

normal shipping temperatures for tropical foliage plants are 60° to 70°F, achieved by specially designed trailers or trucks with the capability of heating, cooling, and circulating air around the cartons or plants. Special consideration should be given to protect plants from temperature extremes as they are moved to and from the trailers or trucks. Care should also be taken to avoid exposing plants to ethylene gas levels exceeding 1 ppm. Ethylene injury is dependent upon ethylene concentration around the plant, exposure duration, and temperature.

A very thorough discussion of commercial culture of foliage plants, including interior trees, is provided in *Foliage Plant Production* (5)

LITERATURE CITED

- 1 Anonymous 1979 *A Guide to Specifications for Interior Landscaping*, second edition Associated Landscape Contractors of America, Interior Landscape Division McLean, Virginia pp 56
- 2 Anonymous 1980 *The Florida Foliage Buyer's Guide* Florida Foliage Association Apopka, Florida pp 180
- 3 Bailey, L H Hortorium, Staff of the 1976 *Hortus Third* Macmillan Publishing Company, Inc New York, New York pp 1290
- 4 Gaines, Richard L 1977 *Guidelines for Foliage Plant Specifications for Interior Use* Florida Foliage Association, Apopka, Florida, pp 36
- 5 Joiner, Jasper N (Editor) 1981 *Foliage Plant Production* Prentice-Hall, Inc, Englewood Cliffs, New Jersey pp 614

QUESTION BOX

The Southern Region Question Box was moderated by Richard Ammon and Ted Richardson

LES CLAY: We are working with tissue culture of rhododendron and kalmia using IAA (3-indoleacetic acid). Has anyone tried using 2,4-D or 2,4,5-T in tissue culture preparations? We have a problem getting a complete plant when tissue culturing kalmia.

FRANK BLAZICH: The usual auxin is NAA (1-naphthaleneacetic acid).

HENRY VAN DER STAAY: You can use IAA or NAA, depending on what results you want and what species you are using; 2,4-D induces callus formation, and you may then have trouble getting a complete plant.

LES CLAY: We are using IAA in agar with kalmia and rhododendron and are then taking the explants from agar to the medium. We use sand, soil, peat and perlite for the rhododendron. However, this mix is not satisfactory for the kalmia, but instead we have found that a mix of peat and sand is better. We

make no further hormone application, as there seems to be a carry-over effect. The cuttings root in 3 to 4 weeks. We get about 80% rooting. We would like to mix the hormone in the original medium.

FRANK BLAZICH: I believe 2,4-D and 2,4,5-T have been used to encourage the formation of callus, but I have no information on their use in tissue culture to promote rooting.

JAKE TINGA: It is essential to recognize the importance of concentration differences when these materials are used as herbicides and when they are used as rooting hormones. The concentrations for herbicide use are much higher. Another important point to recognize is the effect of water concentration on callus formation. Callus formation occurs in cases where there is too much water and too little air. Usually the mix is the problem, and this is also true in tissue culture. The metabolic rate is very high in both cases, and a continuous high level of oxygen must be maintained.

DAVID BYERS: Is there a good herbicide to use on bearing strawberries?

DAN WEATHERSPOON: Devrinol (napropamide, Stauffer) is a possibility.

BRYSON JAMES: Dacthal (DCPA, Diamond-Shamrock) is about the only one that is registered for this purpose.

RALPH SHUGERT: Dacthal is an old herbicide but is the safest. It is marketed in many forms. It is even safe on seedlings if the true leaves have formed. However, if it is applied before that time, the seedlings will be killed. The material should be used at 30 day intervals. Dacthal mainly controls grasses and should be applied before emergence. A final application in October will actually save money in April and May. Even though effectiveness is considered to last for only 30 to 40 days, there will be a considerable carry-over effect the following spring.

DAVE BYERS: I have been asked about the cost of our new refrigerated storage building without including the cost of the refrigeration. The building itself, which is 5,000 square feet, cost \$36,000.

There has also been a question about the cost of the sprayer that we use for application of all herbicides and insecticides. The sprayer is a Hardi, manufactured in Denmark. It sells for about \$5,000 cash. Additional information on the sprayer can be obtained from Bryson James, McMinnville, Tennessee.

RALPH SHUGERT: I am interested in comments on the relative merits of 'Blue Pacific' and 'Emerald Sea' cultivars of *Juniperus conferta*, shore juniper.

JIM GILBERT: We obtained cuttings of 'Emerald Sea' from

USDA and now have 2-year old plants. So far we can see little difference except that the 'Blue Pacific' is slightly darker.

SUSIE GILBERT: It is very difficult to tell 'Emerald Sea' from the species when the plants are in containers. However, they may look different when planted out into the landscape.

RICHARD AMMON: What about its hardiness? We have never been able to grow *Juniperus conferta* in our area but have been able to grow 'Blue Pacific.'

JIM GILBERT: The 'Emerald Sea' does seem to be a little hardier than the species

RALPH SHUBERT: I believe it was collected by Mr. John Creech on one of the Pacific Islands while he was working for the USDA. It was evaluated, named and released by the SCS of USDA from their location at Cap May, New Jersey. It is hardy there. Does it grow off any faster than 'Blue Pacific,' and is it subject to phomopsis?

JIM GILBERT: It does grow faster. We have not as yet had trouble with phomopsis.

AL SCHERFF: Propagators often have trouble with rodents in their seedbeds, and the question was asked as to a solution. We have found the use of Temik (aldicarb, Union Carbide) very effective.

