# Grafting of Waxflowers for Root Rot Management©

**Ian Gordon**
Program Leader — Capacity Building, Centre for Native Floriculture, School of Agronomy and Horticulture, The University of Queensland Gatton, Gatton QLD 4343 Australia

## INTRODUCTION

The genus *Chamelaucium* is a genus of medium- to tall-growing shrubs endemic to the southern and central regions of Western Australia. *Chamelaucium* has been widely cultivated as an export cut flower crop in various regions of Australia. The locality around the Gatton Campus of the University of Queensland has a number of native flower farms growing waxflowers, and the crops produced here are amongst the earliest to flower in Australia. This gives our local growers a competitive edge over growers in other parts of Australia.

The heavy soils of the Gatton district and the high humidity and summer rainfall create a difficult management problem for soil-borne diseases such as *Phytophthora cinnamomi* and other related fungal organisms. Regular drenches of anti-fungal compounds are part of the management program for waxflower growers. However, despite this management practice, many growers experience heavy losses of newly planted selections of waxflower.

At the University, we started to look at the potential for grafting of waxflowers onto rootstocks that are highly resistant to *P. cinnamomi*. The grafting program was developed at the Gatton Campus of the University of Queensland (UQ) about 10 years ago, and the UQ Gatton Plant Nursery is producing grafted plants for the local flower industry and for sale through the retail nursery industry as flowering pot plants in late winter and spring.

## THE ROOTSTOCKS

University of Queensland Gatton became involved in grafting trials as a result of a request by Ken Young of Ebonybrook waxflower farm. Ken approached me with a request that I look at grafting of waxflower cultivars onto rootstocks that appeared to be resistant to *Phytophthora* root rot at Ebonybrook. These rootstocks are *Chamelaucium* selections, which were able to grow in root-rot-infected conditions at Ebonybrook. We propagated some cuttings of these selections, and when these plants were large enough, I experimented by trying a number of grafting techniques to graft different waxflower cultivars. The most successful graft was a spliced side graft where the top was retained on the rootstock until after the graft union had formed. The initial trials showed a success rate of 92% with the spliced side graft, compared to 54% with a simple whip graft. On the basis of this success we have continued to use the spliced side graft for commercial production of grafted plants.

There are several different waxflower selections that we have used as rootstocks, and in order to maintain a commercial edge in the marketing of grafted waxflowers, we have not revealed the identity of the rootstocks. However, a UQ Gatton PhD student, Greg O'Sullivan, carried out a series of inoculation studies under the supervision of our Plant Pathologist, Dr. Vic Galea, and he was able to demonstrate that these rootstock selections were highly resistant to *P. cinnamomi* inoculation. Field trials of grafted waxflowers planted into root-rot-infected soils have demon-

strated that the loss rate after planting is very low. I have also experimented with the use of *Leptospermum* and *Melaleuca* selections as rootstocks. However, some cultivars of waxflower have shown delayed incompatibility after grafting, and we have discontinued using these as rootstocks.

**The Propagation of the Rootstocks.** Grafting takes place from October to April at UQ Gatton Plant Nursery. We find that grafting during winter does not give satisfactory results with many *Chamelaucium* selections. This is probably a result of the onset of flower bud development. The propagation of rootstocks is from softwood terminal stem cuttings. Rootstock propagation takes place during autumn and early winter. The cuttings are trimmed to approximately 5 cm long and dipped in Rootex L liquid hormone (4000 $mg \cdot L^{-1}$ IBA).

The propagation trays used are 100-cell trays supplied by Premium Plastics of Perth. The cells are small and are shaped to promote air pruning of the roots as they develop on the base of the cuttings. The propagation environment used is a high-pressure fog-controlled greenhouse with heavy shade and a warm-water heating system on the benches designed to maintain 25 °C at the base of the cuttings.

Root development on the cuttings occurs at the 4–6 week stage, and after 6 weeks, the trays of cuttings are moved to a hardening off area for another 2–3 weeks prior to potting of the cuttings. The rooted cuttings are potted into native tubes (50 × 50 × 100 mm deep tubes). The rooted cuttings are then placed on open-topped benches in a high light greenhouse. The native tubes have internal ribs, which direct roots downwards in the tubes, and the open-topped benches promote air pruning of the roots. The strike rate in propagation can vary according to cutting quality, but with good quality cuttings in our propagation facility, we expect to get 85%–90% strike rate. The rootstocks are ready to graft when the basal stem area is around 2 mm thick. This generally takes 8–10 weeks from tubing up.

