THE OHIO STATE UNIVERSITY EXTENSION

Extension FactSheet

HYG-3122-96

Plant Pathology, 2021 Coffey Road, Columbus, OH 43210-1087

Fusarium and Verticillium Wilts of Tomato, Potato, Pepper, and Eggplant

Sally A. Miller, Randall C. Rowe, and Richard M. Riedel
Department of Plant Pathology
The Ohio State University

Solanaceous crop plants (tomato, potato, pepper, and eggplant) may be infected at any age by the fungi that cause Fusarium wilt and Verticillium wilt. The wilt organisms usually enter the plant through young roots and then grow into and up the water conducting vessels of the roots and stem. As the vessels are plugged and collapse, the water supply to the leaves is blocked. With a limited water supply, leaves begin to wilt on sunny days and recover at night. Wilting may first appear in the top of the plant or in the lower leaves. The process may continue until the entire plant is wilted, stunted, or dead. Tomato and potato plants may recover somewhat but are usually weak, unthrifty, and produce fruit of low quality. Peppers typically collapse rapidly and die. Fusarium and Verticillium wilts are rarely significant in field grown tomatoes due to the widespread incorporation in tomato cultivars of genes for resistance to the pathogen. However, the resurgent interest in planting "heirloom" tomato varieties which do not carry resistance genes has resulted in increased incidence of Fusarium and Verticillium wilts. Additionally, new races of both pathogens have been identified that are capable of overcoming the resistance in many popular tomato varieties. Verticillium race 2 is now common in tomatoes in Ohio, but its importance in reducing yield is not known at this time. There is very little genetic resistance available to either disease in pepper or eggplant.

Symptoms

Fusarium Wilt

Fusarium wilt symptoms begin in tomato and potato as slight vein clearing on outer leaflets and drooping of leaf petioles. Later the lower leaves wilt, turn yellow and die and the entire plant may be killed, often before the plant reaches maturity. In many cases a single shoot wilts before the rest of the plant shows symptoms or one side of the plant is affected first (Figure 1). If the main stem is cut, dark, chocolate-brown streaks may be seen running lengthwise through the stem (Figure 2). This discoloration often extends upward for some distance and is especially evident at the point where the petiole joins the stem. Potato tubers may show browning of the vascular ring (Figure 3) as well as browning at the stem end and decay where stolons are attached. In pepper, lower leaves do not begin to wilt until roots and the base of the stem have already started to decay. Wilting of the entire plant soon follows. Dark brown, sunken,

Figure 1. Fusarium wilt of tomato. Note yellowing and death of leaves on one side of the stem.

Figure 2. Dark brown vascular discoloration in tomato caused by Fusarium wilt. Verticillium wilt causes a lighter tan discoloration of the vascular tissue.

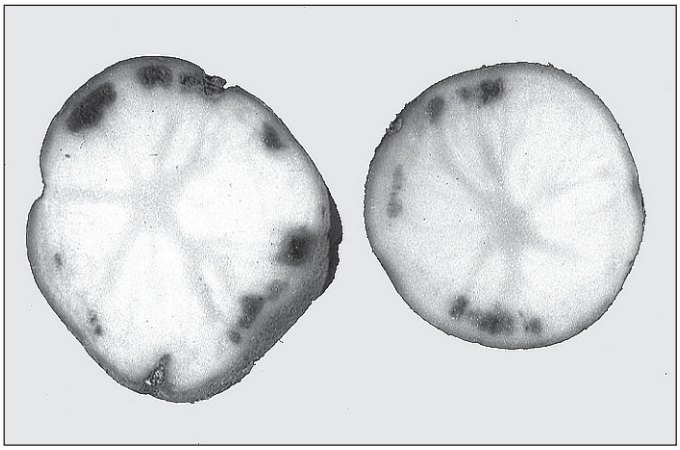

Figure 3. Discoloration of the vascular ring of potato tubers caused by Fusarium wilt organisms.

and eventually girdling cankers may be seen at the base of the pepper plant. In eggplant, wilting progresses from lower to upper leaves, followed by collapse of the plant.

