

Breeding and Cultivating *Grevillea* in Queensland®

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INTRODUCTION

The genus *Grevillea* is native to New Caledonia and Australia, has over 200 species, and belongs to the family Proteaceae. They are named after Charles Francis Greville, a former Vice President of the Royal Society of London who was a patron of horticulture and botany died in 1809. The classification of *Grevillea* was originally carried out by a botanist named Robert Brown.

In Australia, *Grevillea taxa* have captivated the attention of native plant collectors and enthusiasts because of the diversity of the genus. Species range from *G. robusta*, a large tree which can grow to 50 m and inhabits the coastal rainforests of tropical Queensland and Northern NSW; to a range of prostrate forms which are excellent ground covers for landscape and garden use. *Grevillea robusta* is sought after for furniture making and wood turning because of its unusual grain and patterns.

Characteristics include needle-like foliage on freely branching shoots and a winter-flowering habit with flowers that don't have petals. Flower colour predominantly ranges from gold and yellows through pinks to reds with a small collection of paler cream blooms also available.

Grevillea taxa can be grouped into the following categories based on the climatic zones which they inhabit in Australia:

Tropical Grevilleas. These thrive in the higher rainfall and humidity which is associated with coastal Queensland and will perform around the country.

Western Australian Grevilleas. These are the taxa on which this paper will concentrate. They are adapted to a Mediterranean climate which experiences a low, predominantly winter rainfall, hot dry summers with low humidity, and very free-draining soil. This group of plants generally has much finer foliage and can only be successfully grown in the higher rainfall/humidity zones by grafting using *G. robusta* and other forms as a rootstock which is adapted to these conditions.

HORTICULTURAL USES

Grevillea taxa have been widely used as ornamentals due to their relatively fast growth rates and the floral display which attracts native nectar-feeding birds. Where an Australian native landscape garden is required, attractive plantings can be achieved due to the diversity of shape and colour of flowers and foliage as well as growth habits, where prostrate forms can compliment the smaller shrubs or mid-sized trees.

Cut flower production has been increasing over the last few years but has been held back by the relatively short vase life of the blooms. Research and breeding work, as well as trials by producers, are trying to unlock the key to extended vase life as the export potential of the blooms for the northern hemisphere markets is large.

Grevillea was one of the blooms featured in the 2000 Sydney Olympic bouquets presented to the medal winners of each event. This raised a lot of interest in them as a cut flower.

Bloom maturity is critical for shelf life with the perianth being coloured and looped but not extended. Blooms can be harvested in the morning into picking

buckets with wetting agent added to the water. The blooms are then stored at 5°C in a cool room for up to 24 h after picking. This can give up to 7 days in a bouquet or floral arrangement.

SEED PROPAGATION

Because of their free-flowering habit *Grevillea* taxa produce a proliferation of seeds which, when the seed capsule opens, are lightweight and can be dispersed in the wind or distributed by native animals. The majority of the *Grevillea* cultivars that have been commercialised in the past have resulted from chance seedlings through natural hybridisation. Seed is used for bulking up purposes in revegetation projects but not used as a rule in ornamental production because it will not grow true to type.

VEGETATIVE PROPAGATION

Stock Plant Selection. This is the most critical step with the mother plants bearing the desired characteristics. At Redlands Nursery we have experienced the best results producing the mother plants in raised beds which improves the drainage in our periods of high rainfall and reduces the impact of loosing stock plants due to wet feet. *Grevilleas* need to be grown in a well drained soil.

Juvenility. *Grevillea* are a woody ornamentals and are best reproduced from softwood tip cuttings. Like a lot of Australian natives, juvenility is the key in producing softwood cuttings. This can be achieved by a number of different ways:

Annual Regular Hard Pruning. Regular annual hard pruning of the mother plants, with a chain saw, back to the basic branch structure in spring (September) will produce a proliferation of vegetative shoot growth which is ready to harvest 4 to 6 weeks after the prune. The stock plants are grown in hedge rows with the soft vegetative shoots being able to be harvested from the sides and the top of the hedge row. The best orientation for the hedge rows is north to south which then maximizes the amount of available sunlight to the hedge row which is in turn linked to maximizing vegetative shoot production. Ideally mother plant hedge rows should be replaced every 3 to 4 years to ensure the juvenility factor.

Harvesting Cuttings from the Production Cycle. This is a good method for the prostrate groundcovers and the smaller shrub type forms. Not only are there abundant vigorously growing juvenile vegetative shoots, it also performs a pinching operation in shaping the crop.

Grow Stock Plants in the Greenhouse. Ian Gordon, member of the I.P.P.S. Australian Region, at University of Queensland Gatton Campus has been working with a range of Australian natives producing the mother plants under glasshouse conditions to produce soft actively growing vegetative tip cuttings. The soft tip cuttings are rooting very rapidly with strike rates in the 90% plus category on *Chamelaucium* and *Ozothamnus*. At Redlands Nursery we have had experience producing *Grevillea* under 18% shade cover which has produced better results than the full sun production. This area is one which requires more trial work with *Grevillea* and has the potential to increase strike rates and cutting yield.

