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This is what the periodical is all about so why isn't every issue packed with articles on this subject? Why can't we provide precise details on the cultivation of wildflowers — directions that will assure success? We can provide the advice but can you be sure of meeting these conditions?

One competent observer and horticulturalist is Bill Molyneux. When I pointed out to him that what he was really saying in the article opposite was that wildflowers really need good garden conditions he replied "It is true that a large number of failures in gardens occur, because people do not recognize the specific needs of plants, and are often not prepared to institute standard horticultural practices. i.e. many purchasers of plants which derive from western sand plains experience high loss rates when planting these plants into heavy clay conditions. Those people prepared to condition this soil thoroughly, thus providing far better drainage and dispersal of excess salts, increase their survival rates.

"Even so, with deep rooting large plants such as many of the bigger western banksias, heavy soils are still encountered not too far down" — "Interestingly most of these banksias grow well on top of Mt. Dandenong in Victoria even though high winter rainfall and cold, even snow, conditions are encountered. Drainage in a deep friable acid soil would seem to be the reason for this apparent paradox. It is too worth noting that the soil condition is of an acid not an alkaline nature about which much has been written in relation to satisfactory establishment of banksias."

Any "old English gardener" will tell you that apart from plants that prefer heavy soils or special conditions such as lime or bog, a deep friable slightly acid "good" soil is the requirement for the successful cultivation of most exotic horticultural plants. Is this then the assured solution to the use of Australia's flora in horticulture?

The central theme of Volume 9 was the statement "the growing of wildflowers in good garden conditions is easy if you select suitable species". The issues of Volume 9 were devoted to aspects of this statement and readers are first urged to purchase a copy and examine it in some detail.

Improvement In Australian Plants Needed?

As issues 85, 86, 87 and 88 of Australian Plants were considered unsatisfactory by the Federal Council of SGAP the Managing Editor, W. H. Payne, has been discharged forthwith. Any suggestions should not be sent to the Editorial address but to the Secretary of the state in which you live as listed on page 283. As this may be the last issue I am permitted to produce, I wish to thank sincerely, all those thousands of readers who have given me support and assistance and have written to advise their delight and pleasure at the high standard of issues of Australian Plants — W. H. Payne, Interim Editor.

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COVER PLATE: *Hibbertia quadricolor*

Photography by C. Garrett

A low trailing shrub, ideal for a ground cover plant. The prostrate species of *Hibbertia* are rarely vigorous remaining compact and very showy. *H. lasiopus* is very similar but has 5 carpels in the ovary instead of 3 as with *H. quadricolor*.

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Grow Native

by Bill Molyneux*

The seasonal cultivating of ground by those preparing vegetable plots, or installing colourful rows of annuals, is a practice that should be employed more often in current horticultural practice. People continue to suffer from the misbelief that Australian plants do not require the soil to be prepared prior to planting. This lack of understanding causes many fatalities.

Many traditional gardens look healthy because their owners understand plant needs and are prepared to put physical effort into achieving them. Heavy clay or basalt-derived soils are worked over continually, so that every season, after the removal of spent plants, soil is worked and enriched prior to the next year's planting.

It surprises me how many people will not recognise that their soil may need dramatic improvement before they consider planting. I always recommend the use of gypsum as a first stage in improving soil texture. Two further products, pine-peat and ligna-peat (both residues from industry) can be used in much the same way as the addition of high-humus soil into your landscape. Pine-peat is medium-to-fine matured bark that is taken from pine logs. Ligna-peat is brown coal, and has excellent qualities for good root development.

With the diminishing supply of quality loam soils, both these residual materials will be invaluable aids in soil restructuring. Pine-peat, due to its texture, is a boon when worked into clay soils previously treated with gypsum, and into open sandy soils, in which the humus levels need boosting. Humus is that material in soils that retains moisture and supports micro-organisms that, in turn, convert materials into available plant food.

One must ensure that the pine-peat is aged, that is, composted prior to using it. Even so, it will still require treatment to stabilise its pH level, and to nitrify it. This can be achieved during the soil preparation by adding the following at a cubic metre rate:

½ kg ferrous sulphate	1/10 kg fritted trace elements
2 kg colomite	2 kg hoof-and-horn or blood-and-bone.

If your local soil is of a reasonably open texture, that is, not a dense, very sticky clay, blend the pine-peat at a rate of fifty per cent to achieve a friable soil structure. Ligna-peat can be added to this at a rate of twenty per cent of the total mass. As with any material introduced, these materials must be thoroughly blended with your own soils. A thin layer of open-textured soil over clay may work for shallow-rooted grasses, but would certainly not support or encourage substantial root growth of larger shrubs and trees.

When planting a perennial garden, one does not have the opportunity of reworking the soil annually as is possible with bedding plants. The necessity for careful planning prior to plant placement is then even more evident.

I am often asked the basic steps for soil requirements; it is obviously a blank area in the planning processes of many people. ■

* Reprinted by permission from "Grow Native", by Bill Molyneux of Australflo Nursery, Victoria.



Lysiphyllum cunninghamii △

Platylobium formosum ▽





Banksia coccinea (Above)

Photography by C. Henshaw

These spectacularly flowering plants, usually sparse shrubs to 1-2 m high crowned by their 10 cm diameter flowers, have proved difficult to maintain in gardens. The article opposite seeks to resolve apparently conflicting observations and trials by some very competent observers and wildflower horticulturalists. We are grateful for such a careful study. However the full story has not been told as reliable cultivation of these beautiful plants is yet to be defined. Could the next stage in the development of reliable hardy plants be by "evolution", continued propagation from selected forms of plants that do survive general horticultural conditions in the eastern states?

Lysiphyllum cunninghamii (Opposite top)

Photography by H. A. Morrison

Previously known as *Bauhinia* the fire Australian species are interesting trees (except for *L. binatum* which is a sprawling shrub near the sea). The leaves consist of two free leaflets which in the case of *L. cunninghamii* are widest about the middle with both base and apex rounded. The leaves of *L. hookeri* are similar but those of *L. carronii* and *L. gilvum* are widest below the middle tapering to a narrow apex. The receptacle (the solid basal part of the flower, the disc-bearing base of the calyx) is narrow and tubular. Well illustrated in the photograph is the short receptacle and ribbed sepals of *L. cunninghamii*. The receptacle in *L. hookeri* is much longer. The calyx of *L. carronii* is similar to that of *L. cunninghamii* but it is not ribbed and has red-brown hairs on the outside. *L. gilvum* is similar to *L. carronii* except that the hair on the calyx is yellowish and has a narrower pod 1-2.5 cm wide.

The objective here is to provide some assistance with the identification of species of *Lysiphyllum* and to request readers to forward notes on their observations or experiences in the horticultural application of these interesting trees. Please include in your observations other genera in the plant family caesalpinaceae and in particular the northern species of *Cassia*, *Piliostigma malabaricum* (previously *Bauhinia* but now the only species found in Australia in this revised genus), *Cynometra iripa*, *Mesoneuron brachycarpum*, *M. robustum* and *M. schortechinii*, *Intsia bijuga* and the beautiful tree *Barklya syringifolia*. In this "Year Of The Tree" we should be giving special attention to our magnificent northern trees.

Platylobium formosum (Upright form)

Photography by C. L. Wheeler

A close-up of the flower and leaf is shown in colour on page 53 of issue 86 and page 96 of issue 87 where all species of *Platylobium* are described. Of special interest is the upright form of this normally trailing plant and an indication of the size of the plant.

Wildflowers

Wildflower Gardening—1

by W. H. Payne



Most wildflowers will grow
in good garden conditions.

Many statements by competent observers point this way. Refer to the article by Bill Molyneux on page 239 and the editorial. Most writers take the easy way and copy each other with the statement that wildflowers require a well drained, sandy, slightly acid soil. Bill goes a little further and says "a deep friable but acid soil". He describes how to pep up a quality loam with humus and fertilizer. Is not this what the "old English" gardener achieves with his good garden soil for all sorts of exotics remote from their natural habitat?

An experienced scientist, Professor R. L. Specht, in his article, "Conditions for Cultivation of Australian Plants", Australian Plants, Vol. 9, page 312, notes that heathland plants are broadly in two categories, the "pioneer" species (the plants we especially want to grow) and the "long-lived" species (ideal for shrubs). The pioneer species flourish in the fertile conditions following a fire and without the competition for sun by large shrubs and trees. The long-lived heath plants are "deprived of nutrient by their pioneer neighbours inter mixed with them. If for some reason they are placed in a soil of higher fertility, a number of things could happen:

"(i) The seedlings tend to be very sensitive to the higher nutrient level — "osmotic-burning" of the roots may occur; nutrient-imbalance (more phosphate, too little nitrate, or vice-versa) may result; root-rotting fungi, stimulated by the increased fertility, may invade the roots; the seedlings may become more frost sensitive.

"(ii) If the seedling survives all these hazards, most respond by growing more rapidly than usual. Herein lies another danger — the tender young shoots, which may in many cases appear through the summer, are sensitive to the harsh rays of the sun during this season. The young leaves tend to lose water faster than the roots can extract it from the soil. The problem is often exacerbated by the invasion of root fungi (encouraged by the higher nutrient level) which block the passage of water into the plant. Quite suddenly the plants die — almost overnight — with little or no warning. No matter what one does, the end result is inevitable.

"(iii) If the heath plant survives, it certainly grows bigger, brighter and better. It often produces a wealth of flowers, many more than its struggling, unfertilized brothers and sisters. But disaster is at hand — old age appears to catch up with the fertilized plant, many years before its unfertilized relatives."

I suggest you read the whole article but it illustrates:

1. Just as the old gardener periodically replants after proper soil restructuring, so people should realise that many wildflowers only give of their best over a period of 2-5 years. To maintain an attractive garden a replanting programme is necessary for 25% of the garden, every year. Alternatively, if you want a semipermanent garden of long lasting plants, do not push them along or expect spectacular flowering every year.

2. If you create vigorous underground conditions for the plants you also produce favourable conditions for growth organisms that feed off the plants and in some conditions kill them. The old gardener overcomes this by regularly replacing or rehabilitating the soil when he is replanting. Other ways are to create a balanced, healthy community below the soil as described by Dr. Alan Smith in "Microbial Interactions In Soil and Healthy Plant Growth", Australian Plants, Volume 9, page 203. Highly recommended is the series of booklets published by the CSIRO and described in "Soils — Their Care, Fertilization and Health" in Volume 10, page 79.

3. Plant Selection, Evolution!

Plants need to be suitable for the garden position, i.e. to size, climate, exposure, moisture, drainage, etc., but is this as restricted as it seems? I support the theory by my old bush mate, Sid Cadwell. Successive generations of plants propagated from plants established in an area, will be more tolerant of growing conditions in that area. Coupled with careful selection by experienced propagators and observers, who propagate only from the best and hardiest form, this theory of "evolution in reverse" will produce wildflowers adapted and hardy in horticulture. It will not necessarily mean that plants from the desert or dry country or the tropical north or from high elevations in the south, can be grown in temperate climates or artificial garden conditions. There are still problems such as day length that affect flowering that we have yet to learn about, but the above general observation applies. We need competent specialist nurserymen and active study groups.

4. Observe the conditions under which plants grow in the wild and try to emulate them. For too long we have been given this advice, usually from people who do not understand horticulture. Plants often grow in spite of their habitat. It is quite true that our flora has evolved over countless ages and generally has learnt to adapt to harsh low nutrient conditions. For this they have evolved special root systems, leaf surfaces and a dependence in many cases on other plant forms or tiny animals. Millions of years of evolution will not be negated by a few generations of selective breeding. Nor do we wish to change the rugged beauty of our wildflowers. However careful selection and propagation will produce plants that will be hardier over a wide range of conditions and more rewarding in some horticultural feature such as flowering, stature and general appearance.

5. Wildflowers as cultivars! A tragic development, a desecration, or "the way to go"? Certainly a disaster for the purist and the systematic botanist. A mixing of genes in the sphere of man's activities within nature's realm, is inevitable either accidentally or by intent. Like it or not, "pure" species will be fewer and fewer and it is a major objective to protect and treasure our legacy gene bank. For plants in cultivation a "pure" species is less likely to be maintained. On the other extreme, the deliberate hybridisation of species outside natural groupings will occur and the allocation of a cultivar name is essential. At least for some it gives a guide to the "sullied" whereas for others it is the gateway for a place in the most august range of the world's horticultural exotics. The use of cultivar names for selected forms of true species is an area of intense debate. How else can one reliably purchase the "goldfields" form of *Grevillea alpina* other than by a name such as *Grevillea alpina* 'Goldfields'. If it is not formally registered as such, some commercial interest could register it as *Grevillea* 'Supermarket Joes Surprise'. Registration as a cultivar of some species that is the product of breeding over generations as in paragraph 4, above, is the only assurance the purchaser has that what he wants is what he gets. The use of cultivar names in such cases appears essential for the future of the Australian Flora in horticulture.

One suspects it is the man made cultivar name that is repugnant to many. If a plant is a selection of a true species, we must have the full species name but spare us from some of the appendages. Provided a name conforms with the requirements of the International Code of Nomenclature of Cultivated Plants, the Australian Cultivar Registration Authority does not have power to insist on a more appropriate name within a certain limit. Hopefully the society will take action to restore some sanity to the situation. ■

Note: It may quite reasonably be said, "why does the editor have so much to say"? The subject that readers want to hear most of is "how to grow wildflowers". In efforts to get these reports I speak to many experienced growers and beginners. Most either consider that their ideas are not sufficiently based on experience or are just shy on writing. From the views expressed, especially from those who are most competent, I prepare these articles. Any article from readers on this subject would be appreciated.

—Editor.



Grevillea alpina △

Grevillea wilsonii ▽





***Grevillea banksii* 'Kingaroy Slippers'** (Above)

Photography by Murray Fagg

Grevillea banksii is a shrub to 2 m high that attracts a wide range of birds. This cultivar is a special form or possibly a mutation and is described on page 267.

***Grevillea alpina* 'Grampians Gold'** (Opposite top) Photography by Rodger Elliott

A selected form of *Grevillea alpina*, a small very showy species with many beautiful colour forms. The cultivar is described on page 267.

Grevillea wilsonii (Opposite bottom)

Photography by C. L. Wheeler

Grafting *Hakea*

by David Beardsell, David Jones* and Ray Kerr, Victorian Department of Agriculture, Horticultural Research Institute, Knoxfield, P.O. Box 174, Ferntree Gully, 3156.

