



Damping-off of Vegetables & Herbaceous Ornamentals

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IMPORTANCE

Damping-off can occur on any herbaceous crop grown from seed, including vegetables, ornamentals, hemp, and field crops. Seeds, seedlings, and young plants may be affected, resulting in poor stands (FIGURE 1) in residential gardens, greenhouses, high tunnels, and commercial fields. Losses to damping-off can be severe, especially when cool, wet weather prevails at the time of direct seeding, at seed emergence, or transplanting,

SYMPTOMS

Pre-emergence damping-off (FIGURE 2) occurs when seedlings fail to emerge from the soil as a result of seed decay. This decay can occur when seed is already infected by a pathogen prior to planting (seed-borne) or when seed becomes infected after planting (soil-borne). As a result, seedlings fail to emerge from the soil.

Post-emergence damping-off (FIGURE 3) occurs when germinated seeds and seedlings are infected, but plants do not collapse until after emergence. Stems of germinating seedlings develop water-soaked lesions at or below the soil line. As the disease progresses, lesions may darken to brown, reddish-brown, or black. Expanding lesions quickly girdle young, tender stems, causing seedlings to wilt and die soon after emergence.

Wirestem (FIGURE 4) results when infected seedlings survive post-emergence damping-off and are transplanted into the field. Infected transplants may continue to grow but with a constricted, wiry stem near the soil line. As a result, plants are stunted, off-color, and less productive than healthy plants. Wirestem is more common on crops in the cabbage family (crucifers).

CAUSE & DISEASE DEVELOPMENT

Damping-off may be due to one or more species of soilborne fungi (e.g. *Rhizoctonia* and *Fusarium*) and fungus-like organisms (water molds; e.g. *Pythium* and *Phytophthora*). Occasionally other fungi, such as *Sclerotinia*, *Athelia* (formerly *Sclerotium*), and *Botrytis*, may cause damping-off. These pathogens are common in Kentucky soils and can be spread via:

- Water runoff from irrigation or rain
- Movement of contaminated soil
- Infected or infested seed
- Introduction of infected plants
- Improperly sanitized greenhouse
- Irrigation water from ponds.

Once established in the soil, damping-off organisms are often able to survive for many years even in the absence of host plants. Some survive as saprobes/saprophytes



FIGURE 1. DAMPING-OFF CAN RESULT IN SEED DECAY, FAILURE OF GERMINATING SEEDS TO EMERGE, AND/OR COLLAPSE OF YOUNG SEEDLINGS (RIGHT).

