## FRIDAY MORNING SESSION
**September 11, 1970**

MODERATOR SHUGERT: I am delighted to see you this morning after the beautiful day yesterday; the weather cooperated, as you noted, and we had an excellent tour. The site committee certainly did a beautiful job yesterday in presenting an outstanding tour.

You will note on your program that this symposium will be on vegetative propagation: past, present and future. It was to be moderated by Dr. Harold Tukey of Cornell University. However, due to the illness of his father he was not able to be here. So with your kind indulgence, I will moderate the session this morning.

Wednesday afternoon we discussed some of the phases of seedling propagation. Vegetative propagation is certainly as fascinating as seedling propagation and we are fortunate this morning in having a group of gentlemen who will explore various facets of this interesting phase of plant propagation. The lead-off speaker of this symposium is a dynamic, fine gentleman whom I have known since 1953; a man who has been extremely helpful to me and very patient at times in answering some ridiculous questions. I think this is the hallmark of John Mahlstede. John, as you all are aware, has served through the Society in various offices, and is presently at Iowa State University at Ames, Iowa. The title of John's talk is a fascinating one, "The Manipulation of Stock Plants and the Selection of Cuttings".[1]

MODERATOR SHUGERT: Next on the program this morning is a very fine nurseryman who is always willing to share his thoughts and ideas with Society members. He is an extremely well versed and a very, very competent nurseryman. Speaking on "Environmental Control in Rooting Leafy Cuttings", we have Joerg Leiss from Sheridan Nursery, in Ontario, Canada. Joerg.

## ENVIRONMENTAL CONTROL IN ROOTING LEAFY CUTTINGS

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As nearly everyone is concerned with the pollution of our environment by humans, it should come as no surprise that, as plant propagators, we have been at work for a long time to control, to a limited degree, the environmental conditions required for rapid rooting of leafy cuttings. I will not try to go back in history to find out

[1] Ed. Note: Dr. Mahlstede reviewed this subject for the audience.

when and by whom such controls were first used. However, let us find out a little about the conditions most conducive to rapid rooting of leafy or any other cuttings, and how we can control these conditions.

**Prevention of wilting.** This would be my choice as the most important factor. To prevent wilting of leafy cuttings, turgor within the cutting, once it has been taken, should be maintained. Suggestions have been made to take cuttings early in the morning when they are normally the most turgid and transpiration has had little effect. Collect cuttings in containers of moisture-preserving material, such as burlap-lined baskets or plastic sheets; moisten them as soon as possible and, upon arrival at the make-up area, keep them cool and moist. After being prepared as quickly as possible, with a minimum of handling, cuttings are inserted into their rooting environment, which should be so designed as to prevent moisture loss as much as possible. Sash, moist burlap, or plastic-covered frames, bell-jars mist-beds, greenhouses, or other structures which retain a high humidity provided by mist or by a humidifier can be used.

**Control of moisture.** Here we can start right with our stock plants by watering them, if necessary, before taking cuttings, or by placing them in a micro climate which helps them to maintain optimum moisture levels. I might mention here that even the time of year cuttings are taken has an influence on rooting in some plants. An example of this is *Hydrangea anamola* subsp. *petiolaris*; we do not take cuttings until we find, due to longer, cooler nights, aerial rootlets on the very thin wood.

Glass or plastic-covered windbreaks for mist lines, and the use of shade houses play a role in the conservation of moisture in the cutting environment. The application of moisture by mist lines, either continuous or controlled by such means as time clocks, electronic leaves, humidistats, photoelectric cells or thermostats, or controls such as the light-activated leaf described by the University of Connecticut around the beginning of the '60's, or a temperature controlled electronic leaf described as being used in a nursery in Belgium, and a similar set-up used at our nursery where electricity for the "leaf" is controlled by a thermostat in the line—all have a direct bearing on the leaf temperature as well as the amount of moisture supplied to the cuttings' leaf surfaces. Humidifiers are designed to control humidity itself to the desired degree. Placing the cutting into water or flooding of the cutting frame would exhaust the possibilities I can think of for moisture control.

**Light and temperature.** Light alone, supplementary to daylight, is being used to provide optimum daylength for such difficult-to-root items as Exbury azaleas and Japanese maples, as well as for continued growth of the cuttings after rooting. Increasing the temperature alone, as by bottom heat provided by manure packs, electric cables (low or regular voltage), hot water or steam all have proven to

be of considerable help in rooting the more difficult-to-root leafy cuttings.