Grafting as a method of propagation of Australian native plants has been carried out by a number of workers with mixed success (Wrigley and Fagg, 1979; Elliot and Jones, 1980). However, the only plants which are grafted commercially are *Tristania conferta* cv. Variegata and *Agonis flexuosa* cv. Variegata because they cannot be readily propagated from cuttings, weeping standards of *Grevillea x gaudi chaudi* using *Grevillea robusta* as a rootstock, and the nut producing species *Macadamia integrifolia* and *M. tetraphylla*.

Many species of plants from Western Australia are very difficult to grow in the eastern States, possibly due to sensitivity to the root pathogen *Phytophthora cinnamomi* or lack of adaptability to poorly drained and acidic soils. In a number of genera however there are hardy species native to the eastern States which could be used as rootstocks for these difficult species.

This work reports the successful adaptation of *Hakea bucculenta*, *H. francisiana* and *H. multilineata* to cultivation in heavy soils in southern Victoria by grafting onto *Hakea salicifolia*, a hardy species from N.S.W.

Materials and Methods

Young seedlings of *Hakea salicifolia* (syn. *H. saligna*) were potted into 13 cm pots and placed in a heated/cooled glasshouse in December 1975 and in December 1980, until they were actively growing with woody stems 4-8 mm in diameter (pencil thickness). In mid-January terminal shoots 6-10 cm long of *Hakea bucculenta*, *H. francisiana* and *H. multilineata* were taken from both young seedlings in pots grown under hard conditions outside and garden grown plants in mid-January when dormant buds were just beginning to swell prior to the onset of a period of active growth (Figure 1a).

The grafts used were simple wedge (clef) grafts, and as the scion wood was generally narrower than the rootstocks the cambial areas (region of cell division directly under the bark) of rootstock and scion were carefully matched on one side only (Figure 1d). The grafts were tied (Figure 1e) and the scion and top of the rootstock covered with a loose fitting polythene bag (Figure 1f). The bags were left over the grafted plants for 10-14 days to help prevent drying out of the scions before union took place. If the bags were left on longer than this buds were damaged by fungal infection. Although all leaves were removed from the scion wood in order to reduce water loss, a number of leaves *must* be left on the rootstock otherwise callus formation and graft union will not readily take place. Grafted plants were left in the glasshouse until the buds in the scions had produced several fully expanded leaves, approximately eight weeks after grafting. The grafted plants were then placed into a shade house for ten days of hardening off, after which they were placed into the open nursery area and the grafting tape was removed.

Using this method the percentage of successful grafts is above 80 per cent, with most failures occurring in the first two weeks after grafting.

Results and Discussion

It should be noted that although the percentage of successful grafts of the above three *Hakea* spp. when grafted onto *Hakea sauveolens* is also high initially, all grafts of this combination died within six months due to failure of the graft union presumably from incompatibility. Six years after grafting there have been no signs of incompatibility when using *H. salicifolia* as a rootstock. Figure 2 shows the healthy strong graft union of *H. salicifolia*/*H. francisiana* after six years of growth.

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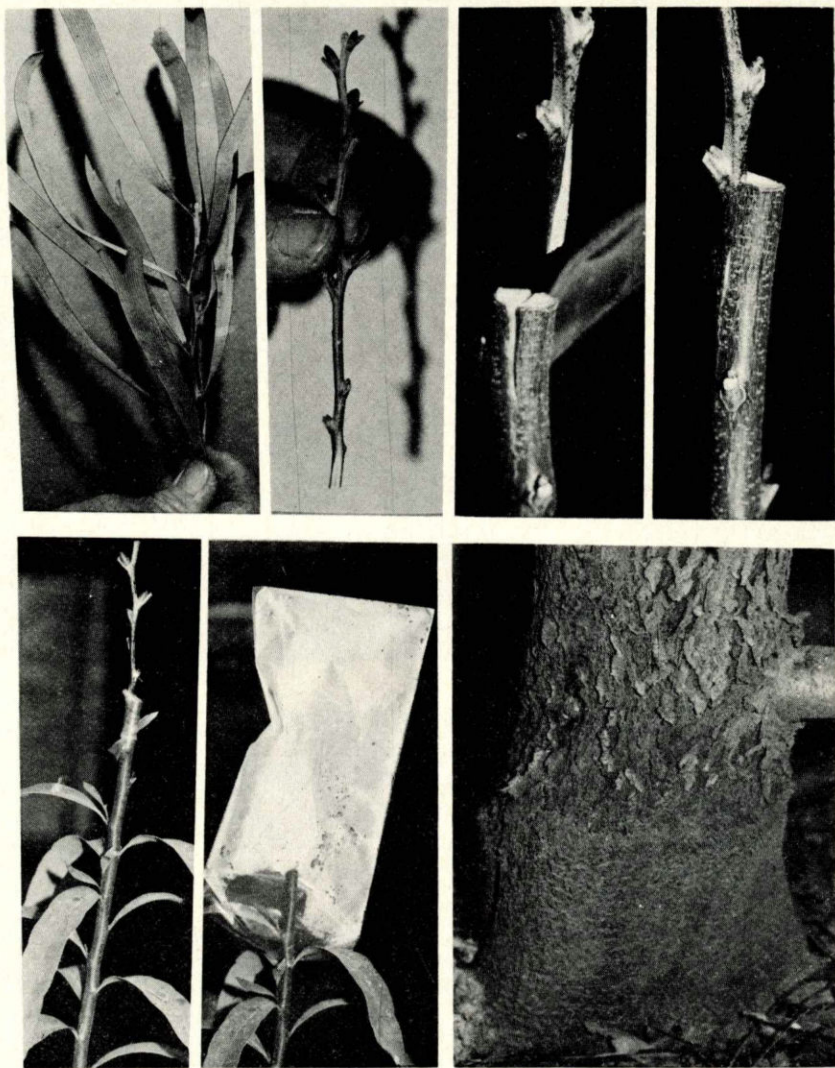


Fig. 1a. A terminal shoot of *Hakea francisiana* before the leaves are trimmed off. Note the swollen vegetative buds just prior to a growth flush.

Fig. 1b. The terminal shoot prepared as a scion for grafting.

Fig. 1c. Insertion of the prepared scion into the rootstock. The lower end of the scion is shaped into a wedge using a very sharp grafting knife. The rootstock which has only had the top few leaves removed is cleanly severed and a cut equal in length to the sides of the wedge on the scion is prepared.

Fig. 1d. The scion is inserted at a slight angle to ensure good cambial contact in at least one place on one side.

Fig. 1e. The scion tied with grafting tape. Note the presence of leaves on the rootstock.

Fig. 1f. The polythene bag loosely draped over the scion and top of the rootstock.

Fig. 2. The graft union of *H. francisiana* and *H. salicifolia* after six years of healthy growth.

Continued on page 250



Chamaexeros serra △

Grevillea miquelliana ▽





***Hakea francisiana* grafted onto *H. salicifolia* (Above)**

The group of *Hakea* species, *H. bucculenta*, *H. francisiana* and *H. multilineata* have spectacular flower heads to 10 cm or more long. They have been illustrated in colour in our previous issues and readers are referred to our number 59 issue of Volume 7 for descriptions and illustrations of these beautiful shrubs. The article on page 246 describes trials following grafting of these sometimes difficult western plants onto *Hakea salicifolia*, a hardy species of N.S.W. The above photograph shows that the resulting plant grows and flowers prolifically, forming a very attractive bush.

***Chamaexeros serra* (Opposite top)**

Photography by J. Simmons

An erect tufted plant to 10 cm tall forming clumps to 20 cm diameter. All species of *Chamaexeros* are described on page 276.

CHAMAEXEROS (cam-ee-ZEER-OS) Bentham 1878 (Xanthorrhoeaceae). Gk chamai, on the ground, dwarf; xeros, dry; a low-growing herb of arid habitat. W.3, Aust. 3 endemic spp. from SW, WA.....

The above is reprinted from "Australian Plant Genera", by J. A. Baines. You will note that one purpose of this unique book is to give the accepted pronunciation of the often difficult scientific names of plants. For every genus of flowering plants of Australia's huge flora the origin of the genus, the number of species and except for large genera, all the species names are given as an authoritative reference to the correct spelling. Order your copy from the Editor, Australian Plants, 860 Henry Lawson Drive, Picnic Point, 2213, and send \$9.90 plus \$1.40 postage.

***Grevillea miquelliana* (Opposite bottom)**

Photography by C. L. Wheeler

A large attractive spreading bush with oval leaves and clusters of drooping brick red blooms as shown. The plant is hardy and fast growing, needing little attention on heavy soil such as found in Melbourne. Being an alpine plant it prefers a cool site.

The growth of grafted *H. bucculenta* on *H. salicifolia* is very vigorous, resulting in a dense attractive bush. Unfortunately it has taken six years for grafted *H. bucculenta* to flower. This may be because of the extreme vigour or it may be simply the result of juvenility as young seedlings were used as scions in the initial grafted plants. Flowering will probably increase in the future, while in the meantime grafted plants of *H. bucculenta* can be admired for their foliage and form alone. In order to increase flowering, scion wood should be taken from plants which have flowered.

In contrast, grafted *Hakea francisiana* flowers prolifically while still growing vigorously, forming a very attractive bush (See the photograph on page 249). The growth has varied where different plants were used as sources of scion wood, however, one plant which has compact growth and produces many dark pink flowers has been selected as the source of future scion wood.

Hakea multilineata when grafted onto *H. salicifolia* has an open, upright growth habit and is not as attractive as *H. francisiana*, but still forms a neat, slender tree.

Conclusion

The three species *Hakea bucculenta*, *H. francisiana* and *H. multilineata* which are difficult to grow in the eastern states can be successfully grown by grafting onto *H. salicifolia*. The results are good enough to encourage nurserymen to carry out grafting of these *Hakea* spp. on a commercial basis.

ACKNOWLEDGEMENT: We would like to thank W. Thompson for critically reviewing this work.

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Vegetative Propagation of *Tristania laurina* R.Br.

by David Beardsell, Department of Agriculture, Horticultural Research Institute, Knoxfield,
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Tristania laurina, because of its ornamental appearance and relatively slow growth rate, is commonly planted in eastern Australia. It is propagated from seed which is difficult to collect because it is shed annually over a short period in July and August. This, combined with the short viability period of the seed (less than 12 months if stored air dry at 20°C; Beardsell, unpub.), means that vegetative propagation of this species is desirable. This would also allow for the propagation of cultivars such as variegated leaved forms. This paper describes propagation of *T. laurina* by cuttings and grafting. This is the first report of easy vegetative propagation in this genus.

Materials and Methods

Twenty terminal shoots approximately 12 cm long were taken from two specimens each of 5 and 50 year old trees of both *T. laurina* and *T. conferta* on 26/7/80. The lower leaves were removed and the cuttings were dipped in either 0.1% IBA in talc or 0.3% IBA in talc (Seradix No. 2). Five cuttings were then placed in 13 cm pots containing a mixture of 2 parts coarse sand and 1 part peat moss. Each treatment was replicated twice and the pots were placed in a misting bed with bottom heat (23°C) inside a heated and cooled glasshouse. The misting was applied for 5 seconds every 10 minutes.

The cuttings were removed from the pots after 66 days and the percentage with roots, percentage unrooted and percentage of dead cuttings was recorded.

Results and Discussion

Table 1 shows that cuttings of *T. laurina* can be readily rooted in a heated propagating bed using intermittent misting. In contrast, cuttings of *T. conferta* do not form roots under the same conditions. Although the cuttings may have been harvested prematurely, preventing higher rooting percentages, this experiment shows that an acceptable rooting percentage of *T. laurina* can be obtained with a minimum of difficulty. The root systems formed in all cases were vigorous and highly branched.

TABLE 1

The percentage of rooted cuttings obtained after 66 days in a mist propagating unit of material taken from five and fifty year old trees of both *Tristania laurina* and *T. conferta*.

Species	Age	% IBA	% Rooted	% Unrooted	% Dead
<i>T. laurina</i>	5y	0.1	70	10	20
<i>T. laurina</i>	5y	0.3	60	0	40
<i>T. conferta</i>	5y	0.1	0	60	40
<i>T. conferta</i>	5y	0.3	0	70	30
<i>T. laurina</i>	50y	0.1	60	40	0
<i>T. laurina</i>	50y	0.3	60	20	20
<i>T. conferta</i>	50y	0.1	0	70	30
<i>T. conferta</i>	50y	0.3	0	90	10

Fig. 1. Harvested cuttings of 50 year old trees of *T. laurina* (left) and *T. conferta*. Note the fruits on each species and the vigorous root system formed on *T. laurina*.

Fig. 2. A young grafted plant of a weeping form of *T. laurina*, 12 months after grafting.

The ease of rooting in *T. laurina* cuttings contrasts with the lack of rooting of cuttings of *T. conferta* and most *Eucalyptus* spp. Unlike the juvenility-related rooting potential in cuttings of *Eucalyptus grandis* (Paton et al.; 1970, 1981) the rooting potential of cuttings of *T. laurina* is independent of tree age, cuttings taken from 50 year old specimens in the Royal Botanic Gardens, Melbourne, rooting as readily as those from young trees (Table 1).

The above trial was also carried out with the intermittent misting replaced by a single daily watering, and all cuttings died from dehydration before rooting could take place. Thus vegetative propagation of *T. laurina* by cuttings does require intermittent misting.

A weeping form of *T. laurina* was vegetatively propagated by using a wedge or cleft graft onto a *T. laurina* seedling. The method used was essentially the same as that reported for *Hakea* spp. (Beardsell et al., 1982). Although more work needs to be carried out on grafting of *T. laurina*, the speed of formation of a strong union indicates that the grafting of this species might be easier than grafting of *T. conferta*.

This paper shows that *Tristania laurina* can be readily propagated either by cuttings in misting beds or by grafting. Superior selections should be commercially propagated in this manner.

ACKNOWLEDGEMENT: I would like to thank Dr. D. M. Churchill and Dr. P. Lumley of the Royal Botanic Gardens, Melbourne, for enabling collection of cuttings from *Tristania laurina* trees in the Royal Botanic Gardens.

