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Commercial Horticulture – Tomato Disease - WILTS

Occasionally, in tomato production, you may identify a tomato plant or two in the field that doesn't look right. The plant may stand out from the others with leaves drooping and foliage discoloration, and you may think it needs water, fertilizer, or a prayer. However, the plant next to it may look healthy and robust. There are many conditions that may cause this. In large operations a condition like this could get out of hand quickly and severely damage the crop by reducing the availability of fresh quality produce to the consumer and the farmers' pocketbook. To ensure the best production and quality of produce, careful monitoring and Integrated Pest Management (IPM) should be in place.

In Florida, there were 29,000 acres of tomatoes that were harvested in 2010. This figure ranks Florida #2 in the United States for total harvested tomatoes. This acreage results in a total farm value of $630 million ranking Florida #1 in the Nation. On the other hand, although this industry is significant in the Florida agricultural economy, it has a few constraints that are shared by most if not all farmers. One constraint is called "wilt". There are several wilt diseases that threaten the tomato; however, some improved tomato varieties show signs of resistance. Through research at the North Florida Research and Education Center in Quincy, Florida, some of the most significant wilt diseases in tomato production are: southern blight; sclerotinia blight; bacterial wilt; fusarium wilt; verticillium wilt; and, tomato spotted wilt. [1]

Southern blight – This warm-season, soil-borne fungal disease affects diverse crops worldwide. One crop affected is tomatoes. When tomatoes wilt, many individuals may associate this with moisture stress, but that may not be the case. The southern blight disease favors high humidity, soil moisture, and warm to hot temperatures (85-95 F). In the initial stages, the base of the stem will have a necrotic section and appear to girdle the stem. At the soil line of the plant, there is a presence of a white substance that is called mycelia which grows along the collar region of the plant adjacent to the soil. This fungal disease is called southern blight – *sclerotium rolfsii*. In early stages, the white

mycelia growth may not be as apparent, but in the later stage, it will. Another specific indicator of southern blight in the later stage is the presence of small structures known as sclerotia. The sclerotia can survive several years in the soil. Appearing as very small BBs, they may be white to light and dark shades of brown. If fruits are affected, the appearance will be a watery or mushy rot with sunken lesions.
Prevention: This is a difficult disease to control because of its broad host range being over 500 plant species; and therefore, making it a high probability for field inoculation. Reducing the impact of southern blight on vegetables may be possible with crop rotation and the use of Integrated Pest Management (IPM) methods. Additional means of prevention is through the method of soil solorization, using pathogen-free transplants, and resistant cultivars. Resistance has been identified for some hosts in six tomato breeding lines: 5635M, 5707M, 5719M, 5737M, 5876M, and 5913M. On the organic approach, soil amendments such as organic fertilizers, biological control agents, and compost of oat, corn straw, and cotton gin trash may help control southern blight.[2] Another method of control is field fumigation with Methyl Bromide.[3] However, Methyl Bromide is predicted to be taken off the marketplace in the next few years.

Sclerotinia blight – Another wilting disease is scerotinia blight – s*clerotinia sclerotiorum*. A member of the pathogens that causes "damping-off" is a cool season pathogen. It favors excessive soil moisture either from rain or irrigation.[4] With scerotinia blight, the symptoms will be similar to southern blight, whereas plants will exhibit a wilting or drooping appearance. White fungal growth will be noticeable on the stem of the plant; however, the distinguishing characteristic different from southern blight is sclerotinia blight will have a black fungal growth called sclerotia inside the stem of the plant. The black sclerotia will have the appearance of rat droppings. The black growth also will have the white fungal growth.
Prevention: Another method of control is field fumigation with Methyl Bromide.[5] However, Methyl Bromide is predicted to be taken off the marketplace in the next few years.

Bacterial wilt – Once again, the observation will be a wilting or drooping plant, but in this case there is no sign of white mycelium on the stem or at ground level along the base of the plant. There are no indications of yellowing leaves prior to the death of the plant; however, the plant may exhibit being stunted prior to the wilting. The distinguishing characteristic about this hot-season and wet-soil pathogen is that if you cut a piece of the stem and suspend the cut end of the stem into a clear glass of water and allow it to be undisturbed for 15-30 seconds, a thread-like white substance will be noticeable coming out of the cut end of the sample. In addition, if you closely observe the cut end with a microscope, you will see mycelium on the cut end. In the later stages, advantageous roots may be enhanced and the stem pith becomes hollow and vascular tissues turn brown. A water-soaked appearance of the dark-colored pith near the surface of the soil, in addition to a gray slippery substance that is given off from cutting the stem at the soil surface, is a sure indicator of bacterial wilt. Through increasing the

soil pH and with the addition of calcium through liming, the disease incidence may be suppressed.[6]
Prevention: Use grafted plants with hybrid rootstocks.

