Easily Constructed Soil Percolation Apparatus

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The construction of a soil percolator from a disposable Nalgene sterilizing filter is described.

In our search for specific microorganisms from soil capable of degrading complex organic molecules, we had a need for a large number of soil perfusion apparatus. Initially, the one described by Audus (1) was used, but a battery of these took considerable laboratory bench space. Several other devices for the continuous percolation of a soil sample have been described (2–9); however, most of these are also rather bulky in size, require time to construct, and may use a considerable amount of glassware. If purchased, they are relatively expensive. The one described by Cripps and Norris (2) is very simple but requires a slow-speed motor; the device of Weeraratne (9) appears to be easily constructed. The soil percolation apparatus described here can be constructed readily by modification of a Nalgene filter unit (catalogue no. 245, Nalgene Labware Division, Sybron Corp., Rochester, N.Y.) that already has the desired basic configuration (Fig. 1).

The sterilizing filter membrane is cut out and replaced with a thin layer of glass wool as a support for the soil mixture. A hole is made in the center of the bottom compartment large enough to accommodate a short piece of Tygon tubing (7-mm inside diameter). This can be done by using heated glass or a metal rod. (A tight fit is necessary to prevent leaking.) The bubble inlet at the side is an adapted glass T-tube (7 mm) bent upright, with a small piece of Tygon tubing added to achieve the necessary height. The glass tubing (7-mm outside diameter) is bent, as shown in Fig. 1, leading through a one-hole no. 12 rubber stopper placed on the top compartment of the Nalgene filter. A small hole is melted through the edge of the junction between the upper and lower chambers, fitted with a short length of Tygon tubing (4-mm diameter), and then topped with a 35-mm length of glass tubing (5-mm diameter). This tubing rises to a height greater than that of the soil and serves as an overflow should the perfusion fluid foam or rise higher than the soil level.

The apparatus is operated by applying suction from a house vacuum line in the usual position for operation of the unit as a sterilizing filter. A needle valve on the vacuum line may be needed to control the air intake. The perfusion fluid from the side arm can be sampled readily with a syringe and needle, Pasteur pipette, or inoculating loop. For extended operation, should the fluid level drop through evaporation, more solution can be added slowly to the side arm. We have found that the top compartment will hold 40 g of a 50:50 soil-sand mixture. The sand increases the percolation rate of compact soil samples. Insoluble compounds to be tested for degradation can be triturated with the soil before addition to the top compartment. The volume of percolation fluid needed is a convenient 100 ml.

The use of the Nalgene filter offers advan-

**FIG. 1. Soil percolator.**
tages over those perfusion units already reported in the literature. The glass tubing portion can be removed readily for cleaning, and the filter unit can be discarded. This, combined with the low cost and the time required for assembly, is a significant saving. The total unit also uses considerably less bench space than most other types. Thus, a greater number can be operated in the same area.

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LITERATURE CITED