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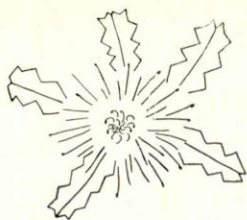
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***Prostanthera ovalifolia*, 'Variegated'** (Above)

Photography by C. L. Wheeler

Always a splendid long-living bountiful flowering plant, this mint bush has the added bonus of having variegated leaves. Mint bushes are excellent shrubs for the garden and you must have a copy of George Althofer's book 'Cradle Of Incense' where he describes and illustrates all species of Australian mint bush. Available from the Editor for \$15.00 plus \$1.00 postage.



Banksia

by R. K. Ellyard, S. Hughes and P. Buckley,
National Botanic Gardens, Canberra, A.C.T.

The Cultivation of Western Australian *Banksia* and the role of lime

Banksia species native to Western Australia have performed poorly when planted out into the National Botanic Gardens. The majority of plants die within twelve months. Webb (1977) advocated the application of large amounts of lime to local soils in order to grow these species. His recommendations have been based on pot trials, trials in his own garden and on observations at the site of successfully established plants. Many of these plants were growing close to brick walls in alkaline soils containing builders' rubble, mortar, etc., or near concrete fence posts. These observations suggest that high calcium and/or pH values are involved.

In their natural environment however, Western Australian *Banksia* are to be found growing on infertile soils, with deep slightly acid sands being the favoured environment for many species. For example, in the Perth region the highest concentration of the family Proteaceae is to be found on the Bassendean Dune System; a system of low hills to 60 metres and poorly draining swales, broadest north of Perth but usually 8 to 10 km wide; composed of grey quartz sands low in calcium, iron and most minerals (Seddon 1972). Lamont (1972) measured an 'available' calcium level for Bassendean sand of 0.8 ppm. Seddon (1972) states that he has recorded up to thirty five different Proteaceae species within an area of a few hundred square yards in the *Banksia*-*Casuarina* low open forest common on this dune system. Eight *Banksia* species are to be found in this central sector of the Swan Coastal Plain: *B. attenuata*, *B. grandis*, *B. menziesii*, *B. loricata*, *B. ilicifolia*, *B. littoralis*, *B. prionotes* and *B. sphaerocarpa*.

Lamont (1972) determined the available calcium level of Kings Park sand to be 40.8 ppm, very close to that of Black Mountain soil used in this experiment. A wide range of *Banksia* species unable to be grown in the National Botanic Gardens can be successfully grown at Kings Park. The Kings Park sand is representative of the deeply leached Karrakatta sands (Seddon 1972) which constitute the eastern part of the Spearwood Dune system; a system to the west of the Bassendean Dune system. The coastal dune system, the Quindalup Dune system, which is highly calcareous, is conspicuous for the absence of Proteaceae species.

Observation by Hocking (1977) of the distribution of *Banksia* species in the Jurien Bay area north of Perth showed the genus to be restricted to acid sands. Alkaline sites in the same region were devoid of Proteaceae. The data presented by Holliday and Watton (1975) also suggests the majority of species prefer a slightly acid well drained sand. Many species however, are tolerant of alkaline conditions (Seddon 1972, Webb 1977, Gotham and Butler 1977, Holliday and Watton 1975).

The problem is to reconcile the preference of many WA *Banksia* species for acid sands in their natural environment with the observation of Webb (1977) and Gotham and Butler (1977) that in heavier soils an alkaline condition is preferable to an acid one.

Webb (1977) suggests that although in their natural environment the plant may be growing in acid sand they have access to limestone at depth and that for healthy growth many WA *Banksia* species require high calcium levels in at least part of the root zone.

Over the last few years experimental work has been undertaken at the National Botanic Gardens to elucidate the role of calcium in the cultivation of Western Australian *Banksia* species.

EXPERIMENT 1.

The effect of high calcium and high calcium/high pH on plant growth was investigated by the addition of gypsum or lime to the sand peat growing medium.

Five *Banksia* species were employed. *B. ericifolia*, an eastern species, is widely distributed in the sandy coastal regions of N.S.W. *B. spinulosa* is native to Victoria, N.S.W. and Queensland and is found throughout the eastern coastal areas and the Great Dividing Range on a range of soils. Both these species grow well in the National Botanic Gardens. *B. baueri* is from the south coast Western Australia where it grows in deep white or yellow sand or occasionally rocky sand. *B. grandis*, from the south west of Western Australia, occurs mainly as an understorey tree in Eucalypt forest in both lateritic gravelly soils of the Darling Range and wet sandy soils of the Jarrah and Karri forests. *B. occidentalis* from the south coast of Western Australia is practically always found growing in swampy peaty sands. The latter three species have generally performed poorly in the National Botanic Gardens.

Seed of all five species was sown in March 1978 in sand perlite (1:1) and pricked into 60 mm tubes in May 1978. A potting mix of 75% sand, 25% peat moss containing 1186 g of blood and bone, 1186 g of lime, 370 g of dolomite, 74 g of potassium nitrate, 74 g of potassium sulphate and 111 g of essimal/m³ was used.

On 24/10/78 the plants in 60 mm tubes were potted into 140 mm slim-line pots. Three mixes were employed:-

- (1) Soilless potting mix as outlined above
- (2) Soilless potting mix + 17.6 kg lime/m³
- (3) Soilless potting mix + 17.6 kg gypsum/m³

These levels of lime and gypsum meant that approximately 30 grams were added per 140 mm pot. Five plants of each species were potted into each mix.

All pots were labelled, numbered and randomised in a single block under 52% shade cloth. Pots were rerandomised at regular intervals and each plant was given 100 ml of 0.1% iron chelates monthly.

In May 1979 all plants were harvested and the dry weight of the shoot and root portions of each plant determined.

At the completion of the experiment a sample of each mix was oven dried and 10 g extracted with distilled water (50 ml) or 1N ammonium chloride (50 ml) to determine the water soluble and available calcium levels. Analysis was undertaken on an atomic absorption spectrophotometer.

Results of Experiment 1 —

pH determinations on the three mixes indicated that the addition of lime increased the pH by approximately 2.0 units while gypsum decreased the pH slightly (Table 1). The pH values did not change significantly from the beginning to the end of the experiment.

Table 1 — Mix	pH at Beginning	pH at End of exp.
1. Control	5.9	6.1
2. Lime	7.6	8.0
3. Gypsum	5.7	5.5

pH values were determined using a glass electrode on a 1:5 (V/V) soil: distilled water sample.

The highest water soluble calcium levels were present in mixes containing gypsum; levels 2-3 times that in mixes containing lime, which in turn were a power of ten higher than the water soluble calcium levels in the control mixes (Table 2). High 'available' calcium levels were present in all mixes.

Table 2 — Mix	Water soluble Calcium (ppm)	'Available' Calcium (ppm)
1. Control	17.9	500
2. Lime	165	1500
3. Gypsum	472	938

All five species used in the experiment remained healthy and grew well under all three treatments suggesting that *Banksia* species can tolerate a wide pH range and high calcium levels.

With all five species the addition of lime failed to stimulate plant growth. In actual fact its addition significantly depressed growth in the case of *B. ericifolia*, *B. baueri* and *B. occidentalis*; particularly shoot growth. (Table 3). Even when significant differences in dry weights were present they were, in percentage term, small. *B. grandis* was the only species to show a significant growth response to the addition of gypsum, although a similar, but non significant, trend was observed with *B. baueri* (Table 3). With *B. grandis* the increase in total plant dry weight, however, was only 16.8%. It would appear, therefore that the level of calcium present in the control mix is sufficient for good plant growth.

TABLE 3 — EFFECT OF LIME AND GYPSUM ON SHOOT, ROOT AND TOTAL DRY WEIGHT OF FIVE BANKSIA SPECIES

TISSUE	Control	TREATMENT Lime	Gypsum	LSD
<i>Banksia spinulosa</i>				
Shoot	5.63	4.13	5.03	NS
Root	1.35	1.15	1.23	NS
Total	6.98	5.28	6.26	NS
<i>Banksia ericifolia</i>				
Shoot	7.21 ^a	4.79 ^b	6.61 ^a	1.37
Root	1.42	1.20	1.34	NS
Total	8.63 ^x	5.99 ^y	7.95 ^x	1.63
<i>Banksia occidentalis</i>				
Shoot	7.43 ^d	6.25 ^e	6.71 ^{de}	0.93
Root	1.69	1.61	1.81	NS
Total	9.12 ^w	7.86 ^v	8.52 ^{wv}	1.20
<i>Banksia baueri</i>				
Shoot	9.07 ^g	7.69 ^h	9.67 ^g	0.85
Root	1.12 ^{tu}	1.08 ^u	1.27 ^t	0.17
Total	10.19 ^j	8.77 ^k	10.94 ^j	0.94
<i>Banksia grandis</i>				
Shoot	11.63 ^{lm}	10.79 ^m	13.38 ^l	1.81
Root	1.81 ^r	2.09 ^r	2.32 ^s	0.35
Total	13.44 ^o	12.88 ^o	15.70 ⁿ	2.06

Each value is the mean of five replicates. Values identified by the same letter are not significantly different at the 5% level.

EXPERIMENT 2.

The effect of lime, gypsum and limestone chips on the growth of four *Banksia* species in Black Mountain soil was investigated.

Seed of *B. baxteri*, *B. baueri*, *B. nutans* and *B. prionotes* were germinated in sand perlite and pricked out at the first leaf stage into 60 mm planting tubes containing the soilless potting mix used in experiment 1. The plants were potted up in November 1977, into 140 mm pots using the same soilless mix.

On 2/5/78 the plants were potted into 250 mm pots using sieved Black Mountain soil. As much of the soilless potting medium as possible was removed from the roots prior to potting into the Black Mountain soil, which was not sterilized. Four mixes were used:—

1. Control — Black Mountain soil.
2. High calcium, high pH — Black Mountain soil and 250 g lime/250 mm pot.
3. High calcium — Black Mountain soil and 250 g gypsum/250 mm pot.
4. Slow release calcium — Black Mountain soil and 1 litre limestone chips/250 mm pot.

The additives were mixed evenly into the Black Mountain soil. The number of replicates employed for each treatment is given in Table 5. All pots were mulched with hardwood chips and treated with Terrazole[®] (50 ml/100 litres water, 500 ml/pot) on 3/5/78, 30/8/78 and 9/12/78. On the 1/3/79 samples of each mix were collected for pH, calcium, aluminium and manganese determination.

Results of Experiment 2 —

The addition of gypsum decreased the pH slightly while both lime and limestone increased the pH by in excess of 2 units. (Table 5). The water soluble and 'available' calcium levels in Black Mountain soil are low (Table 4). The addition of gypsum had the greatest effect on water soluble calcium levels with lime and limestone having similar effects. The gypsum, lime and limestone treated soils all had very high available calcium levels.

The water soluble aluminium levels in all mixes was low. The available aluminium level was reduced to approximately one third in the gypsum treatment and reduced below a measurable level by the lime and limestone treatments. The water soluble manganese level was low on all but the gypsum treated soil.

TABLE 4 — Cation analysis¹ of Black Mountain soil following Gypsum, Limestone and Lime treatments.

SOIL TREATMENT	CALCIUM (ppm)		ALUMINIUM (ppm)		MANGANESE
	Water Soluble	Available	Water Soluble	Available	Water Soluble
Control	15	47	< 1	68.2	0.06
Gypsum	2329	6709	< 1	24.9	4.8
Limestone	134	2253	< 1	< 1	0.08
Lime	174	2556	< 1	< 1	0.02

¹ 10 g samples of oven dry mix were extracted with 50 ml of distilled water or 50 ml of 1N ammonium chloride to determine the soluble and available cation levels respectively. The cation concentration was determined using an atomic absorption spectrophotometer.

Data on the survival rate of plants in the four soil mixes is presented in Table 5. Two *B. baueri* plants, one control and one limestone treated plant, died prior to the final Terrazole treatment. A further plant death, a *B. baxteri* control, occurred in December. An analysis of the roots of this latter plant indicated the presence of *Phytophthora cinnamomi*. All subsequent plants to die showed similar *P. cinnamomi* symptoms. The results clearly show a greater survival rate among lime and limestone treated plants.

After 12 months in Black Mountain soil only one control plant remained alive. Prior to the appearance of the *P. cinnamomi* symptoms however, the control plants appeared as healthy and as vigorous as the lime and limestone treated plants. The plants of *B. baueri* and *B. prionotes* growing in the gypsum mix displayed a browning and death of older leaves suggestive of a toxicity. Soil analysis showed this mix to have a high soluble manganese level.

TABLE 5 — Effect of gypsum, limestone and lime treatments on the survival in Black Mountain soil of four West Australian *Banksia* species.

SPECIES	Control pH 5.3	Gypsum pH 4.8	Limestone pH 7.4	Lime pH 7.9
<i>B. baueri</i>	0*	24/11/78**	1	9/4/79
2 replicates		2/2/79	1	24/11/78
<i>B. nutans</i>	0	14/2/79	3	
3 replicates		27/2/79		3
<i>B. prionotes</i>	1	2/2/79	2	12/9/79
3 replicates		27/2/79	2	27/2/79
<i>B. baxteri</i>	0	23/12/78	3	
3 replicates		8/1/79		3
		10/1/79		

* Number of plants surviving at 2/5/79 — ** Date plant death recorded.

EXPERIMENT 3.

The growth of *B. grandis* in three soil mixes, was investigated with the aim of comparing the effect of good drainage versus lime on plant growth. Three soil mixes used were:-

1. Sieved, unsterilized Black Mountain soil to which 1000 g Osmocote (low phosphate, 8-9 month), 300 g dolomite, 100 g fritted trace elements and 250 g GU49 (slow release iron) were added/m².
2. As for mix 1 plus 15 kg lime/m²/approx. 28 g/140 mm pot.
3. Mix 1 : washed river sand 1 : 3.

Terrazole was added to each mix at the rate of 90 g/m².

Plants of *B. grandis* were potted from 60 mm tubes into 140 mm pots of the three mixes on 6/2/79. The limited number of plants available permitted only 4 replicates of each treatment.

On 12/11/79 all plants were potted up into 250 mm of the same mixes except that terrazole was not included. Immediately following potting all plants were watered with terrazole (0.1%, 500 ml/pot). The plants were further treated with terrazole in January, February and March 1980.

