
- Look for purple colored veins in affected leaves
- Fruit ripens before maturity with wrinkled texture
- Sprays are not effective, no resistant varieties available
- Minimize by deterring leafhopper vectors: avoid widely spaced plantings, instead try [dense rows and intercropping with corn](#)
- Try to exclude insects by using row covers



"Beet Curly Top Virus in Tomato"
by Utah State University, fact sheet May 2008

Tobacco mosaic (Tobacco mosaic virus, TMV)

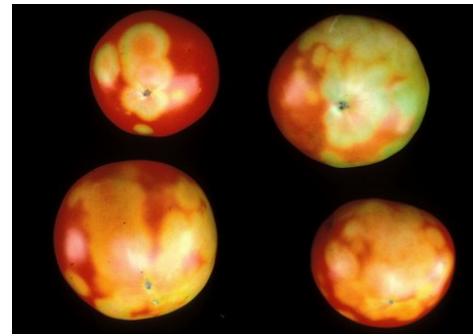
- Fruit size, yield, and condition are impacted
- Foliage symptoms include stunting and dark and light green mottling of leaves
- Fruit undesirable as coloration may be irregular or mottled
- Mostly spread mechanically via sap transmitted by human contact
- Incurable, so prevention is necessary
- Use resistant varieties of plants and seeds, labeled "TMV"
- Seed may also be treated using [soaking or dry heat methods](#)



Mottling of tomato leaves due to tobacco mosaic virus
by Jack Kelly Clark, UC IPM Program

Tomato spotted wilt (Tomato spotted wilt (TSWV) and Impatiens necrotic spot viruses (INSV)

- Disease caused by two viruses, TSWV and INSV, spread by insect vector: thrips
- Wide range of hosts include vegetables, flowers and weeds; tomatoes and peppers very susceptible
- Affect greenhouses where transplants are infected, transplants brought to fields
- Symptoms begin as upper leaves spot and wilt
- Leaves may have dark purple or brown ringspots
- Light green colored ringspots appear on green fruit and yellow on ripe fruit
- Sprays are not effective, resistant varieties are now available
- Using resistant, healthy transplants and symptomatic plant removal are best controls



"[TSWV1](#)" by [Plant pests and diseases](#) is marked with [CC0 1.0](#).

Nematode Diseases

In Oklahoma, the most common of these microscopic, root-feeding worms are the northern and southern root-knot nematodes.

The name is descriptive of the damage they cause; as the nematodes feed in the plant roots, the plant's defense mechanism is to develop swellings - knots or galls - on the affected roots. Overall reduced vigor, yield and eventual death will occur with severe infestations.

Root-knot (*Meloidogyne* spp.)

- Look for pale-green or yellowing, and unexpected wilting
- Avoid moving soil, even on equipment and boots, from infested areas
- High populations can develop in soil with repeated cropping, so rotate at least every two years with resistant crops like corn and milo
- Try soil solarization or soil fumigation (certified applicators only) to reduce numbers
- Resistant varieties available only for southern root-knot nematode
- Monitor populations through soil sampling and analysis



"[Tomato \(*Solanum lycopersicum*\): Root-knot nematodes](#)" by [Plant pests and diseases](#) is marked with [CC0 1.0](#).

Until Next Time...

Until next month's installment, observe your tomatoes often for foliar and fruit disease, and consider the control strategies discussed, including:

- Using disease resistant and certified disease-free seeds and transplants
- Drip irrigation vs. overhead watering
- Proper or alternative mulching products to prevent fruit-to-soil contact
- Crop rotation to lower risk of spread and perpetuating disease
- Sanitation to remove diseased crop debris quickly before spread
- Bactericide treatment programs: foliar and/or fruit coverage, depending on agent
- Soil sampling to monitor nematode population
- Use information and diagnostic resources available from OSU: [OSU Plant Disease and Insect Diagnostic Laboratory](#) and [Tulsa Master Gardeners](#)

Knowing which agents are affecting your tomatoes will dictate the treatment program. Your OSU Extension Office is always available for diagnostic guidance. More information and photographs for each of these diseases can be found at the [links at the end of this article](#).

This concludes **Tomato Diseases, Part 2: Bacteria, viruses, and nematodes**, but we have one more installment in this three-part tomato disease series. Come back next month for **Part 3: Non-Infectious Diseases!**

Resources

Fact Sheets and Resources for Tomato Diseases, Part 2: Bacteria, viruses and nematodes

[OSU Fact Sheet EPP-7626: Common Diseases of Tomatoes: Part 2 Bacteria, Viruses and Nematodes](#)

[OSU Digital Diagnostics](#)

[OSU Fact Sheet EPP-7640: Soil Solarization for Control of Soilborne Diseases](#)

Fact Sheets and Resources for Tomato Diseases, Part 1: Fungi

[OSU Fact Sheet EPP-7625: Common Diseases of Tomatoes: Part 1. Diseases Caused by Fungi](#)

[OSU Fact Sheet L-492: 2021 Tomato Variety Suggestions](#)

[OSU Fact Sheet HLA-6431, Cultural Control Practices](#)

[Cornell University: Disease-Resistant Tomato Varieties](#)

[OSU Fact Sheet HLA-6032: Vegetable Varieties for the Home Garden in Oklahoma](#)

[OSU Plant Disease and Insect Diagnostic Laboratory](#)