SATURDAY MORNING SESSION

SECOND SECTION

The second section of the Saturday morning session convened at 10:40 a.m., Mr. Joseph Houlihan, Houlihan Nursery, Creve Coeur, Missouri, moderator.

MODERATOR HOULIHAN: The first paper of this section will be by Prof. A. F. DeWerth, Texas A. & M. College, College Station, Texas.

THE USE OF A CONTROLLED ENVIRONMENT PLASTIC STRUCTURE FOR PROPAGATION BY CUTTINGS OR GRAFTS

A. F. DEWERTH
Texas A. & M. University
College Station, Texas

The techniques used for rooting leafy cuttings and grafts under mist are now well known and widely practiced by plant propagators. The mist sprays used maintain a film of water on the leaves which not only results in a high water vapor pressure surrounding the leaf but also lowers the temperature of the leaf and the surrounding atmosphere. All of these factors have a decided effect upon decreasing the rate of transpiration.

The use of the mist techniques in the research projects including plant propagation at the Texas Agricultural Experiment Station presented considerable difficulties due to the high soluble salt content in the available water supply. (This was largely due to sodium accumulation on the leaves.) This condition resulted in severe marginal burning of the leaves on most cuttings placed in this environment for periods exceeding 15 days.

Another well-known propagating technique for the propagation of cuttings and grafts is the use of a closed case covered with glass, plastic films, or other translucent materials. In a closed-case system of propagation, the rate of transpiration is reduced by humidification rather than mist. There is normally a distinct difference in the effect of humidification and mist on the rate of transpiration since the relative humidity around the leaf decreases or increases the water vapor pressure around the leaves. In this method the leaves are not usually covered with a film of water that reduces the leaf temperature and in turn decreases water vapor pressure within the leaves. Due to this condition, closed cases used for propagation are normally shaded to reduce temperatures. This reduction in light intensity often makes the rooting environment less desirable.

With the use of mist methods, an ideal environment for the rooting and growth of many types of cuttings and grafts can be maintained if an excellent water source is available, since transpiration is reduced to the lowest level and high light intensity can be maintained to promote a high rate of photosynthesis and a low rate of respiration. When the conventional closed-case propagation was used, unless the case was shaded and ventilated by laborious and time consuming methods, cuttings and grafts suffered due to reduced photosynthesis and increased respiration brought about by hading and high temperatures.

The disadvantages encountered with mist propagation when the water available had a higher than normal soluble salt content and the problems involved in trying to control ideal temperature and humidity relationships in closed-case management prompted the development of a closed-case propagation system with automatic or semi-automatic control of the environmental factors involved. This device has produced excellent results in the propagation of ornamental plants by cuttings and grafts, as well as by seeds.

The propagating case discussed here was constructed inside a greenhouse. (However, this is not an important consideration since it could be constructed and maintained just as efficiently under lath or field conditions where a suitable water supply with 50 pounds pressure and a source of electricity are available.) This closed-case system with automatic controls was constructed over a conventional concrete greenhouse bench 3 feet wide, 8 inches deep, and 33⅓ feet long. The construction of the case proper was kept as simple as possible. The supporting members were constructed of ⅝-inch standard steel conduit such as that used by electricians for electrical wiring. The material was formed with a pipe shaper into a form resembling an inverted "U" with a 2-inch flat area on the top when installed over the bench. The pipe supports were erected and held together and upright by the use of 5 wood strips, one inch thick and 2 inches wide, that extended the length of the case. One strip was bolted to the apex of the inverted "U" pipe forms when they were set in place on the bench. One strip was bolted to the base of the forms on each side and one strip was bolted to the forms at the tangent point on the sides of the inverted "U" forms. This frame made up the superstructure of the closed case.

The bottom of the V-bottom concrete propagating bench was filled with pea gravel to a depth of 2 inches. Thermostatically controlled soil heating cable was placed on the gravel and covered with ¼-inch mesh hardware cloth. One inch of the propagating medium was placed on top of the hardware cloth.

An automatic watering system based upon the sub-irrigating principle, composed of alternating one-foot lengths of porous clay tile with an inside diameter of ½ inch and an outside diameter of approximately one inch and one foot lengths of ½-inch diameter plastic tubing, was placed upon the medium. The watering system was installed in 2 continuous lines spaced 18 inches apart around the entire bench. One end of the system was connected to a small plastic water supply tank controlled by a small float valve. The other end was closed by inserting a

½-inch rubber cork into the end of the line. The water supply tank was connected to the water supply by ¼-inch plastic tubing and a valve.