Stock Plant Maintenance. Immediately after the heavy annual pruning it is important to apply a copper-based fungicide spray, no more than 3 to 4 days after the pruning, to protect the new soft vegetative shoots as they emerge. The shoots will start to emerge after 7 to 10 days after the pruning and can be severely burnt by the copper if the application is delayed. The young vegetative shoots are also vulnerable in the first month to attack by insects with either sucking or chewing mouth parts. If careful monitoring is not done mature plants can be killed in a matter of hours by thrips or caterpillars.

Mulching using organic matter is an important process in managing field-grown mother plants as it improves the soil organic matter content and helps control the temperature of the root zone by insulating the top feeder roots from the heat of summer and the cool of winter. We have had good success in putting the prunings from any of the major prunes through a mulching machine and returning them back as mulch into the growing bed. This provides an easy and practical way to remove and recycle this waste product. Mulching is also an important way of conserving soil moisture in our dry seasons as well as an important preventative step in weed control.

Stock plants should be regularly monitored for insect pests and sprayed only when required. Fungicides are applied as a calendar programme of broad spectrum and systemic materials depending on weather conditions. When rain and high humidity is present these applications can be on a 10- to 14-day rotation.

Selection of Cuttings Material. New vegetative growth of *Grevillea* tends to initially be flat in appearance and grey/green in colour. When the wood changes to a copper brown colour and the stem is rounding, it is firm enough to harvest. The soft growing tip is removed and the cuttings are prepared as one node for placement in the propagation medium and either one or two nodes above depending on availability of material. The leaves are trimmed to remove excess foliage to reduce crowding and increase air movement around the cuttings as well as reduce leaf area for transpiration. A hormone powder is applied, and the individual cuttings are planted in 50-mm tubes in pasteurised propagation media of perlite and peat (3 : 2, v/v). Bottom heat on the propagation benches is aiming for 22°C and intermittent mist to keep the cuttings fresh. Callusing can start to occur in 2 to 3 weeks with rooting being anywhere from 4 to 16 weeks depending on the cultivar.

Research at the University of Queensland Gatton Campus has shown that best results in cuttings propagation can be obtained with 16,000 ppm IBA liquid dips.

Once roots are present the rooted cuttings are hardened off from mist and heat for 1 week and then hardened off under 50% shade cover for 6 to 8 weeks before planting into a well drained and open growing medium of bark (12 mm to fines), peat, sawdust, and coarse washed river sand (1 : 1 : 1 : 1, by volume) and placed into a full sun growing environment.

Being members of the Proteacea family, *Grevillea* is sensitive to phosphorous in the form of superphosphate. However, phosphorous supplied in controlled-release fertiliser — e.g. Osmocote Plus 18N : 3.5P : 10K : 1.2 Mg, 8-9 month release rate) — does not cause the plants to show phosphorous toxicity and can improve flower production.

BREEDING PROGRAMMES

The future of *Grevillea* is exciting with some dedicated breeding programmes producing some amazing results. *Grevillea* cultivars in the past have resulted from introductions from the wild by collectors and native plant enthusiasts as well as natural hybridisation resulting in chance seedlings spotted by plantsmen with a keen eye for a new cultivar.

Natural mutation has also resulted in the likes of *Grevillea* 'Honey Wonder' which was created by a mutating branch on the cultivar 'Honey Gem' stabilised through three successive generations and then commercialised.

Breeding programmes are following the general trend by working towards dwarf or compact growth habits so that growth regulants are not required in the production programme as well as finding plants that are compatible with smaller yards, patios, and balconies.

At Redlands Nursery we are working with a passionate plant breeder who breeds strawberries for his living with our Department of Agriculture. In his spare time, as a hobby, he and his wife have fun breeding *Grevillea*. The programme is focusing on three key areas:

- 1) Compact and dwarf growth habits targeted for container specimens or smaller gardens.
- 2) Prolific flowering habit as well as a long flowering season.
- 3) Diversification of the range of flower colours that are currently commercially available.

This exciting range of grevilleas will be marketed as the 'Honeybird' series. The initial commercial release will be in the Australian Summer of 2002.

One of the challenges of bulking up this range is that it flowers heavily year-round. More regular pruning on the hedgerows to keep them vegetative is one area being trialled as well as establishing plants in tissue culture at the University of Queensland Gatton College. The initiation of the cultures is going very well with the first planting material available shortly.

One area of propagation that will be trialled is taking an initial soft tip cutting from the tissue culture plantlets and using the tissue culture juvenility effect. This has worked very successfully for us in propagating *Metrosideros*, another woody plant, where, after deflasking and once hardened off, the propagules are grown under glasshouse conditions. This produces a soft vegetative growth which has achieved 100% strike rates.

CONCLUSION

Much research, breeding, and development work is going into further exploration of Australia's unique flora for use in gardens and ornamental flowering pot plant production, as well as exploring the cut flower potential of different species. *Grevillea* has the potential to succeed in these areas with their unique growth habits and flower characteristics.