Martin-Gatton
College of Agriculture, Food and Environment
Cooperative Extension Service

Plant Pathology Fact Sheet **PPFS-VG-04**

Phytophthora Blight of Cucurbits & Solanaceous Vegetables

Nicole Gauthier
Plant Pathology
Extension Specialist

Misbakhul Munir
Plant Pathology
Postdoctoral Scholar

Adam Huber
Agricultural
Extension Agent

Importance

Phytophthora blight is an aggressive, fast-moving disease that can cause fruit rot, plant wilting, and plant death. In Kentucky, serious outbreaks with extensive losses (Figure 1) have been reported on squash (summer and winter), cucumber, watermelon, and peppers.

Hosts

Crops: Peppers (bell and hot), tomato, eggplant, cucumber, melons, pumpkin, summer squash (yellow and zucchini), winter squash. Beans (snap and lima) are also susceptible.

Weeds: Night shades (solanaceous), purslane, Carolina geranium.

Figure 1. Phytophthora blight can cause severe losses in summer squash and other cucurbits.

Symptoms & Signs

Symptoms, which initially appear in low-lying, wet or flooded areas of fields, vary depending on the host crop, tissue affected, and stage of plant development. Symptoms can include damping-off, root decay, crown rot, stem rot, and wilting/collapse of plants. Lesions can also develop on leaves and fruit. Plant death is common on hosts with highly susceptible crowns and stems, while other hosts can appear relatively healthy until fruit set. Fruit infections are especially troublesome when symptoms develop in storage. Infected tissues can develop white, moldy growth under wet or humid conditions.

Cucurbit (vining) crops

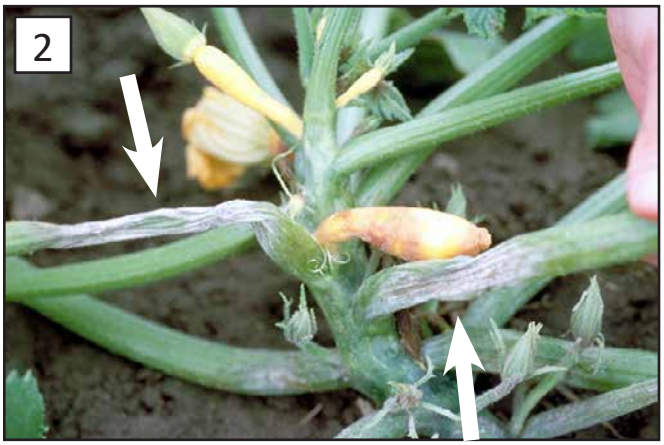
Phytophthora blight can affect all plant tissues of susceptible cucurbits from seedlings to mature plants; however, sensitivity of various plant tissues differs by host (Table 1).

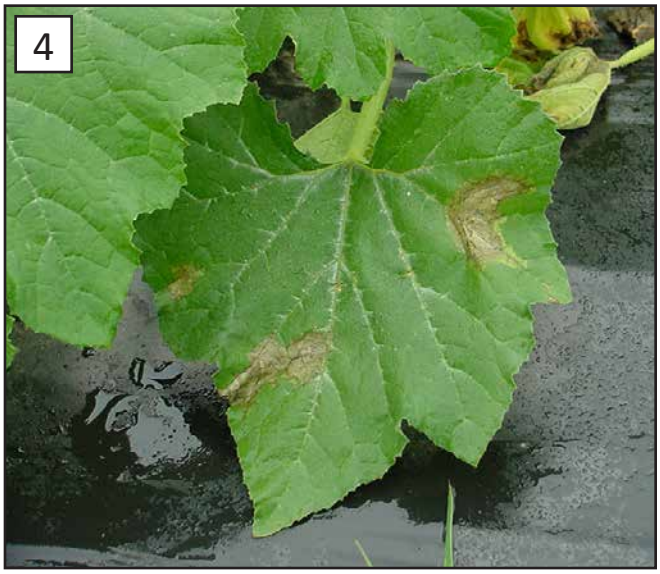
Stem and vine lesions are initially water-soaked and dark brown, later becoming light brown. These lesions become constricted (Figure 2) and can expand several inches above the soil line; girdled stems result in vine or whole plant wilt. **Crown** infections cause total plant collapse (Figure 3). **Root** infections result in death of young plants, while the root systems on mature plants are poorly developed with fewer feeder roots.

