ones dropped. The cultivars listed in Table 1 are examples of daylilies from various color groupings that have passed through the various screens of Figure 1 and would have commercial value. Commercial sources of these *Hemerocallis* cultivars can be obtained by writing directly to Sandy Goembel, Secretary of The American Hemerocallis Society, Route 5, Box 6874, Palatka, Florida 32077.

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PREPARATION AND DEVELOPMENT OF AUSTRALIAN NATIVE PLANTS FOR PROPAGATION

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

We are conducting experiments on Sid Cadwell's property 200 km west of Sydney. Mr. Cadwell's property is situated in a very dry area which receives approximately 300 to 350 mm of rain per year. Summer temperatures reach 40°C and winter temperatures are below 0°C.

Propagation material, such as grevilleas, has been collected with careful attention paid to selection of parent materials from all over Australia. Cutting material is harvested in very early morning or late evening during spring, summer, and fall (October to April). It is recorded and packed in plastic bags with very little water. In most cases cuttings are wrapped first in clean white paper, then packed in styrofoam boxes and air-freighted to their destination.

Propagation takes place either under mist with bottom heat, or in a small glasshouse without mist or bottom heat.

After rooting, the liners are planted out in the field. Their start in life is rugged as they very often only receive the one watering at planting time. Water is in very short supply on this property. However the results have been good.

Under these conditions a *Grevillea* from the Northern Territory grows up alongside one from Victoria, Western Australia, New South Wales, or Queensland. In their natural state this does not occur because thousands of miles separate one from the other. Hence many different Grevillea selections are planted together as are other plants such as the callistemons.

In 2 to 3 growing seasons quite strange things happen; because such plants would never have been grown near one another and now find themselves in the same bed so to speak; natural hybrids occur as seedlings under the parent plant.

When plants are taken into cultivation from the wild and vegetative propagation takes place one of two things is likely to happen. The first, of course, is an unconscious selection for individual clones which are often easier to propagate, and elimination of other members of the group that are difficult to propagate. Many species are self incompatible and out-crossing occurs. In our situation we aim to collect more vigorous selections for nursery production.

Many selections of our flora have come about in this way. Foremost among these are Dave Gordon's *Grevillea* 'Robyn Gordon', the Cadwell, Mason, Payne, and Poorinda hybrids, and the hybrids of Mervyn Hodge in Queensland, and George Lullfitz in Western Australia. Seeing how these plants came about encourages us to support Sid Cadwell in planting out as many species as possible and play the waiting game. Selections from these plantings were made, plants propagated, and assessments made for flowering, growth, and suitability for container production.

Some of these plants have peculiar characteristics. For instance, the Grevillea hybrids 'Robyn Gordon', 'Royal Mantle' and 'Superb' have beautiful flowers but produce no seeds. At the start some of these plants proved difficult to propagate. However, after cuttings were harvested, plants grown, and cuttings taken off these plants and they, in turn, were grown and cuttings taken from the third generation, many plants became much easier to propagate.

These hybrid types or selections, whether they occur naturally or not, have much more vigour and their flowering is not only improved but often extended. Some, like 'Robyn Gordon', flower 8 to 9 months of the year. Others are prized for their foliage, especially in the florist trade. Some examples are

Grevillea longifolia, *G. asplenifolia*, *G. hookerana* and *G. johnsonii*. Some of the genus *Banksia* also fit into this category.

World-wide hybridization and research with many Australian species suitable for the floral trade is under way. Long stems, individual flowers, and attractive foliage of some grevilleas like 'Misty Pink' and 'Sandra Gordon' are being improved in breeding and selecting programmes in North America, Israel, and Holland. Banksias are also being improved in Hawaii. The kangaroo paw (*Anigozanthos*), Western Australia's floral emblem, has been hybridised many times and most selections are available in tissue culture. There are forms for both the floral trade and home gardener.

Australia, being the size it is, makes it impossible to keep wandering all of one's life. However, as a member of IPPS, Australian Region, I am privileged to travel to a different state each year and visit many interesting growers and collectors of plant material. By placing all the selections in one area one can quite easily observe many thousands of plants from all over Australia.

The genus *Banksia* is worthy of mention. There is a form on the east coast of Australia, *Banksia ericifolia* 'Port Wine', that has very striking red flowers borne on long stems, mostly on the outside of the bush. This plant was developed by Sid Cadwell. This form propagates well from soft tip cuttings. More recent development has produced a dwarf form suitable for small gardens. All the banksias and grevilleas are great for birds in the garden and this has helped in the sales of these plants.

Telopea speciosissima, waratah, is much valued for its flowers. Selections of this plant have been planted and many of these are being propagated by cuttings. 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. The white waratah is one of Australia's most endangered plants. There are plant propagators interested enough to endeavour to improve or select from the stock already on the market. This stock, I suspect, has come from more than one parent plant and variations in growth and flowering do occur.

Macadamia, the Queensland nut tree, is an example of the selection and hybridization that 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 for better production.

