

CARBON DIOXIDE LEVELS IN PROPAGATION UNITS

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Adequate amounts of carbon dioxide (CO₂) in the atmosphere during the daylight hours for plant growth is a topic of much current discussion. Adequate CO₂ levels should be important in the propagation of plants from leafy cuttings.

There is little information to indicate the levels of CO₂ in various types of propagation units. Through the cooperation of Beckman Instruments, Inc. and Select Nurseries, Inc., Brea, California, measurements were made in several types of propagation units of the levels of CO₂ during the light and dark periods. Measurements were made in cold-frame units, mist chambers and in a closed greenhouse maintained with a high humidity, commonly called a fog house. The cold frame units in which cuttings began to root and new leaves initiating showed marked deficiencies of CO₂ during part of the light period. (Table 1) Only slight deficiencies during the light period occurred in the mist chamber and in the fog house. Where the normal level of CO₂ in the atmosphere is 308 parts per million, in the cold-frame units, which are enclosed plastic units kept completely sealed, deficiencies dropped to as low as 150 ppm and were below 308 ppm for as long as eight hours during the light period. Repeat measurements were made and more than one unit was sampled with different lots of plants to validate these measurements.

The low levels of CO₂ measured would indicate that, at least in the cold frame units, it may be of value to vent them, once rooting begins to take place. One venting may be sufficient; however, two to three times may be better to maintain at least a level of CO₂ close to normal air levels. This need not be done until the mid-morning period. The reason for this is that during the dark period in this type of unit, the CO₂ level builds up as high as 1350 parts per million. This supplies a fair amount of additional CO₂ for use by the plant leaves during the early light period. Apparently in the mist chamber there occurs sufficient venting to give a more normal level of CO₂. This also appeared to be the case in the fog-house propagation unit. In these latter units, there was also more air volume in proportion to the plants and cuttings.

PERCY EVERETT: Thank you very much, Wes. As always, you give a very dramatic and wonderful presentation. I think this leaves a lot of thoughts and a lot of questions that are in everyone's minds and perhaps next year we'll come back with more definite answers.

Are there any questions now of either Bruce Briggs or Wes Humphrey?

Table 1 Carbon Dioxide Levels in Atmosphere Around Cuttings in Various Propagation Structures at Select Nurseries, Inc., Brea, Calif

Propagation Unit	Plant Species	Per cent Rooted	Average CO ₂ content		*Hours below normal
			Minimum ppm	Maximum ppm	
COLD FRAME	Thuja		230	932	7.75
	Gardenia	0	283	1144	1.40
	Gardenia	50	171	1171	7.14
	Gardenia	100	138	1275	8.06
	Elm	100	165	838	8.75
FOG HOUSE	Juniper		263	392	8.90
MIST CHAMBER Unit 1	Bougainvillea & Lantana		295	465	1.0
MIST CHAMBER Unit 2	Bougainvillea & Lantana		275	475	5.0

*Normal CO₂ level in the air is 308 ppm

Table 2 Light Intensities in Various Propagation Units at Select Nurseries, Inc as Measured on July 28, 1966

Time	Outdoors	Fog House	Cold Frame 1	Cold Frame 2	Mist Unit 1	Mist Unit 2
	ft c	ft c	ft c	ft c	ft c	ft c
9:30 a m	3600	190	440	485	270	300
12:15 p m	9300	625	1900	1500	450	----

JOLLY BATCHELLER: I'd like to ask Bruce. What is the objection to having rooting on the stem? I should think that this would be a way that you'd have a greater root area. I should think this would be far more desirable than having all roots come out of the bottom where there's a chance for them to curl in the pot. Where is your objection? You said this is not desirable, or I understood you to say this.

BRUCE BRIGGS: That is correct, Jolly; maybe I can turn this question over to Ed Wood who grows a lot more herbaceous plants than I do and has done much more transplanting. Did you find any particular objections when you ran into this problem?

ED WOOD: Yes, Bruce, usually we got many roots up on the stem before we got them at the base.

PERCY EVERETT: One question I would like to ask — it may be rather dumb; but why can't you cut the pieces up and use each one of those rooting sections as an individual plant?

ED WOOD: We like to make money too. The bigger we root them, the quicker we sell them. If you have to start chopping them up, you have to grow them for a long time; it's a matter of economics.

RON HUROV: I'd like to ask a question directed to Wes. Wes, in the pineapple industry we use ethylene gas absorbed onto charcoal and water for forcing pineapple. I was wondering if you had any experience with spraying carbon dioxide absorbed onto some absorbent, like charcoal?

WES HUMPHREY: No, I have not, although I have seen references to such an effect even in the household magazines — taking bottled CO₂ and squirting it onto plants and apparently getting some growth response. How much scientific work along this line has been done, so you can actually make some true measurements, I don't know.

MRS. WHALLEY: In making conifer cuttings quite often there will be just one root coming out from one side, a very luxuriant root, but we find that it's not advisable to leave that one root on; we feel that we have to start all over, cut it off, dip it, and start over because in potting it never makes a good root system. That's what we believe. Can anyone tell me why this occurs in conifers? Other growers in our locality have this same experience. Some wound their cuttings and some do not; it still occurs in both cases.

MARION STEPHENS: We've carried on experiments for one year to study the effect of timing in rooting cuttings. We've found this situation to be true in rooting coast redwood. Certain times of the year you'd get one root. You can't plant such cuttings because the root will break off. It seems that other times of the year a wonderful root system will develop. We think the time of year we take the cuttings has a lot to do with it.

MRS. WHALLEY: Well, this would just be an occasional cutting. Most of them would root fine.

VINCENT BAILEY: Our observation is that the juvenility of the cutting is a factor in this; secondly, use of hormones seems to be a great factor in eliminating these one or two roots per cutting.

MRS. WHALLEY: We always use hormones. Do you mean perhaps that they aren't as evenly treated as they should be? We always dip our conifer cuttings — either in a powder or a liquid.

VINCENT BAILEY: We at our place like the liquid best. We think we get more uniform distribution. We use IBA.

ED WOOD: I would like to ask Vince was it the more juvenile or the more mature conifer wood that had a tendency to grow the lone root?

VINCENT BAILEY: The more mature wood, in our experience, has a tendency to form only one or two roots per cutting rather than a group of roots.