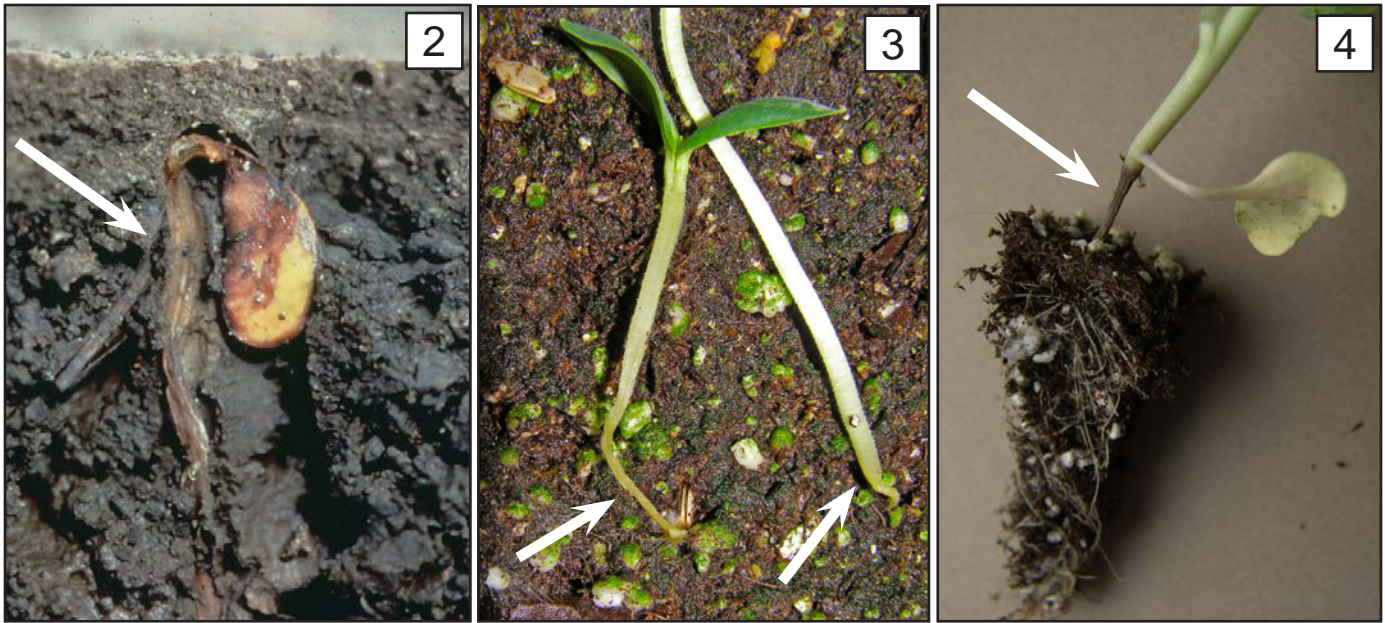


FIGURE 2. PRE-EMERGENCE DAMPING-OFF RESULTS IN SEED DECAY IN THE GROUND OR GERMINATING SEEDS FAIL TO EMERGE. NOTE THE DECAY OF THE RADICLE (ARROW). **FIGURE 3.** POST-EMERGENCE DAMPING-OFF CAUSES SEEDLINGS TO COLLAPSE SHORTLY AFTER EMERGING. NOTE THE LESIONS ON THE LOWER STEMS NEAR THE SOIL (ARROWS). **FIGURE 4.** THIS CABBAGE TRANSPLANT HAS WIRESTEM; NOTE THE CONSTRICTED STEM (ARROW). WIRESTEM CAN BE COMMON IN CRUCIFERS THAT SURVIVE POST-EMERGENCE DAMPING-OFF. IF SET IN THE FIELD, TRANSPLANTS WITH WIRESTEM WILL BE LESS PRODUCTIVE THAN HEALTHY PLANTS.

on plant debris, while others produce survival/resting structures that are capable of enduring adverse conditions. Their wide host range allows damping-off pathogens to extend their lives by moving from host-to-host.

Factors that favor disease development include:

- Wet soils (e.g. resulting from poor drainage or overwatering)
- Cool soils
- Cool to moderate temperatures.

DISEASE MANAGEMENT

Cultural Practices

Prevention is the key to managing damping-off. The following cultural practices can help reduce the incidence of this disease:

- Rotate fields and garden beds every 3 years, particularly if a site has a history of disease.
- Use certified clean seed and transplants or high-quality seed; purchase from a reputable source.
- Plant seeds and seedlings in well-drained soils.
- Do not overwater. Maintain good soil drainage.
- Use sterilized soil and sterile containers when planting seeds into pots or flats.
- Plant seed in the garden or field after the soil has warmed; use a warming mat if greenhouse conditions are cool.
- Disinfest tools, potting containers, and work benches used in seeding/transplanting operations.

Seed Treatment

Use seed treated with a fungicide to protect against seed decay (pre-emergence damping-off) and to protect seedlings upon emergence (post-emergence damping-off).

- Purchase seed that has already been pre-treated with a fungicide. Some commercial vegetable seeds are available in pre-treated form. Check seed catalogs or websites where you purchase your seed for details.
- Dust or soak untreated seed with a fungicide prior to planting.
 - Conventional fungicides are listed in the *UK Vegetable Production Guide for Commercial Growers* (ID-36) and the *Southeastern U.S. Vegetable Crop Handbook*.
 - Biorational products, such as some hydrogen dioxide or quaternary ammonium products, are labeled for seed treatment use.
- Disinfest or disinfect seeds using hot water, bleach, or trisodium phosphate. Seed disinfestation tables are available in the *UK Vegetable Production Guide for Commercial Growers* (ID-36) and the *Southeastern U.S. Vegetable Crop Handbook*.
- Apply biological products to planting media before seeding. Products containing *Bacillus*, *Streptomyces*, *Trichoderma*, and other antagonistic bacteria and fungi are known to reduce populations of soilborne pathogens, including those that are seedborne.

Fungicides

Fungicide drenches and sprays can help manage damping-off if applied as directed. These products are typically applied in-furrow at the time of planting or directly to germinating seedlings. Most conventional drench fungicides are available only to commercial producers, but some general use products may be used as seedling drenches in the home garden.

- Fungicides for greenhouse floriculture are listed in the *New England Floriculture Guide*.
- Fungicides for commercial vegetable production are listed in the UK *Vegetable Production Guide for Commercial Growers* (ID-36) and the *Southeastern U.S. Vegetable Crop Handbook*.
- Fungicide labels change often. Always refer to pesticide labels for usage and safety information, as well as rates and application details.

ADDITIONAL RESOURCES

- Vegetable Production Guide for Commercial Growers (ID-36)
<http://www2.ca.uky.edu/agcomm/pubs/id/id36/id36.pdf>
- Home Vegetable Gardening (ID-128)
<http://www.ca.uky.edu/agc/pubs/id/id128/id128.pdf>
- Managing Greenhouse & High Tunnel Environments to Reduce Plant Diseases (PPFS-GH-01)
<https://plantpathology.ca.uky.edu/files/ppfs-gh-01.pdf>
- New England Greenhouse Floriculture Guide
<https://ag.umass.edu/greenhouse-floriculture/publications-resources/new-england-greenhouse-floriculture-guide>
- Southeastern U.S. Vegetable Crop Handbook
<https://www.aces.edu/wp-content/uploads/2021/01/2022-southeast-us-veg-crop-handbook.pdf>

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