

GRAFTING OF AUSTRALIAN NATIVE PLANTS

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This is a follow-up of work (2) reported previously in *The Plant Propagator* by the present author and at the 1973 ANZAAS Conference by Keith McIntyre, also of Canberra Botanic Gardens (1). I will be drawing heavily from material from both of these papers for this present approach.

The Australian flora includes a great number of species of good horticultural potential. Many species have been introduced to cultivation only in the last few years and even now, large numbers of valuable plants remain untried. It is, therefore, only recently that some of the problems associated with the cultivation of Australian native plants have become apparent.

Canberra Botanic Gardens has concentrated its resources on the study of the Australian flora and has the largest living collection of Australian native plants in the world. In 1969, large scale deaths occurred in the Botanic Gardens nursery. These were traced to the root rot fungus *Phytophthora cinnamomi*. On further investigation, it became apparent that many deaths of plants in the open garden, previously attributed to "wet feet" etc. were in fact due to *P. cinnamomi* infection. This disease has also caused serious damage to native forest areas in many parts of Australia.

It was also evident that certain species were more susceptible to *P. cinnamomi* than others and, in fact, a few species showed considerable resistance to the disease. As a simple fungicidal cure to this problem seemed remote, it was resolved to seek other methods of overcoming the disease. The nursery problem was relatively easy and extensive improvements in hygiene proved the solution. The problem in the garden was far more difficult.

General drainage improvements seemed to do some good by making the conditions less desirable for fungal growth. Built-up garden beds achieved a similar result. Application of fungicides and fungistats seemed to have little effect. It was obvious that an answer had to be found elsewhere.

Grafting techniques had not been used on Australian native plants to any extent until now. However, it appeared that if susceptible species were grafted onto resistant rootstocks it may be possible to overcome the problem.

The first experimental work along these lines was done with the genus *Prostanthera*. Most members of the genus have some horticultural potential and some are outstanding. None, however, can be said to be reliable or long-lived in a garden situation.

As *Prostanthera* ssp. were generally considered susceptible to *Phytophthora* we had to look to the related genus *Westringia* for a resistant rootstock. *W. fruticosa* seemed a logical starting point as it had proved hardy in almost any situation and seedlings had been seen to germinate and develop in areas of known *P. cinnamomi* infection.

Whip grafts, side wedge grafts, and top cleft grafts have been tried but the technique of top cleft grafting has been settled on as the most satisfactory.

Thirty-one species of *Prostanthera* have now been successfully grafted in this way, the operation being carried out in spring or early summer.

The following species have been grafted onto *Westringia fruticosa*:

<i>Prostanthera cuneata</i>	<i>P. seiberi</i>
<i>P. coerulea</i>	<i>P. striatiflora</i>
<i>P. denticulata</i>	<i>P. aspalathoides</i>
<i>P. grylloana</i>	<i>P. rugosa</i>
<i>P. incana</i>	<i>P. walteri</i>
<i>P. incisa</i>	<i>P. spinosa</i>
<i>P. leichhardtii</i>	<i>P. howelliae</i>
<i>P. magnifica</i>	<i>P. teretifolia</i>
<i>P. marifolia</i>	<i>P. linearis</i>
<i>P. nivea</i>	<i>P. discolor</i>
<i>P. ovalifolia</i>	<i>P. behriana</i>
<i>P. rotundifolia</i>	<i>P. lanceolata</i>
<i>P. euphrasioides</i>	<i>P. scutellarioides</i>
<i>P. lasianthos</i>	<i>P. rhombea</i>
<i>P. serpyllifolia</i>	<i>P. phyllicifolia</i>

Some *Westringia* ssp. have also proved unreliable and the following species have been successfully grafted onto *W. fruticosa*:

<i>Westringia lucida</i>	<i>W. williamsonii</i>
<i>W. longifolia</i>	<i>W. rigida</i>
<i>W. amabilis</i>	<i>W. glabra</i>
<i>W. rubiifolia</i>	

(small percentage only)

The genera *Hemiandra* and *Hemigenia* have also been tried but initial trials have only been fair.

