A COMPARISON OF PROPAGATION UNIT SYSTEMS

CHRISTINE MAUNDER[1]

Vincent Nurseries
Eddington Lane, Herne Bay, Kent CT6 5TS

The objective of my investigation was to compare the rooting of hardy nursery stock in different types of propagation unit systems which are currently available to the industry.

The systems used were:

Japanese Paper Pot — paper containers in an expandable honeycomb form.

Vaca 40 — plastic tray insert with 40 sections.

A.P. 40 — polystyrene tray with 40 sections.

Speedling — polystyrene tray with wedge shaped cells.

Jiffy 7's — compressed peat blocks.

Rockwool — preformed into a seed tray with 45 rockwool blocks.

Control — standard seed tray.

Comparative costings of the systems were carried out in relation to the following points:

i) The initial cost of the system.

ii) The number of cuttings per square metre.

iii) Efficiency of handling.

iv) Speed and percentage of rooting.

v) The growth pattern and response of plant material when subsequently potted off.

Propagation material selected included difficult, moderate, and easy-to-root subjects. These were: *Chamaecyparis lawsoniana* 'Ellwood's Gold', *Chamaecyparis lawsoniana* 'Albospica', *Arbutus unedo*, *Prunus laurocerasus* 'Otto Luyken'.

Propagation was carried out in the autumn, under mist, with basal heat at 21°C. Cuttings were prepared in the appropriate manner and inserted into the prepared unit systems. The time and ease of preparation of each system was recorded.

Results showing rooting percentages of each species in the various systems are given in Table 1. Table 2 presents data on comparative costs, areas occupied, and preparation time for each system.

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Table 1. Rooting Percentage of Cuttings in Different Unit Systems.

	Japanese Paper Pot	A.P. 40	Vaca 40	Jiffy 7	Rockwool	Seed Tray	Speedling
Chamaecyparis lawsoniana 'Elwood's Gold'	98.2	—	100	66.1	94.4	100	100
Chamaecyparis lawsoniana 'Albospica'	42.2	7.5	37.5	48.2	31.1	40	—
Arbutus unedo	12.6	15	37.5	32	46.7	42	—
Prunus laurocerasus 'Otto Luyken'	94.3	65	100	80.4	100	100	—

Note: Some systems giving low rooting percentages may have shown better results if tested under a different propagation regime.

DISCUSSION

Japanese Paper Pots. This system gave good results for easy rooting subjects, but average to poor results for more difficult to root subjects.

Advantages:

i) Large number of cuttings per m^2.

ii) Minimum storage requirements.

iii) Hygienic — used only once.

iv) Pots easily separated, hence suitable for machine potting.

Disadvantages:

i) High initial cost, i.e. cost of plastic trays for the paper inserts.

ii) Difficult to fix and fill the sections evenly with compost.

iii) Unit difficult to handle — heavy and liable to collapse, especially when the compost is wet.

iv) The particular unit used (38mm × 76mm sections) was really too small for most of the cuttings with the exception of *Chamaecyparis lawsoniana* 'Ellwood's Gold'.

v) Fairly high cost per cutting — 1.5p (1.2p if plastic trays assumed to have a 10 year life). However, this needs to be offset against increased production and the smaller area occupied by each cutting on the mist bed.

A.P. 40. Propagation results were very disappointing, considering the low cost of the system (0.9p per cutting), and the ease of handling.

Table 2. Cost of Systems, Area Occupied, and Preparation Time.

Unit system	Area occupied by 1 unit	No. cuttings per unit	Cost of unit	Volume of compost per unit	Cost of compost*	Total cost of unit. (Compost + container)	Cost per cutting. (Compost + container)	Preparation time for each system, prior to insertion of cutting
Japanese Paper Pot	600mm × 400mm = 0.24m²	336	385 p	15 liters	120 p	505 p	1.5 p (1.2)**	5.0 min.
AP 40	237 × 375mm = 0.09m²	40	17	2.3	18	35	0.9 (0.7)	0.5
Vaca 40	237 × 375mm = 0.09m²	40	28	2.3	18	46	1.2 (1)	0.5
Speedling	370 × 660mm = 0.24m²	162	64	3	24	88	0.5 (0.3)	0.6
Seed Tray	237 × 375mm = 0.09m²	45	20	4.4	35	55	1.2 (0.8)	0.2
Rockwool	365 × 220mm = 0.08m²	45	58.5	—	—	58.5	1.3 (1.3)	0.2
Jiffy 7's	237 × 375mm = 0.09m²	28	68	—	—	68	2.4 (1.8)	0.8

* Based on compost cost 8p1 per liter

** The original figures calculated on a one year life. The figures in brackets give the estimated cost of the systems when each is given its expected lifetime span.

