



Damping-off Diseases in the Garden

Integrated Pest Management for Home Gardeners and Landscape Professionals

In the garden, planter box, or pot, seeds may fail to come up, or seedlings die soon after they have emerged from the soil (Figure 1). Seeds may rot before they germinate, seedlings may decay before they emerge, or seedlings may wilt and collapse. The problem is caused by plant diseases collectively referred to as damping-off.

IDENTIFICATION AND BIOLOGY

Damping-off can be caused by several soil-dwelling fungi and fungus-like organisms. Species in the genus *Pythium* are most often responsible for damping-off, but several other pathogens, including species of *Rhizoctonia*, *Fusarium*, and *Phytophthora*, can also cause decay. The pathogens that cause damping-off are present in virtually all soils. They survive on dead organic matter and produce spores or other structures that may survive for long periods of time and can infect seedlings when conditions favor their development. The young tissue of emerging seedlings is most susceptible to infection. Also, seedlings are more likely to become infected when growing slowly in cold, wet soil. Vigorously growing seedlings pass through the susceptible stage fairly quickly and become established plants. Established plants are more resistant to damping-off pathogens.

Other garden pests such as cutworms, earwigs, flea beetles, snails and slugs, and root maggots may also damage seedlings in the garden. In order to manage the problem, it's important to determine whether the damage was done by one of these pests or by damping-off diseases.

Authors:

James J. Farrar, UC Statewide IPM Program.

Edward J. Perry, UCCE Stanislaus County (emeritus).



Figure 1. Seedling on right is wilting from postemergence damping-off.



Figure 2. Damping-off of spinach seedlings caused by *Pythium*.

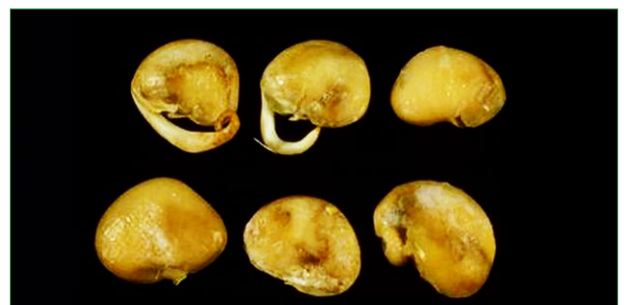


Figure 3. Bean seeds rotting from *Pythium* rot infestation.

DAMAGE

The first above ground evidence of damping-off is the failure of some seeds to emerge as seedlings (Figure 2). If seeds are attacked before they germinate, they become soft and mushy, turn dark brown, and decay (Figure 3). They may have a layer of soil clinging to them when they are dug up because the soil is interwoven with fine, threadlike growth of the pathogen. Seeds that begin to germinate may shrivel and decay. If seedlings are attacked after they emerge, stem tissue near the soil line is decayed (Figure 4) and weakened, usually causing plants to topple and die. If only the roots are decayed (Figure 5), seedlings may continue to grow slowly or may eventually die. As seedlings grow into established plants, they become less susceptible to damping-off pathogens.

MANAGEMENT

Damping-off is prevented by using good sanitation and by planting high-quality seeds in an environment favorable for rapid germination, growth, and establishment. The specific methods to achieve good control of damping-off differ between growing transplants in containers (transplant flats or pots) and directly in garden soil.

Growing transplants

If starting plants in transplant flats or pots indoors, in cold frames, or in greenhouses, good sanitation is the first step to preventing damping-off. If reusing transplant flats or pots, thoroughly wash all potting mix particles off the surfaces, sanitize the flats or pots in a 10% bleach solution for 30 minutes, and then allow the trays to air dry. Use a steam sterilized or pasteurized lightweight and fast-draining seed starting mix. Composted hardwood bark has been reported to reduce damping-off and can be substituted for peat moss in seed starting mixes. Plant when potting mix temperatures are favorable for rapid

germination, which is 65-70°F for most seeds. To achieve good temperatures for seed germination, it may be helpful to place the seeding starts in a warm area of the home or use heat mats underneath the flats/pots.

Maximize seedling vigor and rapid emergence by using fresh, high-quality seeds. Avoid using old seeds or seeds that have been stored in poor conditions, such as high temperatures and high humidity. Plant seeds at the right depth so they will germinate rapidly. A good general rule is that planting depth should be twice the width of the seed. Keep the potting mix moist but not saturated with water after planting the seeds. After the initial wetting of the potting mix, it is a good idea to gently mist the surface rather than thoroughly watering. Misting avoids soil saturation with water and prevents dislodging or pushing seeds too deep. Transplant the seedlings outdoors after the soil temperatures have warmed sufficiently to promote good growth. Measure the soil temperature with a soil thermometer since air and soil temperatures are different.

Direct seeding

If seeding directly into garden soil, bed preparation and appropriate

environmental conditions are important for managing damping-off disease. In the warmer, sunnier regions of California, soil solarization during fallow periods can reduce soilborne pests, including the organisms that cause damping-off. See references



Figure 4. The tap root and lower stem are shriveled and darkened in seedlings affected by damping-off (right).



Figure 5. Bean seedling infected with *Pythium*.

below for specific instructions on soil solarization. Prepare the planting beds so the soil has good drainage. If amending with compost, use only well-decomposed, mature compost. Immature compost can support the growth of some damping-off pathogens and increase disease incidence.

Plant when soil temperatures are favorable for rapid germination, which is 65-70°F for most seeds. Seeds planted in cold soil that is saturated with water are most vulnerable to damping-off. As described above, use only high-quality seeds and plant at the appropriate depth to achieve rapid emergence. Use light sprinkler irrigations to encourage germination and emergence, and do not water to the point of soil saturation. After plants emerge, thin them so that there is good air circulation between the plants. Avoid overfertilizing with nitrogen, which causes tender growth that is susceptible to damping-off infection.



REFERENCES

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Always read and carefully follow all precautions and directions provided on the container label. The label is the law and failure to follow label instructions is an illegal use of the pesticide. Store all chemicals in the original labeled containers in a locked cabinet or shed, away from food or feeds, and out of the reach of children, unauthorized persons, and animals. Never place pesticides in food or drink containers. Consult the pesticide label to determine active ingredients, correct locations for use, signal words, and personal protective equipment you should wear to protect yourself from exposure when applying the material.

Pesticides applied in your garden and landscape can move through water or with soil away from where they were applied, resulting in contamination of creeks, lakes, rivers, and the ocean. Confine pesticides to the property being treated and never allow them to get into drains or creeks. Avoid getting pesticide onto neighboring properties (called drift), especially onto gardens containing fruits or vegetables ready to be picked.

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Technical Editor: K Windbiel-Rojas

ANR Associate Editor: AM Sutherland

Editor and Designer: B Messenger-Sikes

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