College of Agriculture, Food and Environment
Cooperative Extension Service

Plant Pathology Fact Sheet **PPFS-VG-15**

Fusarium Wilts of Vegetable Crops

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Introduction

Fusarium wilts are common vascular diseases that clog and eventually destroy water conducting tissues, resulting in wilt symptoms and eventual plant death. While not all Fusarium wilts are caused by the same strain of the pathogen, symptom development within the various vegetable hosts is similar. Crop losses can occur in commercial fields, greenhouses, high tunnels, and residential plantings.

Hosts

Tomato is the solanaceous crop most frequently affected by a Fusarium wilt disease in Kentucky, but Fusarium wilts can also occur on eggplant and pepper. Affected cucurbit crops include cucumber, watermelon, and occasionally muskmelon. Common weeds that may serve as alternative hosts for the pathogens include pigweed, mallow, and crabgrass.

Symptoms

The first visible symptom of a Fusarium wilt disease occurs when whole or partial plants wilt slightly, especially during the hottest part of the day. Plants may initially recover during the cool of the evening or on mild/rainy days, but eventually wilt becomes permanent.

Wilt is followed by yellowing (Figure 1), which may initially develop on only one side of a shoot or branch (Figure 2), and then necrosis (browning) of leaf tips (Figure 3). Symptoms may begin on lower leaves and move up plants until entire plants are yellowed and necrotic (Figure 4).

Gerald Holmes, Strawberry Center, Cal Poly San Luis Obispo, Bugwood.org

Desiree Szarka, UK

Figure 1. Fusarium wilt of tomato symptoms begin as wilting, followed by yellowing and necrosis.
Figure 2. Symptoms are often first evident on one side or portion of a shoot or branch.

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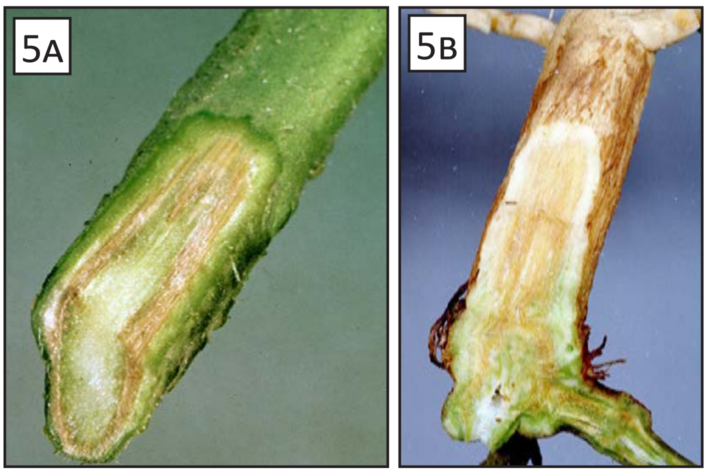

Clemson-USDA CES slide seriew, Bugwoo.org

Figure 3. Wilting and yellowing is followed by browning (necrosis) of leaf tips.
Figure 4. Advanced necrosis from Fusarium wilt leads ultimately to plant death.
Figure 5. Vascular discoloration is characteristic of this disease, shown here on a tomato stem (**A**) and crown of a watermelon plant (**B**) .

After a few weeks, browning of the vascular system (Figure 5) may be observed by cutting the stem open lengthwise with a knife. This discoloration can extend from the roots to the top of the plant. Affected plants are often stunted and, under warm or hot conditions, may die.

Causes & Disease Development

Fusarium wilts are caused by the soil-borne fungus, *Fusarium oxysporum*, a complex fungus that has many host-specific strains. Each strain is referred to as a forma speciales (or form species, abbreviated f. sp.). Some of the strains prevalent in Kentucky include:

- Tomato, eggplant, pepper: *Fusarium oxysporum* f.sp. *lycopersici*
- Cucumber: *Fusarium oxysporum* f.sp. *cucumerinum*
- Watermelon: *Fusarium oxysporum* f.sp. *niveum*

Fusarium wilt pathogens can overwinter as spores (microconidia, macroconidia, or chlamydospores) on debris or in soil, in infected seeds, or in infected weeds or other alternative hosts. Chlamydospores are thick-walled resting spores that enable the fungus to survive many years in soil, even in the absence of a host. Spread into new sites can occur when pathogen-infested soil is moved via water, equipment, or workers. Contaminated seed, transplants, and mulches can also spread the pathogen

Fusarium wilt pathogens favor warm temperatures (80°F to 90°F), acidic soils (pH 5.0 to 5.5), and high humidity. Initial infections occur through wounds in host roots, and then spread throughout the water-conducting vessels (xylem tissue) of plants. Vascular tissue becomes plugged both by fungal growth and the cellular outgrowths (tyloses) produced as a host response to infection. As a result, water movement is impeded in the plugged tissues, and wilting occurs. The fungus subsequently colonizes vascular tissues, causing necrosis; this is a distinguishing characteristic of Fusarium wilt diseases.