31/6/80 all surviving plants were potted on into 320 mm pots employing the same mixes, the mixes contained no terrazole and were not watered with a terrazole solution. Throughout the experiment all plants were treated regularly with iron chelates (0.1%).

Results of Experiment 3 —

Data on the number of plants surviving in each mix is presented in Table 6.

TABLE 6 — Survival of *B. grandis* plants in three different soil mixes.

SOIL MIX	No. plants at start	No. plants surviving	
		14/1/81	14/1/82
Black Mountain Soil	4	0	0
Black Mountain Soil + Lime	4	4	3
Sand : soil 3 : 1	4	3	0

Only one plant death, that of a control plant, occurred while the plants were receiving regular terrazole treatment. The symptoms, however, were that of death due to *P. cinnamomi* infection. The other deaths occurred following potting on into 320 mm pots and after terrazole treatment had ceased. These plants also displayed classic *P. cinnamomi* infection symptoms, loss of turgidity in shoot tips, rapid browning of all leaves and death in 2-3 days. Until the time the *P. cinnamomi* symptoms appeared, however, all plants grew vigorously and were of healthy appearance.

DISCUSSION

The failure to show a stimulatory effect of lime with any of the five species in experiment 1 suggest that there is no requirement for high calcium levels per se for the healthy growth and to prevent the development of calcium deficiency as proposed by Webb (1977). *B. baueri*, in fact, has been grown successfully in sand peat (pH 4.8) with no base fertilizers and with very limited liquid fertilizing; two applications in twelve months (unpublished data). In experiment 3, *B. grandis* also grew vigorously and remained healthy in a soil: sand (1:3) mix under low calcium status.

The results in all three experiments indicate that provided *P. cinnamomi* is controlled, either by using a sterilized mix (experiment 1) or by use of a fungistatic (experiment 2 & 3) the presence of high lime levels is unnecessary. In actual fact the plants used in these experiments grew better in the control (no lime) treatments. The results obtained once terrazole treatment ceased, however, suggest that the primary mode of action of high lime levels in Black Mountain soil is via a control of *P. cinnamomi*, a conclusion already hinted at by Webb (1977) when he stated that 'At Mt. Gambier, on limestone, excellent growth is achieved, and what I believe to be significant — one of the few areas where Phytophthora has not been recorded'.

If calcium is the main factor controlling the *P. cinnamomi* then it might be expected that gypsum would be as effective as lime. Webb (1977) found gypsum to be ineffective. The results obtained in experiment 2 are inconclusive in this respect. A number of studies, (Boughton *et al* 1978, Halsall 1980, Kincaid *et al* 1970, Bingham and Zentmyer 1954) however, suggest that pH may be the major factor. The response to gypsum is undoubtedly complicated by the effect of this compound in increasing the levels of soluble manganese. The leaf symptoms observed with *B. baueri* and *B. prionotes* in experiment 2 may be due to manganese toxicity.

In Canberra, high soil calcium levels may also contribute to the survival of *Banksia* species by increasing frost resistance. Webb (1979) has recently demonstrated higher frost resistance with *Ficus rubiginosa* with plants grown in limed Black Mountain soil than in untreated soil; concluding that calcium was responsible. In the present study the plants were grown under 52% shade cloth and were not subjected to heavy frosts.

Many factors are undoubtedly involved in the failure of Western Australian *Banksia* species to perform well in Canberra including poor drainage, the presence of *P. cinnamomi*, the severity of winter, the chemical properties of the soil, etc. The heavy liming of soil, especially if slow release forms such as limestone chips, concrete rubble, etc., are used, together with the choice of a protected north facing site overcome many of these factors.

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Planting a Native Garden

Pine Rivers Branch of SGAP

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The above has been reprinted from the introduction to a series of small books now in two volumes, compiled and produced by a local branch of SGAP from the northern fringe of Brisbane. It is clear from these little books that the members of this group are keen gardeners of Australian wildflowers and, although they have produced these books for residents of their area, it could equally apply to coastal, sub-tropical areas from Rockhampton south to Coffs Harbour.

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This group is undoubtedly an example to all other groups. You may obtain copies of the above books by mail from Mrs. Jan Sked, "East Sunrise", Corner Myles and Galvin Streets, Lawnton, Queensland, 4501. "Planting A Native Garden" is available for \$3.00 each volume plus 80c postage and "The Flora Of The Pine Rivers Valley" for \$1.50 plus 60c postage. What you cannot buy is the companionship and helpful advice you will receive by attending a meeting or an outing of this obviously active group of people. I shall again quote from the introduction:

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The Potting Mix

The Control of *Phytophthora* In the Nursery

A summary of reports, published in Australasian Plant Pathology, Vol. 10, No. 2, June, 1981, by K. Sivasithamparam, Dept. of Agriculture, Western Australia.

The use of composted hardwood bark in potting mixes has been reported to reduce considerably root rots caused by *Phytophthora* and *Pythium* spp. These root rots are encountered due to poor hygiene methods and especially where peat is used as the major component of potting mixes. The initial test was done to see the effect of cold water extracts of barks and sawdusts on cultures of the fungus, *Phytophthora cinnamomi*. Table 1 lists the materials screened. All barks except the two from *Pinus* spp. were composted for 6 weeks with urea at 1.7 kg/m³ of bark in a metal tumbler-composter and periodically watered by hand. The *Pinus* barks were composted by allowing aging in wet heaps without nitrogen amendment.

TABLE 1

Effect of cold water extracts of various tree bark and sawdust materials on the production of sporangia (spore bearing sacs) (total per microscopic field), the percentage of sporangia releasing zoospores (swarmer-spores) and the survival of zoospores of *Phytophthora cinnamomi*.

e = the immediate transformation of the swarmer spore into immobile form.
a = above effect only with one of the culture (P.c. 43) tested.
s = sluggish movement.
l = death of the swarmer spore.
+ = positive.
* = culture no. of *P. cinnamomi*.
- = not tested.

Medium	pH	Total sporangia/field			% Released			Zoospore (P.c. 31) motility at				Germination
		*Pc31	*Pc32	Pc43	*Pc31	*Pc32	*Pc43	5 mts	1h	2h	5h	
Mineral soln.	4.9	35	49	8	63	89	27	+	+	+	+	+
Peat	4.5	49	30	5	1	54	51	+	+	+	+	+
Fresh <i>Pinus pinaster</i> bark	4.3	8	-	-	35	-	-	+	s	0	0	Rare
BARK - composted												
<i>P. radiata</i>	7.3	103	60	10	82	77	32	+	+	+ ^s	+ ^s	+
<i>P. pinaster</i>	7.3	151	78	10	77	95	33	+	+	+	+	+
Marri (<i>Eucalyptus calophylla</i>)	7.1	0	1	0	0	0	0	+ ^a	0 ^l	0	0	Rare
Wandoo (<i>E. wandoo</i>)	4.2	0	0	0	0	0	0	0 ^l	0	0	0	Rare
Karri (<i>E. diversicolor</i>)	7.4	1	53	0	1	49	0	+ ^a	+	+	+	+
Jarra (<i>E. marginata</i>)	7.2	16	50	4	24	58	1	+	+	+	+	+
Marri + Karri	7.2	56	48	3	47	99	1	+	+ ^s	0	0	+
SAWDUST - fresh												
Wandoo	4.7	0	0	0	0	0	0	0 ^{el}	0	0	0	0
Marri	7.1	0	0	0	0	0	0	0 ^{el}	0	0	0	0
Karri	7.2	0	0	0	0	0	0	+	0	0	0	+
Jarra	7.1	0	0	0	0	0	0	0 ^{el}	0	0	0	0

All three cultures tested produced more sporangia (sacs of spores) in extracts from composted *Pinus* barks than in any other medium including mineral solution. However, fresh pine bark which is known to be phytotoxic was less conducive to sporangial production, although not totally inhibitory.

Sporangial production was strongly inhibited by extracts from marri and wandoo barks and all sawdust material tested. Inhibition of sporangial production was not always associated with inhibition of the growth of the fungus.

The effect of extracts of wandoo bark and the three sawdusts was dramatic, the zoospores (swarmer -spores) swelling up to 3 times its size before collapsing. In general, all extracts inhibitory to sporangial production interfered with zoospore survival. The ability of the zoospore to germinate in various extracts, however, was not always correlated with their ability to swim in them.

It appears unlikely that the dramatic effects observed with sawdust and composted barks were directly related to the pH of the extracts (Table 1). Phenomena described above have been reported with hard wood barks in the United States. As results of the initial study indicated that barks and sawdust of certain Western Australian native trees may have potential as anti-*Phytophthora cinnamomi* components in potting mixtures in a state where many nurseries are exposed to the hazard of *P. cinnamomi* infestation, they were tested for their ability to reduce disease of susceptible plants in potting mixtures. This investigation was first done with lupin seedlings.

TABLE 2

An experiment using various potting mixes (50 per cent river sand and 50 per cent bark or sawdust) on mortality of lupin seedlings subsequent to inoculation with *P. cinnamomi* (Pc 43). Mean number of seedlings (3 replicate trays of 20 plants) alive.

	Material	pH of mix	Day 15 (Inoc.)	Day 15 (Contr. uninoc.)	Day 22 (Inoc.)
Jarrah (<i>Eucalyptus marginata</i>)	Sd†	4.9	5.1 A ^y	17.8 BCD	0.1 A
<i>Pinus radiata</i>	Cb††	5.6	5.5 A	15.1 ABC	2.6 ABC
<i>P. pinaster</i>	Cb	5.5	6.3 A	17.0 ABCD	3.6 BCD
Jarrah	Cb	6.1	6.8 A	14.1 A	2.1 ABC
Wandoo (<i>E. wandoo</i>)	Sd	5.6	7.0 A	16.1 ABCD	0.5 A
Karri (<i>E. diversicolor</i>)	Sd	5.9	7.8 AB	18.1 CD	5.0 CD
Peat		4.5	9.8 ABCD	19.0 D	1.0 AB
Marri (<i>E. calophylla</i>)	Sd	5.2	11.6 BCDE	18.0 CD	6.3 D
Karri	Cb	7.1	11.8 CDE	14.5 AB	10.1 E
Wandoo 25%	Cb	6.1	13.1 DE	17.8 BCD	11.8 E
Karri + Marri	Cb	6.8	13.1 DE	18.8 E	10.0 E
Wandoo	Cb	4.8	13.6 DE	18.1 D	12.0 E
Marri	Cb	6.4	16.1 E	17.1 ABCD	15.5 E

†Sd = Sawdust

††Cb = Composted bark

* = Wandoo bark 25% river sand 75%

y = Figures followed by the same letter are not significantly different from one another (Duncan's multiple range test, 5% level).

The results (Table 2) indicate that jarrah bark and sawdust bark of *Pinus* spp., sawdusts of karri and wandoo did not give the lupins protection from the disease. But as was evident at the rating on the 22nd day, karri, karri + marri, and marri barks gave significant protection. Although wandoo bark appeared to provide some control, it was not possible to reduce its phytotoxic effect on the seedlings even when the mixture was diluted to 25 per cent bark. Because of this effect it was omitted from further screening, as were the sawdusts which did not appear to have any disease suppression effect.

A second screening using *Banksia grandis* Willd. seedlings (kindly supplied by Dr. B. Shearer, Western Australian Department of Forestry, Dwellingup), was made with the three most promising bark treatments. From the results of this test (Table 3) it is possible to assume that potting mixes with peat or marri + karri are relatively better for growth of uninoculated seedlings than marri or karri alone. Although marri and karri barks caused significant reduction of disease in comparison to the other treatments, they failed to provide total protection to the roots. This may be due to the high level of susceptibility *Banksia* shows to the parasite.

TABLE 3

Effect of potting mixes with sawdust or composted barks and river sand (1:1 w/w) on the root rot caused by *P. cinnamomi* (PC 43), means of root rot ratings (0 = healthy to 5.0 = dead) of 42 day old *B. grandis* seedlings (grown in 10 replicate pots of 5 seedlings each) 21 days after inoculation. All barks tested were composted. Peat (with river sand) served as control.

Material in mix	Root rot rating ^y
Peat uninoculated	0.25 A
Marri + karri barks (composted) uninoculated	1.04 B
Karri bark (composted) uninoculated	1.79 C
Marri bark (composted) uninoculated	1.87 C
Marri bark (composted) inoculated	3.28 D
Karri bark (composted) inoculated	3.58 D
Marri + karri barks (composted) inoculated	4.58 E
Peat inoculated	4.94 E

y = Figures followed by the same letter are not significantly different from one another (Duncan's multiple range test, 5% level).

The effect the extracts had on the fungus was in general confirmed in the test with lupin and *Banksia*, with the exception of sawdusts. Although all the sawdust extracts inhibited the production of sporangia and reduced the survival of zoospores, sawdusts in potting mix failed to reduce lupin mortality. This is in agreement with the results obtained in the U.S. where sawdust from various sources was reported to be conducive to root rots. It is noteworthy that jarrah sawdust is commonly used by several nurserymen in the Perth area mainly because it is relatively cheap compared to other materials such as peat. Sawdusts in general are considered in the U.S. to be the least desirable component for use in potting mixes.

The marri and karri barks, although not the best medium for plant propagation, appears to hold some potential as an anti-*Phytophthora cinnamomi* component in potting mixes where hazard of contamination by this pathogen is high. ■

Flora Of Australia — Volume 1, Introduction

The enclosed brochure gives some details of the proposed series on the Flora Of Australia and how to purchase copies of Volume 1 by mail. The introductory volume will be of special interest to readers as following the first chapter headed "Background", which deals largely with the history of previous flora publications, are the following chapters:

The Australian Flora: Its Origin and Evolution

The theories of continental drift, climatic changes and flora migration are well presented with illustrations.

An Introduction To The System Of Classification

Used In The Flora Of Australia

This difficult subject is presented clearly describing in simple terms, the various systems in use and the reasons for selection of the conquest 1981 system.

Key To Families Of Flowering Plants

A very clear and, if the term can be used for an essentially botanical work, simple key to the families of plants that comprise our flora. Naturally we shall use this key for future works in Australian Plants presented in a form that will hopefully encourage the layman to a better understanding of plant nomenclature.

Glossary Of Botanical Terms

Authors will, in the future, be requested to confine their descriptions to use only terms in this glossary. Of special value are the sketches of leaf shapes, and the various configurations of the sexual parts of a flower.