In initial trials, *Prostanthera aspalathoides*, an attractive red species from western N.S.W., proved difficult to graft onto *Westringia fruticosa* and it was thought that it may be incompatible. Later work has yielded about 25 % success. To overcome this apparent problem, 30 nurse grafts were carried out using *P. nivea* as the intermediate species. This resulted in 100 % success.

The oldest of these *Prostanthera* grafts are now two years old and have been planted in the Botanic Gardens where earlier plantings of *Prostanthera* failed due to *Phytophthora cinnamomi*. No plants have yet died, a number are flowering this year, and the largest plants are about 1.2 m. high.

In the search for plants which will be more resistant to *Phytophthora*, three other major plant families, *Proteaceae*, *Myrtaceae*, and *Rutaceae* have been investigated.

The problem plants in the family *Proteaceae* are *Banksia* ssp and *Dryandra* ssp. from Western Australia. Many of these have tremendous horticultural potential but are extremely unreliable.

Initial trials here used *Banksia serrata* as a rootstock. Some success was had with this group although the percentage success was generally low, but at least the compatibility of *Dryandra* with *Banksia* looks satisfactory. The most successful graft on this rootstock was using *B. speciosa* as scion material.

Later trials have used *B. robur* as a rootstock and it is felt that this species would be the most reliable if general compatibility can be established. The western species, *B. occidentalis*, has been successfully grafted onto *B. robur* but plants have not yet been planted into the garden.

The family *Myrtaceae* offers another challenge as it contains some extremely hardy plants but others which are very short-lived. Recent trials have been most encouraging and have revealed an apparently wide range of intergeneric compatibility. In these trials *Callistemon citrinus* and *Kunzea ambigua* have been used as rootstocks.

Callistemon citrinus has accepted scions of the following species with almost complete success: *Darwinia leiostyla*, *Eremaea beaufortioides*, *Kunzea baxteri* and *Melaleuca radula*.

Kunzea ambigua has accepted scions of the following species:

<i>Darwinia leiostyla</i>	100 %	success
<i>Kunzea recurva</i> var. <i>montana</i>	83 %	"
<i>Kunzea baxteri</i>	97 %	"
<i>Verticordia nitens</i>	53 %	"
<i>Kunzea ericifolia</i>	13 %	"
<i>Eremaea beaufortioides</i>	90 %	"
<i>Kunzea pauciflora</i>	33 %	"
<i>Kunzea pomifera</i>	90 %	"

It should be emphasized that these grafts are still young and long-term compatibility must still be determined.

The family Rutaceae is different again, in that we have found difficulty in finding an Australian member of the family which could be considered highly resistant to *Phytophthora cinnamomi*.

The first trials which have achieved some success have used *Coleonema pulchrum*, better known as *Diosma*, from South Africa. Those trials have concentrated on several *Boronia* ssp. *Boronia megastigma* was a complete failure but should be tried again. *B. denticulata* and *B. heterophylla* yielded about 66 % success.

Because of the wealth of desirable species in this family, we intend to look more extensively at other stocks. Grafting to resist disease is only one use for this technique.

Standard *Grevillea* spp. have been produced by grafting prostrate species, such as *G. x gaudichaudii* and *G. laurifolia* onto *G. robusta* a stock. These must surely have their place next to the weeping cherries presently available. Successful grafts have been made with *Clianthus formosus* (Sturt's Desert Pea) onto the New Zealand *Clianthus puniceus*. The object here is to try to obtain a perennial *C. formosus*. These plants are now flowering but only time will tell if we have achieved our aim.

In summary, we consider that grafting of native plants is here to stay if we want to grow the so-called "difficult species." We have merely opened the door; much development work is still to be done before we can determine the most suitable rootstock species.

LITERATURE CITED

1. McIntyre, D.K. Grafting of Australian Native Plants. Paper read at ANZAAS Congress, August, 1973.
2. Wrigley, J. W. and J. Jauhainen. 1973. Grafting of certain Australian native plants with particular reference to *Prostanthera* *The Plant Propagator*, 19: (2).