Stress factors such as drought, flooding, chemical damage, mechanical damage, low soil pH, deposition of soil on stems while cultivating, or incorrect usage of fertilizer may predispose plants to infection by *Fusarium* spp. Other pests such as fungi, bacteria, nematodes, or insects may occur simultaneously in roots or stems or predispose plants to infection by the Fusaria. For example, nematode damage accentuates Fusarium wilt in cotton but not in any notable way in tomatoes, watermelons, or sweet potatoes. Also, lower stems of soybeans and beans are commonly infected with Fusaria and other fungi after hot soil is deposited on stems during cultivation.

Root and stem diseases caused by *Fusarium* debilitate plants by rotting (plant cell destruction) root and stem tissue or by plugging the water-conducting vessels (xylem) in roots or stems. Fusarium wilts can be diagnosed tentatively by slicing the stem in half lengthwise. The presence of two dark bands of water-conducting tissues indicates that the xylem vessels are plugged from infection. If the stem is sliced perpendicular to the length of the stem, the darkened tissue will often appear as a circle. If the infection is one-sided in the plant, a portion of the circular tissue will be darkened. The blockage of the water and nutrient-conducting tissue of the plant results in stunting, discoloration of leaves (usually yellow, initially), and wilting. Yield losses are greater and plants are more likely to die if infection occurs while plants are young. Because other pests and diseases can cause similar symptoms, you are advised to attain formal diagnoses until you become familiar with symptoms and field diagnostic procedures for the crops you produce.

Fusarium wilts

Fusarium wilt of tomato

Fusarium wilt of tomato (Fig. 1) would be more common and devastating throughout Florida if resistant varieties were not used. Resistance to Fusarium wilt in tomato is complete; that is, all plants within a variety are resistant to the designated races unless a seed or transplant mishap has occurred. Currently, races 1, 2, and 3 exist in Florida. If Fusarium wilt is present, slicing the stem lengthwise into equal halves will reveal two dark, orange-red, or brown streaks of darkened water-conducting vessels (Fig. 2). Symptoms include lower leaf yellowing and then browning, stunting, vascular discoloration, and plant death. Leaf yellowing is often seen on one side of the plant and frequently in leaflets on one side of the leaf. The darkened vascular tissue often extends up to the middle part of the stem and sometimes to the top of the stem and into the vascular tissue of the fruit. The optimum temperature for development of Fusarium wilt and growth of the fungus is 82°F (28°C). Growth of the fungus is reduced at temperatures below 68°F (20°C) or above 93°F (34°C). However, Fusarium wilt has occurred in Florida at temperatures above 95°F (35°C).

The primary control for Fusarium wilt of tomato is the combined use of crop rotation, resistant varieties for the pathogenic races in your area, disease-free transplants, and preplant fumigation with a broad spectrum fumigant (e.g., methyl bromide + chloropicrin, vapam, etc.). Reinfestation of fumigated soil with non-fumigated soil and pond water should be avoided. Transplant production areas should be sanitary and should not be adjacent to field production areas or equipment cleaning areas.

Sterilizing used field stakes will reduce, not necessarily eliminate, the amount of inoculum associated with the stakes that can infest fumigated soil. When tomatoes are planted in a new field, it is best to use new stakes because sterilization procedures such as steam or chemicals may not eliminate all of the inoculum. When planting tomatoes in a field that contained tomatoes in the past, use of sterilized stakes is preferred. However, with use of unsterilized stakes, the crop may be near the end of harvest before the wilt fungus causes any noticeable problem.

Additional controls for Fusarium wilt of tomato include adjusting pH, fertility and moisture of the soil. The soil pH should be 6.5 or above coupled with minimum usage of ammonium- containing fertilizer. Avoid the use of excessive amounts of nitrogen, phosphorus, and magnesium. Soil moisture should be adequate for crop production but not excessive. Use of drip or seepage irrigation coupled with adequate drainage for heavy rains will provide a proper soil moisture situation. These adjustments to the soil will be most effective for control of Fusarium wilt if the entire root system is confined within the treated soil such as that within a plastic mulch system.

This fungus can be seed borne. However this source of inoculum is not common. The importance of seed-borne inoculum relates to the potential for introducing new races from other areas of the world.