Fusarium wilt – If you don't have white mycelium on the stem and soil line and there is no thread-like mycelium extending in the water test, as with the bacterial wilt, but there is an indication of yellowing leaves and discoloration of the vascular system, the disease may be either fusarium wilt or verticillium wilt, more specifically: 1) f*usarium oxysporum,* 2) v*erticillium dahlia,* and/or, 3) v*erticillium albo-atrum.* The distinct characteristic of these three pathogens is the discoloration of the vascular system. With young plants, stunting is the first indicator of fusarium wilt. As the plant matures, and mostly between the interval of blossoming and fruit maturation, the symptoms of leaf yellowing begin to appear. The yellowing may first occur on the lower half or possibly on one side of the lower portion of the plant. Sometimes even the leaflets on one side of a petiole may turn yellow, while the other side remains green. With time, there is a progression of the yellowing into the plant and then wilting occurs. This is usually apparent during the hottest time of the day.
Prevention: Use for 1) fusarium wilt – resistant varieties, field fumigation, grafting with resistant rootstocks (increasingly used in organic and greenhouse production); 2) verticillium wilt – resistant varieties, field fumigation, and grafting with resistant rootstocks.

Tomato spotted wilt – If the plant is wilting, drooping, and the leaves are curled with a purple coloration and patterned throughout the leaf, the disease is tomato spotted wilt caused by a tospovirus. The tomato spotted wilt virus occurs frequently in numerous crops in northern Florida. In the later stages, the spotty purple colorations will join as one large blotch. Other symptoms of tomato spotted wilt are chlorotic and necrotic ringspots, meristem necrosis, leaf bronzing, stem necrosis, stunting, and fruit spotting. There may be circular patterns on the fruit and leaves.[7] Thrips are a vector of this disease and with early monitoring and control, thrips populations will be at a minimum. Other indicators are on the fruit. Infected fruit will appear to have concentric rings of brown and lighter green colorations.
Prevention: Use resistant varieties, reflective mulches, thrips pesticide management, kaolin, and, SAR inducer.[8] The most effective means of controlling the virus is through controlling the thrips with the use of spinosyns class insecticides. No other insecticide class provides this level of control. Although there are some levels of resistance cases, follow the recommendation on the label. Only use group 5 insecticides (spinosyns) a maximum of six sprays and no more than two consecutive sprays before rotating to an insecticide in a different class. Avoid sequential sprays on sequential crops. Cyazypyr® and acetamiprid have performed best after the spinosyns in the trials. Other insecticides that have shown significant suppression against the adults and larvae of western flower thrips include flonicamid, spirotetramat, and Requiem® (extract of c*henopodium*

ambrosioides near *ambrosioides*). Azadirachtin and potassium salts of fatty acids are available commercially, and these provide some suppression of western flower thrips. [9]

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[1] Mathews Paret, Gary Vallad, Shouan Zhang, Nick Dufault, Rosemary Loria, Jim Marois, Steve Olson, Hank Dankers, Hands-on identification of vegetable diseases: Tomato, North Florida Research and Education Center, Quincy, FL - Department of Plant Pathology, University of Florida, Gainesville, FL

[2] Chenzhao Xie et.al. Gary Vallad, UF/IFAS, PP272 - Integrated Management of Southern Blight in Vegetable Production

[3] Mathews Paret, Gary Vallad, Shouan Zhang, Nick Dufault, Rosemary Loria, Jim Marois, Steve Olson, Hank Dankers, Hands-on identification of vegetable diseases: Tomato, North Florida Research and Education Center, Quincy, FL - Department of Plant Pathology, University of Florida, Gainesville, FL

[4] Richard Raid and Tom Kucharek, UF/IFAS, PDMG-V3-36, 2006 Florida Plant Disease Management Guide: Celery

[5] Mathews Paret, Gary Vallad, Shouan Zhang, Nick Dufault, Rosemary Loria, Jim Marois, Steve Olson, Hank Dankers, Hands-on identification of vegetable diseases: Tomato, North Florida Research and Education Center, Quincy, FL - Department of Plant Pathology, University of Florida, Gainesville, FL

[6] Tim Momol and Ken Pernezny, UF/IFAS, PDMG-V3-53, 2006 Florida Plant Disease Management Guide: Tomato, Bacterial Wilt (*Ralstonia solanacearum*)

[7] Tim Momol and Ken Pernezny, UF/IFAS, PDMG-V3-53, 2006 Florida Plant Disease Management Guide: Tomato, Bacterial Wilt (*Ralstonia solanacearum*)

[8] Mathews Paret, Gary Vallad, Shouan Zhang, Nick Dufault, Rosemary Loria, Jim Marois, Steve Olson, Hank Dankers, Hands-on identification of vegetable diseases: Tomato, North Florida Research and Education Center, Quincy, FL - Department of Plant Pathology, University of Florida, Gainesville, FL

[9] Joe Funderburk, Stuart Reitz, Steve Olson, Phil Stansly, Hugh Smith, Gene McAvoy, Ozan Demirozer, Crystal Snodgrass, Mathews Paret, and Norm Leppla, UF/IFAS, ENY859, Managing Thrips and Tospoviruses in Tomato, Insecticides