Plant propagators have real winners as the markets they grow for cover such wide areas of interest that new plants and improved forms, with the right promotion, are readily accepted.

The indoor plant field and the material available from our rain forests is about to be discovered in real terms as our 1985 meeting in Rockhampton, Queensland, will show. The flowering hoyas have been hybridized 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.

Whilst in parts of Australia 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 that if they are hybrids there is extra vigour.

Grevillea 'Bronze Rambler' is a classic new ground cover developed in Victoria. It is similar to 'Robyn Gordon' with spectacular foliage. The plant is about to come on the market because it will be readily accepted and should become a good plant to propagate.

Not all the hybrids are sterile. Steven Du Pee did his Masters Degree on *Grevillea* hybridization at Sydney University. His work on this group of plants is well worth studying in Research Report No. 9, Sydney Department of Agronomy and Horticultural Science.

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. Seedling rootstock of *Grevillea robusta* for weeping standard plants is mostly used.

Grafting of *Prostanthera* onto *Westringia* is done for difficult areas, soil types, and *Phytophthora* resistance.

Two carnivorous plants almost extinct until a few months ago have been preserved by propagation in tissue culture. One is a Western Australian rare wildflower, the wongan triggerplant (*Stylidium coroniforme*). This is an example of what plant propagators can and are doing. *Sarracenia*, pitcher plant, also from Western Australia, has proved to be a great novelty that also has been propagated through tissue culture. Both of these plants 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. Table 1 contains a list of the more prominent selections and hybrids. 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 and the customer subsequently finding them to be unsuccessful in this area.

Table 1. Some of the more prominent selections and hybrids of Australian native plants

Anigozanthos hybrids
Callistemon 'Captain Cook', selection
C 'Endeavour', selection
C 'Hannah Ray', selection
Chamaelaucium-Geraldton wax flower There are selections of red, purple, white, and pink for cut flowers
Grevillea 'Boongala Spinebill' (*G bipinnatifida* × *G caleyi*)
G 'Bronze Ramble'
G 'Cadwell's hybrid'
G 'Sid Cadwell'
G 'Ivanhoe' (*G asplenifolia* × *G caleyi*)
G 'Jessie Cadwell'
G Mason's hybrid, also known as Kentlyn hybrid and 'Ned Kelly'
G 'Misty Pink' (*G. banksii* × *G. sessilis*)
G. Poorinda Hybrids, more than 50
G 'Robyn Gordon' (*G. bipinnatifida* × *G. banksii*)
G. 'Royal Mantle' (*G Laurifolia* × *G willisii*)
G 'Sandra Gordon' (*G pteridifolia* × *G sessilis*)
G 'Sid Cadwell'
G 'Superb'
Hoyas hybrids — many new ones not yet on the market. For climbing indoor flowering plants forestmost is the rich red *H macgillivrayi*
Macadamia hybrids
Thryptomeme paynei

The Australian Nursery Industry, in presenting its submission to the Australian Rural Adjustment Unit Workshop on Rural Research, listed no less than 13 areas for research in the nursery industry. The number one area on that list is the breeding and selection of native flora with respect to decorative appeal and ease of culture.

Again in the Sydney University Department of Agronomy and Horticultural Science Report No. 9 for 1980-81, Professor Michael 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 genera mentioned are: *Clianthus*, *Blandfordia*, *Grevillea*, *Isopogon*, *Pandorea*, *Persoonia*, and *Verticordia*. Both the waratah and *Blandfordia* are

being worked on in tissue culture at Sydney University by Professor Mullins

PREPARATION OF CUTTING MATERIAL

1) The material should be selected from late spring to late autumn (November to May), as new growth starts to mature. However, the cuttings must still be soft. In Australia, stock plants must be cut back to produce the most viable material.

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

3) Hormone treatment should contain IBA and NAA in approximately equal parts applied at the rate of from 2,000 to 4,000 ppm, depending on the type of growth.

4) The medium should be well drained, e.g. 25% peat and 75% perlite. Cuttings of some of our native plants strike well in plain sharp sand. All media should be pasteurized.

5) Bottom heat applied at 20°C is a good general practice for cuttings of most native plants.

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

7) Reduction of leaf area for large-leaf plants by approximately half is advisable.

8) Cutting above and below a node is recommended in many of the harder to strike subjects.

9) Cuttings should not be harvested in the heat of the day and should not be stored wet.

10) For smaller leaf type plants, such as callistemons and fine-leaved grevilleas, harder wood, as in semi-hardwood cuttings is advisable Small leaves must be removed carefully in an upward direction.

11) All material should be clean and come from prepared parent plants and dipped in a 1% sodium hypochlorite solution and washed in clean water. Some propagators use captan.

12) Individual tubes for hard to strike plants is an advantage and allows more air and space around the cutting and better root development. Many species may only callus and not produce roots. However, such cuttings often produce roots if they are potted in growing medium after callus has formed.

13) Tissue culture propagation of several new grevilleas is well under way in Australia. This method of propagation is opening up new areas for our native flora.