Grafting Western Australian Natives©

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INTRODUCTION

The Botanic Gardens and Parks Authority (BGPA) nursery specialises in the propagation of Western Australian species, and is responsible for producing approximately 80,000 plants annually for display in the Western Australian Botanic Garden and parkland areas of Kings Park; for restoration projects within the remnant bushland of Kings Park and Bold Park; for arboricultural specimen plantings; and for conservation purposes both within Kings Park and for the Department of Environment and Conservation's translocation programs. A range of techniques including growing from seed and cuttings, and the use of grafted plants are utilised to provide healthy propagules for these display, research, conservation, and restoration activities.

Grafting programs began at BGPA in the late 1970s, with a focus on *Corymbia ficifolia* (see also *Eucalyptus ficifolia*). A progression to other genera began in the early 1980s, with the project expanding and developing to the present day.

There are two major factors that influence our decision to undertake grafting as a propagation method at BGPA. One of these is to produce quality specimens for the purpose of display within the Western Australian Botanic Garden. Our garden displays are a very important conservation and education tool, and we pride ourselves on our ability to showcase the diversity and beauty of this state's flora to a very high standard. However, our specific soil type and other environmental conditions often mean that species we would like to display may struggle on their own root systems. By careful selection of rootstock-scion combinations we are slowly but surely introducing more and more grafted specimens to these displays, with many rewarding results.

The other factor that dictates our decision to graft is if alternative methods of propagation have been largely unsuccessful, or if there is very limited vegetative material available. This is often the case for threatened species. We curate a large collection of Western Australian rare and endangered species within our nursery, which is a very important conservation asset. Grafting of some of these species often allows the plant a longevity it would not otherwise have, and allows us to generate more material with which to trial further propagation methods. Examples of endangered flora that we have found respond well to grafting as opposed to other propagation methods include *Pimelea physodes, Eremophila purpurascens Pityrodia scabra,* and *Eremophila nivea.*

Major genera investigated at BGPA over the past 20 years include *Eremophila* (*Scrophulariaceae*), *Verticordia, Darwinia* (both *Myrtaceae*), *Boronia* (*Rutaceae*), *Pimelea* (*Thymelaeaceae*), *Prostanthera, Hemiandra* (both *Lamiaceae*), and *Grevil-*

lea (*Proteaceae*). There are currently many grafted specimens representing these genera on display in the Botanic Garden, having successfully determined suitable rootstocks for them. All grafting is done by hand; onto both established rootstock and cuttings. Our preferred style of graft is a wedge, or cleft, graft — many of the species worked on have very small stem diameters, often only millimetres thick, and other graft types have proven to be difficult to perform or do not provide the necessary stability. We have also had some success with side veneer grafts; although the resulting specimens tend to lack the vigour of those prepared using the wedge technique. Grafted plants are placed into a propagation tent within a glasshouse, with a single-gang fogging unit that maintains approximately 94% humidity. Capillary matting placed over a heat mat is used within this tent to avoid the need for overhead watering while at the same time contributing to creating the optimum humid environment for grafting success.

Rootstock selection is not limited to within the same genera, to provide a wide range of potential rootstocks, for different situations. We select rootstock for trialing based on availability of material, ease of its propagation, predicted compatibility and longevity, and specific tolerances to certain soil or environmental conditions. Table 1 highlights a selection of the species we have experimented with as rootstock, with their strengths and weaknesses based on both evidentiary and observational factors.

Years of experimentation have provided us with many successful combinations that satisfy all of our required rootstock criteria. Table 2 shows several combinations that have proven consistent compatibility and longevity of a selection of Western Australian species we have trialed.

While we have achieved reasonably good results for the species outlined in Table 2, there is clearly still room for improvement. Additionally, other species have proven more problematic and further investigation and trialing of reliable rootstock-scion compatibilities and longevity will be ongoing, with the aim of building up a body of supporting data for others to access.

