and lime groves by the individuals who ordered the trees.

An unidentified Casuarina tree growing on Merritt Island has also been grafted, using seedlings of C. equisetifolia as the understock.

This tree is a suckering species, but has foliage different from C. lepidophloia and from trees accessioned as C. glauca at the Sub-Tropical Experiment Station. Other combinations of stock and scion within the genus probably are possible.

**A HYDROPONIC MIST-TYPE PLANT PROPAGATOR**

**Joel Kuperberg and William A. Murphy**

*University of Miami*

*Coral Gables*

For the past few years members of the staff and graduate students of the Botany Department, University of Miami, have been conducting research in the field of plant propagation. Several techniques have been successfully developed; however, many problems remain to be investigated.

Phillips (10) and Ellis and Swaney (5) have suggested the possibility of commercial applications of hydroponics to plant propagation. A spray technique for rooting cuttings was introduced in South Florida by Ochse (7), (8). Previous to its introduction here, this spray method had been used successfully in the commercial and experimental propagation of cuttings from tropical and sub-tropical plants (2), (4), (6), (9), (11).

The senior author of this paper, by virtue of his several years experience in commercial applications of hydroponics, became aware of the potentialities of a gravel culture type of installation, combined with the above mentioned spray technique now in use at the University of Miami.

A review of the literature referring to spray techniques suggests limitations to the use of the continuous water spray method; these limitations appear to include leaching of nutrients from leaves and stems and inhibition of root development in the presence of excessive moisture (1), (3), (6).

With the intention of overcoming some of these difficulties the senior author adapted a small, dooryard hydroponic unit to the open bed spray setup. This enabled the use of nutrient solution, applied by sub-irrigation. The overhead spray, while continuing to consist of tap water, was not operated constantly but was used for a 6-12 hour period each day. Length of this spray period was a matter of personal judgment, based upon the prevailing weather conditions.

Although no exact experimental data were kept, over three thousand cuttings from various tropical and sub-tropical plants have been propagated and marketed since July 1951. The total number of plants produced exceeded 50 percent of the original number of cuttings set out. In one group of approximately seventeen hundred Malpighia cuttings the percentage of rooted cuttings marketed approached 90% of the original number. Observations made during this period led to the belief that further improvement might be achieved by modification of the above mentioned installation.

At about the same time the authors were constructing, at the University of Miami, a pair of experimental gravel culture units for use in general physiological research. It was decided that the installation be completed as a spray propagator incorporating features designed with the intention of improving upon previous techniques.

The construction proceeded as follows:

Two similar, adjoining units were constructed, consisting of two beds each. The beds are five feet by twenty feet, averaging thirteen inches in depth. A five foot walkway (which can be converted to a third bed) separates the beds. Two underground storage tanks supply nutrient solution or water through a sump type pump. Design of the beds permits gravity return of the solution to their respective storage tanks. One bed of each unit is provided with a window sash windbreak, forty-one inches high, extending along both ends and one side of each of the beds. The mist is supplied by four Thompson Baffle Spray Heads spaced along the length of the bed, at a level eighteen inches above the surface of the substrate. A tunnel-like structure was constructed over the remaining bed in each unit. The sides of this structure are of win-
The substrata in all beds is crushed Miami Oolitic Limestone which was obtained locally. The crushed limestone consists of two particle sizes—to facilitate drainage a lower layer of coarse rock is used—this is covered by six inches of a finer material, known locally as “shaftings.” A glassy frit, containing iron††, has been worked into the upper six inch layer of one lengthwise half of each bed.

Unit one, composed of one covered and one uncovered bed, receives nutrition both from the spray heads and from sub-irrigation. The second unit duplicates the first except that water is used instead of nutrient in both sub-irrigation and through the spray heads.

The possible advantages which are expected to be derived from the above described installation include:

1. Control of mist production to prevent excessive moisture that is supposed to inhibit root development and leach nutrients from the cuttings (1), (3), (6).
2. Use of nutrient spray as a supplementary nutritive source through the foliage (13).
3. Positive drainage and aeration through the use of the hydroponic method of sub-irrigation.
4. The ability to supply nutrients to the cuttings during the root development period.
5. The ability to raise the osmotic concentration of the solution to aid the hardening off process preceding the removal of the cuttings from the propagation bed.

Adjusting the period of spraying to the degree of root development as an additional means of hardening off the plant material.

The use of frit in offsetting possible alkali chlorosis (12).

In conjunction with the guava research presently being conducted at the Experimental Farm of the University of Miami’s South Campus, this installation is now being used in an attempt to root over three thousand guava (Psidium guajava) cuttings.

It is the authors’ expectation that through operation of this new type of plant propagator observations may be made and conclusions drawn that will prove to be of value in the field of plant propagation.

LITERATURE CITED

6. Evans, H.—Investigations on the Propagation of Cacao. Tropical Agriculture, 28 (7-12); 147-208; 1951.
   —Response of Chlorotic Blueberry Bushes to a very insoluble Iron-containing Glassy Frit.