

dolomite limestone on summer-rooted cuttings, and they are left until the following spring.

M. SCOTT: Don't you run into problems with release of nutrients in hot summer weather?

R. TACCHI: No, not really.

A. WOOD: Initially you chose polythene houses for your nursery, but during the long term these incur high replacement costs for polythene. If you started again, would you choose glass or polythene?

R. TACCHI: It would be a difficult decision; I haven't done any definitive costs and examined the grant position.

W. MATTHEWS: I chose glass and built $\frac{3}{4}$ acre. There are breakage and washing problems, but I would stay with it. It is easier to control temperature and there are no drip problems. With the increasing cost of oil polythene replacement will get more expensive.

SIMPLE BUT EFFECTIVE PROPAGATION IN NORTH AMERICAN NURSERIES

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Last summer, I toured the United States and Canada as a Nuffield Scholar fully funded by the Studley Trust. My prime interest was in the production and marketing of container plants but, as I visited over forty container producing nurseries, I gained an insight into their propagation methods.

One cannot fail to be impressed by the vast open-air mist units of the South and Southwestern states. The progressiveness of the growers in the Pacific Northwest with tissue culture of ornamentals is equally impressive.

However, the humbler propagation techniques used by some growers set me wondering whether we in Europe are employing over-complicated and unnecessarily sophisticated methods for the propagation of easy subjects.

For instance, in the Midwest, millions of *Taxus* and *Juniper* cuttings are produced annually employing a technique which is really no more than an adaption of the old coldframe. Instead of frames, walk-in polytunnels are used to enclose the cuttings stuck in raised ground beds. No bottom heat is provided at all and the only air heating that is done is to prevent irrigation lines from freezing in winter. Large cuttings are

inserted during winter when severe freezing brings most other nursery work to a standstill. The cuttings are 20 to 25cm long, wounded, and dipped in hormone before inserting into raised peat and sand beds on the floor of polyhouses, 2.5 to 3m wide. After filling, houses are sealed up and the cuttings are misted over just two or three times a day with a coarse mist. Rooting is slow and it is normal practice to leave the cuttings in situ for 15 months before lifting for lining out or potting off. This may seem a long time to wait to get a liner by our standards but the costs are low and the system is extremely simple and easy to operate.

The second low cost system which impressed me is one which is currently receiving renewed interest on both sides of the Atlantic. Work conducted by Dr. Milbocker at the Virginia Truck and Ornamentals Experimental Station has caused a revived interest in the use of foggers for propagation of cuttings. This technique has, I believe, been covered in depth at a previous IPPS Conference and I will therefore not dwell long on it. The principle is to provide constant 100% humidity in a polyhouse or glasshouse. The leaf surface of cuttings is cooled by ventilation instead of by evaporation with the mist system. Less water, it is claimed, passes through the rooting medium and one assumes that this, in turn, leads to a heat saving. The system is relatively inexpensive, costing in 1981, just \$500, plus cost of installation.

Undoubtedly, rapid rooting can be achieved by this technique. An added advantage appears to be that fewer leaves need to be removed from cuttings and this results in a reducing in cutting preparation costs. For a low cost installation, this technique would appear to have distinct advantages.

In the Pacific Northwest, a number of growers are successfully rooting shrubs directly into the containers in which they are sold. This direct rooting drastically reduces production costs. Three cuttings are inserted per pot in polythene clad tunnels. Rather than applying mist to aid rooting, heavy irrigation is applied for one minute in every fifteen. A very open compost mix is used to avoid water-logging. This is usually composed of at least 60% bark. Cuttings of easily rooted subjects are stuck in June, relying on the sun's heat to warm the tunnels. Rooting hormones are rarely necessary and the loss percentages are extremely low. The major crops produced in this way are *Arctostaphylos uva-ursi*, ground cover *Cotoneaster* and *Euonymus*, *Potentilla* and *Pyracantha*. *Photinia* × *fraseri* is also rooted in this way but with the assistance of hormones. After rooting, the polythene covers are removed for the summer and stock is fit for sale during the autumn of the same year.

Finally, a technique which is probably very old but is certainly now neglected and which impressed me, is used in Oregon. There, growers are reducing the time required to produce a specimen grafted plant by framework grafting. Large, field-grown *Acer palmatum* trees are lifted and containerised prior to grafting the main branch framework with many scions. A large, grafted specimen is rapidly produced, often with an interesting habit imparted by the framework of the understock. Occasionally, a mixture of scions are worked onto the same framework. This could lead to poor results later on if vigour is not carefully matched.

Conifers are frequently worked onto stems to produce small standards and half-standards for the patio market. This is, I believe, a growing market in Britain and one which provides an additional outlet for hardy plants and nurserymen's grafting skills.

J. GAGGINI: Can you tell us more about topiary *Piceas* grown as standards and half-standards? Where are they sold, and what is the price differential?

A. DOWN: The market is the high quality garden centre. They are often sold with an expensive container, and obtain up to double the price of the usual plant.

S. FRASER: A 6' *Sciadopitys* would make \$280, and \$90-\$150 would be a good price for a spruce, which would retail in the East for up to \$350.

D. HATCH: How many scions are used on grafted trees?

A. DOWN: One scion for standard conifers, but others are multi-scion.

A. WOOD: What is the compatibility of *Picea* cultivars worked on *P. sitchensis*?

A. DOWN: There is no problem, the *P. pungens* cultivars are on Sitka spruce.

E. BATE: Can fungicides be used in the fogging mist?

A. DOWN: It was a new unit and I did not discuss this, but there was very little disease in the cuttings as less leaves are removed with this system.

R. CURRIE: How do American nurserymen handle growth of plants in bark composts with regard to stability, watering, and nutrition?

A. DOWN: At Brigg's Nursery, Olympia, Washington, cuttings were struck directly into containers, and these are kept pot thick. Later the polythene covers are removed from the houses. There is no shortage of water and plants are fed and

watered heavily. The aim is for a low cost landscaping product, not the higher quality garden centre trade.

A. HARGREAVES: Has any work been done in this country using wood chips as a mulch and for weed control in small containers?

M. SCOTT: Efford E.H.S. worked with peat mulches which were best for weed control, but were expensive and difficult to apply in small containers. Spraying is more cost effective.

D. GILBERT: There seems to be some contradiction in shading and outdoor misting; has outdoor misting any place in the U.K.?

A. DOWN: In the U.S.A., outdoor mist is used for evergreen cuttings, but there are large areas of shaded mist. It would not be feasible here because of wind.

NURSERY STANDARDS AND QUALITY CONTROL IN SWEDEN

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Like most countries the nursery industry in Sweden has its own standards for nursery stock. These standards however have, by tradition, been adapted to the unofficial international standards for nursery stock in Northern Europe.

The difference between Sweden and other countries is that our standards were made compulsory some years ago. This means that today no single woody plant might be sold unless it complies with The New Official Standards for Nursery Stock. The official and the former trade standards are very close in their requirements. This means, in practice, that the new official rules are a revision and an elucidation of the former nursery standards and are furthermore made into law.

The purpose of this law is to create a consumer's protection. The background for this is that the trade with nursery stock changed drastically during the last 10 to 15 years. Briefly, the distance between the producer and the consumer has increased. Earlier nursery stock was produced and sold locally but today plants are shipped over long distances, from abroad into Sweden and from the southern part of the country to the mid- and northern parts. Furthermore, nursery stock is today sold through many new non-professional channels.

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