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CONTROL OF DAMPING-OFF IN SEED BEDS

By the Plant Pathology Branch

"DAMPING-OFF" of seedlings is caused by a number of moulds, for example Pythium, Rhizoctonia, etc., which are common inhabitants of garden soils.

Under certain conditions of temperature and moisture, these moulds may attack the germinating seed or young seedling causing it to rot either:

1. before it appears above the soil surface—"pre-emergence damping-off" or;
2. after it has emerged causing a rotting of the stem at ground level with subsequent collapse of the top (see Fig. 1)—"post-emergence damping-off."

Damping-off organisms become prevalent in soils which are frequently used for raising seedlings. Hence it is desirable to use new soil each time a seed bed is prepared. If this is impracticable, appropriate control measures should be applied as losses from damping-off are unpredictable and often very serious.

SEED TREATMENT

Frequently adequate control of pre-emergence damping-off can be obtained by treating the seed prior to planting with a fungicidal dust such as Chloronil (e.g., Tetroc or Coversan) organic mercury (e.g., Ceresan, Agrosan, etc.), Captan, Copper Carbonate and Thiram (see Figs. 2 and 3). Care should be taken in selecting a suitable dust—for example, Chloronil is excellent on peas and beans but is damaging to tomatoes. Before use, carefully check the maker's recommendations to ensure that the dust being used is suitable for the particular seed. Further details on specific
seed treatments for vegetables is available in Leaflet No. 1044.

Seed dusts are best applied by placing both the seed and the required amount of dust in a large screw capped jar and shaking for two to three minutes until all the seeds are coated. Any surplus dust may then be sieved off. The coating of fungicide has the effect of partially sterilising the soil in the immediate vicinity of the seed, thereby promoting better emergence.

SOIL DISINFECTION TREATMENTS

A number of chemicals are available for disinfecting soil before planting. Some will be effective against all soil organisms and weed seeds, others are selective in their action. In all cases the soil should be cultivated, manured and watered to good seed bed condition before treatment is applied. The most useful and widely used materials are:

1. **Formalin.**—This is one of the best soil fungicides but is less lethal to insects and eelworms.

   **Method of Application.**—Mix one part of commercial Formalin with 49 parts of water and drench the soil at the rate of 1/4-1 1/2 gallons per square foot depending on the soil type. The heavier soils require the higher dosage rate but sufficient must be used to saturate the soil. Cover with bags or thick paper and keep the cover wet when the fumes are no longer noticeable, usually about one week later.

2. **Chloropicrin (Tear Gas).**—This is very satisfactory against fungi bacteria and eelworms, but it gives off an irritant and highly toxic gas which necessitates the use of protective equipment including gloves and gas mask. Do not use Chloropicrin if the temperature is below 60° F.

   **Method of Application.**—Inject 1/2 a teaspoon of Chloropicrin at 9 in. centres and 6 in. deep. Firm the soil down immediately and water the area well or cover it with a gas proof covering. After one week cultivate to allow the fumes to escape before planting. Planting may be carried out

3. **Methyl bromide.**—Methyl bromide has the advantage of being effective against eelworms and most weed seeds in addition to the soil fungi and bacteria. This material which is a gas at ordinary temperatures is marketed in sealed containers and requires special apparatus for application to the soil. As for Chloropicrin, it must be handled with extreme care as it is highly lethal to humans. Methyl bromide gas is completely odourless and therefore some manufacturers include a small amount of Chloropicrin so that the presence of the gas can be recognised.

![Fig. 2.—Pre-emergence damping-off of tomato seedlings controlled by seed protectant dressings. A—Seed dusted with Ceresan. B—Untreated seed. C—Seed dusted with red cuprous oxide (After Chamberlain and Brien. N.Z.D.S.I.R. Plan. Dis. Div., Bul. 1.)](image-url)
Most firms distributing the material provide a specialist operator service at small cost. Methyl bromide is used by releasing one to two pounds of the material per 100 square feet of soil surface under a gas proof sheet. The sheet is supported above the soil in the centre but buried in the soil at its edges to prevent leakage. Gas proof plastic sheeting is suitable for application but some growers prefer specially made and more durable corrugated iron covers. The cover can be removed after one to two days and the soil raked to form the bed. Planting can be done within 24 hours. No special digging over is necessary.

4. Heat Treatment.—The most effective heat treatment involves the use of steam generated in a boiler and injected through tubular spiked harrows. However, the high cost of equipment and operation precludes its widespread use. Partial disinfection can be achieved by burning rubbish, etc., on the surface of the soil, but heat penetration is not very great unless a large fire is used. This can damage the soil by destroying humus.

**FUNGICIDE DRENCHES**

When seed and soil disinfection treatments have been neglected and post-emergence damping-off develops, losses can often be reduced by the application of fungicide drenches. These drenches should be applied at the first sign of post-emergence damping-off. Various organic fungicides can be used for this purpose including Thiram, Captan or Zineb. One ounce of the selected material is mixed with four gallons of water and applied at the rate of $\frac{1}{2}$-1 gallon per square yard. It may be necessary to repeat the treatment two or three times to get adequate control. Another older remedy which can prove useful is *Cheshunt compound*. This material is prepared as follows:

1. Crush separately two ounces of bluestone and eleven ounces of rock ammonia (ammonium carbonate) to a fine powder (it is essential that these materials be fresh.)

2. Mix thoroughly and store for 24 hours (at least) in a tightly closed glass or stone jar.

**To Use.**—Dissolve 1 ounce of the mixture in a little hot water and make up to two gallons with cold water. The solution will attack vessels of iron and tin and therefore should only be placed in them immediately before use. Use one quart for each square yard of seed bed. Immediately after treatment water the plants to remove any of the chemical lodged on the leaves. (Subsequent treatments may be necessary twice a week.)