Buy a copy and show your support for this very important venture.

\$15.00 post free from The Editor, 860 Henry Lawson Drive, Picnic Point, N.S.W. 2213.

Australian Plant Cultivars

An official release by the Australian Cultivar Registration Authority.

The Australian Cultivar Registration Authority has been established to formally register the names of plants derived from the Australian Flora, that are regarded as having significant horticultural value. The plants need not be hybrids but may be forms of naturally occurring species found by chance or developed by breeding. This will allow growers to acquire plants with the confidence that they will produce the special characteristics claimed. Not every plant registered can be recommended as the best for the feature claimed but market demand will ensure the eventual survival of the best plants. What other way can we assure the proper selection and survival of the best forms of our wildflowers?

Anigozanthos 'Mini Red'

Origin:

Anigozanthos 'Mini Red' is a seedling which arose spontaneously in the garden of Mr. Albert E. Brooks of Sandringham, Victoria, in the vicinity of *A. flavidus* (red form), *A. rufus* and *A. manglesii*. It is therefore impossible to establish its parentage accurately however there are strong affinities towards *A. flavidus*.

Description:

It is a perennial rosetted herb growing to a height of approximately 600 mm. The leaves are green, long and narrow being about 300 mm long and about 8 mm wide.

The flowers are produced in compact, branched terminal clusters. Individual flowers are red and about 35-40 mm in length.

Diagnosis:

This cultivar is different from other known forms of *Anigozanthos flavidus* in its small, compact habit and dense flower clusters.

Colour Coding:

Ovary and perianth: near red 45c; inner perianth: yellow-green 146C.

Reference Specimen:

Cultivar received by the Authority on 17th March, 1977. Accession No. 113. Applicant is Mr. A. E. Brooks.

Banksia 'Giant Candles'

Origin:

Banksia 'Giant Candles' is a spontaneous hybrid between *B. ericifolia* and *B. spinulosa* var. *spinulosa* that arose in cultivation.

Description:

The leaves of this cultivar are $\pm$ 4.5 cms long and are intermediate between the two parents, being whorled around the stem as in *B. ericifolia* and with the revolute margins of *B. spinulosa*. The leaves are not toothed.

The inflorescence of this cultivar is its most striking attribute. A single inflorescence can measure 38-40 cms long. When fresh the inflorescence resembles *B. ericifolia*. The individual flowers are a rich orange in colour and 2-2.6 cms long, as compared to the gold flowers with black styles of *B. spinulosa* var. *spinulosa*. In Brisbane the flowering period is from autumn through winter.

Diagnosis:

This cultivar is a hybrid between the Gosford form of *B. ericifolia* and a form of *B. spinulosa* var. *spinulosa*. Its hybrid nature was confirmed by herbaria in Queensland and Western Australia.

Colour Coding: R.H.S. Colour Chart — 1966.

Near orange group 28B.

Reference Specimen:

Accession No. 175. Cultivar received by the Authority on the 17th March, 1979. Applicant is Ms. Sylvia E. Peach of Hellawell Road, Sunnybank Hills, Queensland.

***Boronia mollis* 'Lorne Pride'**

Origin:

Boronia mollis 'Lorne Pride' is a form of *B. mollis* found at Lorne near Laurieton, N.S.W.

Description:

It is a dense rounded shrub growing to a height of about 2 m. The deep pink flowers are produced profusely in late winter and through into spring. Occasional flowers are produced throughout the rest of the year. The clusters of flowers are borne in the leaf axils.

Diagnosis:

Boronia mollis 'Lorne Pride' is distinct from other forms of *B. mollis* because of its rounded and compact, much branched habit.

Colour Coding:

Flowers, red-purple group 68A.

Reference Specimen:

Cultivar first received by the Authority on 21st October, 1977. Accession No. 146. Applicant is National Botanic Gardens.

This form of *Boronia mollis* has been described in 'Growing Native Plants', Vol. 6, p. 142.

***Boronia* 'Telopea Valley Star'**

Origin:

Boronia 'Telopea Valley Star' is said to be a hybrid between *B. mollis* and *B. fraseri* which was selected from a batch of seedlings grown from seed collected from cultivated plants. It was raised by Telopea Valley Nursery near Kulnura, N.S.W.

Description:

This cultivar grows to ± 1 metre tall by ± 60 centimetres wide. It is fast growing, has an erect habit, and has quite long distances (6-8 cms) between nodes. These long internodal distances can tend to make the shrub look sparse. The cultivar has round stems, and the newer growth has a covering of fine brown hairs. The leaves are pinnate and glabrous, with the leaflets being from ± 2.5 cms long by ± 0.7 cm wide. The terminal leaflet is longer, being from ± 3.5 cms long by ± 1 cm wide. The leaflets are oblong-elliptical to lanceolate in shape.

The flowers are borne in umbels of 3-6 flowers either terminally on the branchlets or in the leaf axils. They are pink in colour and star shaped and open well to ± 1.5 cms in diameter. Flowers are profuse in the spring but odd flowers are found during most of the year.

Diagnosis:

This cultivar has only a light covering of brownish hairs on the newer growth and the leaves are glabrous. *B. mollis* has a denser covering of hairs on the new growth which extends for some distance down the stems. The leaves on *B. mollis* have stellate hairs on the under side of the leaves. The leaves of the cultivar when checked against specimens of *B. mollis* are generally much larger. Whereas *B. fraseri* has many trifoliate leaves, the leaves of the cultivar are truly pinnate. *B. 'Telopea Valley Star'* has the long internodes of *B. mollis*. *B. fraseri* has much more compact internodal distances, giving a more compact shrub form. The cultivar has round stems as does *B. mollis* while *B. fraseri* has square sectioned stems. The cultivar is more robust than either of its purported parents.

Other Notes:

The cultivar has been checked by the N.S.W. National Herbarium and the A.C.R.A. It has proved hardy in a number of situations in the 5 to 6 years it has been in cultivation. It has proved itself both in the Sydney and Canberra areas. In Canberra it has a tendency to grow sparsely if not kept compact by pruning, which it accepts very readily. It grows well from cuttings, which method must be used to keep this cultivar form.

Synonymous Names — This cultivar has previously been sold as *Boronia mollis* x *B. fraseri* and *Boronia* 'Telopea Star'.

Colour Coding:

Petal — red-purple group 61D, darkening towards the centre to 61C; Central vein in petal — red-purple group 61A; Gynoecium — red-purple group 59A.

Reference Specimen:

Accession No. 181. Applicant is J. R. W. and M. B. Grieve, c/- Post Office, Kulnura, N.S.W. 2250. Cultivar received by the Authority — 15th August, 1979.

***Callistemon pallidus* 'Austraflora Candle Glow'**

Origin:

Callistemon pallidus 'Austraflora Candle Glow' was a chance seedling raised by Austraflora Nursery of Montrose, Victoria. The original plant was purchased by Jeff Briggs of Bursaria Avenue, Ferntree Gully in 1973. In 1976 the plant was repropagated by Austraflora for release to the public.

Description:

C. pallidus 'Austraflora Candle Glow' is a prostrate form of the species. This cultivar grows to 100 mm tall by $\pm$ 2.5 metres across. All other botanical details of the cultivar are as for *C. pallidus*.

Diagnosis:

This cultivar is readily distinguished from the rest of *C. pallidus* by its prostrate habit.

Colour Coding: R.H.S. Colour Chart — 1966.

Close to yellow-green 154D.

Reference Specimen:

Accession No. 190. Cultivar received by the Authority on 30th November, 1979. The applicant is Austraflora Nursery, Belfast Road, Montrose, Victoria.

***Correa reflexa* var. *reflexa* 'Fat Fred'**

Origin:

Correa reflexa var. *reflexa* 'Fat Fred' is a selected form of the species originally introduced by Somerville Nurseries Pty. Ltd. of 419 Flinders Road, Somerville 3912.

Description:

This cultivar is a very large flowered form of the species. The flowers are quite squat, measuring $\pm$ 30 mm overall by $\pm$ 13 mm in diameter. The upper part of the corolla tube is red while the tips are a clear green-yellow. All other characteristics of the cultivar fit within the known range of variation of *C. reflexa* var. *reflexa*.

Diagnosis:

This cultivar can be distinguished by the very large flowers.

Other Notes:

This cultivar has been known previously by the name *Correa* 'Fat Fred'. It will most likely be purchased under the name *Correa reflexa* 'Fat Fred'. The application of the unusual cultivar epithet was questioned by the registrar but the applicant has insisted on its retention.

Colour Coding: R.H.S. Colour Chart — 1966.

Corolla — near red 47A; Corolla tips — yellow-green 154C; Anthers — yellow-orange 15A.

Reference Specimen:

Accession No. 198. Cultivar first received by the Authority on 21st May, 1980. Applicant is Mr. Tom Fawcett of Somerville Nurseries, 419 Flinders Road, Somerville 3912.

***Eucalyptus citriodora* 'Marion'**

Origin:

Eucalyptus citriodora 'Marion' is a seedling variation from the normal form of *E. citriodora* selected by Mr. D. Ross of Bedford Park, S.A., in 1966.

Description:

At twelve years of age the original tree is 10 m high with a spread of more than 10 m. The cultivar branches more frequently, from ground level through to the leaf stems. It therefore forms a very dense canopy which is vastly different from the tall, straight growing, sparsely foliated normal form. The leaves are up to 210 mm long by 30 mm wide. This compares with a length of up to 18 mm with a width of up to 25 mm for leaves of the normal form.

Diagnosis:

This cultivar is different from normal forms of its parent in its closely branching habit and dense crown. Its leaves are wider and occur at a closer spacing. Its mature height is also expected to be considerably less than that for the normal forms which can reach a height of over 33 m. Seed collected and sown has resulted in three year-old plants exhibiting the same characteristics as the parent plant.

Reference Specimen:

Cultivar received by the Authority on 16th February, 1978. Accession No. 152. Applicant is Mr. D. McL. Ross.

***Grevillea* 'Austraflora Canterbury Gold'**

Origin:

Grevillea 'Austraflora Canterbury Gold' is said to be a hybrid between *G. juniperina* (prostrate yellow form) and *G. victoriae* var. *leptoneura*. The cultivar arose in a garden in Canterbury Road, Blackburn, Victoria in 1971. It has been propagated and distributed by Austraflora Nursery since 1975.

Description:

This cultivar has a basically prostrate and dense habit and grows to ± 4 metres across. Occasional branches grow more vigorously to 60 cm tall and have an arching habit.

The stems are round and covered in soft, appressed hairs, particularly on the new growth but also extending to the older stems. The leaves are 3.5-5 cm long when fully grown and alternate on the stems. They are lanceolate in shape. The leaves have a sparse covering of silky hairs above but appear glabrous to the naked eye. The underside of the leaves have a dense covering of these hairs which gives them a glaucous appearance. The leaves have a soft but prominent tip and a prominent raised midvein on both the upper and lower surfaces. The leaf margins vary from slightly recurved to flat.

The flowers are borne in densely packed terminal and axillary racemes. They are a clear yellow to gold in colour and are larger in size than the flowers of *G. juniperina*. The perianth segments are covered in fine, silky hairs while the style is glabrous. The individual flower grows to ± 2.5 cm long on racemes to 3.5 cm long.

Diagnosis:

The leaves of the cultivar have recurved to flat margins as compared to the revolute margins of *G. juniperina* and the recurved margins of *G. victoriae* var. *leptoneura*. They measure 3.5-5 cm long compared with ± 1.25 cm long and 2.75 cm long for *G. juniperina* and *G. victoriae* var. *leptoneura* respectively. *G. juniperina* has pungent, rigid leaves that are glabrous above and hairy below, while *G. victoriae* var. *leptoneura* has apiculate tips and the leaves are hairy above when young, gradually turning glabrous and have a short tomentum below. *Grevillea* 'Austraflora Canterbury Gold' has a prominent, but soft, tip with a sparse hairy covering above and a dense tomentum

below. In all cases the individual flowers are hairy. The style of *G. juniperina* is glabrous to sparsely hairy while the styles of *Grevillea* 'Austraflora Canterbury Gold' and *Grevillea victoriae* var. *leptoneura* are glabrous. The parent form of *G. juniperina* was prostrate while *G. victoriae* var. *leptoneura* grows to 2 metres tall. The cultivar is basically prostrate with some branches arising to 60 cm tall with an arching habit.

The foliage, when fresh, has a grey-green colour which gives a soft appearance to the foliage. It is a prolific flowerer with flowers found all year round. Cuttings strike very readily and vegetative propagation must be used to preserve this cultivar form. It has proved adaptable to both shaded or open aspects, neither of which affect its vigour or habit. It grows best on well drained sites and is frost tolerant. It has been suggested that it would be an excellent plant for utility plantings in parks, median strips and carparks as well as for home gardens.

Colour Coding: R.H.S. Colour Chart — 1966.

Perianth tube — near yellow-orange 18A; Style — near yellow-orange 18A.

Comparative Specimens: *Grevillea juniperina* NBG 014582; *G. victoriae* var. *leptoneura* NBG 068600.

Reference Specimen:

Accession No. 156. Cultivar received by the Authority on the 10th November, 1978. The applicant is Molyneux Nurseries, Belfast Road, Montrose, Victoria. Previous publication in "Your Garden" magazine in September, 1979, page number 67.

***Grevillea* 'Austraflora McDonald Park'**

Origin:

Grevillea 'Austraflora McDonald Park' is said to be a hybrid between *G. rosmarinifolia* and *G. alpina* that arose at McDonald Park, Ararat, Victoria. The *G. rosmarinifolia* were planted and the *G. alpina* occur naturally in McDonald Park. This cultivar was first collected and propagated by Mr. Bill Molyneux of Austraflora Nursery in 1967 and has been in cultivation ever since.

Description:

This cultivar grows to ± 15 cm tall by ± 60 cm across. It forms a dense, low spreading shrub.

The stems are round and the new branchlets are short and covered in hairs. The leaves are densely packed on the branchlets and are ± 2 cm long by ± 0.3 cm wide. The leaf margins are recurved to revolute and the leaves are densely covered with silky hairs underneath and sparsely covered above.

The flowers are borne in terminal racemes on the branchlets. They are red and yellow in colour and very similar to the flowers of *G. alpina*. The perianth segments are almost glabrous with some sparse hairs while the style is densely covered with silky hairs.

