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**78. Dealing with damping off: proper sanitation and other precautions can protect seedlings against disease from various pathogens.** Weiland, J. and Santamaria, L. Digger 57(4):41-45. 2013.

# Dealing with damping off

Proper sanitation and other precautions can protect seedlings against disease from various pathogens



This Douglas fir seedling was killed by *Pythium* species. Note that the growing media has been overly moist, as indicated by the dark shiny texture of the medium and the presence of green algae on the surface.

*By Jerry Weiland and  
Luisa Santamaria*

This past summer, a research colleague faced a frustrating problem. She was a visiting scientist from Turkey who had planted hundreds of cucumber seeds for an experiment about the effects of an organic amendment on seedling health.

Everything seemed to be going fine. The seeds had germinated, and in another week she would finish the experiment and collect the final data. Then, unexpectedly, the seedlings began wilting and dying.

What had happened? She didn't have time to plant another set of seeds and begin anew. Her program was ending and she would return to Turkey in two weeks!

After some diagnostic work, we determined that the seedlings were dying from a disease called damping off. The pathogens that caused the disease had come in on some soil that had been insufficiently pasteurized.

Fortunately, we had enough resources to set up a new trial and complete the project for her. However, her situation shows that damping off can happen at the most inopportune times.

What happened to our colleague can be a problem for anyone attempting to propagate plants from seed, including greenhouse and nursery managers, homeowners, and plant scientists.

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## ▲ DEALING WITH DAMPING OFF

The good news is that with proper sanitation and other precautionary measures, the disease is fairly easy to avoid.

### Disease symptoms

Damping off is a common disease that rots and kills both seeds and recently germinated seedlings. The disease is caused by number of different soilborne pathogens, including true fungi (*Botrytis*, *Fusarium*, and *Rhizoctonia* species) and oomycetes (*Phytophthora* and *Pythium* species). The seedlings of most plant species are susceptible, including annuals and perennials, trees and shrubs, fruits, vegetables, and herbs.

There are two types of damping-off: pre-emergent and post-emergent. Pre-emergent damping-off occurs when the seeds and seedlings are killed before emerging above the soil line. Symptoms at this stage include rotted or soft seeds, poor seedling emergence, and the presence of dead roots and shoots beneath the soil line.

Post-emergent damping-off occurs after the seedlings have emerged from the soil. Symptoms at this stage include the sudden wilting and death of seedlings, stem collapse, root death, and the presence of darkly discolored or water-soaked girdling lesions that move upward from the soil line.

The stem may or may not be constricted at the juncture between living and dead tissues. Occasionally, the

outer cortex of the seedling root may be easily stripped from the seedling, leaving a white cylinder of xylem.

### Managing the problem

Sanitation is the most important practice to prevent damping off. Begin with sterilized, soilless growing media. Many damping-off pathogens are first introduced into the production system through contaminated or improperly sterilized media.

Pasteurization is the most common method for eliminating pathogens from growing media. Several commercial mixes are available that have already been treated.

Sterilized growing media should be kept separate from other nursery operations in a clean, dry place, preferably covered. Avoid the accumulation of dirty pots, old growing media, or plant debris next to the media mixing area, as this will increase the chances of accidentally contaminating growing media with pathogens.

If media must be reused, be sure to pasteurize it thoroughly with steam at 180–200 F for at least 30 minutes.

Next, the use of clean containers, trays, and flats should be mandatory, not optional, every time you plant your seeds. If containers are reused without proper disinfestation, then the residual soil particles and plant debris may carry spores of damping-off pathogens. This can subsequently colonize clean soil

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The outer cortex of this Douglas-fir seedling root was easily stripped off, leaving an intact white cylinder of xylem. This was indicative that *Pythium* may be the causal agent.



and cause damping off.

Scrub dirty containers thoroughly to remove old media and debris, then treat with steam, chlorine, or another disinfectant according to the manufacturer's instructions. If using chlorine, follow, dilute with 10 parts water to one part chlorine, and immerse for at least 10 minutes.

Other sanitation practices are also necessary to reduce the risk of infection while the seedlings are young and vulnerable.

Keep all containers and hose nozzles off the floor to prevent contamination with pathogens. Be careful when watering your seeds with recycled water, as it may contain spores of damping-off pathogens. Recycled water should be treated to remove or kill pathogen spores before reuse.

It is also important to remind workers to disinfect all tools and work benches, especially after they have been used for seedling or transplanting. This will reduce the spread of disease.

#### Use of chemicals as prevention

If, despite your best sanitation efforts, you notice that damping-off has started, a proper soil treatment with chemicals can reduce disease severity.

There are a number of fungicidal drenches and sprays available to help manage damping-off for nursery growers. These fungicides are very specific regarding the damping-off pathogens they control:

- For damping-off caused by the oomycetes *Pythium* and *Phytophthora*, pre-plant application of mefenoxam (metalaxyl), fosetyl-aluminum, or etridiazole will be effective.
- Drench applications of thiophanate-methyl may reduce damping-off by *Fusarium*, *Rhizoctonia*, *Botrytis*, and *Cylindrocladium*.
- Iprodione is a pre-plant drench for control of *Rhizoctonia*.

If the specific fungus causing damping-off is not known, one broad-



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These cucumber seedlings died after they were placed in soil that was not sufficiently pasteurized to protect against damping off.

spectrum fungicide (captan or ferbam), or a prepared combination of fungicides (etridiazole + thiophanate methyl) should be used. Do not use the same fungicide repeatedly, and alternate fungicides with different modes of action to prevent the development of resistant pathogens.<sup>2</sup>

Biocontrol with microbial fungicides has been reported as a potential alternative to control damping off, but there are still many things to understand about the complex interaction among microorganisms in the soil. The use of fungicide-treated seed is another resource to protect seedlings from damping off.

#### The role of environment

Environmental conditions play a significant role in the development

of damping-off disease. A conducive environment can greatly exacerbate disease severity.

Several environmental parameters can easily be modified to slow the progression of disease, including water and temperature regimes. Growing media should only be moist enough to promote germination and never be soggy. Saturated soil is conducive to many damping-off pathogens and can allow the pathogens to spread quickly.

Temperatures should be warm enough to result in rapid, even germination, but not so warm that the resultant growth is weak, leggy and susceptible to damping-off.

Conversely, cold temperatures during germination can delay seedling emergence and lengthen the amount of time that seedling tissues remain susceptible. If soil must be used as a seeding medium, such as in outdoor seed beds, coarse-textured soils containing sand are preferred as they drain much more freely than those with high clay content.

Soil pH should be maintained between 5.2 to 5.7, as many damping-off pathogens are favored by neutral or high soil pH.

Organic amendments can exacerbate damping-off by providing a food base for damping-off pathogens. However, peat moss is present in many commercial mixes because it can help reduce soil pH and may have some antimicrobial activity.

Similarly, some composts have been shown to reduce damping-off severity.<sup>1</sup> Therefore, be cautious when using any new organic amendments until you know how they will perform in your system.

Finally, be frugal with the use of nitrogen fertilizers, particularly during the first few weeks following germination. Excessive nitrogen fertilization can increase damping-off severity by promoting rapid, succulent growth.

#### Summary

Although damping-off pathogens are common, they are relatively easy



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to control through proper sanitation practices.

Always start with clean containers and soil. Use a clean water source and follow best practices to prevent contamination, particularly while the seedlings are young and susceptible. If damping-off pathogens are accidentally introduced, fungicides are available that will stop or slow the spread of disease. Environmental parameters should also be optimized to reduce the chances for disease development.

With proper precautions, damping-off and resultant seedling losses can be prevented. ©

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