JUDSON GERMANY: Is anyone in the group propagating ferns? We have a demand for these plants but very few that will perform satisfactorily in our Ft. Worth area. I am interested in trying to propagate different ones to test in our climate.

BILL CURTIS: We propagate a fern that is commonly known as the Alaska fern. This species forms plantlets along the midrib of the frond. We simply pin down the fronds in a flat of sand and peat until the plantlets form roots. We then cut the frond into pieces and pot the rooted plantlets.

RALPH SHUGERT: In the 1978 Proceedings there are step-by-step details in a paper presented by Ray Aitken of the Australian region (1)

HENRY VAN DER STAAY: We use Jiffy 7's as a top dressing for flats of peat-perlite. We soak these overnight, remove the bags and break the pellet up into fine particles. Everything must be very sanitary for spore propagation. We use boiling water to sanitize all equipment and also use boiled water to water the flats and plantlets. Spores are collected by putting the fertile fronds in a paper bag just before the sori are ready to open. When they have dried, the spores will fall out of the sori into the bottom of the bag. Most of these spores will store indefinitely under proper storage conditions. We distribute the spores on top of the flats, then cover them with glass. We maintain a tempera-

ture of about 70°F. It takes about 8 to 10 days for maidenhair spores to germinate but much longer for many others. The first growth has the appearance of fine moss. It is not possible to water these flats successfully overhead; they must be subirrigated. After 4 to 6 weeks the plantlets are transferred to a tray on approximately 1½ inch centers. The plants will be transplanted at least once more before they are ready for sale. Early spring is a good time to begin propagation. If spores are sown in the winter, extra light is necessary to provide a 16 hour day. We keep the flats heavily shaded and extremely wet to start. We put the flats under a plastic tent to maintain high humidity.

RALPH SHUGERT: Is anyone rooting *Acer rubrum* economically?

RICHARD AMMON: Don Shadow, McMinnville, Tennessee, is doing it with *A. palmatum*.

WILL WITTE: It is being tried in Tennessee. I expect to see more propagation of *Acer rubrum* on its own roots.

RALPH SHUGERT: Much of the 'October Glory' cultivar in the Portland area is being propagated on its own roots, and it seems to be cheaper.

FRANK BLAZICH: An article in the American Nurseryman by Orton describes the rooting of 'October Glory' (2). He used a single-node cutting.

RALPH SHUGERT: I do not believe it would be economical to use a single-node cutting because of the length of time required to attain saleable size.

LES CLAY: Jim English, Chilliwack, British Columbia, uses a single node for propagation of *Acer rubrum* and gets a 2 to 3 foot plant in 1 year. It is comparable to a 1-year seedling.

RICHARD AMMON: Does he line these out and cut them back to get a straight whip?

LES CLAY: I am not sure on this point, but it is quite possible.

HENRY VAN DER STAAY: Is anyone in the group using solar heating for a glasshouse?

JAKE TINGA: I believe we are expecting too much from solar heating. It takes a tremendous collector and a tremendous storage tank to provide the amounts of heat we expect. The investment at present is uneconomical.

HENRY VAN DER STAAY: I am experimenting with solar heating although I am not quite satisfied with my set-up. I am using a 44 m² (about 500 ft²) corrugated iron collector with copper tubing across the top of the sheet. Free water moves across the face of the collector and accumulates in a gutter below where it

again goes into a copper pipe to be carried into the greenhouse bench. We have had no moisture condensation problem except in midwinter. The collector has 4 inches of rockwool insulation behind it and glass over the top. The iron costs \$10 per m². The water is used to heat a 40 by 6 foot bench. In a few hours the temperature is up to 100°F. We formerly were relying on oil for 7 or 8 hours each day during the winter and have now been able to reduce this to 1 hour. I would like to be able to store the hot water in a tank and avoid the 100° temperature.

BILL CURTIS: The Klupengers, Aurora, Oregon, are using a solar system in combination with a heat pump. Ray Klupenger, manager of the range, is able to maintain an even 50°F temperature, even though Oregon has few sunny days during winter. They are using the system for forcing evergreen azaleas. Ron Klupenger's address is in the Proceedings.

JAKE TINGA: Although I have had good success using water barrels, research in Ohio reported this as not feasible because the water in the barrels froze. However, a rather large amount of heat is released during the freezing process; and if the temperature of the frozen water is greater than that of the surroundings, heat will still be given off. The water barrels can also be a great safety factor during spring and fall. The best spacing seems to be one 55 gal barrel for each 100 ft².

RALPH SHUGERT: I saw this system at the Forest Keeling Nursery, Elsberry, Missouri, during the winter of 1955-56, and it certainly worked then.

AL SCHERFF: We have used the water barrels and were able to hold the temperature in a plastic house at 15°F when it was -18°F outside. In another house without the barrels the temperature dropped to 0°F.

VIVIAN MUNDAY: Do the barrels need to be metal?

AL SCHERFF: No, nor must they be black although this is probably the most efficient

HENRY VAN DER STAAY: I have seen black plastic continuous tubing used for this.

RALPH SHUGERT: Question for Ted Richardson. Have you ever used surfactants for wetting your medium?

TED RICHARDSON: No.

TED GOREAU: Question for Ted Richardson. Will you continue to move your rooted cuttings from North Carolina to Florida for growth during their first winter after rooting?

TED RICHARDSON: Yes, I plan to continue the present system as the extra growth during the winter gives us a 15 to 18 inch plant by the following fall.