Diagnosis:

This cultivar is low growing and very dense. In habit it closely resembles *G. alpina*, with the density and leaf size of *G. rosmarinifolia*.

The cultivar's leaves are midway between the narrow, linear sharp pointed leaves of *G. rosmarinifolia* and the flattish, oblong leaves of *G. alpina*. The margins are recurved to revolute compared to the revolute margins of *G. rosmarinifolia* and the flat leaves *G. alpina*. The foliage and flowers are midway between the glabrous nature of *G. rosmarinifolia* and the hairiness of the leaves and flowers of *G. alpina*. The newer growth is hairy, but not as much as *G. alpina* and more so than *G. rosmarinifolia*.

Grevillea 'Austraflora McDonald Park' has been grown in Melbourne since 1967 and has proved reliable in that district. Older plants respond favourably to being cut back. This measure can be taken to keep the shrub rejuvenated and to produce more flowering wood.

This cultivar has previously been catalogued and sold as *G. alpina* 'McDonnell Park' and *G. alpina* 'McDonald Park'. These names are incorrect as the plant is of hybrid origin.

Colour Coding: R.H.S. Colour Chart — 1966.

Perianth tube — red 42A; Perianth limb — yellow-orange 15A; Style — near red 47A; Stigma — yellow-green 152D.

Comparative Specimens: *Grevillea rosmarinifolia*, NBG 020246; *G. alpina* NBG 036418.

Reference Specimen:

Accession No. 164. Cultivar received by the Authority on the 10th November, 1978. Applicant is Molyneux Nurseries, Belfast Road, Montrose, Victoria.

***Grevillea banksii* 'Kingaroy Slippers'**

Origin:

Grevillea banksii 'Kingaroy Slippers' is said to be a mutation of *G. banksii*.

Description:

At two and a half years of age the plant was approximately 2 m high by about 1.5 m wide. The leaves are the same as *G. banksii*.

The flowers are borne in the normal terminal inflorescences for *G. banksii*. Individual florets are pink and about 15 mm long and the dark pink styles are about 40 mm long. It flowers throughout the year with a main flowering period during summer. The cultivar exhibits some frost resistance having withstood a number of frosts down to -1°C without any apparent damage.

Diagnosis:

This cultivar is different from other known normal forms of *G. banksii* in that as the anther unfurls, instead of the limb releasing the stigma and the perianth splitting so the anther can be released, the perianth tube breaks away from just below the ovary, and still being attached at the limb and stigma, is carried away from its normal position. Self pollination occurs as fertile seed is produced.

Colour Coding:

Perianth tube: red-purple 63C; perianth limb: near yellow-orange 16B; style: red-purple 63A. Colour plate on page 245.

Reference Specimen:

Cultivar received by the Authority on 7th April, 1977. Accession No. 115. Applicant is Kingaroy Shire Council, Queensland.

***Grevillea alpina* 'Grampians Gold'**

Origin:

Grevillea alpina 'Grampians Gold' is a selected form of the species that was originally collected by Ms D. Gavin of Mt. Evelyn, Victoria. The plant was discovered in the Grampians.

Description:

This cultivar has golden yellow flowers and the perianth is covered in prominent brownish hairs. All other characteristics are as for *G. alpina*.

Diagnosis:

Grevillea alpina 'Grampians Gold' has golden yellow flowers and prominent rusty brown hairs covering the perianth segments. This distinguishes it from the normal colour forms of *G. alpina* which are red and yellow, or red and cream.

Colour Coding: R.H.S. Colour Chart — 1966.

Perianth segments — yellow-orange group 17C; Perianth hairs — greyed orange group 164A; Stigma — yellow group 4A; Stigmatic plate — yellow-green group 164A. See page 244 for a colour photograph.

Reference Specimen:

Accession No. 209. Cultivar received by the Authority on 10th September, 1980. The applicants are R. and G. Elliot, "Stringybarks", Belfast Road, Montrose 3765, Victoria.

***Grevillea* 'Poorinda Anticipation'**

Origin:

Grevillea 'Poorinda Anticipation' is said to be a cross between *G. longifolia* and *G. willisii*. It was raised in cultivation by Mr. Leo Hodge at his "Poorinda" property, W. Tree, via Buchan, Victoria.

Description:

This cultivar grows to ± 2 metres tall by ± 2.5 metres wide. It forms a moderately dense shrub with some long, spreading branches.

The leaves are deeply dissected and are 18-20 cms long by ± 6 cms wide at the widest point. They are glabrous above and covered with fine, pale coloured hairs below.

The flowers are of the "toothbrush" type and are borne terminally on the branches. The inflorescences are pinkish in colour and are one sided as are the flowers of *Grevillea longifolia*. The racemes of flowers are ± 8 cms long.

Diagnosis:

Grevillea 'Poorinda Anticipation' has the typical habit of *G. willisii*, being moderately dense with some long, spreading branches. The leaves are intermediate between the parents, having the alternate lobing of *G. longifolia*, but the greater width and more deeply dissected leaves of *G. willisii*. Each lobe is tipped with a pungent point, similar to those found on *G. willisii*.

Colour Coding: R.H.S. Colour Chart — 1966.

Style—red group 37C; Style tip—yellow group 4D; Perianth—silky hairy.

Comparative Specimens: *G. longifolia* NBG 037845; *G. willisii* NBG 70050.

Reference Specimen:

Accession No. 183. Cultivar first received by the Authority on 9th September, 1975. Applicant is Mr. L. Hodge, "Poorinda", Mt. Lookout Road, Bairnsdale 3875.

Grevillea* 'Poorinda Rachel'*Origin:**

Grevillea 'Poorinda Rachel' is said to be hybrid between *Grevillea alpina* and *G. juniperina*.

Description:

It is a compact shrub growing to a height of about 1 m. The leaves are entire and are about 30 mm long by about 5 mm wide. The upper leaf surface is shiny green whilst the underside is grey and covered with silky hairs. The leaf edges are rolled under.

The flowers are formed into clusters and are borne terminally on short branchlets. The perianth is buff coloured and about 13 mm long and the pink styles are about 18 mm long. The hybrid is sterile.

Colour Coding:

Perianth and limb: near greyed-orange 168C; style: red 55A; stigma: near orange-red 35A.

Reference Specimen:

Cultivar first received by the Authority on 21st October, 1975. Accession No. 74. Applicant is Mr. L. Hodge.

Grevillea* 'Poorinda Refrain'*Origin:**

Grevillea 'Poorinda Refrain' is said to be a hybrid between a New South Wales form of *Grevillea floribunda* and *G. alpina*.

Description:

It is a bushy shrub growing to a height of about 1.3 m. The leaves, covered on both sides with dense silvery hairs, are about 22 mm long by about 5 mm wide. The leaf edges are rolled under.

The flowers are formed into clusters at the ends of short branchlets. The perianth is very woolly and yellow-buff in colour and about 8 mm long and the styles are about 10 mm long.

Colour Coding:

Perianth tube and limb: yellow-orange 22 between A & B, striped near greyed-red 179A; style: red 54A.

Reference Specimen:

Cultivar first received by the Authority on 7th September, 1964. Accession No. 46. Applicant is Mr. L. Hodge.



***Grevillea* 'Poorinda Royal Mantle' (Above)**

Origin:

Grevillea 'Poorinda Royal Mantle' is said to be a hybrid between *G. laurifolia* and *G. willisii*.

Description:

It is a prostrate plant with a reported spread of 6.5 m after 2½ years. The leaves vary from entire to lobed. The entire leaves measure up to 90 mm long by about 20 mm wide. The lobed leaves are about 100 mm long and about 40 mm wide across their widest point. New growth is densely covered with silky hairs on both sides of the leaves. As the leaves mature they lose their hairs on the upper surface whilst retaining those on the underside. The new foliage is coppery red in colour and most attractive.

The flowers are of the "toothbrush" type and are borne terminally on short branchlets and occasionally on the main stems opposite the leaves. The perianth is dark red and about 10 mm long and the styles about 25 mm long.

Diagnosis:

This cultivar is different from *G. laurifolia* in that most leaves are lobed and is different from *G. willisii* in that the cultivar is prostrate.

Colour Coding:

Perianth: greyed-purple 186A; style: near red 53D; stigma: yellow-green 144A.

Reference Specimen:

Cultivar first received by the Authority on 21st October, 1975. Accession No. 90. Applicant is Mr. L. Hodge.

***Grevillea glabella* 'Lara Dwarf'**

Origin:

Grevillea glabella 'Lara Dwarf' is a naturally occurring form of *G. glabella* selected by Mr. D. Jones from a basaltic plain about 1.5 km E. of Lara, Victoria in 1969.

Description:

It is a prostrate to procumbent shrub growing to a height of up to 300 mm by up to 1 m wide. The grey leaves are up to 14 mm long by about 2 mm wide. The leaf edges are rolled under.

The flowers are borne at the ends of short branchlets. Individual florets are creamy white blushed pink and are about 7 mm long and the deep pink styles are 18 mm long. The main flowering period is from April to October.

Diagnosis:

This cultivar is different from the known forms of *G. glabella* in its prostrate and compact growth habit, grey foliage and masses of flowers which are easily visible.

Colour Coding:

Perianth tube: near yellow 10D blushed with red 52 between B & C; perianth limb: near yellow 10D; — style: red 52B.

Reference Specimen:

Accession No. 129. Cultivar received by the Authority on 30th June, 1977. Applicant is Mr. D. L. Jones. Previous mention — "Austraflora" nursery catalogue. It is reported that this cultivar is best suited to heavy soil types and is very tough and drought resistant. It strikes easily from cuttings and is an excellent rockery plant but tends to be slow growing.

***Grevillea glabella* 'Lime-Light'**

Origin:

Grevillea glabella 'Lime-Light' is a naturally occurring form of *G. glabella* selected by Mr. D. Jones of Montrose, Victoria in 1972 from an area of whipstick scrub about 32 kms N. E. of Bendigo, Victoria.

Description:

It is an erect, sparse shrub growing to a height of up to 3 m by up to 2.5 m wide. The leaves are up to 20 mm long by about 1 mm wide. The leaf edges are tightly recurved.

The flowers are borne in small clusters at the ends of short branches. Individual flowers are lime green and about 7 mm long and the styles are 17 mm long. The main flowering period is from April to September.

Diagnosis:

This cultivar is different from other known forms of *G. glabella* in its erect, sparse habit of growth and lime green flowers. It is outstanding in its production of masses of lime green flowers during the winter months. It is different from *G. glabella* 'Lara Dwarf' in its erect habit and lime green flowers. *G. glabella* 'Lara Dwarf' is prostrate and has creamy white, blushed pink flowers.

Other Notes:

It is reported that this cultivar has grown well in all situations and soil types it has been tried in and is drought resistant as it comes from a 380 mm rainfall area. It is also reported to be frost tolerant.

Colour Coding:

Perianth tube: green-yellow 1C; perianth limb: yellow-green 145C; as the flower ages: streaks of brown 200A appear.

Reference Specimen:

Cultivar received by the Authority on 30th June, 1977. Accession No. 128. Applicant is Mr. D. L. Jones.

***Grevillea* 'Shirley Howie'**

Origin:

Grevillea 'Shirley Howie' is said to be a hybrid between *G. sericea* and *G. capitellata*.

Description:

It is a shrub to a height of about 1.3 m with an equal spread and originated at Howie's Nursery at Coopers Plains, Queensland. The pointed leaves are entire and up to 45 mm long by about 4 mm wide. The upper surface is green with a distinct mid-vein whilst the underside is covered in short hairs. The mid-vein is also prominent on the underside. The leaf edges are rolled under.

The flowers are borne in dense clusters at the end of laterals — some short and others long and spindly. Individual florets are small, pink and about 5 mm long and the styles 10 mm long.

Diagnosis:

This cultivar is different from its stated parents in that it grows higher than is usual for *G. capitellata* and the leaves are larger than is usual for *G. sericea*.

Colour Coding:

Perianth tube and limb: red-purple 70C; style: red-purple 70A.

Reference Specimen:

Cultivar received by the Authority on 9th September, 1977. Accession No. 145. Applicant is Howie's Nursery.

Grevillea* 'Patricia Marie'*Origin:**

Grevillea 'Patricia Marie' is a seedling which shows strong affinities to *Grevillea banksii* but as it arose in a garden where over sixty species of *Grevilleas* are grown it is impossible to be certain that some hybridization has not been involved. It has been growing in the garden of Mr. Burt of Kingaroy, Queensland for the last four years. The leaves are the same as for *G. banksii*.

The flowers are formed into large dense multiple clusters and these are produced terminally. Individual florets are pink and about 15 mm long and the deep pink styles are about 45 mm long.

Diagnosis:

This cultivar is different from the usual forms of *G. banksii* in its clustered shorter inflorescences. They do not taper from the base to the tip as does *G. banksii*.

Colour Coding:

Perianth: red 51C; style: red 53C; stigma: orange 25C.

Reference Specimen:

Cultivar received by the Authority on 3rd May, 1977. Accession No. 117. Applicant is E. C. N. and P. M. Burt.

Grevillea* 'Superb'*Origin:**

Grevillea 'Superb' is a hybrid between *G. bipinnatifida* and a white form of *G. banksii*. This cross was manipulated and was produced in cultivation by Mr. M. Hodge of Moorooka, Queensland. Pollen was removed from *G. banksii* and the seed set on *G. bipinnatifida*.

Description:

This cultivar is a shrub of medium density, growing to ± 1 metre tall by 1-2 metres wide.

The foliage is very similar to *Grevillea* 'Robyn Gordon' (a cross with the same parent species) and is virtually impossible to distinguish between them.

The inflorescence can measure ± 15 cm long by ± 9 cm wide. The individual flowers are moderately densely packed on the raceme and completely encircle the rhachis. Individual flowers measure 4.5 to 5 cm long. The pedicel and perianth are also covered in dense, closely appressed hairs. The style appears glabrous but does have scattered, very short, silky hairs. The inflorescences are borne terminally. The buds are dark in colour before open-

ing. The inflorescences are very similar to *Grevillea* 'Robyn Gordon' except in colouration. The flowers are salmon in colour with the perianth changing to red as they age. The styles are red with yellow tips.

Diagnosis:

Vegetatively this cultivar is very similar to *Grevillea* 'Robyn Gordon'. The difference is in the flower colour as described above.

