

SELECTION, DEVELOPMENT, AND PROPAGATION OF AUSTRALIAN NATIVE PLANTS

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Many Australian plants have been difficult to propagate and many still are in that category. I do not intend to tell you how to propagate all Australian plants, but rather how selection and development of different species have given way to better propagation results.

Australian native plants, like all other flora, have characteristics which enable us to distinguish them from their neighbours. Each species have variations in growth habit, flowering, soil tolerance and climatic range. In an endeavour to gauge these differences we are carrying out experiments with a true-blue Australian plant lover on Sid Cadwell's property 200 kms west of Sydney, situated in a very dry area having approximately 300 to 350 mm rain per year. Summer temperatures reach 40°F and winter temperatures are below 0°C.

Australian plants, such as grevilleas, have been collected from all over Australia. This collection has been done with field trips to all parts where careful selection of parent material, usually cuttings, is made. These cuttings are generally harvested in very early morning or late evening. They are recorded and packed in plastic bags with very little water. In most cases cuttings are wrapped first in clean newspaper, then packed in styrofoam boxes and air-freighted to their destination.

Propagation takes place at two situations, one under mist with bottom heat, and the other without any facilities except a small glasshouse with no equipment at all.

When the plants have reached tube size they are planted out in the field. Many grevilleas are planted together and, say callistemons in another area, all in close proximity to one another. Their start in life is rugged as very often they only receive the one watering at planting time. Water is in very short supply on this property; however the results are good. In fact, autumn and spring are perfect for the job.

Under these conditions a grevillea, say from the Northern Territory, grows up alongside one from Victoria, Western Australia, New South Wales, or Queensland. After two to three growing seasons quite strange things happen, because they would never have been grown near one another and now find

themselves in the same bed so to speak; spontaneous or natural hybrids occur as seedlings under the parent plants.

Most of the property is heavily timbered with *Eucalyptus rossii* and many native species surround these plantings. Growing on the fringe of these clearings thousands of seedlings can be found in the leaf mulch and litter of the bush.

In David Gordon's garden in Glen Morgan, Queensland, famous for native plants, at his peak 6 to 8 gardeners were employed looking after his collection covering some 200 acres. Dave Gordon's idea was to preserve pure species and he, in fact, removed many thousands of natural hybrids. *Grevillea* 'Robyn Gordon,' named after his daughter, was saved by his life-long friend, Sid Cadwell.

When plants are taken into cultivation from the wild and vegetative propagation takes place, one of two things are likely to happen. The first, of course, is an unconscious desire or selection pressure for individual clones which are often easier to propagate, and certain elimination of other members of the group. Many people believe that this leads to a risk of drastic reduction in the genetic viability of the species. Many plants are naturally out-crossing in the wild and are self-incompatible. Whilst this risk is recognised in our situation we aim to collect more vigorous selections for nursery production. This method of obtaining plants is very valuable for the propagator and, at the same time, is anathema to botanists and purists connected with Australian plants.

Many other selections of our flora have come about in this way; foremost among these are the Cadwell, Masons, Paynes, and Poorinda hybrids, Mervyn Hodge in Queensland and George Lullfitz in Western Australia.

Seeing how these plants came about we were encouraged to help support Sid Cadwell plant out as many species as possible and play the waiting game. Selections from these plantings were made and plants propagated and assessments made for flowering, growth, and suitability for container production. Plants must have attractive growth and flowers and must perform well over a wide climatic range. These plants have peculiar characteristics; for instance, many flowered beautifully but produced no seeds, *Grevillea* 'Robyn Gordon,' G. Mason's Hybrid Royal Mantel; and G. 'Superb,' to name a few.

At the start some of these plants proved difficult to propagate but after cuttings were harvested, plants grown, and cuttings taken off these plants and they, in turn, grown and cuttings taken from the 3rd generation, many plants became much easier to propagate.

These hybrid types, or straight out selections, whether they occur naturally or not, have much more vigour and their flowering is not only improved but often extended. Some, like G. 'Robyn Gordon' flower 8 to 9 months of the year. Others are prized for their foliage, especially in the florist trade. Three examples are *Grevillea longifolia*, *Grevillea asplenifolia*, *Grevillea hookeriana*, and *Grevillea johnsonii*. Some species of the Genus *Banksia* also fit this category.

World interest in many Australian species suitable for the floral trade is apparent. Long stems, individual flowers, and attractive foliage of some grevilleas like 'Misty Pink' and 'Sandra Gordon' are being improved in breeding and selection programmes in America, Israel, and Holland. *Banksias ex Hawaii* is a classic example.

The kangaroo paw (*Anigozanthos*), Western Australia's floral emblem, has been hybridised many times and most cultivars are available in tissue culture. There are forms for both the floral trade and the home gardener.

Many of the types of plants, i.e. the selections I have talked about, are available in their wild state. One of these is a beautiful ground cover, hanging basket, spill-over type plant from Western Australia, called *Dampiera diversifolia*, a compact plant with small leaves and suckering habit. It has brilliant blue flowers most of the year but are best from winter to the end of spring — our largest selling ground cover plant.

