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SUCCESSES AND FAILURES WITH MICROPROPAGATED PLANTS: THE BLOOMS' EXPERIENCE

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Micropropagation is hardly new but is only now being accepted by the majority of the trade as a useful and standard method of propagation. Twenty years ago, it was barely talked about in the hardy nursery stock industry nor considered a viable alternative or replacement to more traditional methods. We looked upon it with a mixture of excitement and dread. On the one hand it had a potential benefit for producing hitherto difficult to propagate plants, apart from new or unusual forms—but on the other it seemed to open the way to very real dangers of overproduction.

Questions were asked like: Would it revolutionize propagation methods? Would it put the skilled propagator out of business? Would it make the rare plant common, bring down prices and flood the market?

At that time there was no way those questions could be answered. As a company we had to ask the question, "What was in it for Blooms?" Whether or not you like to face change and new technology, if you don't you will soon find progress passing you by. We had to avail ourselves of this science to help us produce items that were consistently in short supply and for rapidly building up stock of new plants. Plants in test tubes did seem rather far-fetched but it was exciting to consider getting new, rare, or unusual plants into

micropropagation and hopefully on the market before others. The next question was . . . do we consider setting up our own unit, or go to outside independent laboratories?

Travelling quite widely gave me the opportunity to assess what might be best for Blooms. Nurseries in the USA I visited were dubious about getting returns for some years on their investment. This, coupled with finding and keeping qualified research technicians and many teething problems, decided us to, at least initially, look for specialist tissue culture labs to provide the resources for early experimentation and production. The one large scale lab in the UK at the time didn't seem interested in any new work unless guarantees for large quantities could be given. We found that both Neo Plants of Stoke on Trent and ourselves had a common purpose. They were a small lab looking for diversification, we had a considerable range of plants and a requirement for quite reasonable quantities once propagation was achieved.

It was very much a give and take situation for the first few years. There were few quick results, and in many cases no result. Success and disappointment. It soon became evident how susceptible these plants were to contamination. First results from pricking out cultures from flasks on our nursery were mixed. It seems elementary now, but it was obvious the laboratory would have to do the weaning, producing a plug or liner for the nursery.

We also learned not to rely on forecasts for plants until they were in the weaning stage and, if possible of course, to take delivery at the beginning of the natural growing season, since we did not have sufficient protected cropping or heated glass to handle large quantities. This, of course, was and is no different to most traditional young plant trade.

Both Neo Plants and ourselves had to learn the hard way, they with the techniques for a wide range of mainly perennial plants, the growth and weaning, Blooms with the growing-on to saleable plants. We have, and one must, be prepared to enter a sort of partnership in which there is trust and understanding. In the end all one is doing is forming a business relationship with expert propagators working on a long term contract. If a plant is agreed as exclusive then the lab must resist the temptation to overproduce and offer the surplus to what may be a very large open market. Such an action would immediately bring a stop to any future relationships.

We, of course, do not now only deal with one lab, since with the broad range of subjects we deal with, one could not supply all our requirements, but the same principles apply for all unless you are buying purely from a list.

Frankly, once the lab, whether it be your own or not, has weaned the plants—if good nursery practices are followed—one should not fail to succeed. But perhaps we should look a little further than the nuts and bolts of this new technology and what

questions arise for now and the future.

The first question is: do you first find a plant and look for a market—or a market and then find a plant? In the old days it did not matter so much, the markets were more traditional and competition less fierce. There seemed to be good possibilities for *Hosta* and *Hemerocallis* for which, surely, there were good markets in the U.K. and elsewhere. So off I went to Japan and the United States in search of these and other plants. The selection of new hostas and daylilies in the US was amazing; some of the best hostas also originated in Japan. Over two or three years we built up a trial of over 100 hostas and 150 hemerocallis at Bressingham to test for best selections for northern European conditions. We selected some of the best and they were ideal for micropropagation—or were they?

Any self respecting nursery has a duty to be sure that what it sells is true to name—so hemerocallis must be grown for at least two years, possibly three to ensure they flower true-to-type. Tissue-cultured hostas have received some strong criticism from hosta buffs who suggest they do not come true from tissue culture and are liable to revert. Single foliage colours seem to be no problem, but variegated forms have shown instability, as the labs and growers are now aware. They might produce anywhere between 5 and 50 per cent true—but like any other nursery, the labs who are clever enough to come up with the highest percentage win the prizes, if not the business.

But for the grower with these and many other tissue-cultured crops it means a long delay from the date of receiving the material to the point where he can recoup. With large quantities of such plants it needs patience and an understanding bank manager.

