SCIENTIFIC APPARATUS AND LABORATORY METHODS

IMPROVEMENT IN KEEPING QUALITY OF SUCCULENT PLANTS AND CUT FLOWERS BY TREATMENT UNDER WATER IN PARTIAL VACUUM[1]

SUCCULENT plants wilt rapidly when cut and exposed to hot, dry conditions. This is also true of cut flowers when left out of water for even short periods. A method has been found which will lengthen from 4 to 36 hours the period during which succulent plants and cut flowers may be kept in a fresh turgid condition.

Initial trials were made with sixty tomato plants (*Lycopersicum esculentum*), six inches tall, which were selected for uniformity. Thirty plants were placed in water (60 degrees F) in a 200-mm glass desiccator fitted with ground stopcock. A light weight was placed on the plants to keep them submerged, and the air in the desiccator was evacuated by means of a water pump to a pressure of approximately 30 pounds per square inch for 20 minutes. During this period, air bubbles streamed from the plants. When the vigorous escape of air had ceased, the water pump was turned off and the pressure brought gradually (10 minutes) to atmospheric pressure. In this way, air in the plants was replaced with water.

The treated tomato plants were heavy and had a dark green, translucent, water-soaked appearance which disappeared after two hours. They were placed in a chamber, with both roots and tops exposed to the air, at a temperature of 95 degrees F and a relative humidity of 20. Check plants in water were placed in the chamber along with the treated plants. After 5 minutes the untreated plants showed wilting, and after 30 minutes they were badly wilted. The vacuum-treated plants showed wilting only after 4 hours' exposure, and only half were badly wilted in 7 hours. After 7 hours' exposure, all the plants were placed with their roots in water. Twenty-six of the vacuum-treated plants regained turgidity, and four recovered partially. Of the untreated plants, 26 died and 4 recovered partially.

Similar results were obtained with cut flowers. Twelve Narcissus flowers (*Narcissus poeticus* and *N. maximus*) with stems 6 inches long were placed under water in the desiccator and the air evacuated as previously described. At 11 A.M., the 12 treated flowers, together with 12 untreated flowers, were placed in direct sunlight, with an air temperature of 80 degrees F, in order to provide severe conditions. The untreated flowers were badly wilted after 30 minutes, and after 5 hours the petals were dry and crisp. The vacuum-treated flowers were still turgid and in excellent condition at 5 P.M., or 6 hours after treatment. They were then brought into a warm room (80 degrees F) and kept on a laboratory desk over night. By 8 A.M., 21 hours after treatment, they were showing signs of wilting and by 5 P.M., 30 hours after treatment, they were all badly wilted.

Twelve trillium flowers (*Trillium grandiflorum*) were given similar treatment. Six of the treated flowers and six of the untreated ones were stood in water, and compared with six treated and six untreated which were exposed on a laboratory desk. The exposed flowers which had not been vacuum-treated were badly wilted within 1 hour, whereas those which had received the vacuum treatment began to wilt only after 6 hours. Of the flowers which were stood in water, the vacuum-treated ones remained in a fresh condition for 5 days, or 2 days longer than the untreated. The water-soaked appearance of vacuum-treated flowers was lost within 2 hours when flowers were exposed on the table, but not until 4 to 5 hours when placed with their stems in water.

Perhaps the most striking results were obtained with lilacs (*Syringa vulgaris*). Branches, leaves and flowers were vacuum-treated, as previously described. Some of both treated and untreated branches were then placed immediately in water, and others were left exposed out of water on a laboratory table at 60 to 70 degrees F.

Untreated flowers that lay exposed were badly wilted within 8 hours, while treated flowers similarly exposed remained in a fresh, turgid condition 4 to 8 hours longer. Branches which were placed in water immediately after treatment remained fresh and in good condition for 5 days, whereas untreated branches similarly placed in water showed wilting within 2 days and were badly wilted in 3 days. The water-soaked appearance disappeared in an hour or two and the flowers were in excellent condition.

