

VEGETABLE CROPS

CORNELL COOPERATIVE EXTENSION

Phytophthora Blight of Pepper and Certain Other Vegetables

Thomas A. Zitter

Department of Plant Pathology
Cornell University

Phytophthora blight of pepper is caused by the fungus *Phytophthora capsici*. Other names applied to this disease of peppers are damping off and Phytophthora root rot, crown rot, and stem and fruit rot. All of these names can apply since all parts of the pepper plant are affected.

The disease has occurred sporadically in New York for more than 40 years, and has been responsible for serious losses in New Jersey, California, New Mexico, and Florida. Other crops infected in New York have included eggplant, tomato, summer and winter squash, and pumpkin. Other reported hosts include cucumber, watermelon, and honeydew melon. The pathogen involved in these latter crops may be *Phytophthora parasitica* or *P. capsici* (see table).

Symptoms

Phytophthora blight of peppers can attack the roots, stems, leaves, and fruit, depending upon which stage plants are infected. A grower not knowing what to expect might first encounter the disease at mid-season when sudden wilting and death occur as plants reach the fruiting stage (fig. 1). Early infected plants are quickly killed (foreground, fig. 1), while later-infected plants show irreversible wilt (fig. 2). Often a number of plants in a row or in a roughly circular pattern will show these symptoms at the same time.

Fig. 1



Fig. 2



Fig. 3



Fig. 4



Fig. 5



Fig. 6



Fig. 7



Fungus-infected seedlings will damp off at the soil line, but relatively few plants die when temperatures are cool. Far more commonly, the disease will strike older plants which then exhibit early wilting. Stem lesions can occur at the soil line and at any level on the stem. Stems discolor internally, collapse, and may become woody in time (fig. 3). Lesions may girdle the stem, leading to wilt above the lesion, or plants may wilt and die because the fungus has invaded the top branches before the stem lesions are severe enough to cause collapse.

Leaves first show small dark green spots that enlarge and become bleached, as though scalded (fig. 4). If the plant stems are infected, an irreversible wilt of the foliage occurs.

Infected fruits initially develop dark, water-soaked patches that become coated with white mold and spores of the fungus (fig. 4). Fruits wither but remain attached to the plant (fig. 1). Seeds will be shriveled and infested by the fungus.

Because of the wide host range and the various phases at which plants can be infected, refer to the table for clarification of the crops affected and the *Phytophthora* species involved.

The symptoms of buckeye rot of tomato (mainly caused by *P. parasitica*, fig. 5) consist of leathery tan or brown spots, often appearing as concentric rings or bands on green fruit. Lesions can appear on the shoulder or, more commonly, on the blossom end where the tomato has contact with wet soil. On butternut squash (fig. 6) (and on several of the other crops listed with fruit symptoms) tan or brown lesions may give a banding affect or appear as large circular spots. Under humid conditions, white cottony mycelium and spores occur on the surface, and fruit are likely to rot quickly from secondary organisms.

Epidemiology and disease development

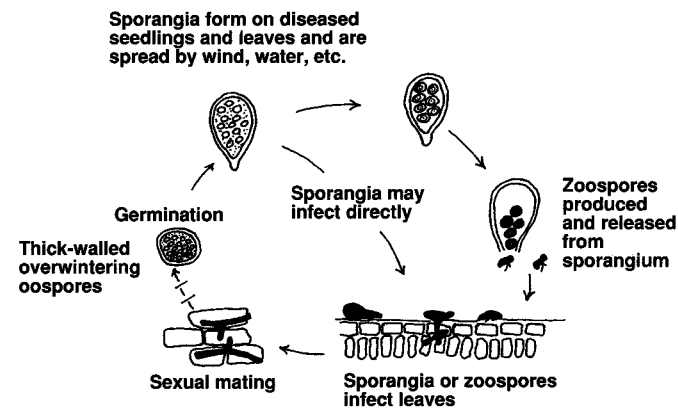
The following comments address pepper Phytophthora blight (*P. capsici*), and in general also apply for diseases of crops listed in the table. The fungus occurs naturally in most soils and can infect

Phytophthora Blight

pepper and other crops at most stages of growth when there is excess soil moisture and warm, wet weather. The fungus overwinters in soil as thick-walled oospores. For pepper, the fungus also survives on and in infested seed, but this is not a factor with commercially purchased seed. Infected plants produce irregularly branched thread-like structures (sporangiophores) which in turn produce variously shaped sporangia spores. With adequate moisture the sporangia give rise to biflagellate (two-tailed) motile zoospores. These spores produce germ tubes that penetrate plant tissue. The cycle is repeated with the production of more sporangiophores and sporangia.

