

DAMPING-OFF

Mary W. Olsen

Pathogens

Soilborne fungi and fungal-like organisms: *Rhizoctonia solani*, *Thielaviopsis basicola*, *Pythium* spp.

Host

Seedlings of many plants, including most vegetables and flowers.

Symptoms/signs

Because damping-off is caused by several different organisms on many different plants, symptoms of disease vary. Emerging or established seedlings fall over and die rapidly, collapsing even when soil moisture is adequate. When dug up and inspected, the plants are soft, dark colored and usually disintegrating. Seeds may fail to emerge at all.

When infected with *Pythium* spp., the stems and roots of seedlings are black and rotted. Often the entire root system is soft and the outer root sloughs off.

Seedlings infected with *Rhizoctonia solani* have reddish brown to black lesions on the stem and roots. Stems are often girdled or become water-soaked and soft, causing the plant to fall over. Infections of small seedlings are often difficult to distinguish from *Pythium* rot without laboratory confirmation.

Thielaviopsis basicola causes a black root rot that may affect all or part of the root system. The fungus produces large dark spores on the root that form as a short column that breaks into several individual spores. These spores are diagnostic and can be easily seen under low power of a microscope.

Environmental conditions

Damping-off occurs in both cool and warm soils since the organisms that cause disease are active at different soil temperatures. Disease occurs in moist to wet soils. The optimum temperatures for disease vary: *Pythium aphanidermatum*, the most common species of *Pythium* in the

low desert, is most active in wet, warm soils, and is most problematic in summer months, while other *Pythium* species may be active in cooler soils in the winter. *Rhizoctonia solani* causes damping-off most frequently in cool, moist soils. *Thielaviopsis basicola* is most active at cooler temperatures in wet to moist soils.

Disease

Damping-off is caused by several soilborne fungi or fungal-like organisms commonly found in soils that may or may not have been previously cultivated. None of these organisms needs a wound or natural opening to enter the plant, but wounding can increase the incidence of disease.

At a Glance

Damping off is caused by several different pathogens under different environmental conditions:

- *Pythium* damping-off—collapse of the seedling stem or a pre-emergence rot; blackened rotted roots on older seedlings; usually in warm, wet soils.
- *Rhizoctonia* damping-off—reddish brown to dark brown lesions on the stem or roots; in warm to cool soils.
- *Thielaviopsis* damping-off—black root rot of seedlings; plants may grow out of disease but remain stunted compared to healthy plants; usually in cool soils.

Prevent disease using good cultural practices: plant when temperatures are optimum for seedling growth; plant into soils that are moist but not wet and maintain uniform soil moisture; use vigorous seed and seedlings; plant at appropriate depth.

When environmental conditions are right and a susceptible host is present, *Pythium* produces motile spores that can infect a plant root within a few minutes. These spores germinate to produce hyphae, microscopic tubular filaments that are the “body” of the organism. The hyphae grow into the roots, killing plant tissue as they grow. *Pythium* also produces sexual spores in the roots or in the soil that are resistant to adverse environmental conditions such as drying or cold temperatures. They can survive in a dormant state for months or years. These spores germinate and produce hyphae in the presence of a susceptible host when there is plenty of moisture. The hyphae penetrate the host root and begin the infection process.

Rhizoctonia does not produce spores but grows on dead organic matter in the soil from which it can invade the roots and hypocotyls of susceptible hosts. Once the host tissue has died, *Rhizoctonia* can continue to live on the dead organic matter or may form survival structures from its hyphae called sclerotia that can remain in soils for a long time without a food source or moisture. Hyphae from germinating sclerotia infect host plants.

Thielaviopsis produces asexual spores that can survive in the soil for many years. When there is adequate soil moisture and cool soil temperatures, the spores germinate, probably in response to exudates from susceptible host roots, and produce hyphae that invade host plant roots.

Prevention/control

Cultural Practices

Host plant resistance to the pathogens that cause damping-off is not available. Therefore, cultural practices are extremely important for prevention and control. Seed beds should be irrigated carefully to avoid excessive soil moisture. Plants and seeds should be planted when environmental conditions are best for the most rapid growth of seedlings. Use only healthy transplants. When buying young transplants, look for healthy white roots, sturdy stems and good color. Put seeds and transplants at the appropriate depth since deep planting slows emergence or growth and encourages disease.

In low desert areas, wait until temperatures cool down in October and November to transplant winter flowers to avoid *Pythium* and *Rhizoctonia* damping-off. In high desert areas, where annual flowers and vegetables are planted in the spring, wait until days are warm enough for good plant growth to avoid infections of *Rhizoctonia* and *Thielaviopsis*. Healthy, fast-growing seedlings and soils that dry slightly between irrigations are the best prevention methods for damping-off.

Chemical Control

In infested soils, seed treatments may give some control. Look for treated seed from the distributor. Many seed companies offer the option of treated or non-treated seed. Seed is usually treated with metalaxyl for control of *Pythium* and with PCNB (pentachloronitrobenzene) or Chloroneb for control of *Rhizoctonia*. Seed treatments with myclobutanil are effective for control of *Thielaviopsis basicola*.



THE UNIVERSITY OF ARIZONA
COLLEGE OF AGRICULTURE AND LIFE SCIENCES
TUCSON, ARIZONA 85721

MARY W. OLSEN
Extension Plant Pathologist, School of Plant Sciences

CONTACT:
MARY W. OLSEN
molsen@cals.arizona.edu

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