Table 1. (Continued)

Sorbus × *hybrida* 'Gibbsii' *S. sargentiana*	*Sorbus aucuparia*	whip — retaining terminal bud for *S. sargentiana*
Sorbus aria 'Lutescens' *S.a* 'Magnifica'	*Sorbus intermedia*	whip

PRODUCTION OF NORWAY MAPLE CULTIVARS BY BENCH GRAFTING

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Why propagate Norway maple by grafting and not by the accepted practice of field budding?

a) because of poor bud takes in the field, due to spring planting and sometimes the poor quality of stocks available

b) to fit in with cropping programme on the nursery (i.e. at Oakover we are seed sowing or potting container plants at critical times for the field production)

c) labour profile, i.e. (because we have peaks at planting and budding time, it is convenient to graft these in the winter)

d) to produce a well-grown maiden whip of good size for field lining (i.e. 5-7′)

e) to be able to line out in the field at 100% crop

PRODUCTION METHODS

Understocks. Strong, well-grown, 1-year seedlings are lifted from the seed-bed during the winter. These should then be carefully graded by an experienced staff member and 5-7 mm sized stocks are selected, all having good fibrous root systems. Fangy or coarse-rooted seedlings are discarded. Cut all the stocks to 12-15″ in length to facilitate ease of potting.

They are then potted up into 4″ long tom polypropylene pots during January before the main potting season commences; they are then stood down in a frame outside. They should be potted with the hypocotyl just above soil level.
The compost used is: 80% peat, and 20% sand.

To this is added — per bale of medium Irish moss peat:

12 ozs Osmocote 18N:6P:12K
10 ozs Aldrin (for control of vine weevil)

10 ozs dolomite lime
5 ozs triple superphosphate
3½ ozs fritted trace elements

When the stocks begin to move in the spring, drench them with Benlate as a precaution against verticillium wilt. Any stocks showing signs of the disease should be thrown away at this time. The stocks are maintained for one growing season in the frame. They are also liquid fed at weekly intervals from April to August with Vitafeed 3:0:1. Pests and diseases other than verticillum wilt present few problems and a routine spray with Benlate and metasystox should keep stocks healthy.

The aim is to produce a healthy, well-established stock with a good root system in the pot. Drainage through the pots and the media they stand on is very important for maples in all stages of container growing; therefore, correct watering is of prime importance. If the roots are white, all is well; if they are brown you have drainage problems!

Grafting. This commences about the end of January to early February. The stocks are brought inside the glasshouse 3 to 4 weeks prior to grafting and stood on the unheated open bench. Any stocks which appear to be poorly established should be discarded as subsequent operations are costly in time and labour and any failures make it more so. They are then slowly dried off; one word of warning here though, when using no-soil composts they should not be dried right off but kept just damp. When a no-soil compost dries out you have great difficulty in re-wetting it when the graft begins to grow. By this time it may be too late as much of the root system may be dead. The stocks are cut down to 9 to 10′ to make grafting easier and also to leave a snag for excess sap to flow up which might otherwise flood the union.

The graft is made by using a side veneer graft as low down as possible on the stock. The scion should be 4 to 6″ long and of the current season's growth. The best material comes from the feathers on 2-year-old trees growing in the field. The terminal bud, however, often produces flowers, so cut the scion to a lateral bud, however, often produces flowers, so cut the scion to a lateral bud (cutting out the opposite bud at the same time), as this is more likely to be a growth bud. It is a time-consuming job picking off the flowers, but they tend to bring *Botrytis* into the grafts which can be damaging to soft growth. The graft is then tied in with a rubber strip (make a turn at the top; do not tie the flap in with subsequent turns, which should be spiralled down, leaving ⅛′ gaps between each turn and do not tie over the nick at the base of the graft and then tie-off below the nick). The graft is then stood down on the bench. The grit should be well-soaked so as to maintain a humid atmosphere. A polythene

tent is erected over the grafts to maintain humidity. Waxing of the graft is not necessary where high humidity is maintained. A bottom temperature of 65°F is given.