## THE GRAFTING PROGRAM

Successful grafting requires operator skill and a sharp knife. Knowledge of knife sharpening is essential to grafting success. Grafting takes place in an air-conditioned workroom for operator comfort and for plant comfort. As mentioned previously, the graft that is used is a spliced side graft. Given that the stems of the rootstocks are very thin, all that is required is a 2–3 cm long slice of bark removed from the side of the rootstock about 5 cm above medium level in the pots, and a corresponding sized slice of bark is removed from the base of the scion stem. The two cut surfaces are very carefully matched together, and the graft is tightly tied using a thin strip of Parafilm tape. Parafilm is preferred because it stretches during the tying operation and it breaks down as a result of UV degradation over time. This means we don't need to remove the tape after grafting.

The grafted plants are placed in a high humidity propagation greenhouse on heated benches, which maintain 25 °C at bench level. Humidity is managed by a high-pressure fogging system so that we can maintain humidity of 85%–90% during the first few weeks after grafting. Two weeks after grafting, the graft union is forming and, with most scion shoots, regrowth is starting to appear. At this time we carefully cut back the top of the rootstock to the graft union, which encourages the scion shoots to produce a bushy top to the grafted plant. Grafted plants remain in the high-humidity greenhouse for 2 weeks after cutting back of the rootstocks.

At this time the grafted plants are moved to a high-light greenhouse to continue growth. The propagation success rate achieved during grafting is very high with most *Chamelaucium* cultivars and is consistently above 95%.

The grafted plants are tip pruned to promote a bushy, multi-stem habit. When the grafted plants are about 3 months old, they are moved out into a full sun growing area for final sun hardening prior to despatch to the customer. The grafted plants are inspected regularly, and any sideshoot growth from below the graft union is removed to prevent rootstock regrowth. Grafted plants are supplied to flower growers in the native tubes for field planting. A number of southeast Queensland waxflower growers are using grafted plants rather than cutting-grown plants because they believe that the improved vigour of the grafted plants and the root-rot inhibition provides larger and more vigorous plants.

**The Benefits of Grafted Plants to the Waxflower Grower.** During 1998, a large trial of grafted plants of 'Purple Pride', 'Winter White', and 'Iceberg' was planted in a waxflower plantation close to UQ Gatton. There are approximately 2,500 grafted plants on four different rootstock selections in this block. As far as we can ascertain, this block of grafted plants is the largest block of grafted Australian native plants established anywhere in Australia.

The benefits of using grafted plants can be summarised as follows:

- Built in resistance to *Phytophthora* root rot.
- Ensures long-term survival of plants in the field.
- Grafted plants are more vigorous and uniform in growth.
- Grafted plants require less fungicide use.
- This represents a reduced cost to the grower.
- There are additional environmental benefits.

**Grafting for the Retail Nursery Industry.** University of Queensland Gatton Plant Nursery is providing grafted plants to Redlands Nursery for growing as flowering pot plants. These grafted plants are marketed to the retail nursery industry under the name "Elite Grafted Wax." A number of different waxflower selections are used in this marketing program, and there is a strong demand for Elite Grafted Wax in the east coast nursery industry. A large grafting program is currently under way for next season's Elite Grafted Wax plants.

**Propagation Licence Agreements.** University of Queensland Gatton has a propagation Licence Agreement in place with Western Flora Nursery of Western Australian. This enables us to propagate and market their PBR-protected cultivars in Queensland and New South Wales. We also have a propagation sub-licence agreement in place with Western Flora that enables us to propagate the new AgWest waxflower selections for sale within Australia. This means that the new "Pearl" series waxflowers are now available in Queensland. There is strong interest in the Queensland waxflower industry in gaining access to these protected cultivars.

**Grafted Waxflower Sales.** During the time that the UQ Gatton Plant Nursery has been producing grafted plants we have produced in excess of 30,000 grafted plants. During the current grafting season we expect to graft 25,000 waxflower plants for the flower industry and for sale through Redlands Nursery as "Elite Grafted Wax." I believe that this grafting program for wildflowers is the most successful program of its kind in Australia.