Verticillium Wilt

Verticillium wilt symptoms on tomato, potato, and eggplant are similar to those of Fusarium wilt. Often no symptoms are seen until the plant is bearing heavily or a dry period occurs. The bottom leaves become pale, then tips and edges die and leaves finally die and drop off. V-shaped lesions at leaf tips are typical of Verticillium wilt of tomato (Figure 4). Infected plants usually survive the season but are somewhat stunted and both yields and fruits may be small depending on severity of attack. A light tan discoloration in the stem similar to that caused by Fusarium wilt may be found but is usually confined to lower plant parts. The discoloration is typically lighter in color than with Fusarium wilt. Symptoms on one side of the plant only are sometimes seen (Figure 5). In potatoes the pathogen may be part of a complex that includes, among others, the root lesion nematode and the bacterial soft rot organism, resulting in premature plant death ("potato early dying disease"). Tubers from *Verticillium*-infected plants may show light brown vascular discoloration, usually restricted to the stem end. In pepper, the lower leaves wilt, then leaf tips and margins dry and turn brown. Brown streaks in the vascular tissue can be observed well up into the plant, which rapidly collapses and dies.

Causal Organisms

Fusarium wilt in solanaceous crops is caused by several different types of the fungus *Fusarium oxysporum*. These are: *F. oxysporum* f. sp. *lycopersici* (tomato), *F. oxysporum* f. sp. *melongenae* (eggplant) and *F. oxysporum* var. *vasinfectum* (pepper). Fusarium wilt in potato is caused by a complex of up to four different *Fusarium* spp. All of the Fusarium wilt pathogens are generally specific to their hosts and are soilborne. They are warm weather organisms, and therefore Fusarium wilts are most serious later in the growing season in Ohio.

Verticillium wilt is caused by the fungi *Verticillium albo-atrum* and *V. dahliae*. These fungi attack a wide range of plant species, including cultivated crops and weeds. They are soilborne in field and greenhouse soils where they can persist for many years. *V. albo-atrum* is a cool weather organism that grows best when soil temperatures are between 65 and 75 degrees F. *V. dahliae* is more active between 75 and 83 degrees F. Although disease is retarded by the higher temperatures that favor Fusarium wilt, visible symptoms may appear to be more severe when high temperatures exist, due to restricted water movement in the plant brought about by damage done to the water conducting vessels earlier in the growing season.

Management

1. Because Fusarium and Verticillium fungi are widespread and persist several years in soil, a long crop rotation (4 to 6 years) is necessary to reduce populations of these fungi. Avoid using any solanaceous crop (potato, tomato, pepper, eggplant) in the rotation, and if Verticillium wilt is a problem, also avoid the use of strawberries and raspberries, which are highly susceptible. Rotate with cereals and grasses wherever possible.

Figure 4.Typical V-shaped lesions on tomato leaves associated with Verticillium wilt.

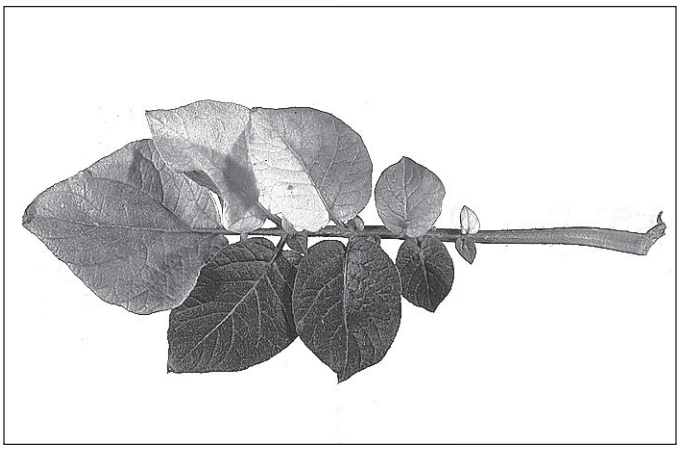

Figure 5. One-sided wilt and death of potato leaves caused by *Verticillium* spp.

2. Keep rotational crops weed-free (there are many weeds hosts of *Verticillium*).
3. Whenever practical, remove and destroy infested plant material after harvest.
4. Maintain a high level of plant vigor with appropriate fertilization and irrigation, but do not over-irrigate, especially early in the season.
5. Plant disease resistant tomato varieties, labeled V (for *Verticillium*) and F (for *Fusarium*). These disease resistance designations are usually shown in seed catalogues. *Fusarium*- or *Verticillium*-resistant varieties of eggplant, potato, and pepper are generally not available.
6. If soils are severely infested, production of solanaceous crops may not be possible unless soil fumigation is an option. See the Ohio Vegetable Production Guide (OSU Extension Bulletin No. 672) for information on soil fumigation.

9/96—360—klw