

DOMESTICATION OF THE AUSTRALIAN TROPICAL PROTEACEAE

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The sub-tropical and tropical representatives of the important Proteaceae family contain some of Australia's most spectacular flowering and foliage ornamental trees and shrubs. There is considerable horticultural interest in their economic importance both in Australia and abroad as their attributes become better known.

This family has also given Australia and the world a popular and delicious nut crop. The macadamia, is now of considerable economic importance, especially in Hawaii. This is one of the few Australian plants used for food purposes on any scale. Several other lesser known rainforest species produce edible nuts which could have future potential.

Most of the tree species produce beautiful coloured and grained and very sought after cabinet timbers. These timbers, usually marketed as various forms of silky oak come from shrinking virgin stands of forests, and another 20 years will see the end of this resource. No replanting has been done using these trees despite the fact that they are tough and fast growing, and have few pests or diseases. They can thrive on poor soils and in most cases make excellent windbreaks.

New species are still being discovered and named in the fast disappearing and ravaged rainforests of North Queensland. Let us work and hope that all of these species can be introduced into cultivation before their habitat is alienated forever. National Parks are no guarantee that they are all safe because National Parks only consist of a disjointed series of logged mountains and an occasional beach; the diversity and variability of these forests means that each local area, creek or mountain, often has its own unique and endemic species. This family's members are rarely found in pure stands. They mingle and are found scattered through the forests and grasslands. They contribute to the total ecology of a forest, an important aspect of its health. Only they have the ability to breakdown inorganic and insoluble phosphates locked in the phosphate-poor Australian soils, by a combination of their special root systems — in conjunction with mycorrhiza — into organic and soluble phosphates at the soil surface where it is eventually available to other plants as well.

Hence, in combination with legumes, they can be impor-

tant colonisers of ravaged areas or depleted soils and are able to convert poor, very acidic soils into something which will support other plants as well.

Their importance is obvious, judged by any set of values. They improve forest health, and provide food for fauna. No other plant group produces as much nectar from their flowers. They also provide food for humans. Aesthetically they have attractive foliage with beautiful and often highly perfumed flowers. Large numbers of birds, including parrots, are attracted to these plants. They are also used for windbreaks and will grow well in poor soils where nothing else will thrive.

There are hundreds of species plus an increasing number of hybrids from man's combinations of these in the tropical Proteaceae. These will ensure that they will always show us the ability of the ancient God, Proteus — that their family was named after — that of diversity of form and the ability to change shape at the God's (substitute 20th century man's) will.

Proteaceae occupy two broad ecological niches in the tropics.

- (a) *Rainforest*. They are mainly small to large trees and sometimes understory shrubs around the edges of the forest.
- (b) *Open forest and heathlands*. Here they vary from ground covers, to shrubs, to small trees in open country. Many grow in the full tropical sun.

PROPAGATION

Four main methods of propagation have been successfully used to grow tropical Proteaceae.

1. **Seed**. Seed is difficult to obtain for many species, particularly the rain forest trees. Seed is often easier to obtain from the shrubs and open forest species. Their habit of shedding their seed erratically, often means that it is difficult to collect large quantities and seeds may therefore be quite expensive, as time and patience is required to collect them.

Seed viability is often short — from a few months for rainforest species to a year or two for grevilleas and others. Seed from rainforest species is generally winged and has a thin papery shell.

For germination the seeds need to be fresh, placed in a sterile well-drained low phosphorus medium, and only lightly covered. The pH should be about 6 and best results are with bottom heat and about 50% shade.

The hard-coated seeds also need to be fresh for best results. They can be germinated using a similar method but can be covered a little more, and can tolerate more sun.

The seed from cultivated plants is easier to harvest, but there is always the danger of hybridisation when species from different areas are grown together in a garden. Hybrids should be grown to assess their horticultural potential. The form of some species varies in cultivation; for example, some rainforest trees which are tall, slender, and have only small crowns naturally form neat rounded and shorter trees when grown in the open. They often flower spectacularly and seed collection is usually much easier from these trees.

2. Grafting and Budding. Grafting and budding has been used as a propagation technique for tropical Proteaceae.

Macadamia plants propagated for commercial plantings are produced by grafting or budding onto seedling rootstocks.

Grevillea "standards" are being produced by approach grafting ground cover species onto *Grevillea robusta* (silky oak) rootstocks. By this technique a weeping habit is obtained, or with others, simply a reliable rootstock which allows that species to survive in a different environment. Commercially the "standard" using the prostrate *Grevillea* 'Royal Mantle' grafted onto 1.5 to 2 m high *G. robusta* rootstock has been quite successful.

G. dryandri, a "touchy" tropical grevillea has been successfully grafted onto *G. robusta* rootstock and this has improved its reliability and reduced its susceptibility to *Phytophthora cinnamoni*.

Telopea speciosissima, the New South Wales waratah has recently been successfully budded onto some species rootstocks so as to get earlier flowering and to keep improved cultivars, including the white form, of this outstanding plant.

There is a future for these techniques in propagation as more species, and unusual forms for specialist effects, are required by a public which is becoming more sophisticated in its plant needs.

3. Tissue Culture. Tissue culture is newer on the scene than the traditional forms of propagation but has already proved successful with several grevillea species. This method will become more widespread as problems of overcallusing, transplanting, and hardening off are overcome. To date, tissue culture has not been used on tropical Proteaceae to my knowledge, but no doubt it is possible.

4. Cuttings. This is probably the best method of propagating the tropical Proteaceae. We have developed techniques over the last decade to propagate all the grevillea hybrids and several of the most spectacular rainforest trees from cuttings, although not all of these are commercial propositions at this

stage.

