Experiences With Direct Sticking

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Nursery-stock prices in Europe have failed to keep pace with the increasing costs of production. Direct sticking of cuttings into cells and pots rather than into trays or beds can reduce labour costs while improving crop quality and uniformity and allows more nurseries to propagate their own liners in order to reduce the production cost of finished plants. At Glenbrook Nurseries, the average price of producing a liner of a subject, such as *Spiraea, Potentilla, Cytisus, Lavandula, Hypericum*, and *Ceanothus*, direct stuck in a P8 pot in the autumn, for topping up into a 2-litre pot in June, is 10.37p. The market price for a similar liner is 40p, therefore, the nursery saves 29.63p. At a production rate of, for example, 500,000 units this would be a £148,150 saving, or percentage wise, selling at £1.20 yielding £600,000 a 24.69% saving.

For crops such as *Viburnum tinus* and its cultivars, *Photinia, Leptospermum, Callistemon*, etc. the costs of producing a quality liner would be 14p, but this would mean sticking in a 108 plug and potting on into a P8 pot after a well developed root has been established, but the sales price would compensate for the extra costs thus the saving would be 39p per unit or £195,000 or 27.85% (based on 500,000 units selling for £700,000 and buying the liner at 53p).

For nurseries selling subjects in P9, 1-litre, or 1.5-litre pots it is quite simple to direct stick cuttings into the saleable pots, but this can and does lead to significant losses; sticking plug-propagated material is best and for the extra small investment an excellent crop can be produced. With the demand for larger size containers of 5 litres and 7 litres such material may be suitable as liners or young plants.

INTRODUCTION

There are two main reasons for direct sticking cuttings in nursery stock production. One reason is that it is a cheap method of producing groundcover type plants for the landscape trade or for the garden centre. Single or multiple cuttings can be inserted in a small pot or container, rooted in situ and sold on in a short time frame, thus making savings on handling, potting expenses, and general overheads.

The second reason is to produce a cost-effective liner for potting on by reducing one or two tasks within the nursery production cycle and it is this aspect that has made a significant impact in the production calendar at Glenbrook Nurseries.

One of the main reasons for this is that, over the past 10 years, the selling price of nursery stock in Europe has been quite stagnant, while the overhead costs have risen with the inflation. It is, therefore, vital for nurseries to adopt better management and more cost-effective production systems to maintain profitability.

DEVELOPMENT OF PRODUCTION SYSTEMS AT GLENBROOK NURSERIES

When I founded Glenbrook Nurseries some 10 years ago we used traditional methods of rooting cuttings using trays or flats filled with a propagation medium consisting of peat and sand (2 : 1, v/v) mix. After rooting these would be knocked out, roots teased apart and potted up into a liner pot, usually 8-cm squares, and grown

on for a further period until a good root ball had developed. Depending on the time of year these would either be potted on or grown on until the next season. All this was labour intensive, time consuming, and the percentage losses were high, about 20% overall. These high losses were due to root disturbance, poor root development, and lack of fertiliser. In many cases roots were actually pulled from the cuttings during the teasing out from the flats or trays. We felt that we needed a system that caused less root disturbance and would yield a higher number of better quality liners for potting on into a saleable container.

Production System Costings. Glenbook, in the early days, was growing plants for a wide range of markets but in small numbers. The nursery expanded rapidly, growing some 22,000 units in 1991 to 500,000 today. The system adopted in 1991 is still the system in use today. Cuttings are rooted in low tunnels without heat or any artificial aids. These are situated inside standard single span polytunnels covering 100 m^2 and covered with either transparent or translucent polythene 700 gauge E.V.A. The cost of each tunnel is approximately IR£1000 and the cost is depreciated over 5 years at IR£200 per annum or IR£2 m^{-2} per annum.

Filling each tunnel with 12,000 8-cm pots results in a capital cost of 1.6p per cutting per annum as it is only possible to get one crop of liners per annum out of each tunnel. Within the tunnel there are four beds of 8-cm pots, 11 pots wide at the two edges running down the tunnel and two larger beds 15 pots wide down the centre. The pots are filled using a JAVO potting machine at the rate of 12,000 per day. Each bed is covered with a small tunnel, hoops made from 12-mm conduit or water pipe, fixed into the soil with 15-cm pieces of bamboo and covered with 100-gauge, milky-white polythene. The floor is covered with Mypex to keep a clean environment. Watering, which is done only when necessary, is applied using Dutch pins overhead.

