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KEEPING PLANTS WARM WITH COVERS

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For the past five years we have used a practical and inexpensive system for protecting container nursery stock during the most severe periods of winter, i.e. late December to late February. The procedure involves laying white 4 mil. plastic directly on top of the plants.

The Development. Our standard practice is to overwinter plants in unheated plastic houses; however, to overcome the high construction cost involved, we began to investigate structureless systems such as Gouin's Microfoam (1). This effective practice was discarded because Microfoam is available only in narrow widths and the material is costly. In addition, I could not see my way clear to lay several hundred thousand plants on their side and then have the monumental task of setting everything back up again the following spring.

I constantly asked myself, "What purpose does the poly-house provide that can't be done by poly alone"? I realize that there are many complex factors that are involved but the one function I kept coming up with is that the poly-house provides a means of holding the plastic cover in place.

The System. Before covering, to help reduce the possibility of a fungus problem, we apply a shotgun fungicide mixture of Benlate, Manzate 200, and Daconil. A thorough watering just prior to covering is necessary because you will not be able to get to the plants for the next several months.

In our area late December through mid-February is the time of our most severe freezes and is our period of covering. To expedite the covering process we constructed a 3-point tractor mounted pipe boom that extends half way across our standard 17 ft. wide bed. A 20 ft. roll of 4 mil. white plastic is put over the pipe and the tractor travels down a roadway adjacent to the bed unrolling the poly directly over the plants.

Working with the tractor are 4 men, 2 on each side of the plant bed, pulling the plastic over and down sealing along the edge with previously placed pots filled with potting mix. Immediately following the poly tractor is a second tractor and crew unrolling 78% shade cloth which has grommets installed every 2 ft. The shade cloth is pulled over the bed and stretched tight then secured using ¼ × 12 in. gutter spikes driven into the ground at each grommet thus holding the poly in place. This anchoring procedure is the most critical step in the entire operation; if not done properly you can be sure the plastic will blow off during the first big wind that always accompanies a cold front.

Rainwater collecting on the top of the plastic sheet can present a serious weight problem. This is easily prevented by drilling a new unrolled sheet of plastic with one row of ¼ in. holes 12 in. apart. These small holes are closer together toward the center of the roll but do not appear to reduce the protection provided by the plastic cover. The weight of snow, up to 18 in., seems to be no problem because the weight is uniformly distributed over the cover surface.

Removal of the covers the following spring must have its own systematic method. Our shop man, Johnny Patterson, designed and constructed a tractor-driven trailer device for rerolling the plastic and shade cloth. Putting the heavy bulky material on rolls accomplishes not only having a convenient easy way to handle and store but also facilitates the application operation.

The ground stakes are removed from the shade cloth and the material is folded on top of the plants so that the overall width is reduced to 10 ft. Then the shade is rolled up by the device, parked at the end of the bed, producing a neat package that we can handle easily with fork lift tractors. An average roll will contain 2 pieces of material 20 × 300 ft. The plastic is folded on top of the plants and handled in a similar manner. Using this system and with proper storage we have been using the same plastic for over 4 years.

Using this method we have successfully protected many broadleaf evergreen species at temperatures below 0° F.

Table 3. Height of clones rooted in 1978 and field-planted in 1980. Recorded July, 1985.

Clone No.	Height
8303-06	210 cm
8303-15	230
8303-27	220
8303-35	290
8303-50	170

Clones grown as stock plant hedges. Rooting of cuttings started in 7 cm pots was recorded by carefully removing the pots from the compost ball and recording the plant as rooted, if roots were visible on the surface of the medium. The rooting of cuttings harvested and inserted in the rooting compost at two dates is shown in Table 4. Data is given for untreated cuttings as well as for cuttings treated with a rooting hormone.

Precautions. Slow-release fertilizer, such as Osmocote, will continue to release under the covers and salts have a tendency to accumulate in toxic amounts. If you are using slow-release fertilizers then please make sure you flush the containers as soon as they are uncovered to remove these excess soluble salts.

Evergreen azaleas have not responded well to this system. *Botrytis* seems to develop heavily in the environment under the covers, so go slow in storage of your azaleas.

SUMMARY

There is a great deal that we do not know about the system. Every new production technique creates a series of new problems that must be worked out. This practice is no different, but from what I have seen to date, "Keeping Plants Warm with Covers" is a viable production tool.

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DIANE ERICKSON: Using irrigation for frost protection, I can understand how the heat of fusion works when the first ice layer is right next to the plant foliage but as you irrigate through the night and ice is 3 or 4 in. from the plant it seems that the energy given off is also 3 or 4 in. from the plant — so how is the plant tissue actually protected?

C.J. WEISER: As long as there is a ice/water interface, the ice is a pretty good heat conductor, and it does work. The one thing you do not want to do is to shut the water off before the temperature gets above freezing. Tissues will cool down very quickly when there is not a free water surface.

VOICE: A salesman told me that if I sprayed his micronutrient spray on my plants right before cold weather they would be protected from freezing. Is there anything to that at all?

C.J. WEISER: No!

GARY HARTNETT: What about snow-making machines they use on ski slopes. Has this been tried for frost protection in nurseries?

SALLY JOHNSON: Yes, it has been used extensively in British Columbia for frost protection. Several nurseries there are considering buying snow-making equipment because they cannot depend on natural snow for winter freeze protection.

BRUCE BRIGGS: If you had a plant that had been attacked by insects or diseases, or poorly fed and lacking certain micronutrients, wouldn't that plant be more likely to be winterkilled?

C.J. WEISER: A healthy plant, growing well, and going into proper dormancy in the fall will withstand low temperatures best. Withholding nitrogen in late summer to cause growth cessation is good strategy. But I have not seen any experimental evidence that a micronutrient spray just before cold weather will impart any hardiness.

BACTERIZATION OF PLANT PROPAGATION PROPAGULES TO ENHANCE PLANT GROWTH

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INTRODUCTION

Reports have been published recently about the enhanced growth of plants achieved through inoculation of plant propagating propagules with specific kinds of bacteria, a process called "bacterization".

Now, these bacteria have been reported to increase the growth of plants, by as much as 500% over the non-inoculated control plants. The rhizobacteria have been subdivided into three value groups (beneficial, deleterious, and neutral) (30) based on how these bacteria affect the plant.

The purpose of this paper is to describe the bacterization process, provide examples of positive and negative results, list proposed mechanisms of action, evaluate the findings, and discuss some of the theoretical and practical considerations about use of PGPR in plant propagation.