

GRAFTING UNUSUAL BETULA CULTIVARS

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Although many thousands of birches are raised from seed in New Zealand each season, two factors have limited our propagation techniques to grafting.

1. Seedlings of birches are well-known for their variability. This is a result of the ease with which the various species hybridise once they are removed from the geographical barriers which separate them in the wild. Thus, the only reliable seed sources are collections from the wild state and, unfortunately, these are rare.
2. While propagation of birches by cuttings has been successful to a limited extent with some cultivars, it is very unreliable. Moreover, propagation material has been difficult to obtain — our first material came in small quantities from arboretums and from overseas. Grafting has proved to be the only means of bulking up and producing trees quickly.

PREPARATION, TEMPERATURE AND HUMIDITY CONTROLS

Seedlings of *Betula pendula* and *Betula papyrifera* are raised in trays, pricked out into tubes, and finally established in two-liter polythene bags during the growing season prior to grafting. At the end of the season they are approximately 60 cm tall and have pencil-thick trunks. At the end of winter (late July or early August), after the plants have been cleared of all dead leaves (to break the re-infection cycle of *Melampsorium betulae* rust), they are placed in a polythene-covered tunnelhouse.

We do not need to heat the house until grafting begins, since trapped solar radiation is sufficient to force growth of the seedlings. After 10 to 14 days the buds have burst and the leaves expand, signalling that it is time to commence grafting.

The source of heat for our greenhouse is a wood-burning stove. It heats 450 litres (100 gallons) of water which is then pump-circulated through grid radiators. The warm air around the radiators is blown through the greenhouse by fans which, together with the circulation pump, are thermostatically controlled at 18°C. We endeavour to keep the greenhouse about 20°C but, in practice, we achieve a temperature of about 12°C above the outdoor temperature. On frosty nights the temperature may drop to around 10°C but this does not appear to

adversely affect the grafts. Excessively high temperatures (i.e. over 35°C) are unlikely in late winter so there is little danger of "cooking" the buds at this stage. When the sun becomes stronger in early spring we put a 50% shade cloth over the polythene-walled greenhouse to reduce the extremes of both temperature and light.

Because our tunnelhouse has an earth floor, it generates considerable natural humidity. As the season progresses we keep the floor damp in order to maintain moisture in the air. The plants themselves need very little water while the grafts are young and the foliage is sparse. Where watering is required we soak the pots in a water bath rather than risk the spread of disease by using a hose. Disease outbreaks are largely prevented by applications of fungicidal powder with a hand duster throughout the season.

THE GRAFTING OPERATION

Success in grafting is never a foregone conclusion but the chances of success are vastly improved if vigorous, healthy scions and understocks are used.

Scions — At grafting time we collect scionwood directly from stock plants maintained in the nursery. Where necessary, we store scionwood by wrapping it in damp newspaper or sphagnum moss and putting it in a plastic bag in the refrigerator. Immediately before grafting we cut it into two-bud lengths.

Understocks — Prior to grafting, all buds on the lowest 10 cm of each seedling are removed and the top is reduced to 30 cm to facilitate handling and tying.

Grafting — We use a side cleft graft for all *Betula* cultivars. The scions are cut with two slanting cuts (one slightly longer than the other) at the basal end, to form a gradually tapering wedge. Next, a single cut (slightly longer than the cut surface of the scion) is made at an angle of about 25° into the understock. The scion is inserted with the longer side of the wedge outermost, by bending the stock plant back slightly to open the cut. This longer side of the scion is carefully placed so that the cambium layer of the understock matches it both inside and outside the scion. It is then tied firmly in place with a stretched rubber band. We do not use a sealant, partly because some grafting pastes cause rubber ties to loosen and slip and also because the high humidity eliminates the need.

The initial signs of a successful graft are slight browning of the cut edges of the understock after about two weeks, followed by the appearance of callus on the unmatched side of the understock cut and, finally, the swelling of the scion bud.

When the majority of the plants have swollen buds we head back each understock to the union and move the young trees to a shadehouse so that they may leaf out under normal outdoor temperatures.

Aftercare — Growth is rapid after bud-break (Figure 1) and extreme care is necessary to avoid damaging the graft. We transfer the newly-grafted plants into their final pot size when they have made about 30 cm of new growth, removing rubber ties (if they haven't already dropped off), and staking at the same time. Any shoots from the understock are carefully broken or cut out until the shoots from the scion dominate completely.

Rapid growth continues throughout the summer and, by autumn, we have a young tree, often over two metres tall, ready for sale.



Figure 1. *Betula albo-sinensis* var *septentrionalis* six weeks after grafting.

PROBLEMS IN HANDLING FORESTRY AND SHELTER TREES THROUGH THE RETAIL NURSERY TRADE

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When considering nursery and establishment practice of forestry or other mass produced trees, it should be appreciated that outside the state or large forestry companies, large numbers of trees are handled by various types of nurseries. These range from growers who supply their customers direct, to retail garden centres who buy in all trees from a wholesale