Australia being the size it is makes it impossible to keep wandering over it all of your life; however, as a member of I.P.P.S. I am privileged to travel to a different state each year for our annual meetings and visit many interesting growers and collectors of plant material. We try to visit somewhere each month as well as at Sid Cadwell's planting. But by placing all the selections in one area one can quite easily observe many thousands of plants from all over Australia.

The *Banksia* genera is worthy of mention as there is a form of the east coast *Banksia ericifolia* 'Port Wine' which has most striking red flowers borne on long stems mostly on the outside of the bush, ideal for the florist trade and prized as a cut flower. This plant was developed by Sid Cadwell. It responds well to cutting propagation, rooting readily from soft tip material. A recent development has produced a dwarf form suitable for small areas of the garden. All species of the *Banksia* and *Grevillea* genera are great for birds in the garden and this has helped in plant sales.

The waratah (*Telopea speciosissima*) is much valued for its flowers. Selections of this plant have been planted and many

of these are being grown from cuttings. This is a very expensive operation; waratahs do not produce material suitable for propagation at a very fast rate. However, if one wishes to have these plants for flower production then they had best choose vegetative propagation methods, especially for the white and pink waratah.

Many propagators choose to grow this plant from seed and I do not wish to knock them since I grow thousands from seed myself.

I am not familiar with the New Zealand native plants and have no knowledge as to how they would perform planted out under the conditions I have described. I suspect similar situations and results would occur. Certainly I have one plant at Dural in Australia which is a terrific seller — *Metrosideros thomasi*; this plant flowers for at least 6 months of the year and has a most attractive grey foliage, a two-tone grey on green.

A more recent development by the C.S.I.R.O. Forestry Research Unit, Canberra, has produced a whole new range of salt-tolerant river red gum (*Eucalyptus camaldulensis*). During this programme many crosses were made and resultant strains of highly ornamental *Eucalyptus* suitable for the nursery industry have been developed. They will be propagated from tissue culture or micropropagation methods.

Looking to the future for new plant material and production of propagation material, suitable and viable sources have to be maintained. One can never hope to cover all the material available and the different purposes for which it can be used. There are people interested enough to endeavour to improve or select from the stock already on the market, much of which I suspect has come from more than one parent plant.

Macadamia, the Queensland nut tree, (*Macadamia integrifolia*) is an example of selection and hybridising and has been based very much on the type of planting I have described. I do not deny some cultivars have been deliberately crossed and bred.

Plant propagators have real winners as the fields they service cover such wide markets, and new plants and improved forms with the right promotion are readily accepted.

Grevillae 'Mason's Hybrid,' re-named 'Ned Kelly,' was a real stick up. In fact, they doubled the price of this plant which had been around for a long time.

The indoor plant field and the material available from our rain forests is about to be discovered in real terms.

The flowering hoyas have been hybridised and spectacular plants are coming on the market. Native cissus have found their place in similar programmes all around the world. The interesting part about the hoyas is their ability to be propagated by tissue culture. This method builds up initial stocks and makes propagation by traditional means much easier and quicker after 3 or 4 generations of plants have been produced.

In our plantings we prefer very small tube size plants, planting in the autumn and early spring; they receive very little water, in fact most are only watered once at planting time. They are mulched with bush or leaf litter to conserve moisture.

Whilst the summers are very hot and winters severe the spontaneous sports or natural hybrids seem almost to thrive. In fact, one may well be led to believe that they are bred for the area in which they find themselves. Other observations show that these plants do well in most climates. Why this is so I am unable to answer other than to say if they are hybrids there is extra vigour. Growing enough plants for field and container production is still difficult. In the first place there can be many hybrids or selections to choose from. To make the selection early is like going to the races, one does not know which will be the favourite. Plants with fantastic foliage in the early stage of life may get you excited, only to find the flowers disappointing.

These hybrids, or spontaneous sports as some people refer to them, are not new to me. My first experience in propagating and choosing a new plant was with the Swane's Golden pencil pine; 15,600 odd seedlings later I was rewarded with 30 or so variegated and full-coloured parent plants. I selected five parent plants, which I know was wrong. I should have used just one parent.

One classic new form of ground cover grevillea developed in Victoria, similar to *G. 'Robyn Gordon'*, with spectacular flowers is about to come on the market. This plant will be readily acceptable and has become an easy plant to propagate.

What all of this work has led to, of course, is other standard propagation methods being used, such as approach grafting of grevilleas resulting in weeping standard trees with ready sales.

Prostanthera is grafted onto *Westringia* for difficult areas and soil types and *Phytophthora* resistance. Selection of two carnivorous plants almost extinct until a few months ago has led to their propagation in tissue culture in order to preserve them. One of Western Australia's rarest wildflowers, the Won-

gan triggerplant (*Stylidium coroniforme*) is an example of what plant propagators can and are doing. Pitcher plant (*Sarracenia*) also from Western Australia, has proved to be a great novelty plant; it is also tissue-cultured. They both sell well in the nursery trade as novelties.