When the humidity is high, the sporangia can survive for long periods. During such times wind-borne sporangia can be carried long distances, causing widespread dissemination and a rapid increase in the disease. Zoospores are readily spread by splashing rain and by flowing irrigation and surface water. The disease develops first in low areas after heavy rains and can quickly spread throughout the field. Favorable conditions for the fungus include wet soils above 65°F (18°C) and prolonged wet periods with air temperatures in the 75-85°F (24-29°C) range (refer to fig.8).

Fig. 8 Disease cycle of *Phytophthora* blight of pepper caused by *Phytophthora capsici*.



Control

Because *Phytophthora* blight is soilborne and more prevalent on poorly drained soils, careful attention must be given to cultural practices, especially on fields with a history of the disease.

- Practice crop rotation with crops other than tomato, eggplant, and cucurbits for at least 3 years.
- Avoid poorly drained fields for growing these crops.
- Plant the crop on a ridge, or better yet on raised, dome-shaped beds (fig. 7) to provide better soil drainage. Unmulched, low-profile beds will deteriorate during the season and may not provide sufficient drainage in July and August when disease spread can occur. Maintaining the uniform soil moisture necessary to prevent blossom end rot of peppers is difficult with raised beds unless trickle irrigation is used. Overhead irrigation, like rainfall, will encourage disease spread and should be discontinued if the disease is present.
- Fungicide use will vary depending upon the crop grown and in some cases the particular disease phase to be controlled. Refer to the current *Cornell Recommendations for Commercial Vegetable Production* for a list of available fungicides and their proper use. Soil fumigation, although useful in greenhouse situations, is not practical for field use because the fungus quickly reinvades treated soil.

A SELECT LISTING OF VEGETABLE CROPS AFFECTED BY VARIOUS *PHYTOPHTHORA* SPP.

Host and culinary type	Plant part affected	Causal organism
Pepper, especially bell and cherry types; also many pungent types	Blight (foliar phase); damping off, crown rot, root rot, fruit rot.	<i>Phytophthora capsici</i>
	Damping off	<i>Phytophthora</i> spp. (also <i>Pythium</i> and other fungi)
Tomato, all types; some varieties differ in susceptibility	Buckeye fruit rot	Mainly <i>Phytophthora parasitica</i> , but other <i>Phytophthora</i> spp. including <i>P. capsici</i>
	Phytophthora root rot	Mainly <i>Phytophthora parasitica</i> ; also <i>P. capsici</i>
Eggplant	Phytophthora fruit rot, also collar rot and stem canker	<i>Phytophthora parasitica</i> and <i>P. capsici</i>
Cucurbits: Summer squash	Phytophthora root rot; stem and leaf collapse	<i>Phytophthora capsici</i> and other <i>Phytophthora</i> spp.
Winter squash (butternut, Hubbard, etc.) and pumpkins (small and large types); cucumber and watermelon	Phytophthora fruit rot	Same as above
	Phytophthora blight	Same as above

Acknowledgments

Appreciation is extended to Ed Rutkowski and Steve Johnston for providing several photographs used in this publication, and to Steve Johnston for technical advice on specific disease control measures.

Quantity discount available.

This publication is issued to further Cooperative Extension work mandated by acts of Congress of May 8 and June 30, 1914. It was produced with the cooperation of the U.S. Department of Agriculture, Cornell Cooperative Extension, New York State College of Agriculture and Life Sciences, New York State College of Human Ecology, and New York State College of Veterinary Medicine, at Cornell University. Cornell Cooperative Extension provides equal program and employment opportunities. Lucinda A. Noble, Director.