MICROPROPAGATION IN NORTHWESTERN AMERICA

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This paper is a report of my trip to America using the 1981 Travel Award.

The aim of my trip was to look at some micropropagation being practiced commercially, and to make practical recommendations to British nurserymen interested in the technique. I also wanted to find out about any new knowledge in mycorrhizal relationships that could benefit the nursery trade in the U.K. While focusing on these two areas, I took the opportunity to visit some nurseries of more general interest, a chance not to be missed.

Undoubtedly rhododendrons are the most successful subject for micropropagation developed so far in the American northwest. Dr. Wilbur C. Anderson of the Northwestern Washington Research Unit at Mount Vernon estimates that at least 10% of rhododendron production in Washington State now is done by micropropagation. He has done a lot of research and development of rhododendron microculture and explained some of the practical problems to me. The majority of micropropagation work requires dexterity but is somewhat tedious and Dr. Anderson recommends having one qualified person of high calibre to run the laboratory, recruiting the rest of the laboratory staff from nursery workers already employed. This was certainly evident at the facilities I visited, where the tedious division of plantlets, the "cooking up" of culture media, and the delicate placing of plantlets on the media were all carried out by female staff trained in tissue culture on the nursery and without any previous experience.

Dr. Anderson also warned against over-investing capital. A very serviceable laboratory can be equipped without buying a lot of very expensive gadgets; for instance, an ordinary domestic washing machine and refrigerator, open shelving as used in offices or stores, and plain Formica work surfaces are all quite adequate. However, he suggested that it was well worth buying a really good autoclave and top quality chemical reagents.

A point that Dr. Anderson stressed was that of competitiveness; this seems to be the cornerstone of many American success stories. He saw this as a real stumbling block for micropropagation of rootstocks, which would have to compete with stooled stocks at 25¢ each; obviously the higher unit price of rhododendrons allows for higher production costs.

However, he estimated that problems of production that tend to raise costs should be overcome within 10 years, but that the solutions involved more than just tinkering with the ingredients of culture media, etc., and thus were too much for small commercial laboratories to tackle. Clearly, therefore, large scale research is still required, funded either by the government or a large firm.

In developing microculture of rhododendrons Dr. Anderson has been in close contact with Bruce Briggs, who propagates a large range of rhododendrons by tissue culture at his nursery at Olympia, Washington. Bruce has a standard tissue culture laboratory and uses the standard three phases of culture in vitro; multiplication, shoot growth, and root growth. Each phase has a different culture medium. When the plants are taken out of the laboratory they are treated rather as seedlings, being "pricked out", hardened off, and potted on as for conventionally raïsed plants.

Bruce is optimistic about the returns on his investment. One obvious advantage is that stockplants are no longer required, as material is taken from growing stock.

Another is that stocks of a new introduction can be rapidly bulked up from a small amount of plant material. While they are happy with results so far, Briggs Nursery has tried to extend their range of tissue-cultured plants to include ornamental plums, crabapples, and conifers but, so far, have not gone into production.

Briggs Nursery also has a water chlorination plant, which means that they do not have a problem with moss in their containers. In contrast, Clay's Nursery, Langley, British Columbia, do not chlorinate their water, and do have a moss problem. However, they find that Ronstar gives satisfactory control of this.

A more conspicuous difference at Clay's is that the tissue cultured plants are not rooted in vitro as at Briggs. Instead, rooting takes place in paper tubes using a peat-perlite medium. (Sand cannot be used in the medium due to soil requirements for export.) The tubes are placed in a polythene tent in a glasshouse. Humidity is controlled by conventional fine mist nozzles; temperature is controlled by a fan that brings cooled air into the tent. Air cooling is by an ingenious device similar in appearance to a car radiator, which contains circulating cold water which takes heat from air being drawn through it. Sterilization of benches is simple, as all benches in the glasshouse at Clay's are concrete and have the heating calbes embedded in them, giving a smooth surface for swabbing down. While Clay's mainly clone rhododendrons they also produce some

Kalmia, *Amelanchier*, *Photinia*, *Sequoia*, and *Hypericum*.

Different subjects again are microcultured by Microplant Nurseries of Gervais, Oregon; for example, *Malus* 'Royalty', *Betula* 'Dalecarlica', and 'Newport' plum. The laboratory is a sophisticated one, on the site of one of Oregon Rootstock's nurseries, and is funded by them, in partnership with McGill and Son of Fairview, Oregon, among others. Some material from Microplant is sent to McGills for growing on under glass and then in the field. McGills have found that plum plantlets grow away better after a cold period of about 3 weeks. They have tried tissue culture of Norway maple but, at the moment, have problems with rooting.

I got the impression that setting up the Microplant Laboratory has been costly, and that there was spare production capacity not being fully used. Gayle Suttle, the manager, said that they were looking hard for sales to recover funds to meeting running costs. I felt that this experience at Microplant backed up Dr. Anderson's advice to be very careful about costing a tissue culture unit before investing.

The British nursery stock trade can, therefore, learn this lesson from the American experience: Technically, tissue culture has great potential to become a major tool for our industry, but caution is needed. Before embarking on a microcultural program it must be proved to be competitive as investment of capital and time are considerable. For many plant subjects there are still problems to be overcome before they can be produced successfully in vitro, but there is a good prospect that solutions will be found, and found in the foreseeable future, say five or ten years.

SOME IMPRESSIONS OF CURRENT PROPAGATION AND PRODUCTION TECHNIQUES IN THE U.S.A.

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I hope by the time I finish I will have frightened you a little, because during my tours abroad in recent months I have become scared. I could begin with the story of a French micropropagation concern who propagated 500,000 M27 apple rootstocks, and when they were out in the field it was realized that there had been a swapping of flasks in the laboratory and they had 500,000 MM 106!

In the U.S.A. they have reached a stage of very considerable over-production. I could tell you about the American