In 1996, 1.2 ha of glasshouses (15 bays each of 3.5 m × 42 m) was acquired and today we use 0.2 ha for liner propagation using the same low tunnel system used in the polytunnels. Liners produced under glass have a lower capital cost compared with those produced under polythene. We can get 225,000 liners into the 0.2 ha. The beds are 15 pots wide and each bay has two beds holding 6000 pots. The capital cost of this glass was IR£50,000 per acre (IR£112,500 ha^{-1}); depreciating over 10 years the capital cost works out at 1.1p per plant per annum.

TIMING OF CUTTINGS

All cuttings are grown without heat. Insertion begins mid to late July and continues on into early January but it would be preferable to finish by mid December to avoid the delayed rooting caused by excessively low winter temperatures.

However, it is not beneficial to start too early, either, as this system is not suitable for very soft material unless extra management time is available to closely monitor temperature control. Heavy shading of the polythene tunnel or glasshouse, with emulsion paint, can be beneficial.

At Glenbrook the first crop of cuttings in mid July are heathers in 150 unit cells, potted up into P8 pots the following spring and then into 2-litre pots. This crop is followed by subjects such as *Potentilla, Santolina, Spiraea, Lavatera, Lavandula, Halimium,* and *Cytisus*.

The plants more suited for insertion in the latter part of the year are *Hebe, Escallonia, Olearia,* and *Griselinia*. All these root very easily even if it is very late in season.

SUBSTRATES AND NUTRITION

Rooting Substrate. A very open, friable substrate is essential for successful rooting. At Glenbrook we aim for an air-filled porosity (AFP) of between 15% and 18%. Since pots and trays are filled mechanically we have to start with a graded peat which, when it passes through the machine, gives us the desired AFP. In order to get this we use a mixture of equal proportions 0 to 16 mm and 6 to 12 mm for cell trays; and 40% 0 to 16 mm plus 60% 12 to 25 mm for pot sizes from 6 cm upwards.

For some subjects, especially heathers and subjects rooting very late in the year, we add 15% medium grade perlite to increase drainage and warmth.

Fertilizers and Pesticides. At Glenbrook, slow-release Osmocote is used in the rooting mix. This ensures there is fertilizer available when the plants are sufficiently rooted in early spring but avoids any problems of salt damage during the rooting period. Some growers prefer liquid feeding in early spring, using nitrogen and potassium only initially and adding phosphate to meet the demand of growth flushes — but this does demand more management.

Table 1. Fertiliser and pesticide incorporation into cuttings substrates at Glenbrook Nurseries.

Calcicoles (plant normally growing on calcareous soils)	Calcifuges (plant not normally growing on calcareous soils)
1.2 kg Osmocote*	1.2 kg Osmocote
2.4 kg ground limestone	1.2 kg ground limestone
750 g Suscon Green**	750 g Suscon Green

*12-14 month Osmocote Plus autumn potting. All figures are per cubic metre.

** Slow-release fertiliser10% w/w Chlorpyrifos.

CUTTTINGS TYPES, HORMONES, FUNGICIDES, AND WORK RATES

Direct sticking allows use of a larger cutting, particularly in P8 pots where it has more space and an airier microclimate. At Glenbrook we use a cutting of about 8 cm but for the later-stuck subjects we use a 10-cm nodal cutting, depending on the subject. For subjects such as *Aucuba, Clematis montana, Viburnum tinus,* and *Cornus alba* cultivars internodal cutting have proved very successful. Hormones are used in a mixture of 8000 ppm IBA and Captan (1 : 1, v/v) to almost all cuttings. After a few days a drench of Carbendazim (Bavistin) is applied to control *Botrytis*.

Work rates for preparation and sticking of direct-stuck cuttings are no different from the conventional methods. At Glenbrook we are currently producing 250 per worker hour but feel this can be improved with closer scrutiny of the work methods, especially for sticking.

AFTERCARE

Once rooting takes place we remove the polythene sheets and let the crop dry to just above wilting to harden the roots and top growth. Trimming is done using an electric hedge trimmer if feasible but for the more prostrate subjects we hand trim to a fist size. For weed control we hand-weed initially but then apply isoxoben (Gallery, Flexidor) at 1 litre ha^{-1}. This herbicide has proved phytotoxic to *Berberis* and *Buddleja* in our experience. Mogeton at the rate of 2.5 g $litre^{-1}$ is sprayed over the crops with no ill effect to control mosses and liverworts.

Downy mildew (*Pseudoperonospora*) can be a problem on some subjects, especially *Hebe*; we spray with fosethyl aluminium (Aliette) at monthly intervals. Keeping the foliage of these susceptible crops dry is very important.

