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NOTCUTTS' EXPERIENCES WITH MICROPROPAGATION

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INTRODUCTION

Notcutts' interest in micropropagation began in the late 1970's when the company realised the potential for the technique on a modern nursery. What was less clear was what specific role would develop for micropropagation in the nursery stock industry and what production levels for the technique would be appropriate.

Initially micropropagated plants were brought in from commercial laboratories and closer links were formed with one of the UK laboratories. However, it soon became apparent that an on-site laboratory was necessary and in 1980 a laboratory was constructed within the propagation unit at Woodbridge.

The laboratory now produces approximately 120 subjects and represents perhaps 10 to 15 percent of Notcutts' production.

PRODUCTION TIMING

The key to the existence of a nursery-based laboratory is very clearly the growing-on of propagules to saleable size. It was clear at an early stage that the classic approach of the laboratory producing all propagules for a spring lining-out was impractical.

Propagules were always difficult to wean in February and March, although sodium vapor lights have subsequently aided winter weaning, meaning that laboratory production peaks during April and May clashed with traditional cutting production. If weaning was later, perhaps in June and July, subsequent lining out of propagules in August and September often proved just too late in the season for successful establishment. So, although spring lining out of propagules is clearly advantageous, other avenues had to be opened.

Lining out of dormant propagules under cold glass has proven to be a very useful strategy, particularly for herbaceous perennials, such as hosta and *Dicentra spectabilis*. This is also so with roses, particularly the climbing, hybrid tea and floribunda. Laboratory production of roses is now geared to produce plantlets leaving the laboratory in September and October, weaning under sodium vapor lights giving approximately a 2,500 Lux intensity. After weaning, the plants are allowed to become dormant.

Dormant propagules can then be lined out at leisure in November, December or January. No top growth will occur but, interestingly, root development will occur if the liners are watered very sparingly.

A bark/peat based compost with 8 to 9 month Osmocote at 2kg/M^3 is used and at low winter temperatures feed is released very slowly.

Watering and perhaps supplementary feed can begin, under glass, in mid-January and February and by March top growth appears in profusion as dormancy breaks, supported by the good root system developed over the winter. This is an important advance because our experience with roses is that while micropropagated climbing roses produce very good saleable plants by September, if they do not quite make it they are extremely difficult and therefore, uneconomic to overwinter. We have found that the liner must be in the saleable container by the last week in May. Clearly spring lining-out would put great pressure on the plant to make up in time, and those of our early rose batches which were even just a few days too late, were never sold.

Winter lining-out of herbaceous perennials is often advantageous, producing much larger plants later in the year. However, in this case ensure the crown is very near to the compost surface, no deeper than 1 cm. If this is not done, the first leaves or shoots become drawn through the compost and because they are very soft and produced early in the spring will damp-off quickly.

Other plants are better weaned in January and February—again under lights. The propagules then produced in March and April are obviously ideal for early lining-out under protection and then have the whole growing season to develop. This is ideal for rhododendron where a propagule lined-out into a 7 cm plastic pot and severely pinched back in March will produce a very good liner which, in September, can be put into an intermediate one litre pot and overwintered. It can then be put into a saleable 3 litre pot in July to be sold that autumn or the following spring.

However, while very good rhododendrons can, with a little care, be produced from micropropagation, in Notcutts' particular circumstances, with our excellent Waterers' rhododendron cuttings, traditional propagation would appear to be more economically effective.

Attempts to line out propagules much later than mid-August while they remain active, have met with poor results. However, propagules weaned later in the year over-winter reliably in the cellular modules we now use. The small size of these plants densely packed in modular trays is an economic use of space, since they are then ready for lining out very early the following spring.

One hazard to over-wintering is *Rhizoctonia*, which destroys the root system of propagules in modules very quickly, particularly in a cold damp January and February. A drench of fungicide, e.g. Rovral or Basilex in either late December or early January, appears to prevent this problem.

Some plants are successfully lined-out at any time during the year, irrespective of seasonal and weather conditions. Clematis is a good example. Lined-out at any time between March and October, a year's top growth will die back over winter leaving a crown of 4 to 8 buds just below the compost, which break in the spring to give a bushy, vigorous plant.

LINING OUT

Our liner unit is approximately 3 miles from our propagation unit and the movement of plants to it is a change in environment analogous to commercial laboratory-produced plants being bought in by the nurseryman.

Micropropagated plants are generally allowed 2 to 3 weeks acclimatisation in their new environment before lining-out.