Decaying roots become water-soaked, light brown, and the epidermis (outer portion of roots) sloughs off easily. **Foliar** spots are circular and initially water-soaked (Figure 4), rapidly becoming tan to dark brown and irregular in shape. **Fruit** lesions, which develop where fruit comes in contact with soil, are circular and water-soaked (Figure 5), later becoming sunken and covered with white, moldy growth (Figure 6).

Table 1. Tissues susceptible to Phytophthora blight differ between cucurbit (vining crop) hosts, as indicated in the table.

Host crop	Highly susceptible tissues
Cucumber	Fruit
Muskmelon (cantaloupe)	Fruit
Pumpkin	Crown, stem, and fruit
Watermelon	Fruit
Yellow summer squash	Crown, stem, and fruit
Zucchini squash	Crown, stem, and fruit





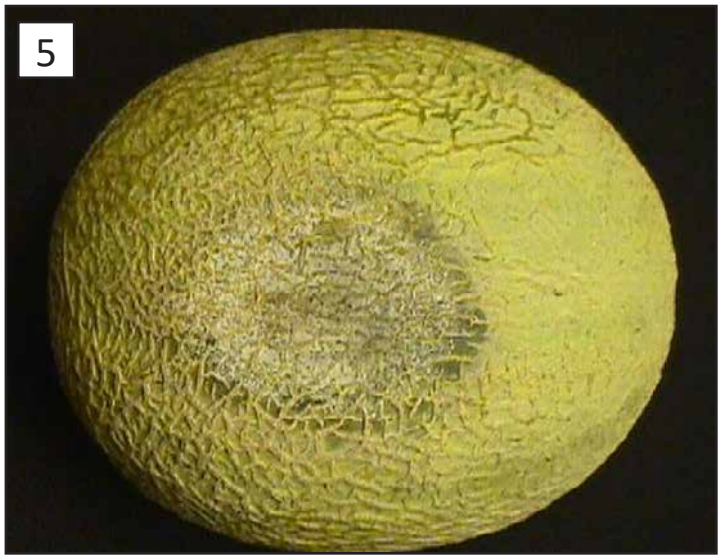


Figure 2. Phytophthora blight infections on cucurbit (vining crop) hosts commonly result in the constriction of stems and vines (arrows).
Figure 3. Crown rot can result in total plant collapse.
Figure 4. Foliar symptoms on cucurbits appear as irregularly-shaped, water-soaked spots.
Figure 5. This disease develops where fruit come into contact with the soil.
Figure 6. Infections can rapidly expand to entire fruit, often developing moldy growth.

Solanaceous crops

Phytophthora blight most commonly affects crowns, roots, stems, and fruit of solanaceous crops; however, leaves can also become infected. Sensitivity of various plant tissues differs by host (Table 2).

Crowns and **roots** become necrotic and decay, resulting in wilt and eventual plant death. **Stems** develop darkened cankers near the soil line (Figure 7), which can expand to several inches aboveground. Water-soaked spots on **leaves** are pale-green to yellow (Figure 8); **fruit** lesions are water-soaked (Figure 9).

Figure 7. Phytophthora blight stem lesions often appear near the soil line on infected pepper plants (arrow).

Figure 8. Foliar symptoms are circular and water-soaked.

Figure 9. Fruit infections result in water-soaked lesions, which can become covered in moldy growth.

Table 2. Tissues susceptible to Phytophthora blight differ between solanaceous hosts, as indicated in the table.

Host crop	Highly susceptible tissues
Eggplant	Fruit
Pepper	Crown, stem & fruit
Tomato	Fruit

Cause & Disease Development

Phytophthora blight is caused by *Phytophthora capsici*, a fungus-like organism commonly referred to as a water mold. As this latter name implies, the pathogen thrives in wet conditions: excess rain and/or irrigation, standing water, and saturated soils. Inoculum (infective propagules, such as spores) may enter fields via contaminated irrigation water (e.g., from streams or ponds), infected transplants, and soil carried on equipment or tools from infested fields.

The pathogen overwinters as thick-walled, resting spores (oospores) in infected crop debris and on susceptible hosts (e.g., weeds and volunteer plants). Oospores can remain dormant and persist in soil for several years, even in the absence of a host. Oospores germinate and produce sporangia (capsules filled with spores), which in turn produce and release zoospores (single-celled swimming spores). Motile zoospores actively move in water films or are splashed onto susceptible tissues where they infect and produce additional sporangia. Sporangia provide inoculum for secondary cycles and are spread short distances by wind, splashing water, windblown rain, and infested soil. Wet conditions combined with warm temperatures (75°F to 90°F) favor infections.

