PROCEDURES AND PROBLEMS ASSOCIATED WITH THE TRANSFER OF TISSUE-CULTURED PLANTS

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Topline Nurseries started accepting tissue-cultured plants in spring, 1982, the main crop being *Zantedeschia*.

These were transferred, but not very successfully, mainly due to the fact that we did not have the right conditions. We had set up plastic humidity tents in an existing tunnel house. As this house was being used as a seed house with variable temperatures, it was obvious that a separate and permanent transfer house was needed.

At the end of 1982, a transfer house was built the size of our standard tunnel house — 1,000 sq. ft., covered and lined with a double skin of Fabricon polythene, with a concrete floor and the roof covered with 50% shade cloth. Inside there is a pull-over shade cloth which we use in the summer. A form of humidifier was used to maintain maximum humidity. We adapted an electrical chemical applicator by connecting a water supply to the vat and using a ball-cock; this ensured the vat would not run dry. The humidifier was on a time switch, which we adjusted according to the weather and inside temperatures, the ideal temperature being 20 to 25°C with 90 to 100% humidity. Both humidity and temperature are monitored continuously using a thermohygrograph.

With the onset of winter the two small heaters we had were not sufficient to maintain temperatures so a fan heater was installed. This has a seasonal summer/winter switch and for winter is set at 20°C. This has proved successful in keeping temperatures and humidity at a constant level. To extend light hours during the winter months (April to early September), lights were installed giving 16 hours of light per day.

This year the main crop we have transferred are *Zantedeschia*, and babacos (*Carica*), as well as a few *Eucalyptus ficifolia*, with trials of *Caladium*.

ZANTEDESCHIA

Plants are received from the laboratory in plastic pots. These are plants which have been cut from sub-cultures — elongation stage plates — via the refrigerator. These plants need to be transferred immediately to avoid dehydration. Pots can be stored in a cool store if need be to hold them in limbo (maximum period of 1 week).

Prior to setting the pots are staged on a bench for 2 days with lids on. The lids are then removed and pots are left to sit for 1 or 2 days to allow plants to straighten and adjust to the ambient temperature. The plants are then removed from the agar and graded according to size and quality.

They are then washed under running lukewarm water to remove the agar with roots being trimmed at the same time. (By trimming roots we find the plants establish new ones quicker.) They are then submerged in a antibacterial solution for 10 minutes, drained, then set.

For setting we use plastic trays which have been washed and dipped in a anti-bacterial solution. The medium is 80% sieved propagation mix (which is 50:50 peat and pumice sand with minimal nutrients) and 20% perlite. Before using, the medium is drenched with a antibacterial solution plus Terrazole; left to drain, then roughed up for aeration. Plants are then set according to grade. We have three grades: strong plants, clump with stem, clump with budlets. We also set unrooted pieces from which the majority set roots.

Once set, plants are left on the middle bench for a week after which they start photosynthesising and form cuticle layers. At this stage they need minimal overhead watering. They are then moved to the side bench for more light for 5 days after which they will produce new roots and leaf growth.

During this 5 day period they are liquid-fed, which is continued until the plants are tubed. The plants are removed from the transfer house to another tunnel house to harden-off for another week before being tubed into 5 cm tubes for selling as liners. During the winter months this tunnel house has lights installed to extend the light hours. Also lower temperatures help the hardening-off process. After tubing, plants are kept in a tunnel house for another 10 days before being moved outside to a shaded cloche.

During the winter months the plants die down leaving a rhizome. This rhizome is removed from the medium, washed, dipped in a solution of fungicide (such as Benlate) and Terrazole, dried and dusted, then stored in muslin bags or boxes in which vermiculite or sphagnum moss has been added to prevent dehydration. These rhizomes are now ready for sale or for storing in a cool place for next year's sowing. Before sowing it is recommended to dip the rhizomes in gibberellic acid, 40 ppm. This stimulates growth of very small rhizomes and flowering in larger rhizomes.

During the past 2 years we have encountered many problems with *Zantedeschia*.

Media: We used vermiculite and perlite to start with. This proved successful for about 2 weeks then the plants stopped growing due to the fact that this medium contained no added nutrients. To overcome this we reset the plants into a propagation and perlite mix with the plants responding by producing new roots and leaf growth in about 8 to 10 days.

Bacterial decay: This was in the form of healthy plants collapsing overnight. We discovered this was caused by the fluctuation in temperature and humidity. It is also a seasonal problem. We have controlled this by regular use of an antibacterial solution and by installing the fan heater, thus keeping temperature constant.

Humidity: We constantly wet all benches and floors, along with capillary matting on all benches, to keep humidity at 90 to 100%. But with summer temperatures rising, keeping the moisture level in the air to achieve 90 to 100% humidity is proving a problem. To eliminate this problem we are planning to install a permanent fogging system.