The need to change lines of plant material brings the plant propagator under pressure to keep coming up with plants of high quality and performance. Native plants are in this situation. The craze for selling these has been dampened by selling too many untried plants from different regions of Australia, with the customer finding them to be unsuccessful in his area. A selection of *Eutaxia obovata*, a small native shrub to about 1½ metres, has been promoted as 'Sunshine'. This plant is older than I am and has not sold well because it was grown from a poor form.

The following list contains some of the more prominent Australian selections and hybrids:

Grevillea 'Robyn Gordon' hybrid (*G. bipinnatifida* × *G. banksii*)

G. 'Sandra Gordon' (*G. pteroclifolia* × *G. sessilis*)

G. 'Misty Pink' *Banksii* × *G. sessilis*

G. 'Mason's Hybrid,' also known as 'Kentlyn Hybrid' and 'Ned Kelly'

G. 'Superb'

G. 'Boongala Spinebill' (*G. bipinnatifida* × *G. caleyi*)

G. 'Cadwell's Hybrid'

G. 'Side Cadwell'

G. 'Jessie Cadwell'

G. 'Ivanhoe' (*G. asplenifolia* × *G. caleyi*)

G. Royal Mantle (*G. laurifolia* × *G. willesii*)

Macadamia hybrids

Kangaroo Paws hybrids

Callistemon Captain Cook selection

Hanna Rae selection

Endeavour selection

All the Poorinda hybrids (there are more than 20)

Paynes *Thryptomene* selection

Hoyas — many new hybrids not yet on the market. For climbing indoor flowering plants, foremost is 'McGilveriana', with rich red flowers.

Chamelaucium uncinatum, Geraldton wax flower, for cut flowers is grown in hundred acre lots in Israel. There are selections red, purple, white and pink. These are grown in Israel by Western Australia nurserymen.

The Australian nursery industry, in presenting its submission to the Australian Rural Adjustment Unit Workshop on Rural Research, listed no less than 13 areas of research for the nursery industry.

Number 1 on that list reads as follows:

Plant breeding and selection of native flora in respect to decorative appeal and ease of culture.

(This submission was presented by Bruce Owen French, Chief Executive Officer — Australian Nurserymen's Association in October, 1983).

Again, in the Department of Agronomy and Horticultural Science Report No. 9, 1980-81 Sydney, Professor M. Mullins reports on the development of the waratah. *Telopea speciosissima* forms have been collected from the wild and are being selected for desirable traits. In this same report other native plants are mentioned for use as cut flowers: *Clianthus*, *Isopogon*, *Pandorea*, *Persoonia*, *Verticordia*, *Grevillea* and the Christmas bells (*Blandfordia* spp.). The waratahs and *Blandfordia* are being studied for tissue culture propagation at Sydney University.

Directions for rooting cuttings of large-leaved grevilleas:

1. The material should be selected during the summer as the new growth starts to mature; however, the cuttings must still be soft.

2. Cuttings should be made about 20 cm in length and given a basal wound by removing a sliver of bark, about 2 cm in length, in order to expose the cambium.

3. Hormone treatment should contain IBA and NAA in approximately equal parts, applied at the rate of 2,000 ppm to 4,000 ppm, depending on the type of growth (we like to use powder, not liquid).

4. The rooting medium should be well drained, such as 25% peat and 75% perlite, although some of our natives strike well in plain sharp sand.

5. Bottom heat applied to the cuttings at 20°C is a general guide.

6. Misting should be carefully controlled in rooting many Australian plants and should not be used in excess. Fogging is a great advantage.

7. Reduction of leaf area for large-leaf type plants is available — i.e. remove approximately half the leaf area.

8. Collection of cutting material should not be done in the heat of the day and the material should not be stored too wet.

9. For small-leaved plants harder wood, as used in semi-hardwood cuttings, is advisable — e.g. callistemons and fine-leaf grevilleas.

10. All cutting material should be clean and come from prepared parent plants and dipped in sodium hypochlorite, 1% solution, and washed in clear water.

11. Individual tubes for hard to strike plants is an advantage and allows more air and space around the cutting.

PROPAGATION OF DECIDUOUS TREES BY HARDWOOD CUTTINGS IN HEATED BINS

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Propagation of woody plants from hardwood cuttings planted directly into the field has been a traditional method of plant production; in fact it was probably the earliest method of cutting propagation. The number of plants which could be propagated in this way was limited and it was useful only for those plants which have a very high potential to form roots. Studies over the last 2 decades have changed the whole picture of propagation by winter cuttings. In general it has been shown that by using more sophisticated technology it is possible to produce a much wider range of plants in this way than was previously the case. In particular it has been demonstrated that suitable cuttings of most deciduous woody plants, given the correct treatment, will generally root in the so-called "winter period". Much of this work has been carried out with fruit tree rootstocks, but similar techniques are now being applied to many ornamental plants as well, and this will no doubt become more important over the years to come.

It is important to point out that this type of propagation requires a rather more sophisticated approach than the traditional one; there is much less room for error. Having said that, I would stress that it does not require anything which is beyond the resources of the competent propagator. Most of the