AN EXPERIMENT IN AIR-ROOTING

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Stimulated by the far-reaching talk[1] by Dr. J. P. Nitsch of France entitled "Propagation in the Year 2000"; we were inspired to attempt a experiment in "air-rooting". The principle was to induce rooting in a mist chamber, rather than in the usual media of sand, peat, etc. I have proceeded using basically an open case with the tops of the cuttings exposed. Another nurseryman in Olympia, John Eichelser of the Melrose Nursery, has conducted similar experiments using a closed case, but still confining the misting to the basal part of the cuttings.

The case was made similar to a grafting case with a 1 x 12 board used on each side. Flats made with wooden sides and 1½ mil polyethylene bottoms were set on top of this case. The cuttings were inserted through the plastic, leaving the tops above and putting the basal part down into the closed chamber. Black polyethylene was found to induce better rooting than clear poly. A single layer was adequate for summer rooting, but a double layer provided additional insulation during the winter months to maintain higher bottom heat. It also served to keep the tops cooler in the closed case.

The cuttings were prepared in the same manner as for insertion into conventional media. They were treated with a drench of Captan, dried, dipped into Jiffy Grow[2], left to dry a few minutes, and then stuck through the plastic. In order to avoid washing off the hormones applied that day, no water was applied to the base and only a light misting on the tops for 24-hours. After that, moisture was applied 24-hours a day to the bases within the chamber.

An insulated water pipe was used to carry hot water (120°F.) from a water heater to the chamber. It was misted onto the base of the cuttings through fogger nozzles spaced closely enough to create a dense fogging. An interval of 5 seconds every 6 minutes was necessary to maintain enough warmth in the chamber. In the spring when the weather warmed, overhead misting was applied through #300 brass, Flora-Mist, nozzles set for 5 seconds every 12 minutes during the heat of the day.

After about a year of testing, we determined that some of the cuttings were receiving too much water and were rooting poorly or too slowly so we devised a new way of misting the roots using two Standard automatic humidifiers. To broaden the scope of the experiment, two new chambers were set up, each one having a section of closed case and open case. One chamber received fog containing hormones with 1% active ingredients, which were fed into the humidifier at the rate of 1 ounce per 3 gallons of water. This was applied constantly for

[1] International Plant Propagators' Society, Combined Proceedings Vol 14, pp 316-324 1964
[2] Active ingredients I B A and N A A (0 5% each), phenylmercuric, boron

a few days and then tapered off to only afternoon application with the mist turned off during the night.

We were working toward checking fungicide dips, relationship of hormone strength with and without bottom feeding, reactions to hormone strength in the closed case, top feeding, use of sugars, kinins and other factors affecting rooting as reported by Richard T. Vanderbilt.[3] During this last summer, we had some sun damage from lack of adequate shading, so only part of the work was done, and no heat was used in these new chambers.

During this last summer, we also continued further testing using the original hot water chamber. We installed 3 M. P. proportioners and used one check, testing different liquids applied to the cutting bases through the hot water under both closed and open frame conditions. Additional work will be necessary to prevent excessive loss of heat as the water passes through the proportioners.

This "air-rooting" has been an interesting and rewarding experiment. At the present time, it hardly seems suitable for commercial propagation, but the basic principle is sound. We have been able to root most plants equally as well in air as in the conventional media. There are added advantages of additional control of hormones, water, and heat. Further, you can actually watch your cuttings rooting. This makes it an ideal method for basic research, the classroom, or practical research around the nursery.

At the present time, after two years of experimentation, we could summarize our findings as follows:

1. Some cuttings will root in the light, but for the best results darkness around the basal part of the cuttings is necessary.

2. Both the amount of water and sunlight affect "air-rooting", the same as rooting in conventional media. Too much water slows down or inhibits rooting, either by leaching auxins, hormones, co-factors, or other materials.

3. The amount of hormone and the method of application must be geared to the specific rooting conditions. Equally good results may be obtained by basal, pre-dipped, or foliage applications when in the proper proportions. (a) The concentration of hormone ordinarily used for rooting cuttings under mist, causes burning when used under closed-case conditions. applied either as a pre-dip or fed later through the mist. (b) Heavy misting requires a heavier application of hormones than light misting. (c) Foliage feeding of hormones on some easily rooted plants results in the formation of too many roots near the top of the cutting.

4. "Air-rooted" cuttings may be transplanted in the normal fashion and will proceed without setback toward a normal growth. The roots formed on "air-rooted" plants in many cases seem tougher and more hardened than those formed in

[3]The auxin effects of some common fungicides and other chemicals The Plant Propagator, Vol II, No 3, Fall, 1965

soil. The timing of the transplanting is no more critical than for other media. Cuttings may be held in the rooting chamber for three months or so after rooting and will continue to grow without additional feeding.

We intend to carry this research further, working to gain more control of heating and watering, and to develop a better insulating material to hold the cuttings. With such additional refinements, this "air-rooting" can point the way to discovering more about the "how" and "why" of conventional rooting and lead to improved practices in the commercial field.

PERCY EVERETT: Bruce, we again thank you for your very able presentation.

Now we come to a man, Wes Humphrey, who has helped in so many different ways in putting on this program. I have found this to be true of the Agricultural Extension Service wherever we go. When people come and ask me about certain problems they're having, and I certainly don't know many of the answers, I always refer them to their Agricultural Extension Service. Often they are quite ignorant of the fact that there is such a service. I'm really concerned that this should be so. Wes, will you take over now and tell us about the use of CO_2 in growing and propagating plants?

FOLIAGE PLANTS RESPONSE TO INCREASED CO_2

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Higher daytime temperatures are used for foliage plant production which results in longer daytime periods when greenhouses are closed compared to many other greenhouse crops grown in southern California. A closed greenhouse during the light period offers an opportunity to utilize CO_2 injections for growth stimulation. A study was conducted to determine if foliage plants would respond to elevated levels of CO_2 in the atmosphere during the daylight period when the ventilators were closed. This was done in cooperation with Bob Weidner at Buena Park Greenhouses, Inc., Brea, California.

Two 18-foot-long greenhouse sections were used, one in each of two separate greenhouses. Each section was isolated by a polyethylene film curtain at each end of the 18-foot length and sheets of polyethylene film were tacked inside the remaining glass area except for the ventilator area. Temperature, light, irrigation and nutritional levels were maintained as nearly alike as possible in both units.

The study was conducted from February to June, 1966, using a variety of foliage plants. CO_2 was added in one of the sections from a dry-ice convertor furnished by Pure Carbonic Co. Levels of CO_2 were measured by the use of a Beckman non-