IN THE LABORATORY

Methods of Automatic Watering of Plants

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The usual method of surface watering of bench crops and potted plants is a time-consuming operation, and, because of lack of sufficient labor, plants in many research investigations are not adequately watered. In recent years several methods (*1–5*) of automatic watering of bench crops and potted plants have been developed for research and commercial use in the field of floriculture. The constant water level system is the simplest and has worked well in the production of all types of florists' crops.

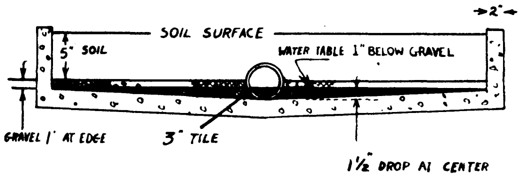

FIG. 1. Arrangement of bench for automatic watering of bench crops.

Bench crops. Tile is placed lengthwise in the middle of a water-tight bench (Fig. 1). Pea gravel to a depth of 1″ at the side of the bench is leveled, and the bench is filled with soil. A constant water table is maintained in the bottom of the bench about ¾–1″ below the soil by means of a float valve in a tank on the side of the bench. The water moves through the soil by capillarity.

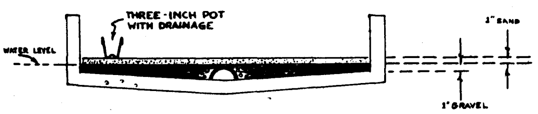

FIG. 2. Bench with pot on sand for automatic watering by the constant water level method.

Potted plants. The plants are placed on a layer of sand in a water-tight bench with a constant water table 1″ below the pot (Fig. 2). The water table should not contact the bottom of the pot. Water moves from the water table in the bottom of the bench through the sand, through the walls of the pot, and through the soil in the pot. As water is removed from the soil by plants and by evaporation, more water moves into the soil by capillarity. If the plants do not obtain sufficient water automatically, more sand is added and the pots are plunged; large pots generally have to be partly plunged.

Several other automatic and semiautomatic methods of watering plants are also described in the references presented.

References

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Use of Thin Kidney Slices and Isolated Renal Tubules for Direct Study of Cellular Transport Kinetics

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The techniques described here were developed with the intention of examining active cellular transport by a simple, direct method which would obviate the more complicated tissue culture procedures. Thin slices of kidney or kidney fragments were obtained as for the Warburg manometric techniques, but here the kinetics of phenol red concentration in the lumina of renal tubules was observed *in vitro* rather than the nature of gas exchange by the excised tissue. It was hoped that this method would be useful in rapid screening to test the possible effects of chemical and physical agents on renal tubular secretion and also permit an examination of the nature of the secretory process itself through a study of metabolic competition and an analysis of specific stimulants and depressants of dye transport.

Active cellular transport is characterized as the performance of work empowered by the expenditure of some fraction of the energy in cellular metabolic reactions. It seems to be a general property of living organisms to produce striking differences in concentrations across their boundaries by the constant expenditure of energy to maintain steady states sometimes far removed from chemical equilibrium. Hill (*3*) states: ''Throughout we are involved, not with genuine equilibria, but with conditions maintained constant by delicate governors and by a continual expenditure of energy. How that energy is supplied, how it is utilized to maintain the structure and the organization, is, I think, the major problem of biophysics.'' Such examples of steady state in the renal tubule are found in the selective elimination of metabolic end-products as urea and uric acid in the lower vertebrates, and of diodrast, *p*-amino hippuric acid, and phenol red by all the vertebrate kidneys. The selective reab-