Comparative Specimens: *G. banksii*, NBG 050950; *G. bipinnatifida* NBG 7901690; *G. 'Robyn Gordon'* ACRA No. 1.

Colour Coding: R.H.S. Colour Chart — 1966.

Style tip — orange group 24B; Style — red group 46C fading to red group 39C; Perianth lobes — red group 39B; Perianth — orange group 29C.

Reference Specimen:

Accession No. 201. Applicant is Mr. M. Hodge, 25 Barford Street, Moorooka 4105. Cultivar received by the Authority on 26th May, 1980.

***Prostanthera lasianthos* 'Kallista Pink'**

Origin:

P. lasianthos 'Kallista Pink' is a naturally occurring deep pink flowering form of the species selected from a plant growing in the Dandenong Ranges in Victoria.

Description:

This cultivar has deep clear pink flowers borne in profusion. The shrub grows from 4 to 5 metres tall by $\pm$ 3 metres wide. All other features of the plant are as for *P. lasianthos*.

Other Notes:

This cultivar has been in cultivation for approximately 8 years and has proved very reliable in the near vicinity of Melbourne. It was originally selected by Mr. L. Henry.

Colour Coding:

Petal tips — near red-purple group 65A; Base of corolla tube — red-purple group 65D.

Reference Specimen:

Accession No. 192. Cultivar received by the Authority on 9th December, 1979. Applicant is W. R. and G. M. Elliott of "Stringybarks", Belfast Road, Montrose, Victoria.

***Telopea* 'Braidwood Brilliant'**

Origin:

Telopea 'Braidwood Brilliant' was a selection from the crossing of *Telopea mungaensis* R.Br. and *T. speciosissima* Cheel. A full report on its development, with a colour plate is in Australian Plants, Vol. 7, page 168.

Description:

Telopea 'Braidwood Brilliant' is an upright and compact glabrous shrub producing 5 or more stems from the ground level. It is estimated that a mature plant will reach a height of about 2 m.

The leaves are coriaceous, narrow and cuneate tapering from a long petiole. The margin is slightly undulating but at the top is distinctly toothed. The leaves measure between 15 and 20 cms in length.

The flower colour, a brilliant cherry-red has been determined using the R.H.S. Colour Chart (1966) to be Red 53B to 53C (i.e. style 53C). The inflorescence is slightly less conical and less dense than *T. speciosissima* but vastly superior to *T. mungaensis* in this regard with a flower diameter of 6-8 cm. Bracts are present but these are less colourful than in *T. speciosissima*. The flowering period lasts for 2-3 weeks in October. It appears that this cultivar is quite well suited to the colder regions when afforded protection. Frost damage has so far not been noted. This cultivar has distinct possibilities for use in areas too cold for the N.S.W. waratah.

Reference Specimen:

Cultivar received by the Authority on 3rd November, 1974. Accession No. 3. Applicant is R. Powell, C.P.A.



Eucalyptus melliodora

An ornamental form

by D. Beardsell¹ and C. Beardsell²

Eucalyptus melliodora (yellow box) is a highly variable tree, widespread in south-eastern Australia. Within natural populations trees may be found which are pendulous or upright in habit, while leaf colour may be green or grey (highly glaucous). Pink flowering forms are also known to occur near Deep Lead and Marong in Victoria, and Tamworth in N.S.W.



Eucalyptus melliodora — An ornamental red-flowered form.

Yellow box has not been widely planted as an ornamental tree because of its large size in natural populations and because it is not normally regarded as an ornamental plant. This paper, however, describes an ornamental form of *E. melliodora* which has been used as a plantation tree in northern Victoria. The aim of this paper is to ensure that an attractive and valuable cultivar is brought to the attention of urban and rural parks and gardens authorities.

Origin: Murchison in northern Victoria, but the natural origin is thought to

be near Tamworth, N.S.W.

Soil type: Poorly drained, rich alluvial soil, in the Goulburn River Valley.

1. Horticultural Research Institute, Knoxfield, P.O. Box 174, Ferntree Gully 3156.
2. Arthur Rylah Institute, 123 Brown Street, Heidelberg 3084.

Tree Uniformity: The trees vary slightly in size and form, but are uniform except in flower colour which varies from pale pink to deep pink (almost red).

Dimensions: The trees are approximately 30 years of age and are 12 m high and have a canopy drip line diameter of approximately 8 m.

Trunk: The trees have a well developed trunk with the lowest branches commencing at a height of approximately 2.5 m. The bark is semi-deciduous with patches of yellowish, fibrous bark interdispersed with white, gum type of bark similar to some forms of *E. leucoxydon*. Smaller branches have white, deciduous bark.

Leaves: The leaves are very narrow and long compared to most forms of *E. melliodora* (10 cm long x 1 cm max. width). This gives the trees a superficial appearance to a good specimen of *E. nicholii*. The leaves are green without any glaucousness.

Flowers: Flower colour varies from pale pink to deep pink and seedling progeny would be expected to show similar variability, although seed has been collected from a tree with deep pink flowers. Flowering time varies from July (1981 season) to December (1979 season), and although the trees flower every year, prolific flowering in recent years has occurred every second year. During full flowering the trees are visited by large numbers of honey-eaters and lorikeets.

Canopy structure: The trees have canopies of medium density, typical of *E. melliodora*, while the smaller, leafy branches hang vertically giving the tree a graceful, semi-pendulous appearance.

Seed supply: Seed is available from the Horticultural Research Institute, Knoxfield, P.O. Box 174, Ferntree Gully 3156, by sending a self addressed, stamped envelope, on the condition that the exact place of planting is given. As the seed supply is limited preference will be given to municipal councils, parks and gardens authorities, government bodies and native plant propagators. This will ensure that this valuable seed source is preserved for further generations.

ACKNOWLEDGEMENT: We would like to thank Bill Cane of Maffra for bringing this form of *E. melliodora* to our attention. ■

Eastern *Lomandra* by Charles Napier-Thomson

Lomandra longifolia is the most noticeable species in the east of Australia as it has the longest and broadest leaves and is common and widespread on the coast, tablelands and western slopes from North Queensland to Tasmania. It is a variable species and has been divided into several subspecies. Sometimes the flowers are dull cream, but sometimes they are bright yellow. The spikes always include spiny bracts between the flowers, and therefore they must be handled carefully. If the brighter colour can be obtained a few spikes make an unusual and long-lasting interior decoration. As the plants are found in nature in such diverse situations as the sand at the back of beaches, rich soil on creek banks, and in rock crevices in the sandstones there should be little difficulty in adapting them to any garden soil. They are not subject to pests. Once established they demand no further attention at all.

Lomandra multiflora is also common and widespread in eastern Australia, but in addition is found in the west. The leaves, and in fact the whole tuft, are smaller than in *L. longifolia*, but the male spike has its flowers arranged symmetrically and distinctively on a long slender rachis. One plant produces many inflorescences at a time, so that a plant in full flower (August to November) is a remarkable sight. This species should also be easily adaptable to any soil.

Lomandra montana is not common and is localised in gullies of the Blue Mountains of N.S.W. It arrived in my garden fortuitously, as a seed or a rhizome in some imported soil. It has dense blue foliage. At first I thought it was some kind of blue grass, but as it was so attractive I kept it. I have tried to separate pieces without success. ■

Lomandra

And Related Genera in The
Plant Family Xanthorrhoeaceae

by G. J. Keighery, Kings Park and Botanic Garden, Perth, Western Australia

The Plant Family Xanthorrhoeaceae

Lomandra has generally been placed in the family Xanthorrhoeaceae, along with *Acanthocarpus* Lehm. (4 species), *Chamaexeros* Benth. (4 species), *Baxteria* R.Br. (1 species), *Calectasia* R.Br. (3 species), *Dasypogon* R.Br. (2 species), *Kingia* R.Br. (1 species), *Romnaldia* Stevens (1 species) and *Xanthorrhoea* J. Smith. (ca 15 species).

Acanthocarpus, *Baxteria*, *Chamaexeros*, *Dasypogon* and *Kingia* are confined to South Western Australia, *Romnaldia* to Papuasias and Queensland, *Xanthorrhoea* to temperate Australia and *Lomandra* to Australia and Papuasias.

The family is on nearly all characters an unnatural grouping consisting of 5 very separate sub-units:

- (1) Lomandreae : *Acanthocarpus*, *Chamaexeros*, *Lomandra* and *Romnaldia*.
- (2) Dasypogoneae : *Dasypogon* and *Kingia*.
- (3) Xanthorrhoeae : *Xanthorrhoea*.
- (4) Baxterieae : *Baxteria*.
- (5) Calectasieae : *Calectasia*.

The only useful approach to the classification of this difficult group is either to segregate out several new families based on 2, 3, 4 and 5, or to return all genera to the Liliaceae as the tribes given above. The following report deals only with the genera of the Lomandreae.

Simple Key to the genera of the Lomandreae

- 1 : Flowers dioecious, styles short with 3 recurved lobes — *Lomandra*.
- 1 : Flowers bisexual, style subulate simple —
- 2 : Capsule smooth, leaves in basal tufts — 3
- 2 : Capsule muricate, leaves distributed along aerial stems — *Acanthocarpus*
- 3 : fls. yellow, leaf margins scarious — *Chamaexeros*
- 3 : fls. greenish/white, leaf margins smooth — *Romnaldia*

The Genus *Acanthocarpus*

This genus contains 4 species (3 undescribed) all confined to Western Australia. All members are erect perennial rhizomatous herbs, multistemmed, to 1-1.5 metres in height. The flowers are hermaphrodite, 5-10mm in diameter with equal perianth segments. Borne in terminal clusters of 2-8. Leaves are generally small (5-25mm) and rigid, with an acute to pungent apex and distributed along the stems. Capsule is 3 valved, generally muricate on the surface.

Acanthocarpus preissii Lehm.

Erect herb, to 1m, flowers white striped faint purple. Flowering occurs in winter and early spring. The typical variant is common on beach dunes, calcareous sands or yellow sands. Considerable variation is known within this species —

- (A) Darling Scarp variant — This forms large colonies by extensive rhizomes, and has bright green leaves. It is only found on granitic loam soils.
- (B) Northern Coastal variant — Has intensely glaucous foliage and very spiny fruits. Found in the Shark's Bay to Carnarvon region, this is the most attractive of all members of the genus.

- (C) Northern Inland variant — Has very fragile almost spineless fruits.
Found in the Ebbano — Ajana — Mingenew area.

Acanthocarpus preissii occurs in largely coastal regions of the South West (Warren, Darling and Irwin) and Eremaean (Austin).

Acanthocarpus sp. I

Robust erect tufted herb with flowers having the outer perianth white and the inner pink. Flowering in winter and spring. Growing on calcareous sands, in coastal regions of the Eremaean. (Austin and Ashburton districts).

Acanthocarpus sp. II

Tangled erect herb, flowers white, with very reduced leaves such that they may appear absent on mature branches. Flowering in winter and spring, on a range of heavy soils (granite, clay, saline loam) in the South West (Irwin, Avon) and Eremaean (Coolgardie).

Acanthocarpus sp. III

Tangled erect herb, flowers white striped prominently purple, large (0 to 10mm diameter) and very open. Young branches with short leaves (5-8mm), mature branches with long fine leaves (10-25mm). Flowering in winter and spring, and growing on calcareous sands in the Eremaean (Austin and Ashburton districts).

All species can be readily grown from seed, generally sown in autumn. Plants will flower in 18 months from sowing. It is also possible to strike cuttings of all species attempted. However, in general *Acanthocarpus* is of limited horticultural value being more of specialist interest, than having intrinsic beauty.

The Genus *Chamaexeros*

A small genus of 4 species (1 undescribed), all confined to Southern Western Australia. All species are perennial rhizomatous herbs, to 30cm in height. The flowers are hermaphrodite, yellow, 5-8mm in diameter, with equal perianth segments. The inflorescence is axillary, either a long loose panicle (to 40cm) or an umbel-like cluster. Leaves are linear, basal, to 30cm long, bordered (at least when young) by a narrow scarious lacerated margin. Capsule 3 valved, smooth.

Chamaexeros fimbriata (F. Muell.) Benth.

An erect tufted plant, to 20cm, forming small clumps to 20cm diameter. Flowers yellow in a loose panicle. Flowering in winter and spring, and growing on sandy loam or clay soils in the South West (Avon) and Eremaean (Coolgardie).

Chamaexeros macranthera Kuchel

An erect tufted plant, to 20cm forming small clumps to 20cm diameter. Flowers yellow in a loose panicle. Flowering in spring, and growing on granitic loam, in the South West (Avon) and Eremaean (Coolgardie).

Chamaexeros serra (Endl.) Benth.

An erect tufted plant to 10 cm tall, forming clumps to 20cm diameter. Flowers basal, yellow, flowering in spring, and growing on a wide variety of soils (lateritic sands, loams, clay, granite), in the South West (Avon, and Eremaean).

Chamaexeros sp.

An erect tufted plant, forming very large colonies. Flowers in umbels on short peduncles just exceeding the leaves, yellow. Flowering in late spring and early summer, growing on peaty sands in the South West (Warren).

Members of this genus make attractive pot plants or rockery subjects. They must be grown in free draining soil in the full sun. All species can be grown from seed, but are slow and difficult to raise to maturity. I have had little success with dividing plants or using offshoots.

The Genus *Lomandra*

A relatively large genus of ca 40 species, the majority being confined to continental Australia, but two species extend into Papuaia and New Caledonia. All members are erect perennial rhizomatous herbs, ranging from 25cm to 1.5 metres in height. The flowers are almost always unisexual and the plants dioecious. Generally they are white or purple, 5-10mm in diameter with equal perianth segments, and are borne on elongated or compact panicles. Leaves are mainly linear, 10cm-1 metre long and borne in basal clusters or along the stem. The capsule is 3 valved, globular and smooth.

Male plants are the most attractive plants in nearly all species. The following account deals with the species of *Lomandra* native to Western Australia.

Lomandra caespitosa (Benth.) Ewart

Clumps to 15cm tall x 20cm wide, fls. basal, not exceeding the leaves, cream. Flowering in winter and spring, occurring on sandy soils in the South West (Darling, Warren, Stirling).

Lomandra drummondii

Clumps to 30cm x 30cm, fls. in tall panicles to 1m, purple flowering in spring, occurring on sandy loam in the South West (Darling, Warren).

