

Did the seeds you planted fail to come up? Or did the young plants die soon after they emerged from the soil?

Perhaps you did not irrigate frequently and deeply enough to keep seeds and young roots moist. However, if they were irrigated sufficiently or especially if they were overwatered, the problem probably was caused by a damping-off disease to which seeds, germinating seeds, and young plants of flowers, vegetables and turf are particularly susceptible. As they mature, plants become less susceptible.

## CAUSES

Damping-off diseases are caused by various fungi that live in the soil. The most common are caused by two “families” of fungi, *Rhizoctonia* and *Pythium*.

*Pythium* is the most common fungus attacking seeds and germinating seeds before they emerge from the soil. When infected seeds are dug up, they are mushy and discolored. If the root is visible, it is often soft and discolored.

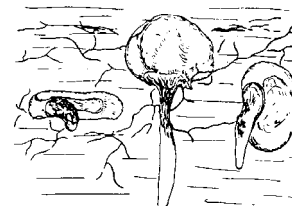
After the young plants emerge from the soil, they may rot near the soil surface and fall over. Either *Rhizoctonia* or *Pythium* can cause this type of damping-off. Some young plants partially rot near the soil surface but they do not fall over. They remain stunted and may eventually die. *Rhizoctonia* is usually the cause.

Other disease-causing organisms may cause damping-off; in fact, more than 40 damping-off organisms attack vegetables alone. Generally, these are not as common as *Rhizoctonia* and *Pythium*. *Scierotinia* can cause damping-off and is recognized by dense, white, cottony mycelium (fungus strands) and many hard black sclerotia (masses of fungus mycelium) in the soil and infected plants. *Fusarium* causes damping-off in China aster, some vegetables and conifers. *Alternaria*, sometimes found under the seed coats of tomato, cabbage and cauliflower seeds, can cause damping-off. *Phytophthora* is related to *Pythium* and causes similar symptoms.

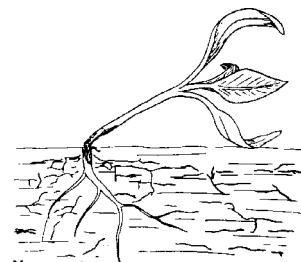
## CONTROL

These diseases are most effectively controlled by eliminating the disease organisms from infected sources. Disease organisms can be found on gardening tools and containers, in the soil, and the seeds can be infected even before they are planted.

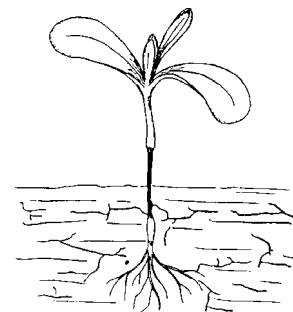
Soil conditions and gardening practices must be controlled to minimize the chance of infection until the seedling has passed its initial vulnerable stage of growth.



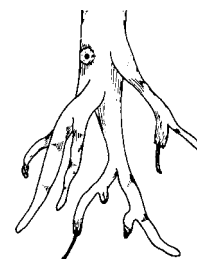
Seeds may decay before they emerge from the soil. Usually caused by *Pythium*.



Young plants may rot near the soil surface and fall over. May be caused either by *Rhizoctonia* or *Pythium*.



Young plants may partially rot near the soil surface. They remain stunted and eventually die. Usually causes by *Rhizoctonia*.



The root tips of young plants are frequently invaded by *Pythium* and the fungus usually progresses up the stem, eventually killing the plant.

### **Starting Seeds in a Disease-free Medium.**

Vegetables or flowers can be started indoors in containers and then transplanted outdoors when temperatures are appropriate. Use a soil-less germination mix or pasteurized soil. Include sphagnum moss in the seed starting mix. A pseudomonas bacteria has been identified in sphagnum moss that produces chemicals which inhibit the growth of pathogenic fungi such as phthium, rhizoctonia, and fusarium.

Pasteurization kills diseases in soil. A porous soil can be purchased already pasteurized or you can pasteurize potting soil yourself, using several methods, most of which involve the use of heat. For heat treatments to be effective, the soil should be held at 140° F for 30 minutes. To insure that this temperature is reached and maintained, it should be checked within the soil mass during heating.

One of the following methods can be used to heat the soil:

***Conventional or microwave oven.*** Paper bags can be filled with potting soil and placed in an oven. A little experimenting will be necessary to determine proper “cooking” time and temperature. A microwave oven is probably more effective than a conventional oven because sufficient temperatures are reached more quickly within the soil mass.

***Hot water drench.*** Boiling water can be poured through a container of potting soil. Repeated drenchings will be necessary to maintain a temperature of 140° F for 30 minutes.

***Solarization (use of the sun).*** Moist potting soil in a thin, clear plastic bag can be placed in full sunlight. Heat accumulates in the bag and kills the damping-off fungi. Solarization is effective when light intensity and air

temperatures are high, as during summer. Spreading the potting soil out as thinly as possible within the plastic bag improves control.

### **Sanitizing Tools and Containers**

A 0.5 percent sodium hypochlorite solution (1 part household chlorine bleach to 9 parts water) is an effective disinfectant that can be swabbed onto tools and containers. Once swabbed, they then are rinsed in tap water and air dried. Tools and containers must be free of clinging soil because bleach has poor penetrating qualities.

### **Water, Soil, and Fertilizer Management**

Overwatering or poor soil drainage promotes damping-off. If the soil can be kept as dry as that consistent with good plant growth, damping-off can be reduced. A well-aerated potting soil should be used when you germinate seeds in containers.

If seeds are planted directly into the garden, soil aeration can be improved by adding an amendment like redwood shavings, peat moss or fir bark. Seeds should be planted on raised beds or mounds to enhance drainage.

Very little fertilizer is required at germination. In fact, excessive fertilization may injure seedlings or cause soft growth which is more vulnerable to damping-off.

### **Seeds and Seeding**

Fresh seeds should be bought each year to insure good germination and plant vigor. Seeds that are saved should be stored in a tightly sealed package in a refrigerator. Seeds should be planted at the depth recommended on the seed package and should be sown thinly so that later the young plants are not crowded. Good ventilation is necessary for germinating seeds indoors.