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## FUSARIUM WILT OF TOMATO

Fusarium wilt is a devastating soil-borne fungal disease of tomato throughout the United States and worldwide. The disease is caused by *Fusarium oxysporum* f. sp. *lycopersici* that can cause significant yield losses of tomato production in greenhouse, high tunnel, and field.

### Symptoms and diagnostics

Fusarium wilt of tomato is a systemic vascular disease. The pathogen enters tomato plants through roots and colonizes the plant's vascular tissues, which clogs the xylem and causes drooping of leaves (Figure 1).



Figure 1. Wilting of leaves of a tomato plant

Symptoms generally are noticeable in the mid to late growing season although plants can be infected at any stages of growth. The initial symptoms of the disease are drooping and yellowing of leaves, often on one side of the plant, which may recover during the evening hours. As the disease progresses, wilting of the plant gets worse and become permanent. The disease also causes stunted growth of the plant. The earlier a plant is infected, the more severe the stunting is. Over time, severely infected plants will die, while others just perform poorly and produce few



Figure 2. Stunted growth of a tomato plant

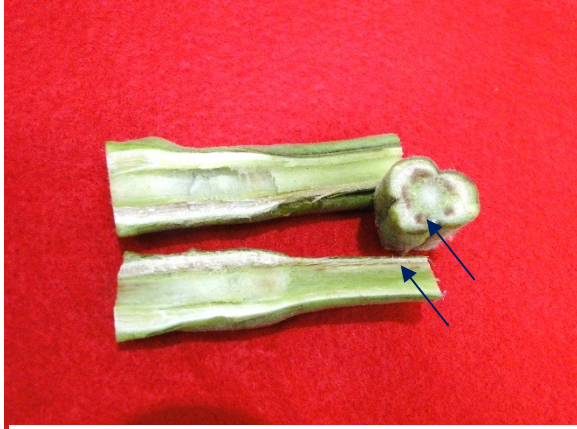


Figure 3. Discoloration of vascular tissues (indicated by arrows)

flowers or fruit (Figure 2). A characteristic and diagnostic symptom of the disease is dark brown streaks in the vascular tissue, which can be seen when the stem is cut open at the base of the plant (Figure 3).

### Disease development

The pathogen can survive many years as dormant mycelium in plant debris and as resting spores (chlamydospores) in the soil without a host plant. The pathogen penetrates root tips and lateral roots of young plants and extends in the xylem throughout the plant. The infection is favored by wounds caused by cultivation or nematode feeding on roots. The optimum conditions for the disease development are sandy, acidic soil (pH 5.0-5.5), high nitrogen (especially ammonia-nitrogen), and warm temperature (80° to 90° F). The pathogen can be spread throughout the field by mechanical methods such as irrigation water, tractor equipment, and tools. Contaminated seed and transplants can result in long-distance spread of the disease. Based on the virulence to different resistant genes in tomatoes, three races, Race 1, Race 2, and Race 3, have been reported in the pathogen.

### Management

*Resistant cultivar:* Use of resistant cultivars is the most effective and practical way to prevent losses due to Fusarium wilt of tomato. Many commercial hybrid cultivars are resistant to various races of the pathogen (labeled F on seed packages). Most heirloom varieties are not resistant.

*Grafting:* Grafting a favorite variety, such as heirloom tomato, onto a disease-resistant rootstock is a way to meet local market needs in high tunnel or greenhouse tomato production. Graft can decrease susceptibility to root diseases and increase growth vigor of tomato. The most widely used for rootstock in the greenhouse are ‘Maxifort’ and ‘Beaufort’.

*Cultural practice:* Use disease-free seeds and transplants. Rotate away from tomato and other solanaceous crops for 4-5 years to reduce the inoculum level in the soil. Prevent movement of the infested soil clinging to machinery, transplants, vehicles, tools, and stakes into areas where are free of the pathogen. As there is no cure for Fusarium wilt, remove and destroy diseased plants from the field or garden when it is confirmed. Do not place the debris in compost pile. Raise the soil pH to 6.5-7.0 by liming and use calcium nitrate fertilizers, which can reduce disease severities.

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