DEVELOPMENT OF A TISSUE CULTURE LABORATORY IN NEW ZEALAND[1]

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Topline Laboratories, Limited, was established in early 1981 after 6 months of research and construction. At the beginning it was decided that a new building would be erected, but due to local laws, delays were experienced, and the laboratory was, therefore, established within one of the present buildings sited on the premises of Topline Nurseries Limited.

The decision to move into this field was brought about after having attended one of the first tissue culture workshops held in New Zealand. Since this occasion, considerable interest has been shown in this field. A lot of plant breeding and research currently being undertaken in New Zealand has been a result of a horticultural boom. The establishment of a Laboratory Company within the nursery confines appeared most attractive.

The interest of a staff member, Lynsay Averill, who had been with the Company for 5 years, with a good horticultural background and basic plant propagation knowledge, also aided the decision to proceed with this new venture.

As Topline Nurseries Limited is part of the Hortex Group of Companies in New Zealand, being a major exporter to many countries, the possibility of rapid propagation of selected crops, and the placing of these on overseas markets, appeared attractive, and it was for this reason the Company was established as a separate identity so that it could contract itself to outside plant producers or operate within the four nursery operations currently running.

The decision to proceed was highlighted by the fact that the managers of the nurseries were invited to become shareholders and directors, and today Topline Laboratories Ltd is a private company with a shareholding split amongst five directors, the manager, Lynsay Averill, being a shareholder and director.

Over the past five years, tissue culture, or micropropagation, in New Zealand has developed considerably; this has been highlighted by the demand for orchids, which has caused an upsurge in the interest of tissue culture. Coupled with this, New Zealand, with its primary produce and the popularity of the New Zealand kiwifruit, has recently gone through a horti-

[1] Paper presented at the meeting by Terry Hatch.

cultural boom, ranging from many fruiting crops through to cut flowers. With the demands being placed upon the industry, there was an opportunity for a laboratory to develop and carry on the work currently undertaken by Government Departments and Universities. It is, therefore, the policy of the Company to only carry out the research that is necessary and, where applicable, contract out to Government Departments and Universities.

It was necessary for Topline Laboratories to establish itself with the necessary equipment to carry out media preparation. At the inception of the Company, it was intended that the Laboratory include a small transfer room which contained one laminar flow hood and all the relevant requirements for media making; that is, water still, autoclave, balance, pH meter, etc. The culture room had shelving added as required.

This was well underway when the first crop of tamarillos was in propagation, but a decision was made to travel to Australia and look at tissue culture laboratories in Sydney; this was undertaken by two of our directors. The purpose of this trip was to ascertain if our thinking was correct, and to gain any available practical knowledge. We were both encouraged by our reception at the Australian laboratories and by the assistance given. To this day a close liaison is maintained with several of these Companies.

It became obvious that the field of work we were undertaking was going to change rapidly, and it would be necessary to make modifications and adjustments within the Laboratory if we were to keep up with the changing theories being applied throughout the world. It is for this reason that as a Company, althugh in depth research is not carried out at present, managers and directors should, when possible, attend research meetings. This year both the writer and manager attended the World Tissue Culture Congress in Japan; it is felt that such meetings as these assist in many of the long term plans for the future.

In the early stages of 1981 the work carried out was the propagation of one crop only, that being tamarillos, and this quickly proceeded through the Laboratory and into the nursery operation, ending up as container stock available to the industry within New Zealand.

With this one simple crop nearly behind us, one of the most obvious problems that appeared in the Laboratory was the need for media preparation. An association with a laboratory offering their services to make media for us was finalized, and a decision to move to glass or plastic containers was necessary. In New Zealand, where we have a small population,

many products are high priced, and glassware is a very expensive item; therefore it was decided to proceed with disposable containers if at all possible.

Fastfood containers, proved to be an ideal unit for our cultures, while the use of petri dishes for the first stages of in vitro culture was successful.

Today all our media is prepared on a pre-order basis at least 2 to 3 weeks in advance by the Laboratory responsible for media making. It is delivered to us sterilized, in plastic sleeves, after being held for approximately 2 weeks on their premises to ensure against contamination. This eliminated the use of labour for media making on our premises and allowed staff to apply their time where best suited, that is, at the laminar flow hood.

Today we still maintain media making facilities within our Laboratory and this is used for small runs where necessary, but all volume crops are produced in plastic containers with commercially made media.