BABACOS

Babaco plants are received from the laboratory in plastic pots which are placed on the side bench in a transfer house for 2 to 3 days to acclimatize the plants to the ambient temperatures. They are then taken out of the pots, washed under lukewarm water to remove the agar, with grading done at the same time. They are then submerged in lukewarm water to prevent any dehydration prior to setting. The plants are then set into a medium of sieved propagation mix (which is 50% peat and 50% pumice sand) and perlite (50/50), which is drenched with an antibacterial solution and Terrazole.

Once set, the plants are put in the transfer house under a fine mist for 4 to 5 days, then weaned from the mist by moving them further down the house. The plants are fed regularly with Wuxal applied by spraying, using a Cambrian bottle. They are also sprayed with Benlate to reduce *Botrytis*.

Once established, with visual root and leaf growth, they are moved to a side bench for hardening off. They stayed there for about a week before being moved to a tunnel house to harden off completely before being tubed up as a liner ready for sale. Babacos respond to liquid feeding, so once they have been tubed we give them weekly sprays of Wuxal to promote utmost growth.

Problems we have encountered with babacos are:

Media: We used vermiculite and perlite to begin with but after 10 days there was no response so we changed to a propa-

gation and perlite mix (50/50) with an immediate response in both root and leaf growth.

Desiccation of leaves: We experimented with taking lids off prior to setting but leaves became too dehydrated. To prevent dehydration after setting, the plants were put under a fine mist. We are also investigating a fogging system to combat this problem.

Roots susceptibility to chemicals: This may cause root burn and stunted growth. We use a weak concentration of a fungicide (Benlate) and Terrazole solution which seems to be adequate.

Leaf drop: Babaco plants are susceptible to any temperature, chemical, or fertilizer change; this causes leaf drop to occur rapidly which is detrimental to plant growth; we are still investigating this problem.

EUCALYPTUS

We have had limited success with *Eucalyptus ficifolia* doing many trials with different media, size of roots and plants prior to setting, and using various chemicals.

The main significance of the trials was that both root and plant size seemed to be a major factor for a successful transfer. The plants we had the most success with had roots 1.5 to 2 cm in length, with the actual plant being about 2 to 3 cm in height. We had the most success with our control trays which had no treatment. The medium we used was 50/50 sieved propagation mix and perlite. Trays used were washed and submerged in an antibacterial solution and then the medium was drenched with Benlate and Terrazole.

Once plants were set they were placed on the side bench for 5 days then gradually weaned off by being moved to a higher degree of light for the next 3 to 4 weeks, then moved to another tunnel house to harden off before being tubed up as a liner.

Problems with *Eucalyptus ficifolia* were mainly *Botrytis*. We controlled this by regular sprays of Benlate and Diathane (½ tsp each to 1 Cambrian spray bottle). Also we found by putting plants under mist we encouraged *Botrytis*, so to combat this we sprayed plants with water 4 to 5 times a day using a Cambrian spray bottle.

CONCLUSIONS

Overall, we have succeeded in transferring tissue-cultured plants successfully, maintaining an 80% plus survival rate. The main factor for success is to have the right conditions for

each kind of plant. To achieve this we hope to expand and have the right environment for each plant transferred.

Our main objective for the future is to offer the highest quality product to the New Zealand grower and meet the demands required for export. Tissue-cultured plants hold an exciting future and it is our intention to continue our research and selection so that we can offer the industry quality that will produce high returns.

USE OF *PINUS RADIATA* BARK: A FOUR-YEAR EXPERIENCE

GRAEME C. PLATT

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Processed *Pinus radiata* bark has now been available in New Zealand for over four years and, during this time, we have used it exclusively for all our production of a wide range of New Zealand native plants.

Prior to using pine bark, we had been using sawdust for a number of years and had established that wood waste was a satisfactory medium in which to grow plants. Our prime motive for using sawdust had been economics. Our local timber mill was delivering 12-metre loads to our nursery free of charge, with the exception of a minor freight charge. Our respect for wood waste soon increased far beyond economic considerations. Besides costing nothing, it was weed-free. Plants developed far superior roots, with little or no pathogenic damage — generally described as water-borne fungi — such as *Phytophthora*. However, the longer we used sawdust, the more problems we were having with non-pathogenic fungi, which rapidly decomposed the sawdust. The final blow was a fungi which only took a couple of weeks to decompose an 8-pint planter bag full of sawdust. It also produced an unpleasant odor, along with enough heat to cook the roots of the plants, which subsequently died.

In order to overcome this decomposition problem we decided to change to pine bark, which had proved more than satisfactory in small trials. We spent considerable time designing a machine which would pulverise bark into a potting mix in one operation. However, while we were still working on this design, we were approached by a soil company, who asked what the prospects were for pulverised pine bark as a peat substitute in horticulture. We responded enthusiastically, and the company, known as Granulated Bark, was set up.