Use of In Vitro Plants in the Irish Hardy Nursery Stock Industry

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Micropropagation has become an integral part of the horticultural industry. A survey was conducted to enquire into the usage of in vitro plants by Irish nurseries. The amount of tissue culture material used does not exceed 5%. The small size of the Irish industry means that the Irish market for tissue culture material is very small. The vast majority of users of tissue culture material recognised its great advantages but found suppliers unreliable in terms of delivery date and quantity but not quality. The unreliability was explained by the peaks inherent in hardy nursery stock production.

INTRODUCTION

Tissue-culture technology has developed over the last four decades from basic laboratory research into commercial micropropagation of plants. The structure and product mix of commercial laboratories generally reflects the market considerations from which the basic research originated. The reduced transport costs and comparative ease in meeting plant quarantine requirements has resulted in a global micropropagation market.

The 1993 Directory of European Plant Tissue Culture Laboratories lists 501 laboratories. Of these, 172 are commercial laboratories. The list shows around 1850 plant species at different stages of micropropagation protocol development. This undoubtedly underestimates the total, as a result of underreporting by commercial laboratories (O'Riordain, 1994).

Micropropagated material now plays an integral part in the horticultural industry, but accurate production statistics are unavailable for two reasons: production figures are kept as commercial secrets, and official statistics do not subcategorize micropropagated material from other propagation material (Deberegh and Reid, 1992).

In Ireland, micropropagation began as an academic research tool, for virus elimination and as a plant breeding technique. The first major commercial venture was started in 1984 by Vitroflora Ltd., which later failed, primarily due to undercapitalisation and unrealistic market expectations. It was followed by a number of others who failed for similar reasons. Plant Technology Ltd. is the only Irish general micropropagation company which has survived since its foundation in 1989. It is now the largest general micropropagation company in Ireland. The company's expansion has, however, been almost exclusively on the strength of the export market.

The costs and requirements of a very basic tissue-culture facility has been discussed from an Irish nursery's perspective by Hunter (1989). The advantages of tissue culture are also discussed in his paper (Hunter, 1989). The paper presented

here seeks to examine the use of microcuttings in the Irish Nursery Stock Industry and it is based on the results of a questionnaire survey conducted by Plant Technology Ltd.

THE MARKET

Market research conducted on behalf of An Bord Glas estimated the value of the domestic market for plants at £24.05m at retail prices. Shrubs, trees, and bulbs account for 19.4% of this, or £4.66m. (An Bord Glas, 1996). The following table summarises the area and gross value of Irish nursery production for the year 1995. A comparison between production and retail sales suggests a high level of exports.

Table 1. Size and value of the Irish nursery stock industry (Source: Dept. of Agriculture, Estimate of Gross Horticultural Output 1995)

	Area (acres)	Value (£1000)
Hardy nursery stock	1200	18,792
Bulbs	281	1112
Foliage	75	300
Total	1556	20,204
Under glass		
Cut flowers	20.4	1484
Pot plants	15.7	1564
Bedding plants	26.6	1330
Other nonfood crops	9.9	31

GROWER ATTITUDES TOWARD MICROPROPAGATED PLANTS

The questionnaire was a simple design and was distributed to most large nurseries selected from An Bord Glas listing (An Bord Trachtala/An Bord Glas, 1992). Information was requested on nursery size and structure, their major products and their views and experience with tissue-cultured material. The limited response rate made statistical analysis difficult. However, general trends are apparent as most of the largest nurseries responded.

Usage of Tissue Cultured Plants. Only half of the respondents are using tissue-cultured plants, and their usage in all cases is 5% or less. In context, this represents 40,000 units of tissue cultured material for the largest user. Users preferred to deal directly with a laboratory rather than buying generally available material.

Skills in the Handling of Microcuttings. Most current users of tissue-cultured material used weaned plugs rather than microcuttings.

All users of tissue-cultured plant material accepted that they did not have the skills to wean microcuttings. Ironically, most non-user respondents felt they had these skills. Given that both groups have the infrastructure and skills needed for handling conventional cuttings, it must be concluded that first-hand experience demonstrated the sensitivity of microcuttings. In major horticultural centres around the

world, this sensitivity has lead to the development of specialist microcutting weaners within the liner production industry.

Motivation to Use Tissue-Culture Material. The two major factors were the competitive edge that greater plant availability gives, followed by the rapid production of new material which tissue culture promises. Neither cost reduction nor improved plant quality were major motivators in the tissue-culture plant purchase decision. Cost reduction is not a major factor, perhaps because of the low volumes sold on the Irish market and cost reduction only becomes a factor at high volumes. Although not a motivating factor, the improved quality that tissue culture can deliver was recognised but only for some lines, probably where evenness of development is of importance.

Difficulties Encountered in Using Tissue-Culture Laboratories. Almost all respondents felt that tissue-culture laboratories were an unreliable source of plant material—even those who never used tissue-culture material! This is despite the fact that almost all respondents were aware of the fact that tissue culture production could not be guaranteed, that a lead period of up to 2 years was expected and tissue-culture plants should be tested before full-scale production.

The perceived source of unreliability can be summarised by one of the respondents, "They promised too much and delivered too little, if any".

This, in the view of the authors, is an unfair comment. The introduction of a new micropropagated line should be considered a major research project unless there is previous experience of similar taxa. Respondents identified the accelerated production of new plant lines as one of the major motivating factors in using tissue-culture material, hence, by definition, a major research project whose results can be slow and unpredictable thus possibly late and underproduced.

Plant specification did not appear to be a problem in comparison to the problems of volume and timing.

These opinions are not uniquely Irish but are reflected by hardy nursery stock tissue-culture users internationally.

Propagule demand peaks are an intrinsic part of hardy nursery stock production. Hence hardy nursery stock plant production is like an inverted pyramid. This results in a huge peak in demand for specialised skilled labour and inefficient usage of highly expensive laboratory and growth room space. Any slight production difficulties are magnified by the accelerated propagation rate. It is very significant that the bulk of tissue-culture plant material goes to indoor plant producers. Indoor plant production is year-round with minimal demand peaks.

CONCLUSION

There are three types of laboratory structure which can successfully produce hardy nursery stock:

- Large general laboratories where the bulk of their production is of indoor plants, thus tolerating the small peaks of hardy nursery stock.
- Small laboratories attached to very large nurseries with sales all in house. These survive by spreading management costs and sharing staff at peak production periods.

- Highly specialised laboratories. These are primarily in business to accelerate the promotion of material from their own breeding programme.

LITERATURE

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