After approximately 6 months of operation, the first contract to be undertaken by our Laboratory with an outside Company was signed, and this brought home the need for planning for at least the next 15 months.

The production of zantedeshias on a commercial scale in vitro had not been undertaken previously in New Zealand, and it was only recently that research work had been undertaken by Government Departments. Through a close liaison with these people, it was possible to establish clones of these cultures quickly and within a short period of time, our Laboratory was developing the flow line of sub-cultures.

Included in this contract was the transfer of the plant from in vitro to nursery facilities as the plant was required to be offered for sale as a dried rhizome or a green plant in a small propagation tube.

During the period of this contract, other crops were brought into production — many of them being what I would describe as short term lines, such as Nephrolepsis and Rex begonias. These were introduced for the purpose of quick cash flow, and secondly, taking out some quiet periods when proliferation was slow.

With the increase in volume, the staff slowly increased from one full-time and one part-time, to three people and, at this point, a second laminar flow hood was introduced. It was found that the capacity of our culture room was greater than what one laminar flow hood could offer.

Since the introduction of these crops in the Laboratory, a

program based on between 5,000 and 6,000 transfers per week per hood has been established, and it is from this basic figure that our budgets for the next 12 months have been based. This allows for approximately 40,000 plants to be produced per month from the Laboratory.

The Laboratory now works with a series of staff members who are trained to work with laminar flow hoods, consisting of women who are available for approximately 4 hours per day. From the outset, 4 hours of concentrated work at a laminar flow hood was considered sufficient for one person per day, and it was for this reason that alternating staff are used from the nursery.

With media preparation being made off the premises by a separate Company, it is necessary to have an understanding of each other's operations. There must be a certain amount of trust, as formulations are made available to the Company concerned, and the order is placed for the forthcoming month's requirements.

Topline Laboratories have always made their premises available for viewing to a restricted number of people, as we believe in sharing the information we have. Although some people believe that it is necessary to have secrets, it is basically my opinion that the formulations and facts are available to most commercial producers today and it is, therefore, the applications of this information that makes success or failure. We see our Laboratory as an operation carrying on the work from where research organizations leave off. The expression of a "bread and butter" operation may not appear particularly complimentary, but it has meant that we commercialize and bring into production crops that are required within the industry, and it is through the use of micropropagation that plant numbers can be increased rapidly and brought onto a market place much more quickly than through other conventional propagation methods.

There is no doubt that research is one of the most important areas of the whole horticultural industry and I believe, as a New Zealand horticulturist, we are very fortunate to have facilities available to us within Government Departments and Universities. Although research must be paid for by such Companies as ourselves when undertaken, the cost of applying this within their own Laboratory would be somewhat daunting, and it is our wish that these services available to us will continue in the future. Likewise, it is the wish of Topline Laboratories to assist with University training, and we are pleased to be able to offer students training for practical horticulture as well as degree courses. The opportunity to work

during their holiday periods in the Laboratory gives them understanding of the practical aspects of this exciting area.

We are now approaching the end of a second year since we established the Laboratory, and it is with some excitement that we look to the future as we foresee the development of many new crops along with the increase in the numbers of many basic crops currently in production.

Plans are already underway for the development of a new Laboratory in association with a new nursery. This will include 5 work stations and 3 culture rooms. It would also include a basic laboratory area as well as facilities for media preparation, as we must be aware of the possibility, due to changes of ownership, for failure of other companies to meet our needs. Should media preparation be necessary within our own Company for commercial use, we must safeguard ourselves. This would not mean the expense of all the equipment, but at least the basic space.

Tissue culture, or micropropagation, is presently the most exciting, challenging, and demanding aspect of horticulture and, putting aside all of this, it is one of the most demanding on the dollar. Anyone who is involved in it will surely agree that the money spent in what is a small square footage area, along with the cost of running such an operation, is sizeable.

Nevertheless, it is possible to make a profit, but it is necessary that crop planning and projections be carefully estimated. Records as to actual performances must be kept so that a case history of crops can be developed and, therefore, a plan for future production can be applied. Tissue culture can be fun, fascinating, and frustrating but, what's more, it can be financially disastrous without careful planning.

AN OVERVIEW OF A COMMERCIAL PLANT TISSUE CULTURE LABORATORY IN HAWAII

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We are a specialized laboratory with over 90% of our work dealing with the mericloning of orchids. The other 10% entails the mericloning of other ornamentals, such as *Anthurium andraeanum*, *Cordyline*, *Dieffenbachia*, Spathiphylum, and bromeliads.