Disease Management

Resistant Cultivars

The most effective method of managing Fusarium wilt diseases is through the use of resistant cultivars.

- Select vegetable cultivars designated with the letter 'F' to indicate resistance to Fusarium wilt.
- Cultivar resistance information is available in seed catalogs and is also listed in the *Southeastern U.S. Vegetable Crop Handbook.*

Production Practices

The following practices can help prevent the introduction of Fusarium wilt pathogens into plantings, reduce inoculum levels (amounts of infective spores and survival structures) once it is present, and/or reduce disease severity.

- Avoid movement of fungal inoculum from infested fields. Thoroughly wash soil and plant debris from all equipment before moving to a new location.
- Sanitize pots, benches, and tools before re-use.
- Use sterile potting mixes for starting transplants; avoid reusing soil and media.
- Increase acidic soil pH to 6.5 to 7.0 and avoid excessive nitrogen applications.
- Plant only healthy, disease-free seed and transplants.
- Manage weeds; many species can serve as alternative hosts for *Fusarium* sp.
- Rotate out of susceptible crops for 5 to 7 years to help reduce inoculum levels. However, the ability of the fungus to survive long periods of time in the soil and the presence of alternative weed hosts means this strategy alone may not be effective.

Fungicides

Cucurbits. There are limited fungicides available for management of Fusarium wilt diseases in commercial cucurbit production. These fungicides are most effective when used before disease develops and when levels of inoculum are low. Fungicides should be combined with resistant cultivars and multiple cultural practices as outlined above.

Solanaceous crops. No fungicides are labeled for management of Fusarium wilt of tomato or solanaceous crops.

Soil Fumigation

Soil fumigation, an option only available to commercial growers, seldom eradicates inoculum completely, and recolonization by the pathogen can quickly occur in fumigated soils. It is also costly and requires specially certified applicators. Fumigation is not permitted in high tunnels or greenhouses.

Solarization

Soil solarization may be effective in destroying inoculum if soil temperatures can be raised above 108°F. This method may be more successful in high tunnels during summer months when temperatures are higher and days are longer. Research is ongoing to determine solarization recommendations for Kentucky climates.

Additional Resources

General Management Guides

- Home Vegetable Gardening in Kentucky (ID-128)
http://www2.ca.uky.edu/agcomm/pubs/id/id128/id128.pdf
- Managing Greenhouse & High Tunnel Environments to Reduce Plant Diseases (PPFS-GH-01)
https://plantpathology.ca.uky.edu/files/ppfs-gh-01.pdf
- Southeastern U.S. Vegetable Crop Handbook
https://www.aces.edu/wp-content/uploads/2022/01/Southeast-U.S.-Vegetable-Crop-Handbook_ANR-1344.pdf
- Vegetable Production Guide for Commercial Growers (ID-36)
http://www.ca.uky.edu/agc/pubs/id/id36/id36.pdf

IPM Scouting Guides

- IPM Scouting Guide for Common Pests of Solanaceous Crops in Kentucky (ID-172)
http://www.ca.uky.edu/agc/pubs/id/id172/id172.pdf
- IPM Scouting Guide for Common Problems of Cucurbit Crops in Kentucky (ID-91)
http://www2.ca.uky.edu/agcomm/pubs/id/id91/id91.pdf

Sanitation

- Cleaning & Disinfecting Home Garden Tools & Equipment (PPFS-GEN-17)
https://plantpathology.ca.uky.edu/files/ppfs-gen-17.pdf
- Cleaning & Sanitizing Commercial Greenhouse Surfaces (PPFS-GH-07)
https://plantpathology.ca.uky.edu/files/ppfs-gh-07.pdf
- Greenhouse Sanitation (PPFS-GH-04)
https://plantpathology.ca.uky.edu/files/ppfs-gh-04.pdf

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