**Control of light and temperature.** Shading comes to mind as the foremost control for the **exclusion** of part of the available light and lowering the temperature. Shading can be accomplished by such means as paint-on coverings, shade cloth in various forms, structures such as the Nehring frame, fiberglass, P.V.C., and opaque plastic coverings. Added light can be provided by incandescent, fluorescent, or mercury vapour lamps as described by Pfeifer before this Society.

Temperature control by air conditioning, by use of ventilators and mist evaporation are also effective in cooling leafy cuttings. The trapping of sunlight in houses, or frames covered by glass, plastic or other opaque material is not to be forgotten; it is this source which provides us with most of the required heat for rooting leafy cuttings during the summer.

The **condition** of the stock plant, both from a nutritional standpoint and in relation to freedom from pests and diseases, has a definite bearing on the failure or success of the leafy cutting. The stock plant should not be lacking in any of the major or minor elements; neither should there be an excess of any of them. The condition of the stock plants results from proper feeding and watering, and from good disease and pest control. Preventing the introduction of pests and diseases into the cutting bed by cleanliness and by sterilization of the cutting bed and the medium and tools and by the use of disinfectants is a cheap way to obtain healthy vigorous cuttings. Our Western Region members, in their presentations, and the U.C. System book by Baker (1), especially, show us why such preventative measures as disinfection by fungicidal materials, steam or gaseous materials are necessary. The dipping and washing of cuttings with substances such as Morton's Soil Drench, mercury, Terrachlor, Dexon, etc., all reduce the contamination of cuttings by disease organisms. Last, but not least, the painting of all containers and houses with a disinfectant should be done. As far as pests and disease go, proper spraying, selection and maintenance of healthy, pathogen-free plants is to be desired. I cannot see a good propagator trying to produce plants which are saddled with failure either before they root or after being sold and growing on unless, of course, he is not aware of his disease and insect problems. If he is not, surely he will not be successful for very long.

The **rooting medium**, even if its function is only holding the cutting up, has a bearing on success or failure in rooting leafy cuttings. It should be well-drained and as free from pathogens as possible. It can consist of any one of a number of materials, or of their mixtures which, by experience, have been found to be beneficial in rooting cuttings of specific plants. Such materials as sand, peat, perlite, vermiculite, ashes, calcined clays, sawdust, and their combinations have all been successfully used in rooting cuttings.

**Nutrients** in the rooting medium, while not necessarily beneficial to root initiation, are of help in establishing the plants from the rooted cuttings.

**The water** used in propagation should be as free of chemicals and sediment as it can be made. Bruce Briggs has previously discussed the addition of chlorine to kill fungi and bacteria in the water.

Lastly, the propagator himself and his experience in propagation — when and how to take cuttings — by feel, so to speak, is very important; this is where science has failed us so far — this feel cannot be described. It is an intuition which you either have or you do not.

I can see in the foreseeable future the development of a machine which will tell us, by inserting a sample cutting, what to do to root the particular sample cutting. It will probably be transistorized and incorporate a small computer. It would be measuring the electrical resistance and by a chart will tell us if the cutting is in a rootable condition — (I will not invent it).

We have had various speakers talking to us on new discoveries, especially propagation by cell or tissue cultures, with the production of healthy and clean plants. I can see the establishment of a so-called cell bank where, on demand by a specialist propagator, a nucleus stock of almost any plant will be available for propagation in completely controlled growth chambers, incorporating artificial light and atmospheres, heat to a specific level, and optimum moisture, all working automatically to root the cuttings with the required amounts predetermined by computer. However, the propagator will still be around most likely if our own environment has not killed him off.

## LITERATURE CITED

1. Baker, Kenneth, *et al.* 1957. The U. C. System for producing healthy container-grown plants. *Univ. of Calif. Agr. Exp. Sta. Man.* 23.

MODERATOR SHUGERT: That was great, Joerg. Great slides and a tremendous presentation. Thank you on behalf of all of us. We are fortunate now to have a member speak to us from the Great Britain and Ireland Region. Everyone in this room has heard of the Grafters' Handbook, and has heard the praises of the East Malling Research Station. The gentleman who is certainly well known for his work at the East Malling Station in England is Bob Garner. It is a delight to have Bob with us this morning, and he is going to discuss with you "Fruit Tree Raising in England Today". I present, with a tremendous amount of pleasure and honor, Robert Garner.