SCIENTIFIC APPARATUS AND LABORATORY METHODS

APPARATUS FOR THE PRODUCTION OF ARTIFICIAL FROST INJURY IN THE BRANCHES OF LIVING TREES[1]

NATURAL late frost injuries have been used by Glock in the past to determine the presence of multiple growth layers (or "rings") in one year in the branches of living trees. In connection with this work Studhalter suggested that, to serve the same purpose, an apparatus be devised for the production of artificial frost injury under controlled conditions.

The resulting apparatus has certain advantages over other types described by Sorauer[2] and by Mix[3] for application to a portion of a branch. These advantages include ease of application to branches, use of solid carbon dioxide (dry ice), which permits a wide range of low temperature, and the simulation of natural conditions in which the freezing element does not come into direct contact with the plant tissue.

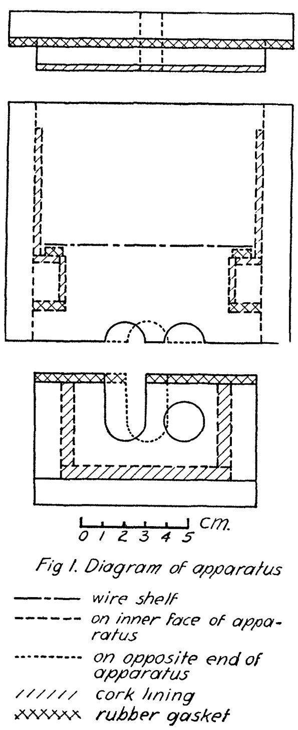

FIG. 1

The apparatus, square in cross section, is made of half-inch seasoned lumber and consists of three essential units (Fig. 1), namely, lid, dry-ice chamber and treatment chamber. Sheet cork gives insulation on the interior and aluminum paint on the exterior. Rubber gaskets are placed on all surfaces where the units come in contact.

A 1-cm hole through the center of the lid permits the escape of air at the beginning of an experiment and, later, of the carbon dioxide gas as it is pushed upward by the descending colder gas. In the dry-ice chamber a wire screen supports the solid carbon dioxide which is placed in the upper part of the unit. The wire screen rests on a rubber gasket made discontinuous in order to allow free passage of carbon dioxide gas into and out of the lower unit. The treatment chamber fits up into the bottom of the dry-ice chamber. In one side of the treatment chamber a hole receives a low-temperature thermometer held firmly by a cork. Into each of two sides, as shown in the figure, a channel is cut to receive the branch, the one on the same side as the thermometer hole being offset from the middle. Sponge rubber gaskets are cemented into the channels so as to fill them nearly to the top.

An apparatus with the dimensions shown in Fig. 1, which is drawn to scale, will receive branches up to 12 mm in diameter. When the apparatus is applied in the field, the treatment unit is brought up from below to the part of the branch to be frozen so that the branch sinks into the sponge rubber of the channels. Separate blocks of sponge rubber are inserted into the channels on top of the branch. Then the other units are lowered into place and the whole held together by strong rubber bands. If necessary for adequate support, a cord may be passed around the apparatus and over a superjacent limb.

It has been found by experiments during the past two years that the range of temperature obtainable extends from 0 to -45 degrees C. for an interval up to 7 hours. In order to obtain different temperatures, the following factors are varied as the experiments demand: absolute quantity of dry ice, size and number of pieces (to determine the amount of surface exposed), length of time of application and degree of pre-cooling. Extensive calibration studies prove that the dry-ice chamber should be above the treatment chamber for the most effective results.

Throughout two field seasons the apparatus has been used for anatomical and ecological field experiments and for the study of cambial activity especially during and after freezing. It has proved its efficacy in the duplication of natural frost injury and in the placement of an internal label whereby growth flushes are being timed and the number of growth layers determined.

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[1] Presented at the Dallas, Texas, meetings of the American Association for the Advancement of Science, on December 29, 1941. Abstract in *Amer. Jour. Bot.*, 28 (10, Sup.): 6s, 1941.

[2] P. Sorauer, *Ber. deut. bot. Ges.*, 2: xxii–xxv, 1884.

[3] A. J. Mix, N. Y. (Cornell) *Agr. Exp. Sta. Bul.*, 382: 235–284, 1916.

THE USE OF TERTIARY BUTYL ALCOHOL IN MICROTECHNIQUE

TECHNICIANS, always interested in improving microtechnique by using new reagents, are especially anxious to conserve materials vital to war industry. Tertiary butyl alcohol (TBA) is used partially to replace dehydrating agents such as ethyl alcohol and clearing agents such as xylol and benzol, which are becoming increasingly expensive and difficult to obtain. TBA is obtainable without priority rating,[1] is cheaper than most laboratory reagents,[2] and safe to

[1] According to R. W. Greeff and Company, 10 Rockefeller Plaza, New York, N. Y.

[2] Based on list prices of the California Botanical Materials Company, 787 Melville Ave., Palo Alto, Calif.