With certain herbaceous material, once you have large two or three-year stock beds it will be much cheaper to produce vegetatively, so unless there continues to be strong demand, this particular line maybe lost to the lab. So two, three, or four years after you begin to micropropagate you get the plants on the market—hopefully before the competition. There are two risks to be taken—*first* that the perceived market demand will be there when you finally get the plants ready for sale, and *secondly*—that other labs and growers have not been doing identical work, coming onto the market with the same products at a similar time!

Once it is known that one lab is having success with say, rhododendrons, kalmias, hostas, or hemerocallis, such plants may be seen to be "fashionable", or in demand at least by the growers, then everyone jumps onto the bandwagon. Thus demand can be often grower-led, rather than market-led with inevitable consequences of overproduction. Most micropropagation laboratories are now realizing the benefits of specialization and contract growing.

Such unique plants as *Choisya ternata* 'Sundance' or *Betula* 'Golden Cloud' are perfect examples of the successful use of

micropropagation. These and other plants, discovered by individuals, growers, or breeders, which otherwise would take years to build up stock, can be mass produced and the production cycle shortened by several years.

I have strong views on Plant Breeders Rights and Plant Patents. Whether we like it or not they are here to stay and with home and international competition speeding up, investment in breeding and promotion of new plants increasing, it will be seen as not only desirable but necessary for more new plants to be protected.

The world is becoming more interdependent than ever, with such markets as the Australasian, North American, and Eastern European—including the new Russian—plus the Chinese and, of course, the Japanese becoming potentially available to us. This may not be as significant as the fact that the more developed economies are becoming available to Third World or underdeveloped countries, with their much cheaper production costs. One European company discovered it cost the same to set up a lab in China, employing 150 people, as it did to have a small 5 person lab in Holland. The implications are obvious. Perhaps the Japanese and even the Dutch have been a little slow off the mark with micropropagation but they are quickly making up for lost time.

A new £10 million lab in Holland is only one of the latest large scale world-wide investments in micropropagation and biotechnology facilities, though the first priority of these labs is seldom ornamental horticulture. But horticulturists from Japan, Holland, and elsewhere are looking for new plants, and new products that might be suitable for pot plant or cut flower markets.

What easier way than to despatch plants or cultures in the tube from one lab to another across international borders, plant health requirements not withstanding. Whether in Tasmania or Alaska a lab works in totally controlled conditions and, with modern communications, making possible deliveries from one part of the world to another within 24 hours. The answer to the question of how to control and protect becomes somewhat difficult under such potentially secretive and fast moving modern technology.

Biotechnology, including such techniques as mutagenesis, organogenesis, cell fusion and symbiotics—which may mean as little to most of you as to me—can, we are told, revolutionize plant breeding and selection. Micropropagation is the production method to produce these new wonder or monster plants—according to one's views.

If this sounds frightening then an article in a recent edition of American Nurseryman sounds even more so. This reports on Native Plants, Inc. (N.P.I.), that has its own Phytotec labs in Utah, Belgium, and Australia, as well as nursery production facilities. This company suggested in a recent magazine article that by the year 2000 *most* horticultural crops will be produced by tissue cul-

ture. Another statement by the same company contends that "over-production benefits the nurseryman and the consumer", concluding that "through mass production prices will drop and nurseries will be able to compete better with the mass merchandizers". If that principle is taken up by other larger labs who do not have their feet on good horticultural ground we could be in for a very interesting decade. Perhaps the questions asked at the beginning of my talk have yet to be answered. Though we should be aware of what is happening and what could happen, perhaps we should not be too alarmed.

Of course micropropagation is here to stay, and is becoming more relevant to the nursery stock business as a propagation technique with which we are quickly coming to terms. That it will become possible to propagate a wider and wider range of plants is without doubt.

But let us not allow this modern technology to divert us from paying attention to the importance of the traditional and skilled propagator in our business, and be prepared to respect and pay them accordingly. If we don't we may not only lose our skills to the laboratory, but we may find ourselves hijacked by other cultures.

OBSERVATIONS ON THE ROLE OF CYTOKININS IN MICROPROPAGATION AND JUVENILITY

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Micropropagation is a tool with many uses. As propagators we are most interested in its use for rapid multiplication of subjects that are difficult to root by other methods. Plants coming from micropropagation yield cuttings which, in many cases, root more easily than the original source of micropropagated material. This result may be compared with traditional methods of inducing juvenility in stock plants, such as hedging. It may be that cytokinins could be used on traditional stockbeds to induce juvenility.

In 1977, the staff at Rochfords Nurseries' Technical Department were examining methods of increasing the numbers of shoots on *Dracaena marginata* for propagation purposes. Various methods of introducing cytokinins into the plants were investigated but none resulted in substantial increases in shoot numbers. One method