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Vegetable Diseases

Mature Watermelon Vine Decline and Similar Vine Decline Diseases of Cucurbits

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Since the mid-1980s, watermelon fields in southwestern Indiana have experienced outbreaks of a disease syndrome known as mature watermelon vine decline (originally known as sudden wilt). The disease was a limiting factor in production and reduced yields in many fields in 1989, 1995, and 1999. In 2000, it was especially severe, affecting more than 50 percent of watermelon acreage in southwest Indiana, and reducing total estimated yield by 20 percent.

This publication describes the characteristics of mature watermelon vine decline (MWVD), the features that distinguish MWVD from more common watermelon diseases, and what has been learned about MWVD since 2000.

Figure 1. Mature watermelon vine decline causes infected vines to wilt and collapse.

Symptoms

Initial MWVD symptoms include necrosis and wilting of leaves, followed by the wilt and collapse of the vines (Figure 1). Vine collapse reduces fruit quantity, size, and quality; prevents normal ripening; and exposes fruit to sunburn. On symptomatic plants, the root systems are generally sparse — the primary roots are necrotic (dead tissue) and the plant has few secondary roots (Figure 2).

Symptoms often appear on mature plants in low, poorly drained areas (Figure 3). Under the right conditions, MWVD incidence will increase through the summer, often resulting in the collapse and decline of large portions of affected fields (Figure 4). Plants with MWVD often yield no marketable fruit.

Figure 2. The root systems of watermelon plants with aboveground MWVD symptoms often include dark brown necrotic roots and few secondary roots.

Research and Recommendations

Since the late 1990s, Purdue Extension has conducted research on the cause and management of MWVD that has lead to recommendations for managing MWVD. While a definitive cause has not yet been determined, greenhouse experiments showed that MWVD could be reproduced in plants grown in soil gathered from a commercial watermelon field with MWVD, but plants grown in fumigated soil remained healthy. This indicates that MWVD is caused by a soilborne organism.

Figure 3. MWVD symptoms are often noticed in low, poorly drained areas first.

Figure 4. Widespread MWVD can result in the collapse and decline of large portions of fields.

Several different fungal pathogens have been isolated from root systems of MWVD-infected plants. It is possible that under the right conditions one or more different organisms might cause MWVD. To avoid the potential buildup of disease-causing organisms in the soil, it is recommended to rotate crops away from watermelon and other cucurbits in areas where MWVD is a problem.

In another set of greenhouse experiments, MWVD could be induced by drenching the soil with water. These results support observations from commercial fields that showed MWVD symptoms often appear after heavy rains. Based on these results, fields should be irrigated judiciously and fields with poor drainage avoided.

A three-year study involved the use of canola as a cover crop and bio-inoculants (microbial products) as options for managing MWVD. During the duration of the experiment, MWVD occurred only one of the three years, and in that year, canola as a cover crop reduced MWVD severity. Bio-inoculants did not help control MWVD. Based on these results, it appears that some types of cover crops (such as canola, winter rape, and mustards) may help reduce the severity of MWVD.

Our research results, as well as those of others, show that plants with well-developed root systems resist MWVD better than those with poorly developed root systems. Therefore, cultural conditions that promote good root development should be practiced. While direct-seeding typically produces plants with stronger root systems, transplanted plants that are irrigated with dual, buried drip tapes (instead of the traditional single surface tape) may also improve root growth and development.

In a different series of greenhouse experiments, watermelon cultivars were screened for host resistance to Fusarium wilt. Although Fusarium wilt has not been directly implicated in MWVD, plants that are resistant to a variety of diseases are more likely to resist other diseases such as MWVD. For this reason, we recommend using watermelon varieties with partial resistance to Fusarium wilt. *The Midwest Vegetable Production Guide* (Purdue Extension publication ID-56) regularly updates information on Fusarium wilt resistance.

Figure 5. Fusarium of wilt of watermelon causes leaves on individual vines to wilt. Eventually, the entire plant may die.

Figure 6. Stem lesions toward the base of plants are another symptom of Fusarium wilt of watermelon.

Figure 7. The stems of watermelon plants affected by Fusarium wilt are typically discolored and necrotic.

Problems Causing Similar Symptoms

Fusarium Wilt

Because MWVD and Fusarium wilt both cause plants to eventually collapse and die, MWVD may be confused with Fusarium wilt; however, there are some distinct differences between them. Fusarium wilt is caused by the soilborne fungal pathogen *Fusarium oxysporum* f. sp. *niveum*.

The fungus that causes Fusarium wilt invades the water conducting tissue (xylem), which results in vascular necrosis that causes the vines to wilt (Figure 5). In addition, stem lesions may occur near the crown of the plant (Figure 6). Neither of these symptoms are prominent in MWVD.

Watermelon varieties also differ in their susceptibility to Fusarium wilt, but all watermelon varieties are equally susceptible to MWVD. Another distinguishing characteristic is that Fusarium wilt outbreaks often occur within clusters of plants and rarely destroy an entire field.

Distinct vascular browning in a longitudinal or cross-section of the taproot or lower stem of a wilted plant is diagnostic for Fusarium wilt (Figure 7); however laboratory confirmation may be required for a definitive answer.

Figure 8. Root knot nematode causes galls on the roots of a wide variety of plants.

Root Knot Nematode

MWVD also may be confused with root knot nematode damage because both can cause the decline and collapse of watermelon plants over a broad area of the field. The most visible difference is that root knot nematode causes clearly distinguishable galls on the roots while MWVD-affected plants do not have galls (Figure 8). Root knot nematode also affects many different kinds of plants (including muskmelon and tomato), while MWVD has only been observed to affect watermelon.

Plants infected with root knot nematode typically are clustered in a field, and the plants are usually stunted, but seldom wilt or die. In contrast, plants affected by MWVD decline much more rapidly (in most cases) than plants affected with root knot nematode and the entire vine my collapse and die.

Figure 9. This muskmelon plant has wilted due to bacterial wilt.

Bacterial Wilt

MWVD also is confused with bacterial wilt, which is caused by *Erwinia tracheiphila*, a pathogenic bacterium spread by striped and spotted cucumber beetles. Bacterial wilt also causes infected plants to rapidly wilt and collapse (Figure 9). However, bacterial wilt occurs on muskmelon and cucumber, but does not affect watermelon.

More information about watermelon and muskmelon diseases in the Midwest are available in:

- *Diseases and Pests of Muskmelon and Watermelon* (Purdue Extension publication BP-44)
- *Midwest Vegetable Production Guide for Commercial Growers* (Purdue Extension publication ID-56)

Both publications are available from the Purdue Extension Education Store:
www.the-education-store.com

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