A modular established plantlet does not appear to require extra shading after it is potted-on as damage to root systems is usually minimal and this has released areas of shading to other crops. However occasionally the top growth of the propagule evident in the modular tray will drop off or die-back after potting on. Although initially alarming, this does not appear too detrimental to the plant as the crown quickly regenerates leaf growth and new shoots.

Hard pinching back is often a very good idea and this is straightforward since the plant's crown is often at compost level. Hard pinching is particularly useful for producing very bushy rhododendron liners.

We spray with fungicides all newly lined-out micropropagated material since laboratory-produced plants are smaller and softer than a traditional cutting would be. *Phytophthora* is a common nuisance and a light foliar spray of Aliette is good at control and protection. For established liners a heavier drench with Aliette is a better technique.

Weaned propagules are very tough and resilient to mechanical damage. A cold shock however, is a very efficient killer and special care is needed to avoid it, especially when plants are growing in the small compost volume associated with modules.

We have found that the correct liner container is important. Plants with a fibrous root system, particularly rhododendron, will perform much better in a plastic 7 cm pot, rather than an equivalent peat container, as will ophiopogon, which is particularly slow to establish in a peat container. Generally we favour the plastic pot despite its higher cost.

The roots and particularly the growing point, need high levels of oxygen for good establishment. Oxygen starvation is easily caused by overwatering and this is a real killer, especially in a plastic container. Yuccas are a good example where better establishment is achieved by careful, light watering only.

We prefer composts with high air-filled porosity and, as a standard, we would use 50 per cent 100-grade bark: 50 per cent Finnish peat with Osmocote 16:10:10 added at 2 kg/M^3.

Over-wintering established liners under protection is reasonably straightforward but we have noticed one or two common problems. Roses, in particular, are prone to botrytis and to downy mildew as temperatures rise in the spring. A proprietary chemical, Rovral perhaps, will control this but may produce a wet and cold liner, difficult to dry out in mid-winter.

One cost-effective technique is not to spray, but to push up the glasshouse heating for a few hours and then raise the vents. This gives a short period of a hot dry atmosphere which helps to control botrytis. This may consume 50 gallons of oil, but this should be cheaper than two or three hours labour and chemical costs.

Micropropagated liners are often embarrassingly vigorous and we have noted very high levels of bud-break at the plant crown. This is ideal for some plants such as rhododendron and ground cover roses but can produce over-bushy plants, especially if the liners are not moved on to their intermediate or final pots quickly. This means that liners often need cutting back, leading to a thick crop of new shoots. HT roses are often far too bushy with 10 to 20 weak shoots being produced rather than 4 or 5 much stronger stems.

LINER TO SALEABLE SIZE

The old adage of "produce a good liner and you will produce a good saleable plant" is very true of micropropagated plants. We have had few problems producing a high quality product once the liner is established and growing and once we have gained experience at the container fields with individual crops.

Timing can once again be critical however and the sooner an established liner is potted on the better, especially for plants where hard pruning of an oversized liner would produce too bushy a final product.

We have mentioned the need to have climbing, HT, and floribunda roses in their final container by late May. This is crucial as the plants just do not make up in time to be sold that September and will not over-winter well in containers.

We noted Roger Bentley's (1) work at Luddington EHS and increased our feed levels in container-grown micropropagated roses from a standard 4 kg/M^3 12 to 14 month 17:10:10 Osmocote to 6 kg/M^3. This produces a better quality plant by the autumn.

Liners derived from micropropagated plants remain a little softer than liners from traditional cuttings, especially since our liners are protected under glass throughout the year.

We have had some problems with *Phytophthora* on final potted *Sambucus racemosa* 'Plumosa Aurea' when protected under polythene tunnels. We have incorporated the fungicide Fongarid into our composts but have found that a better strategy is to grow this crop without protection. The plants remain clear of problems and grow well without the shading we would normally give.

We have had problems with downy mildew, particularly on the very free branching ground cover roses. We have found that by beginning a routine spraying regime very early and keeping this up the problem is eased.

CONCLUSIONS

We have found micropropagation to be a very useful tool, providing an economical method of producing some cultivars of plants and for cost-effective bulking up of new cultivars.

With a little care and acceptance some micropropagated plants do need slight modifications to established production techniques, but very high quality saleable plants can be produced in volume at realistic prices.

Micropropagation has a role to play in the nursery stock industry and although we do not anticipate it becoming the dominant method of propagation at Notcutts' we will continue to develop it as another very useful string to the propagator's bow.

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