Aftercare. The grafts are sprayed with water and the polythene turned daily in the early stages. If it is at all sunny the grafts should be shaded with Rokolene and sprayed fairly often. Callusing occurs after two weeks and a strong union four weeks from the time of callusing. Spray with Benlate twice during this period to control *Botrytis*. The bottom heat is reduced gradually and air given morning and evening. During March, more and more air is given until the polythene can be replaced with Rokolene to harden up the growth on the scion. When the growth on the scion is 3 to 4″ long the snag is cut off and the cut waxed over. Sucker growth is removed at all stages whilst it rubs out easily with the fingers. At the time of snagging back a 2′ split cane is put in the pot and the graft and new shoot are tied in to get a good straight stem right from the start. Liquid feeding commences 2 to 3 weeks prior to potting on in April.

Potting on. The grafts are now potted on into 6″ pots by hand as this job must be done carefully.

The compost used is: 80% peat and 20% sand.

To this is added — per bale of medium Irish moss peat:
1 lb, 9 ozs Osmocote 18N:6P:12K
2 lb dolomite lime
10 ozs Aldrin
5 ozs triple superphosphate
3½ ozs fritted trace element

The pots are then stood down in a conventional 14′ polytunnel which has extended legs; this gives an extra 3′ of headroom necessary for growing container trees under protected cover. A 6′ cane is then put in the pot and the graft tied into it. Pathways must be left every so often between the pots to allow for access for tying-in operations later on; all tying in is done by machine ties. It is advisable to put some shading over the polytunnel when the grafts are moved in from the glasshouse to prevent scorching by strong sun.

Aftercare. The plants should be sprayed over regularly (especially in hot weather) after they are potted-on to aid their establishment in the new pot. They are liquid-fed each week with 'Vitafeed' 3:0:1 until the end of August. Growth is tied in to the canes as necessary.

CONCLUSIONS

The plants are field-lined in the autumn/winter to grow on as standards. Hopefully one has produced a whip, varying in size between 5 to 7′. Obviously they should be graded out when

they are field-lined. From my experience so far, whilst the maples make good growth under polythene, they do it in flushes which are erratic. It is, therefore, difficult to get a good, even crop. One important point is to make sure when potting the grafts on, that they are actively growing because then they will continue to do so. If growth has stopped it appears that the plant has to have a rest period before it recommences growth. As can be seen, this method offers a practicable alternative to field-budding for those who have the facilities. A better take (i.e. 90%) can be achieved with grafting than with field budding and whilst bench grafting and subsequent growing-on under protection may be expensive, so are the gaps caused by bud failures in the field. How often do we see a drift of *Acer platanoids* with the few *A.p.* 'Crimson King' or *A.p.* 'Drummondii' trying to fight their way up between them. With the bench grafts they can be graded and a 100% crop lined out in the field.

CONTAINER-GROWN TREES

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There are at the outset two major subdivisions to be considered; (1) production under protected cropping — whether it be glass, polythene or woven materials and (2) in the open.

Protected cropping. Possibly the advent of the woven materials gives cause for optimism. The growing environment on a hot day for humans, at least, is more agreeable than under polythene and it is reasonable to believe the plants, too, are under less stress and also that growth would be less drawn. These materials also offer a slight amount more protection from frost damage than does polythene. Polythene with it's very quick temperature build up, particularly in the early months of the year, constantly causes anxious moments when slow-release fertilizers are incorporated in the compost. To alleviate these risks, either a reduced rate of fertilizer is added to the compost, or it is eliminated entirely, depending only on regular liquid feeding. Glass can be ventilated, as can a newer type of polythene structure, which will limit the higher temperatures of polythene, but the plants can still be at risk. I would still advocate no slow-release fertilizer but rely on regular liquid feeding to be a safer alternative.