The bench was filled with a standardized propagating medium composed of 50% horticultural grade perlite and 50% sphagnum peat moss with 7 pounds of dolomite and 10 pounds of gypsum thoroughly incorporated into each cubic yard of the mixture. (For acid loving plants, the dolomite could be omitted and in areas where sodium salts in the water are not a problem, the gypsum could be omitted.) The medium was well watered by hand to establish capillarity with the automatic watering system. (For grafts in pots or seeds planted in flats the bench could be filled about half full of perlite or fine gravel and the pots or flats placed on this medium and the watering system turned off.)

About three-fifths of the case (from the upper wood strip on one side to the lowest strip on the other side) was covered with weatherable mylar and stapled to the wood strips. The other side of the case was covered with polyethylene curtains, 9 feet 5 inches long, fastened to the upper wood strip. A wood strip was fastened to the bottom end of these polyethylene curtains permitting them to be rolled and unrolled like a window curtain. In this manner, one section of the case would be opened while the remainder of the case remained closed.

One end of the case was covered with a 50 mesh brass screen. A Defensor humidifier was installed in this end and was controlled by a humidistat and a solenoid valve. The humidistat was located in the middle of the case. The manufacture of this humidifier later was discontinued and the humidifier was replaced by 2 Monarch No. F 11OC fog nozzles installed ⅓ of the distance from each end of the case and connected to the same control system. A 10-inch exhaust fan similar to those used for greenhouse cooling was installed in the other end of the case. The area around the fan was enclosed with mylar. The fan was controlled by a thermostat located midway between the two ends of the case.

The watering system provides an excellent air-water relationship in the rooting medium by capillarity. When the thermostats on the soil cable are set at the desired temperatures they automatically control the temperature in the propagating medium. When the thermostat on the fan is set at the desired relative humidity a constant percentage of humidity will be provided automatically. The automatic control of temperature and relative humidity eliminates the need for the shading usually required with closed-case propagation.

Excellent results have been obtained with seed germination and the propagation of cuttings and grafts. Several types and kinds of plants, including several kinds of exotic plants that were difficult to root under mist, have been successfully propagated by this method. Bedding plants have been started from seed, both in flats and pots.

The growth chamber approach to this problem appears to give highly satisfactory results, since by regulating the controls the cuttings or seedlings can readily be hardened off for potting or transplanting before they are removed from the case. When peat pots are used the automatic watering system can be employed. This has worked especially well with the propagation and hardening off of bedding plants and small seedlings of woody plants.

It is hoped several additional uses will be found for this system in the future.

MODERATOR HOULIHAN: Thank you, Prof. DeWerth. The next paper will be given by Mr. Zophar Warner, Warner Nurseries, Willoughby, Ohio.

INEXPENSIVE PLASTIC STRUCTURES FOR WINTER PROTECTION OF PLANTS

ZOPHAR P. WARNER
Warner Nursery
Willoughby, Ohio

There is a great deal of information about plastic houses. The Cunningham house was described before this Society two years ago. This presentation can be found on page 142 of the 1961 Plant Propagators' Proceedings. Harvey Templeton has some pipe frame and woven wire structures. The Berryhill Nursery has been using quonset hut type plastic structures for several years. I am sure there are many other good ones in use, some with wood frames.

The most obvious requirement of an inexpensive plastic structure is that it cover the most area or furnish the most cubic feet of space at the least cost per square foot or cubic foot. On this level, it is an engineering problem in which local snow and wind loads must be taken into consideration. If this were the only problem this audience would be better served by having an architect or engineer furnish structural data that I am in no way qualified to present.

I would like to depart to a large extent from the structural aspects of "Inexpensive Plastic Structures For Winter Protection Of Plants." I think this can be done without departing from the spirit of the subject. Anyway, we can rewrite the title using exactly the same words to read "Inexpensive Winter Protection Of Plants in Plastic Structures." The structures in themselves may or may not be expensive since they are only one of several factors contributing to cost.

The first requirement of inexpensive winter storing is success!

When John Roller asked me to give this talk I was reluctant to make a presentation based on failure. After giving the matter some thought, I decided information based on known failure