Only material from cutting-grown cultivated specimens is commercially useful, where it can be kept clean of insects and fungi by a regular spray program, and where the plants nutrient levels are kept at an optimum. The state and quality of the cutting material is of crucial importance for a good result.

The cutting material is kept as clean as possible, and when the cuttings are made they are placed in a sterile medium under mist. (We use an electronic sensor system). The house has automatic ventilation, good light, and a bottom heat temperature of 27 to 30°C is maintained.

Initially at Lakkari Nursery we only used cutting material from the pots with an occasional pruning of the garden plants. Pruning the pots, while giving the plants shape, dramatically slows down nursery turnover whilst waiting for them to grow back. Results were reasonable, however, and commercial enough to get by. Since we have been obtaining bulk cutting material from our Farm Nursery Gardens however, results have been much better. This is because cutting material taken from well-maintained in-ground stock plants is superior. The results were 10 to 20% better and produced more vigorous plants without the need to hold nursery stock in pots, thereby increasing turnover.

There was a problem caused by ethylene damage, causing leaf burn and overheating in the sealed boxes used to transport the cuttings the 120 kilometers from the farm to the production nursery. Ethasorb was used and this has solved the problem.

It has not been necessary to use refrigeration for the transport of cuttings; material can be sent quite long distances by road or air transport using the above method.

The propagation of *Oreocallis wickhamii* from cuttings has advantages over seed propagation as seeds are often hard to find and must be fresh. Seedlings are also slow to develop in the early stage. They also take 6 to 8 years to flower.

Cuttings of the rainforest species, such as *Oreocallis* spp. and *Athertonia* spp., are fairly slow to strike — to 12 to 16 weeks compared to 6 to 8 weeks for grevilleas. Once struck they are slow to establish in the tubes, or when potted on, they are slow to develop a good root system. Extra iron and a good supply of nitrogen is essential for good growth, and for this reason, *Oreocallis* spp. has only been marketed in 175 mm or 200 mm pots.

The rainforest species have proven very hardy and amenable to cultivation particularly when grown by cuttings as they

maintain a compact form and flower prolifically when young. They are much hardier than their origin would have one believe. The high altitude species can handle mild frost and have been grown and flowered as far south as Melbourne in some cases. They do well in the sub-tropics and in warm to cool temperature climates. They can survive in dry or wet conditions once established. One outstanding member of the rainforest Proteaceae is *Oreocallis wickhamii* (Queensland tree waratah). This tree is probably the most spectacular flowering tree in Australia when in full bloom. It was formerly known as *Embothrium wickhamii* and is a small rainforest tree occurring naturally on the deep red soils of the Atherton Tableland and similar high altitude rainforests in North Queensland. It occurs usually at altitudes of 1000 m or more, where the climate is wet most of the time, cool in winter (down to 0° or less, in fact it snowed recently) and hot for the rest of the year, with occasional dry spells.

Most of the tree's former geographical range has now been cleared for grazing. Though small by rainforest standards, it is still sought by foresters because of its beautifully grained, pink shiny timber. Never common, it is now rare in the wild due to forestry and clearing for farming. No replanting has ever been done and it could soon join the ever-growing list of endangered species. *O. wickhamii*'s future in the wild depends on habitats being protected in National parks, but its future in cultivation is assured now that it can be reliably and continuously propagated from cuttings. *O. wickhamii* in cultivation is a small tree, growing to 6 to 7 m x 3 m. New growth is a furry, light lime green, and older leaves are a bright green, making a very dense and attractive canopy. The flowers are this tree's most eye-catching feature, covering the whole canopy with hundreds of 20 to 30 cm bright scarlet clusters of "Waratah" — like blooms from September to November. They will last well on the tree provided the many parrots and honeyeaters attracted to the nectar-dipping flowers do not get to them first.

Athertonia diversifolia is one of the most beautifully foliated of the Australian rainforest Proteaceae. It has giant oak-like leaves up to 60 cm long. The new growth is a shiny bright red changing to a rust-tinged dark green. The flowers occur in 30 cm long racemes similar to macadamia flowers, and are a creamy honey colour. The seed pods are large and bright blue enclosing a large almond-shaped nut, reputedly sweeter than a macadamia and just as palatable.

This highland tropical rainforest from the Atherton tablelands (hence its name) was formerly called *Helicia diversifolia*. Seed is difficult to obtain from this species.

Two seedlings were obtained 6 years ago and planted on deep red former rainforest soil on our farm in northern New South Wales. They have survived a severe drought and minimum temperatures of -4°C , and are currently 5 metres high and are magnificent.

Cutting material is taken from stems which are 1 to 2 cm thick and covered with a red furry down. These cuttings are quite difficult to strike but some success has been achieved.

This spectacular plant is rare in the wild and therefore warrants attention to bring it into cultivation to ensure its continuing survival.

Grevillea hilliana is an endangered species in the wild. It has been grown from seed in the past but this is not always easy to obtain. Plants from seedlings take many years to flower. Plants grown from cuttings have produced a bushy plant that has flowered in two years. Mature leaves are large and shiny green with a silvery reverse side. The flowers are spectacular with many clusters of lemon flowers 30 to 40 mm long all over the whole tree.

Its habitat in northern New South Wales and Queensland rainforest is dwindling. It produces an excellent timber and makes a tough and showy ornamental.

I have only described a few species of the rarest and most spectacular of the tropical Proteaceae.

Most of this group are spectacular and are amenable to cultivation. Their diversity is such that new species are still being discovered and new hybrids continue to appear.

This group of species occurs in our own backyard and its domestication for use in home gardens, landscaping, re-vegetation, and medicinal purposes is a worthwhile challenge.

The continued survival of many of our most beautiful nectar-feeding birds, parrots, bats and possums, are inextricably bound up with the continued survival of the tropical Proteaceae.