Many plants become diseased while still in the seedbed or flat and are so weakened by the attack that either they do not develop normally when set in the field, or they succumb more readily to later infection. Many plant diseases are caused by organisms living in the soil such as fungi, bacteria, and parasitical worms. There is little question as to the value of soil pasteurization for the control of these diseases.

Pasteurization may be accomplished by the use of heat or by the application of certain chemicals. Heat is considered to be the most effective method for the control of such plant diseases as bacteria, fungi, worms, insect life, and weed seeds. Heating soil with steam is possible for only a few of the larger florists and specialty growers. To bring soil pasteurization within the means of a large number of growers, a method must be available that is inexpensive and, at the same time, convenient and dependable. Because electricity is constantly becoming more readily available and because it seems to be the only practical and economical method for the small operator, much study has been given to the use of electricity as a source of the necessary heat. Thus far the electrical method has been found best suited for the purpose where comparatively small quantities of soil are treated at one time as for cutting beds, plotting benches, or seeding flats.

Two methods are used to heat the soil electrically: (1) the so-called direct method in which the heating is accomplished by passing an electric current through the soil itself; and (2) the indirect method in which the heating is accomplished by imbedding insulated heating elements in the soil. Although the first method has certain advantages, it has two disadvantages, a variable electrical load and possible hazard to the operator. The indirect method is, therefore, recommended. The requirements for convenient use and good results from this type are:

1. Construction of the soil box easy to fill and empty. One way to do this is to have the box pivoted horizontally.
2. Good insulation to prevent heat loss and to facilitate its even distribution.

The insulation should be permanent, sturdy, and resistant to moisture damage.

3. Spacing and temperature of the heating elements so that the temperature of the whole mass of soil rises uniformly.

4. Dimensions of the apparatus such that the unit may be moved through standard doors.

Construction. A pasteurizer of approximately 1/4 cubic yard capacity, as illustrated, fulfills the requirements. It is shown tipped down and with the cover removed. The cross-section inside dimensions are 28" x 29" and the depth is 30 inches. The framework of the double-walled box and cover is 2" x 4" redwood. The inner lining is 24-gauge galvanized sheet iron, and the outer panels are three-fourths inch fir plywood painted with aluminum paint. The space around the framework between the lining and the outer panels in both the box and cover is filled with insulating material. The support is made of 3-inch channel iron. A rigid support of any material would serve. The four heating units are each rated at 750 watts on 115 volts. Total cost of materials is about $40.

Operation. Soil to be pasteurized should contain a little more moisture than is required for best plant growth since all disease organisms are much less resistant to moist heat than to dry heat. Furthermore, a sufficient moisture supply, premature drying, hence excessive heating, would take place near the heating units. After the box is filled and the cover in place, the current is turned on and left on until the desired temperature of the soil is reached. The temperature rises depends on many things such as the type of soil, the moisture content, and the temperature of the room. On test the average temperature increase was 20° to 25° F. per hour. The temperature difference between the warmest and coldest part of the soil during the heating period is about 35° F. In order to equalize the temperature, a "soaking" period of about an hour and a half is allowed after the current is turned off.

Temperature. Cornell University studies show soil should be heated to a minimum of 160° F. This, if maintained for an hour, will kill all the common disease organisms, all insects, worms, and weed seeds. An advantage of electric pasteurization is that the soil may be heated to a relatively low temperature which can be maintained for some time after the electricity is turned off. This is just as effective as heating for a shorter time at a higher temperature, and it does less harm to the soil. Starting with a soil temperature of 70° F., the current must be on 4 hours to reach 160° F.

Cost of operation depends on total time the current must be on to obtain desired temperature of soil and, therefore, is dependent upon type of soil, moisture content, temperature of the room, and initial temperature of the soil. With room and soil temperature at 70° F. and soil raised to a mean temperature of 185° F., energy requirements varied from .8 to 9 kilowatt-hour per cubic foot, or cost would vary from 32 to 36 cents per cubic foot. If price of electricity is 4 cents per kilowatt-hour.

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