Liners are potted on from mid May to late June into either 2- or 3-litre pots. This system suits the Irish climate because the potting season does not start until mid May, due to the late spring when night frosts can occur. The growing season carries on into October to early November.

Table 2. Production programmes for some species propagated using direct sticking at Glenbrook Nurseries.

	Olearia macrodonta	*Cytisus ×praecox* 'Warminster'	*Escallonia*	*Hebe*
Timing	Nov. - Dec.	Aug. - Sept.	Oct. - Nov.	Nov. - Dec.
Pot size	P8	P8	P8	P8
Cut size (cm)	10	10	8	6
Root by	Mar.	Nov. - Dec.	Dec. - Jan.	Feb. - Mar.
Rooting (%)	100	95	100	100

	Viburnum tinus	*Photinia ×fraseri* 'Red Robin'	*Camellia*	*Leptospermum*
Timing	Oct. - Nov.	Sept. - Oct.	Aug.	Nov.
Cell	77s	108s	54s	108s
Cutting type	Internodal	Nodal	Nodal	Nodal
Size (cm)	3.75	6	7.5	7.5
Rooted	Feb. - Mar.	Dec. - Jan.	Feb. - Mar.	May - June.
Pot up	P8	P8	1 litre	P8
Pot on date	Oct.	Sept.	Feb.	Sept.
Pot on size	2 litre	2 litre	3 litre	2 litre

Table 3. Comparison of itemised liner production costs for three different production systems on a nursery selling 2-litre and 3-litre containers, not including overheads, which can be written against the selling price. All figures are IR£.

System 1	
Rooting cuttings in standard trays July to Jan.; potting into liners Feb. to June; growing on for a further season before potting into 2- or 3-litre container.	
Rooting costs	
Tray Preparation (77 cuttings per tray, 26 trays per 2000)	5.00
Peat and sand	6.00
Preparation of cuttings and insertion	80.00
Aftercare	18.00
Pulling out	8.60
Potting up costs	
Peat (fertilized)	25.00
Pots	17.00
Suscon Green	12.00
Potting on Machine	25.60
Aftercare	38.00
Total	235.20
Cost per unit	11.76p
System 2	
Direct sticking into fertilised medium in 8-cm pot July to Jan., potting April to June into 2- or 3-litre container.	
Pot Filling (2000 pots filled on JAVO Machine)	13.60
Pots (8 × 8 × 8 or 8 × 8 × 7 Soparco)	17.00
Peat (fertilized)	25.00
Suscon Green	12.00
Polythene	3.25
Hoops	0.25
Preparation of cuttings and insertion	80.00
Aftercare	38.00
Total	189.10
Cost per unit incl. 10% losses	10.4p

Production costs are reduced dramatically. In system 1 we needed 12 to 15 months whereas in this system we need only 6 to12 months for our return This system is suitable for: *Potentilla, Spiraea, Cistus, Deutzia, Cotoneaster, Berberis thunbergii* taxa, *Ceanothus, Philadelphus, Rubus, Corokia, Myrtus, Hebe, Lavatera, Escallonia, Phlox, Phygelius, Lavandula, Cytisus, Helianthemum, Santolina, Ulex, Weigela, Clematis, Ozothamnus, Olearia, Hypericum, Lonicera, Griselinia, Fuchsia, Halimium, Caryopteris.*

System 3
Direct sticking into 108 cells Nov. to Jan.; potting up into P8 May to Aug.; growing on for a further period before potting up Feb. to April into 2- or 3-litre container.

Rooting in 108 cells	
Plug trays (20 x 108's)	8.60
Peat (fertilized)	5.00
Suscon Green	2.50
Tray filling	4.25
Polythene	4.25
Hoops	0.20
Preparation of cuttings and insertion	80.00
Aftercare	38.00
Potting on into P8's	
Pots	17.00
Peat fertilized	25.00
Suscon Green	12.00
Labour	25.60
Aftercare	38.00
Total	260.40
Cost per unit incl. 10% for losses	13.5p

This programme suits the larger slower subjects such as: evergreen *Berberis, Leptospermum, Leucothoe, Mahonia, Photinia, Lophomyrtus, Gaultheria* (syn. *Pernettya*), *Osmanthus, Viburnum tinus, Correa, Hydrangea, Choisya, Rhododendron* (evergreen azaleas), *Callistemon, Hedera, Pieris, Erica* (for 2 litres), *Euonymus, Ilex*.