Advantages:

i) Light and easy to handle, with cuttings being easily removed for potting.

ii) Maximum contact with the base substrate.

iii) Hygienic — no contact between roots.

Disadvantages:

i) Problems of individual sections drying out, with the polystyrene acting as a barrier against movement of water in the tray.

ii) Problems of coarse rooting subjects rooting into the polystyrene. This could be avoided by earlier potting.

iii) Need to sterilise if used more than once.

iv) Large amount of storage space required.

Vaca 40. Rooting results were excellent for easy rooting subjects and average for more difficult subjects. Drainage does not seem to be a problem despite the small drainage hole in each section, neither does the lack of direct contact with the base substrate. Price per cutting is average at 1.2p.

Advantages:

i) Quick and simple to use. Light to handle.

ii) Hygienic. Used only once, and there is no contact between cuttings.

iii) Minimum storage requirements.

Disadvantages:

i) Problems of root curl on vigorous, coarse rooting subjects such as *Prunus laurocerasus* 'Otto Luyken', which may result in subsequent problems of root constriction.

Speedling. This system was really too small, so was only used for *Chamaecyparis lawsoniana* 'Ellwood's Gold'. Substituted by A.P. 40 for the other subjects.

Advantages and disadvantages similar to the A.P. 40 system.

Jiffy 7's. This was the most expensive system used, with a cost of 2.4p per cutting, plus the cost of peat to cover the base of the tray (necessary to prevent units drying out). The system was also the most expensive in terms of space required per cutting. Overall propagation results were poor to average, the only exception to this being *Chamaecyparis lawsoniana* 'Albospica', which produced the best results under this system.

Disadvantages:

i) Difficult to keep large cuttings upright.

ii) Tendency for the neck of the cutting to rot off, as the compost does not wash into the pre-made hole after insertion.

iii) Problems of maintaining the correct moisture level.

iv) Fungal growth on pots.

Rockwool. Propagation results were generally good, and it produced the best results for *Arbutus unedo*. However, it is a very unpleasant material to handle, causing irritation to the skin. Gloves should be worn, especially when separating the blocks for potting.

Advantages:

i) Hygienic, no soilborne diseases. A sterile medium.

ii) Easy to prepare.

Disadvantages:

i) Material unpleasant to handle.

ii) Unit system is floppy, difficult to transport and store. There is also the tendency for the blocks to become top heavy with large cuttings, and fall over.

iii) Problem of maintaining the system at the correct moisture level.

iv) Blocks can be difficult to separate, especially where the cuttings have rooted through.

v) Heavy callus formation can, in some cases, prevent root emergence.

Seed Tray (Control). Good propagation results were recorded.

Advantages:

i) Easy to handle. Quick to prepare.

ii) No problems of sections drying out, the compost is moist throughout the tray.

iii) Good root system formed, with no root curl problems.

iv) Cost per cutting is shown in Table 2 as 1.2p. This figure is based on annual replacement of trays. The actual life of the tray would probably be 10 years, depending on type of tray used. This would reduce the cost to approximately 0.8p per cutting.

Disadvantages:

i) Not hygienic — problem of transfer of soilborne diseases.

ii) Need for sterilisation if the trays are used more than once.

iii) Problem of root disturbance when the cuttings are potted.

Growth of cuttings after potting. As the investigation had to terminate at the end of the college year, it was not possible to draw any conclusions on ability of the cuttings to grow away after potting off from the different systems. At the time the project was concluded the only system showing any noticeable difference was the Rockwool cuttings being slow to get away.

CONCLUSIONS

The general conclusion drawn from my investigation was that the standard seed tray is still adequate for most nursery stock propagation, especially when potting is carried out by hand.

The seed tray produces good results at low cost. It has greater flexibility than the unit systems, allowing the number of cuttings to be increased or lowered, according to their size. Thus the mist bed can be used more intensively. Also one is not dependent upon a particular supplier for a particular system, with the associated problems of price increases or the supplier going out of business.

Where machine potting is employed, the Japanese Paper Pot may prove a more efficient system for pre-potting preparation of the rooted cuttings and for easier insertion of the cutting into the pot. However, a larger unit size would be required than the one used in the investigation for larger-leaved subjects and this may help to reduce leaf decay.

Unit systems may show a marginally better root establishment after potting, but the extra costs incurred when using a unit system may not be worth the increased expenditure, e.g. Japanese Paper Pot — 1.2p compared to 0.8p per cutting in a seed tray. This may be the reason why further investigations have not been carried out and why most nurseries still use the open tray technique.