Conflicting results were secured with commercial roses. In some instances the vacuum-treated flowers became brown and the petals dropped sooner than on untreated plants. On the other hand, on two occasions very favorable results were secured. Cut hybrid tea roses in the loose bud stage with 10-inch stems were vacuum-treated and left exposed on the laboratory table at 80 degrees F. Untreated roses were similarly exposed, for comparison. Those which were not vacuum-treated became wilted within 4 hours, while treated ones remained turgid for 9 to 12 hours or 5 to 8 hours longer. Flowers which were placed in water after treatment remained in the loose bud stage for 6 days, whereas the control flowers were fully opened after 2 hours and were badly wilted within 3 days.

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The control plants also showed "blueing" of the petals after 2 days, in contrast to the relatively unchanged shade of the treated flowers. The treated flowers remained in the loose bud stage for 6 days and, although not wilted appreciably by this time, showed browning of the bases and margins of the petals. Some of the fragrance was lost as a result of treatments.

Azalea, grape hyacinth, iris, carnation and *Spirea Vanhouttei* were also treated, but the results were not outstanding.

As Table 1 indicates, there is a large increase in

TABLE 1

WEIGHT OF CUT FLOWERS BEFORE AND AFTER SUBMERGENCE IN WATER FOR 20 MINUTES IN PARTIAL VACUUM

Material	Weight (grams)	
	Before treatment	After treatment
Azalea	6.00	16.2
Carnation	25.0	42.0
Grape Hyacinth (*Muscari botryoides*)	14.1	25.0
Iris	6.6	12.6
Lilac (*Syringa vulgaris*)	130.8	180.0
Narcissus maximus	18.3	21.3
Rose (Hybrid Tea)	75.1	109.5
Rosa Hugonis	21.1	40.1
Spirea Vanhouttei	60.0	133.8
Tulip (*Tulipa Gesneriana*)	43.0	58.0

weight following treatment. In some cases it is more than double, depending on the material. During treatment, tissues can be observed to become water-soaked and translucent. This condition disappears rapidly in some plants, as in lilacs, but more slowly in others. Since some plants are capable of taking in more water and holding it longer than others, each kind responds differently to treatment. In general, the best results were obtained with plant materials which have large leaves and stems and large inferior ovaries, capable of serving as reservoirs.

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MODIFIED METHOD OF EXTRACTING CHOLESTEROL*

MANY methods of extracting cholesterol from blood have been devised and most of the methods used for extraction from liver are based on those used for blood. The most common method used is that of Bloor,[1] which involves saponification. An interfering yellow color which reduces the accuracy of the Leibermann-Burchard determination is produced, which may be reduced by absence of heat[2] or the use of a red filter.[3] Ireland[4] found that the use of a red filter did not eliminate interference and devised a new method of extraction. Schoenheimer and Sperry[5] purified the cholesterol extract by precipitation with digitonin. Foldes[6] modified the digitonin precipitation method in order to eliminate the interference of bile. Noyons[7] using a method similar to Bloor's[1] found that saponification gave consistent but lower values than extraction without saponification. Teeri[8] states that extraction without saponification produced values 25 per cent. higher than extraction with saponification. Gershberg and Forbes[9] devised an acetone and alcohol extraction method with saponification for determining cholesterol content of blood.

Most of the above methods are time-consuming and many do not give reproducible results. Therefore, a new method has been devised which reduces time and gives consistent results. The method is as follows: The liver is ground thoroughly with anhydrous sodium sulfate and three portions of 3:1 acetone-alcohol mixture—a ten cc portion followed by two five cc portions. The acetone, alcohol and liver are placed in a centrifuging tube together with 15 cc of anhydrous ether. The mixture is shaken for ten minutes, centrifuged and the supernatant evaporated in a partial vacuum under nitrogen. The cholesterol is determined by means of the Leibermann-Burchard test with the Evelyn photoelectric colorimeter.

The above method produces more consistent results than a modification of the Bloor method.

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DISCUSSION

THE EFFECT OF THIOURACIL ON TISSUE OXIDASE

WE have read with great interest the paper entitled "The Effect of Thiouracil on the Respiration of Bone Marrow and Leucocytes *in vitro*," by Dr. Charles O. Warren.[1]

We have recently studied the influence of thiouracil, sulfonamides and a number of other compounds on the cytochrome oxidase (paraphenylendiamine oxidase) of the thyroid gland of the rat.[2] Thiouracil in 0.002 M solution added to thyroid tissue *in vitro* inhibits the oxidase activity significantly (decrease

[1] SCIENCE, 102: 174, August 17, 1945.

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