

SOIL STERILIZATION

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The primary purpose of soil sterilization is to kill disease-causing organisms which may be present in the soil and which may attack the crop when planted. Other advantages are often realized as explained below. On account of the expense involved soil sterilization can be practised only on a small scale, as in seedbeds for tobacco, cabbage, tomato, and other crops, and in greenhouse soils. The methods most commonly employed are (1) steaming the soil by the "inverted pan" method, and (2) the formaldehyde drench method. The former is to be preferred where practicable on account of its greater efficiency and its probably lower cost.

The usual and perhaps the best time for sterilizing soil out of doors is in the spring as soon as the soil can be worked. The possibility of delay in planting may be avoided by doing the work in the fall, but this offers opportunity for re-infestation of the soil during the winter. Greenhouse soils may be sterilized at any time they are not occupied by crops. This is usually during the summer. If soil-borne diseases develop seriously at any time, the soil should be sterilized before the next crop is put in.

STEAMING THE SOIL

Equipment Necessary.—(1) A steam boiler. An ordinary steam traction engine boiler of 12 to 15 horsepower and capable of developing 80 to 200 pounds pressure is satisfactory.

(2) A steam pan made of No. 16 galvanized iron. The size of the pan will depend in part upon local preference, but is usually 6 feet by 10 or 12 feet by 6 or 8 inches. The pan should be reinforced with angle iron and should be airtight. Handles for carrying are attached, preferably at the sides. The edges should be sharp. A one-half inch or one-inch pipe with union connection is attached in the center of the top or at one end for the inlet of steam.

(3) Steam hose usually three-fourths inch, four-ply, is needed for connecting the pan with the boiler. A steam-valve near the boiler is advisable.

Condition of the Soil.—The soil should be prepared in the usual way for seeding. If manure is to be used, it should be added first. The soil should be moist but neither too wet nor too dry.

Procedure.—The pan is inverted upon the bed, the edges pressed down two to three inches into the soil, and the steam turned on. A pressure of from 100 to 150 pounds is maintained for from 30 minutes to 1 hour. The shorter time is probably sufficient under favorable conditions. The time necessary depends upon the character of the soil and the pressure maintained. If the soil is heavy or compact, or if a lower steam pressure is maintained, the longer time should be allowed. The pan should be weighted down if there is any tendency to lift. This tendency may be offset in part by turning the steam into the pan slowly. At the end of the steaming period the steam is shut off and the pan moved to the next section of soil where the operation is repeated.

Benefits of Steam Sterilization.—As illustrating what may be expected from steam sterilization of soils, the following favorable results of the steaming of tobacco beds are mentioned:

(1) The fungi which cause bed-rot and root-rot are destroyed, insuring a supply of healthy plants. In some localities in certain years the only men who have a sufficient number of plants are those who practise sterilization.

(2) Weed seeds are killed, thus eliminating the necessity for hand weeding. The cost of weeding is often in excess of that of sterilization.

(3) Many injurious insects in the soil are killed.

(4) Aside from the matter of disease, steamed soils produce earlier, better, more uniform, and more thrifty plants.

THE FORMALDEHYDE DRENCH METHOD

Whenever, for any reason, it is inconvenient to sterilize the soil by steaming, the formaldehyde drench may be used.

The soil should be prepared as for planting and should be friable and moderately moist. One gallon of formaldehyde of 37 or 40 percent strength is added to 50 gallons of water and stirred. The solution is sprinkled on the soil gradually and as evenly as possible at the rate of 2 quarts to the square foot or 50 gallons per 100 square feet. Since some soils will not take up this amount of water all at once it is best to put it on in two or more applications.

The bed should then be covered over for about two days with canvas, old blankets, carpet or bags in order to hold in the formaldehyde fumes.

Since formaldehyde is injurious to many seeds, the fumes should be allowed to escape by airing and drying the soil for six or eight days before planting.