The cycle of infection and spore production can be repeated many times during the same growing season. Under warm wet conditions, disease spread is explosive and often devastating. Infections and disease spread cease with the onset of dry conditions.

Disease Management

For sites with no prior history of Phytophthora blight, prevention is the key management strategy. Growers should prevent introduction of the pathogen into clean fields by avoiding the following: planting diseased plant material, movement of contaminated soil, and use of surface water irrigation.

For sites with a history of this disease or if disease is now confirmed, management requires an integrated approach that relies on a combination of cultural practices, crop rotation, and judicious use of fungicides. No one management tactic (such as fungicides only) will be effective once *P. capsici* is introduced because of the pathogen's wide host range and persistent nature. Management strategies must begin prior to planting and then include diligent monitoring throughout the growing season. Once the pathogen has become established in a field, management can be difficult; epidemics are nearly impossible to stop.

Site selection, cultivars, and planting

- Avoid planting into sites known to be infested, near infested fields where water run-off is likely, and in fields where susceptible crops have been grown in the past 3 to 4 years.
- Select planting sites with good drainage and even terrain. Avoid low lying fields with poor drainage and heavy clay soils.
- Plant tolerant cultivars when available. A few lines of moderately resistant pepper cultivars are available.
- Plant only disease-free transplants.

Moisture management

- Improve surface drainage and break up hardpans, if needed. Grade fields to prevent standing water.
- Plant into raised beds. Fill in depressions around transplants to eliminate water pockets.
- Install plastic mulch to prevent fruit from contacting soil.
- Avoid use of surface water (e.g., ponds, streams) for irrigation.
- Avoid overhead irrigation.
- Do not overwater.

Sanitation

- Clean and sanitize equipment after use in infested fields.
- Remove infected crop material from plantings; all plant debris should be moved far from production fields and irrigation water sources.
- Use municipal, well water, or other clean water sources for irrigation.
- Deep plow fields at the end of the season to bury residual debris.

Crop rotation

- Rotate to non-host crops for a minimum of 4 years to reduce pathogen populations. Cereal crops (such as corn and wheat) and cole crops (such as broccoli, cabbage, and kale) are non-hosts and make suitable rotational crops.
- Rotations longer than 4 years may be needed in fields with a history of severe outbreaks of Phytophthora blight, especially if the site is wet.
- Manage weeds that are known hosts throughout the rotation period.

Fungicides

- Select products that are specifically labeled for management of Phytophthora blight. Water molds are not true fungi, and products that manage water mold pathogens, such as *P. capsici,* are different from most fungicides. These products may be referred to as oomycides.
- Apply preventative fungicides (oomycides) registered for the target crop prior to symptom development. Refer to the *Vegetable Production Guide for Commercial Growers* (ID-36) and *Southeastern U.S. Vegetable Crop Handbook* for current fungicides available for managing this disease, or contact a local county Extension office.
- Always read the product label carefully for application rates, directions, and restrictions.

Additional Resources

Production guides

- Southeast U.S. Vegetable Crop Handbook
https://www.aces.edu/blog/topics/vegetable-crops/southeastern-us-vegetable-crop-handbook/
- Vegetable Production Guide for Commercial Growers, ID-36
http://www2.ca.uky.edu/agcomm/pubs/id/id36/id36.pdf

IPM scouting guides

- IPM Scouting Guide for Common Pests of Solanaceous Crops in Kentucky (ID-172)
http://www.ca.uky.edu/agc/pubs/id/id172/id172.pdf
- IPM Scouting Guide for Common Problems of Cucurbit Crops in Kentucky (ID-91)
http://www.ca.uky.edu/agc/pubs/id/id91/id91.pdf
- IPM Scouting Guide for Common Problems of Vegetable Crops (mobile website)
https://veggiescout.ca.uky.edu/

Sanitation

- Cleaning & Disinfecting Hand Tools & Planting Supplies (PPFS-GEN-17)
https://plantpathology.ca.uky.edu/files/ppfs-gen-17.pdf
- Greenhouse Sanitation (PPFS-GH-04)
https://plantpathology.ca.uky.edu/files/ppfs-gh-04.pdf

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Editor: Cheryl Kaiser, Plant Pathology Extension Support
Photos: University of Kentucky—Kenny Seebold (1 & 4) and William Nesmith (2); Bugwood.org—Gerald Holmes, Strawberry Center, Cal Poly San Luis Obispo (3, 6, 7, 8 & 9) and Jason Brock, University of Georgia (5)

Revised from the fact sheet, *Phytophthora Blight of Cucurbits and Peppers* (PPFS-VG-04) by Kenny Seebold.