To insert, the prepared cuttings are just pushed into the moist medium to a depth of 1-1½ inches and at a spacing of 2x2 inches. Any difficulty experienced in the insertion would suggest that the medium has been over-compacted. On completion of the 'sticking', give a thorough watering, then cover with the Dutch lights and then the shaded English frame lights. No further watering is likely to be necessary for several weeks. So long as the inside of the Dutch lights are mist-coated, leave well alone.

Once the cuttings are rooted, start giving air by propping up alternate Dutch lights, but leave them in position until growth becomes really active in March-April, when they may be removed entirely. The English lights, however, should be left on the frames until all risk of frost has passed, ventilation being given on favourable occasions. An occasional watering will be necessary until planting out takes place, which may commence towards the end of April. As the young new growths of holly are very tender and easily damaged by frost and drying cold winds, some protection is desirable. This may be given by covering with nets over a light framework or by wooden lath frames.

RESEARCH INTO BUDDING ACERS AND OTHER DIFFICULT SUBJECTS

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Nurserymen have difficulty in obtaining a high proportion of successful unions when budding ornamental cultivars of Norway maple on to seedling rootstocks by the traditional shield or T-budding method, and low percentage stands are not uncommon even after re-budding when earlier buds have died. In the past, this problem has not been pressing because where buds have failed, rootstocks have been grown-on to produce the common Norway maple which has been used for general amenity purposes. The current demand from new development corporations and other large-scale buyers for large numbers of high quality trees of specified cultivars has, however, shown the need to improve techniques of tree production.

Chip budding. Potential for improvement lies in the replacement of traditional shield budding by chip budding, which involves the substitution of a wedge-shaped piece of scionwood bearing the bud for a similar shaped piece of rootstock tissue, rather than the addition of the bud shield to the rootstock tissue,

by sliding it under the rind as in T-budding. The substitution process in chip budding results in the matching of cambia of stock and scion, with the result that a good union forms within a few months of budding, leading to uniform and vigorous growth the following spring, in contrast to the variable and usually weaker growth resulting from T buds where union formation is often delayed.

When firmly tied with polythene tape in such a way as to avoid compressing the actual bud, chip buds have shown a number of advantages over shield budding. These include higher bud-take and larger nursery trees of *Tilia platyphyllos* 'Rubra', *Ulmus* x *hollandica* [*U vegeta*] 'Commelin', and a range of ornamental *Malus* and ornamental *Prunus* (1).

The quality and uniformity of nursery apple trees from chip buds are also superior to those from shield buds, and when the normally high level of bud-take in dessert apple trees was reduced by severe winter frost injury, chip buds survived in greater numbers than shield buds (2).

Acers. Chip budding has also shown considerable potential for Norway maples. Although commercially acceptable levels of bud-take have not yet been obtained owing to the lateness of budding, preliminary trials with the cultivar, Crimson King, have shown almost a threefold increase in bud-take from chip budding compared with shield budding.

It has been demonstrated in an unreported I.P.P.S. nursery trial[1] that bud-take in the cultivar, Drummondii, can also be improved to a similar extent by budding in mid-June as budwood of the current season becomes available, rather than two months later

By bringing together treatment optima in this way the potential exists to improve levels of success with such difficult-to-propagate species. In current trials, using chip budding to investigate seasonal budding effects, promising results have been obtained with cold-stored budwood used before the current season's growth is available

LITERATURE CITED

1. Howard, B. H 1973 Research at East Malling points way to replacing traditional shield budding with chip budding for ornamental trees. *Grower*, *80* (2), 84-6.
2. Howard, B H. & Skene, D. S. 1973. Winter cold injury to fruit nursery stock. *Rep E Malling Res Stn for* 1972, 193-8.

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[1] I P P S Nursery Experiment No 3, 1969, James Coles & Sons, The Nurseries, Thurnby Leicester

Discussion

In response to an enquiry from Bill Flemer about the tying in of chip buds, Brian Howard replied that the most effective was polythene strip as it completely encloses and prevents water loss; rubber strip was only effective if completely overlapping, and "Fleischauer" ties had proved ineffective. The President asked whether the bud should be enclosed and was told ideally all but very big buds should be enclosed. Chris Thomas, however, emphasized the importance of removing the strip as soon as possible to prevent any 'sleepy' effects — usually five weeks was sufficient.

Ralph Shugert was interested in the speed of operation. Brian Howard replied that at East Malling skilled shield budders had been able to chip bud marginally faster, but the point was that greater productivity was achieved (i.e. fewer failures occurred) with this technique. Jolly Batchellor disagreed, suggesting that failures in shield budding could be due to excessive damage to the cambium. However, Brian Howard pointed out that the important cambium was at the bottom of the cut and was not severely damaged.

Finally, Brian Howard concluded by emphasising that the research worker produces the technique and that it is up to management to adopt it and adapt it to nursery conditions.

NEW CONCEPTS IN BUDDING AND GRAFTING EUCALYPTUS

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The beauty of the red-flowering eucalyptus (*Eucalyptus ficifolia*) has led many horticulturists and nurserymen to seek means of propagating selected trees vegetatively, because production by seed is totally unreliable. (4, 13, 17). A very few species of eucalyptus propagate easily from cuttings or air layers, but *E ficifolia* does not. Reports by horticulturists of an occasional success in grafting these plants has led the author to try different techniques over the past 25 years, with no success. A meeting with I. J Thulin[1] in 1970 rekindled the author's interest, for Thulin had developed in New Zealand a technique for grafting eucalyptus on very young vigorous stock. (16)

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[1] I J Thulin, Forest Research Institute, Rotorua, New Zealand