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Plant Pathology Fact Sheet

Phytophthora Blight of Cucurbits and Peppers

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Importance

Under ideal conditions, Phytophthora blight is an aggressive, fast moving disease that can cause extensive losses. This disease has become increasingly problematic on cucurbits and solanaceous crops in the United States. During the past decade, Phytophthora blight has been causing significant losses in several major vegetable production areas of the U.S. In Kentucky, serious outbreaks have been reported on summer squash (Figure 1), winter squash, cucumbers, watermelons, and peppers.

Figure 1

Symptoms and Signs

The plant parts affected by Phytophthora blight differ between hosts, as indicated in Table 1.

Symptoms also vary depending on the host crop. Typically symptoms include damping-off, root rot, crown rot, stem rot, wilting/ collapse of plants, and lesions on leaves and fruit. Plant mortality is commonly seen in hosts with highly susceptible crowns and stems, while other hosts can appear relatively healthy until fruit set. Fruit infection is especially troublesome because the symptoms may not become visible until after harvest.

Cucurbit hosts

Stem lesions are constricted, darkened, and water-soaked, often extending a few inches above the soil line—similar to black shank on tobacco. Infections of the crown result in

TABLE 1. SUSCEPTIBILITY OF VARIOUS PLANT TISSUES IN HOSTS OF PHYTOPTHORA BLIGHT

Host crop	Highly susceptible tissues	Other susceptible tissues
Muskmelon (cantaloupe)	Fruit	Leaves
Cucumber	Fruit	Leaves
Pumpkin	Crown, stem, and fruit	Leaves
Watermelon	Fruit	
Yellow summer squash	Crown, stem, and fruit	Leaves
Zucchini squash	Crown, stem, and fruit	leaves
Eggplant	Fruit	Crown and leaves
Pepper	Crown, stem, and fruit	Roots and leaves
Tomato	Fruit	Crown and stem


FIGURE 2


FIGURE 3


FIGURE 4


FIGURE 5

total plant collapse (FIGURE 2). Lesions on leaves tend to be circular and initially water-soaked in appearance (FIGURE 3). Later, a tan to dark brown color will develop. Circular lesions are common on fruit (FIGURE 4), and will appear water-soaked and sunken. The surface of the lesion may be covered in a thin, yeasty film made up of mycelium and sporangia (FIGURE 4) of the pathogen, particularly in damp weather. Fruit infections can advance rapidly and result in complete decay (FIGURE 5).

Pepper

The most common symptoms include rotting or necrosis of roots and crowns, and darkened cankers on stems (FIGURE 6). Plants with infected roots and stems wilt (FIGURE 7) and eventually die. Leaves may become infected, resulting in water-soaked, pale-green to yellow lesions. Infected fruit develop water-soaked lesions and may show a thin layer of white fungal growth when humidity is high.

FIGURE 6

FIGURE 7

CAUSE AND DISEASE DEVELOPMENT

This disease is caused by *Phytophthora capsici*, a fungus-like organism belonging to a group called the Stramenopiles. This pathogen is related to the organisms causing black shank of tobacco, damping-off of many crops, downy mildew of vegetables, and blue mold of tobacco.

P. capsici overwinters as thick-walled, long-surviving resting spores (oospores). Initial infections arise primarily from oospores on crop residue. Oospores germinate and produce sporangia, which in turn release swimming spores (zoospores) that actively move in water films to plant parts. Numerous sporangia are then produced on the surface of infected roots, crowns, and fruit. The sporangia, which provide inoculum for secondary cycles, are highly detachable and easily windblown to susceptible tissues.

The pathogen is also spread by splashing water and infested soil in contact with the host, the movement of infested soil by human activity, contaminated irrigation water, and on infected transplants. The cycle of infection and spore production can be repeated many times during the same growing season.

Phytophthora blight is favored by warm (80°F is ideal), wet conditions. Under favorable conditions, disease spread is explosive and often devastating.

DISEASE MANAGEMENT

Management of Phytophthora blight can be difficult once the pathogen has become established in a field. Individual management tactics are not effective because of the wide host range and persistent nature of the pathogen—oospores can survive for 5 years (or longer) in the absence of a host. Disease management requires an integrated approach that relies on a combination of cultural practices, crop rotation, and judicious use of fungicides. Once started, epidemics of the disease are nearly impossible to stop so planning a management strategy for Phytophthora blight must begin prior to planting a crop.

Crop rotation

Crop rotation is critical to reducing pathogen populations in the field. Growers should avoid planting crops susceptible to *P. capsici* in fields where Phytophthora blight has been historically high. A key problem is the pathogen's wide host range, which includes a large number of high-valued cash crops. Pathogenic isolates have been recovered from all of the following crops in Kentucky: peppers, cucumbers, pumpkins, summer squash (yellow and zucchini), winter squash, gourds, watermelon, tomato, eggplant, tobacco; along with several weeds in the nightshade family, including common black nightshade. A minimum of 3 years crop rotation to non-hosts is recommended to avoid build-up of *P. capsici* spores. However, longer rotations may be needed in a field with a history of severe outbreaks of this disease, especially if the site is wet-natured.

Moisture management

Field preparation should include minimizing areas that promote standing water. Install drain tiles and break up hardpans, if needed. The pathogen requires free water to develop and spread, and wet spots are usually the first place that Phytophthora blight appears. Plant crops into raised beds to promote drainage and fill in depressions around transplants with soil to eliminate pockets that will collect water. Do not use surface water to set transplants or irrigate the crop. Because *P. capsici* can be found readily in ponds and creeks, it can become established in clean fields that are irrigated with surface water.

Fungicides

Fungicides and fumigants are labeled for many of the crops susceptible to *P. capsici*. Early applications can reduce the incidence and severity of disease. However, fungicides alone will not provide adequate control of Phytophthora blight and should be used as part of a comprehensive management plan.

Using a pre-plant fumigant may reduce pathogen populations and delay the onset of the disease in problem fields. Fungicides can be applied prior to transplanting and/or after transplanting or seeding to suppress Phytophthora blight. To be effective, these materials should be applied as part of a regular fungicide program before symptoms appear. Refer to the University of Kentucky *Vegetable Production Guide for Commercial Growers* (ID-36) for current chemicals available for managing this disease. Always read pesticide labels carefully for application rates, directions, and restrictions.

Sanitation

Remove infected plants and destroy them immediately. Equipment, vehicles, and feet should be sanitized when moving from infested to clean fields.

Resistance

Host resistance is largely unavailable for most crops; however, a few lines of pepper that are tolerant to *P. capsici* are available.

Additional Resources

Disease management and crop production advice can be found in the following University of Kentucky publications available at County Extension offices, as well as on the Internet.

- IPM Scouting Guide for Common Pests of Solanaceous Crops in Kentucky, ID-172 (2008) http://www.ca.uky.edu/agc/pubs/id/id172/id172.pdf
- IPM Scouting Guide for Common Problems of Cucurbit Crops in Kentucky, ID-91 (2009) http://www.ca.uky.edu/agc/pubs/id/id91/id91.pdf
- Kentucky Pepper Integrated Pest Management Grower Manual(2000) http://www.uky.edu/Ag/IPM/manuals/ipm13pep.pdf

- Management Tips for Disease Control in Commercial Vegetables in Kentucky, PPFS-VG-05 (1994)
http://www.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/PPFS-VG-5.pdf

- Vegetable Production Guide for Commercial Growers, ID-36
http://www.ca.uky.edu/agc/pubs/id/id36/id36.htm

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