Concurrently, the future of the BGPA grafting program includes:

1) Broadening the range of species for grafting; members of the Proteaceae family, particularly *Grevillea*, will remain a focus, and a wide range of other species we have not previously attempted will also be introduced into the program.
2) Continued investigation and trials of alternative rootstock for a wide range of conditions; while utilising Western Australian species as rootstock has been traditional, we intend to experiment with the use of Eastern Australian species, as well as exotic species.
3) Possible planting trials in other areas of Western Australia with different soil and environmental conditions to Perth; the majority of our work thus far has involved field trials on Perth's infamous sandy soils. We are currently investigating opportunities to trial selected grafted specimens on the heavier soils of the Darling Range, as well as further afield.

Table1. Characteristics of selected rootstock used at Botanic Gardens and Parks Authority nursery.

Rootstock	Strike rate	Growing on	Strengths	Weaknesses
Boronia clavata	Good	Quick	Compatibility with a range of species, hardy	Susceptible to scale and mealy bug
Boronia crenulata	Good	Quick	Thin diameter for smaller species	Susceptible to scale and mealy bug
Chamelaucium ×*Verticordia* 'Paddys Pink'	Good	Quick	Thin diameter for smaller species	Highly susceptible to botrytis in glasshouse environment
Chamelaucium floriferum ×*uncinatum*	Good	Quick	Shows good initial compatibility	Possible Phytophthora susceptibility? with a range of species
Chamelaucium ×*Verticordia* 'Jasper'	Good	Quick	Thin diameter for smaller species	Highly susceptible to botrytis in glasshouse environment. Poor vigour in Botanic Gardens
Darwinia citriodora	Good	Quick	Phytophthora tolerant? Grows in a range of conditions	Display nutrient deficiencies in alkaline soils
Grevillea preissii	Average	Moderate	Initial trials show good compatibility	Longevity not ideal
Grevillea hybrid	Good	Moderate	Quick strike rate	High losses in humid environment, susceptible to rotting
Myoporum insulare	Good	Quick	Thick diameter good for matching thicker species, hardy	Selective scion matches due to thickness. Highly susceptible to aphids and scale
Myoporum montanum	Good	Quick	Nematode tolerant? Good compatibility with range of species, quick strike rate	Susceptible to aphids and scale. High maintenance post-graft
Myoporum tetrandrum	Good	Quick	Thin diameter, good compatibility with range of species	Susceptible to nematodes, aphids and scale. High maintenance post-graft
Pimelea ferruginea	Good	Moderate	Good for coastal conditions	Relatively short-lived. Not ideal for a wide range of soil types
Westringia dampieri	Good	Quick	Hardy, good compatibility with a range of species	High maintenance post-graft

Table 2. Selected proven rootstock-scion combinations.

Scion	Rootstock	Average compatibility (%) (on established rootstock)	Longest lived specimen
Eremophila nivea	*Myoporum montanum*	53%	10 years – Botanic Garden
Microcorys eremophiloides	*Westringia dampieri*	45%	13 years – container stock 6 years – Botanic Garden
Pimelea ciliata	*Pimelea ferruginea*	86%	5 years – Botanic Garden NB: trials on this species only began 5 years ago
Pimelea physodes	*Pimelea ferruginea*	88%	6 years – Botanic Garden NB: trials on this species only began 6 years ago
Prostanthera magnifica	*Westringia dampieri*	56%	20 years – Botanic Garden 17 years – container stock

4) Continued improvement of our techniques; ongoing staff training, refining practices, and researching new findings and products can only contribute to further improving our grafting success rates.
5) The publication of our findings; there currently is limited data available on suitable rootstock, rootstock-scion compatibilities, and longevity of grafts for Western Australian conditions. A comprehensive catalogue of our data on our findings in these areas is planned for publication in the near future.

In conclusion, while grafting of Australian natives is not yet a common practice in Western Australia, we strongly believe there is definite potential for a wider use of grafted plants. Given that BGPA's mission statement is "to conserve and enhance Kings Park and Botanic Garden and Bold Park within the community and to conserve biological diversity generally," we consider grafting as a vital factor in assisting us to achieve these important outcomes.