Lomandra effusa (Lindl.) Ewart

Clumps to 20cm x 20cm, fls. basal, not exceeding the leaves, white. Flowering in autumn and winter, on sandy loam soils in the South West (Darling, Avon, Stirling) and Eremaean (Coolgardie).

Lomandra glauca (Benth.) Ewart ssp. *collina* (R.Br.) A. Lee

Clumps to 30cm x 30cm, fls. not exceeding the leaves, cream. Flowering in spring, on sandy soils in the South West (Avon, Stirling, Eyre).

Lomandra hastilis (R.Br.) Ewart

A large herb, leaves to 70cm, inflorescence a dense spike to 1m, of purple flowers. Flowering in spring on sandy soils in the South West (Irwin, Darling, Warren, Stirling, Eyre). An outstanding species.

Lomandra hermaphrodita (Andr.) C. A. Gardn.

Clumps to 20cm x 20cm, fls. not exceeding the leaves, reddish-purple. Flowering in winter and spring on coastal sands in the south West (Darling).

Lomandra leucocephala (R.Br.) Ewart

A large herb, leaves to 1m, inflorescence a dense woody spike of cream flowers to 1.5m. Flowering in winter and early spring, on desert dunes, in the Eremaean (Coolgardie, Austin, Carnegie). Another outstanding species, but very difficult to maintain in cultivation.

Lomandra micrantha (Endl. in Lehm.) Ewart

Clumps to 20cm x 20cm, inflorescence a loose panicle of small purple flowers to 20cm tall. Flowering in winter and spring, on peaty sands to sandy clays, in the South West (Irwin, Darling, Avon, Warren, Stirling, Eyre).

Two distinct forms are found, a terete-leaved southern form and a broad-leaved northern form. I have had the southern form in my garden for 7 years but it has never flowered in Perth. This form may have considerable potential as a rockery plant.

Lomandra mucronata (R.Br.) A. Lee

A small perennial, to 15 cm tall, often raised above the soil on aerial roots. The leaves are rigid and glaucous with the cream flowers inconspicuous, inflorescences as long as the leaves. Flowering in spring, on sandy soils in the South West (Darling, Stirling, Eyre). An unusual container plant, that can be grown from cuttings.

Lomandra odora (Endl.) Ewart

Clumps 30cm tall x 15cm wide, inflorescence a compact panicle of scented cream flowers scarcely exceeding the leaves. Flowering in Spring on sandy soils in the South West (Darling, Warren, Stirling, Eyre).

Lomandra ordii (F. Muell.) Ewart

A robust herb, clumps to 1m x 1.5m, inflorescence a compact panicle of white flowers to 1.5m. Flowering in spring and early summer, on peaty sands in the South West (Warren).

Lomandra pauciflora (R.Br.) Ewart.

Grass-like tufted herb, clumps 50cm x 30cm, fls. small, cream. Flowering in spring and early summer on loam or sand in the South West (Warren, Stirling).

Lomandra preissii (Endl.) Ewart

Clumped perennial herb, inflorescence, an erect spike to 30cm, leaves 15cm, flowers green or purple. Flowering in winter, on sandy soils in the South West (Darling, Irwin).

Lomandra purpurea (Endl.) Ewart

Clumped perennial herb, inflorescence to 60cm, leaves to 30cm, flowers purple. Flowering in spring on loams or sands in the South West (Darling, Warren and Stirling).

Lomandra rigida Labill.

Erect rigid herb, clumps 30cm x 15cm, fls. equal to leaves, cream. Flowering in spring on granite in the South West (Eyre). Very easy to grow from cuttings.

Lomandra sericea (Endl.) Ewart

Tufted herb, clumps 15cm x 30cm, fls. basal, purple. Flowering in spring on sandy soils in the South West (Irwin, Darling, Warren and Stirling).

Lomandra sonderi (F. Muell.) Ewart

Clumped perennial herb, to 15cm x 30cm, flowers basal, purple/green. Flowering in spring on sandy soils in the South West (Darling, Warren).

Lomandra spartea (Endl.) Macbride

Clumped perennial herb, 15cm x 20cm, fls. basal, purple. Flowering in spring, on laterite, in the South West (Darling).

Lomandra suaveolens (Endl.) Ewart

Clumped perennial herb, to 15cm x 15cm, flowers basal, white. Flowering in autumn and winter, on sandy loams or clay in the South West (Darling, Stirling and Eyre).

I would suggest that the best species to grow are:

flowers: *Lomandra drummondii*, *L. hastilis*, *L. leucocephala*, *L. micrantha*, *L. odora*, *L. ordii* and *L. preissii*.

foliage/and or growth form: *Lomandra effusa*, *L. pauciflora* and *L. rigida*.

The Genus *Romnalda*

Perennial herbs with linear basal leaves, to 38cm long, with acute apex and smooth margins. Flowers hermaphrodite, in a sparsely branched inflorescence to 20cm, greenish — white. Perianth segments equal, flowers 6-8mm wide, inconspicuous. Fruit globular, 3 valved, smooth.

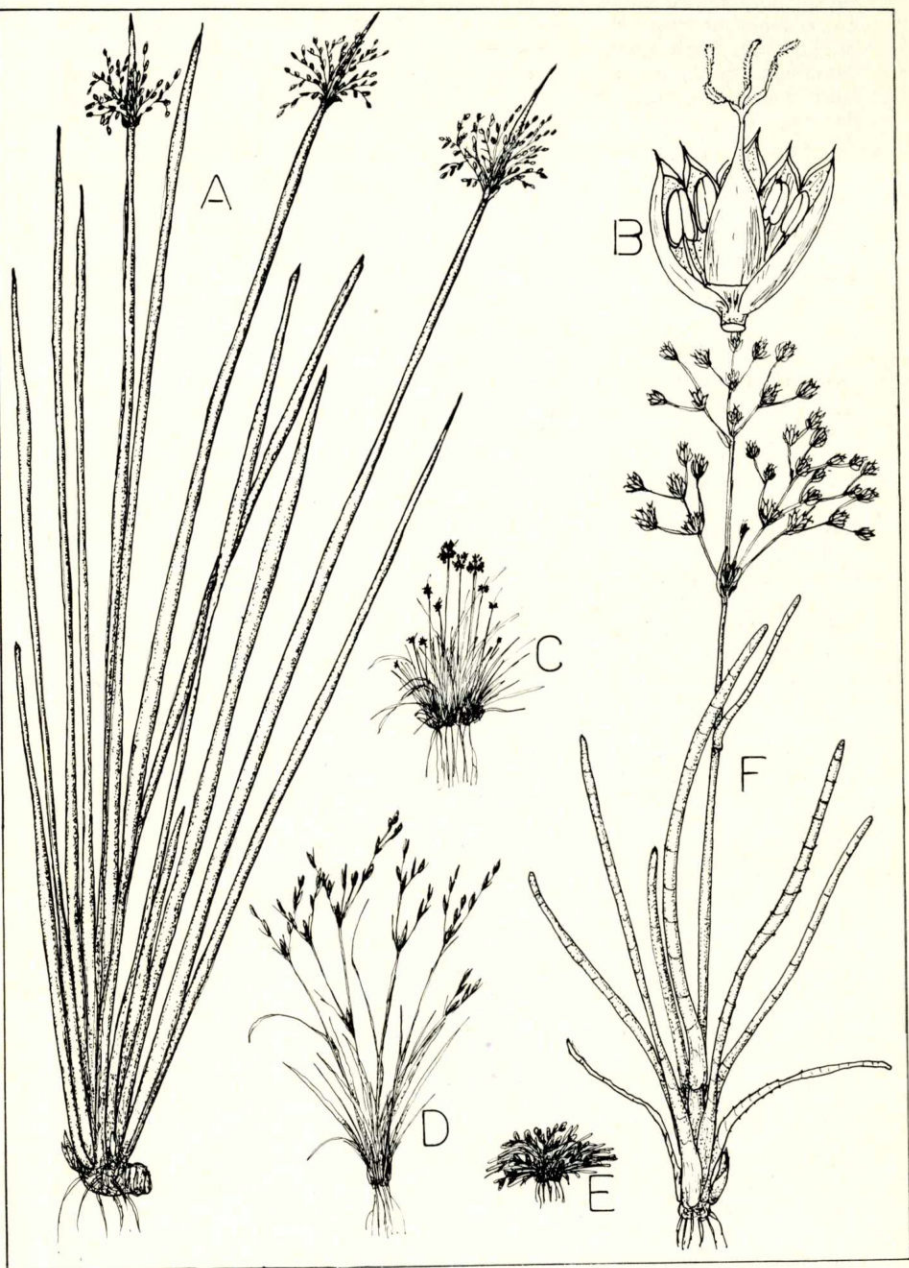
At present *Romnalda*, consists of one species (*R. papuana* (Lauterbach) P. F. Stevens) found in colline rain forest from 250-960 metres, on dry stony ridges, creek banks and forests in Papua, New Guinea and Irian Jaya. The species does not appear to have any horticultural significance. An undescribed species of *Romnalda* occurs in Queensland (R. Henderson, pers comm.).

The Plant Family JUNCACEAE

by G. J. Keighery

The Juncaceae are a cosmopolitan family of annual/perennial herbs (very rarely shrubs) generally occupying wet habitats. The family is considered closely related to the Liliaceae, differing principally in being wind pollinated instead of insect pollinated. Therefore, members have small, generally brown flowers lacking scent or nectar and should be grown for their fruits or foliage, not flowers.

Within Western Australia 22 species distributed in two genera (21 in *Juncus*, 1 in *Luzula*) are found, of which 5 are naturalized aliens. At least one native species (*Juncus pallidus*) has become invasive in wetter pasture regions and another species (*Juncus butonius*) appears to be composed of a complex of native and introduced forms.



Representative species of the genus *Juncus*

(A) *Juncus pallidus*; (B) Generalized *Juncus* flower, with half perianth removed; (C) *Juncus oxycarpus*; (D) Erect form of *Juncus butonius*; (E) Cushion form of *Juncus butonius*; (F) *Juncus holoschoenus*.

Seeds of *Juncus* species are very small and require light to germinate. Hence they should be dusted on the surface of a sandy soil mix, kept covered by a sheet of glass (to ensure a high humidity) until large enough to be pricked out. Snail attack is often very severe when the plants are young, and seedlings should be retained in pots for the first year until the next winter. Most perennial species transplant readily, and can be divided if the clumps become too large.

Pruning of old foliage can help maintain a neat appearance.

The most hardy species are *Juncus aridicola* and *Juncus pallidus* which can be grown in sandy unirrigated soils in full sun or deep shade. However, most species are seen to their best when grown near water in moist soils.

Many of the species of *Juncus* are colonial, and some of the introduced species (*J. acutus* and *J. articulatus*) are quite invasive. *Juncus pallidus*, *Juncus aridicola* and *Juncus butonius* readily self seed once established.

The most desirable species are:

Tall robust herbs to 2 metres

Juncus aridicola L. A. S. Johnson. A robust clumped perennial to 2m, flowers small, greenish, flowering in spring.

Juncus microcephalus H. B. K. A colonial herb, to 2 metres, flowers brown in an open inflorescence, flowering late spring to summer.

Juncus pallidus R. Br. A tufted herb, to 1.5 metres, flowers greenish, flowering in spring and summer.

Plants to 1 metre

Juncus holoschoenus R. Br. An erect perennial, flowering stems to 1 metre, flowers dark brown on an open inflorescence, flowering spring to summer. Forms dense clumps.

Juncus kraussii Hochst. A colonial perennial herb, flowering stems to 1 metre, flowers dark brown in dense heads, flowering late spring and summer. Forms edging colonies around brackish water, probably a useful species for binding eroding banks of pools, streams or estuaries.

Juncus polyanthemus Buchen. A tufted perennial herb, to 50cm, flowers light brown in large congested heads, flowering in spring and summer.

Small herbs

Juncus caespiticius E. Mey. A small tufted perennial, flowering stems to 20cm, flowers in open inflorescences, dark brown, flowering spring and summer.

Juncus oxycarpus E. Mey. A small colonial grass-like herb, to 10cm, flowers in small heads, dark brown, flowering in spring and summer. A very attractive ground cover in wet areas.

Other species

Juncus butonius L. A small slender annual, to 20cm, flowers green, flowering in spring and summer. The "cushion" form of this species may have horticultural potential.

Juncus gracilis R. Br. A perennial aquatic herb, with emergent inflorescences, flowering in winter and spring.

Juncus pauciflorus R. Br. A colonial perennial herb, to 70cm, flowers green, flowering in spring.

Juncus planifolius R. Br. A perennial (? occasionally annual) grass-like herb, to ??cm, flowers brown, flowering in spring and summer.

Juncus radula Buchen. A perennial herb, inflorescences to 70cm, flowers greenish, flowering in summer.

Juncus subsecundus N. A. Wakefield. A slender colonial perennial herb, inflorescences to 70cm, flowers brown, flowering in spring and summer.

Luzula meridionalis Nord. A tufted grass-like ? perennial herb, inflorescences to 20cm, flowers dark brown, flowering in spring. ■

Australian Plants For Cut Flowers And Foliage

I am undertaking developmental research on the cultivation of Australian plants for cut flowers and foliage. Before any large scale work is commenced it is necessary to know the keeping qualities of a wide range of species. At present I am assessing the vase life of Hawkesbury sandstone flora. In order to gather as much information on other species I would like to hear from S.G.A.P. members who have any records they feel could contribute to this cause. Such information would include source of material, date picked, special treatments, vase life (days) and any other observations (e.g. petal drop, clonal differences, offensive odour). By gathering this information, promising species may be identified and research effort can be focussed on the selection, propagation and cultivation of these species.

GREG LAMONT, Research Horticulturist, N.S.W. Department of Agriculture, P.O. Box 720, GOSFORD, N.S.W. 2250.

Australian Wildflower Seed Suppliers

Nindethana Seed Service — Largest selection of native seed in Australia. Nindethana, Narrikup, W.A. 6326. Available in 50c pks. gram lots or kgs. Send 24c stamp for free catalogue.

H. Grant — 2 Sandra Pl., Dubbo, 2830. West N.S.W. a speciality. Two stamps for a catalogue posted.

Wildflower Nurseries in New South Wales

Bundara Native Nursery — 37 Carters Road, Dural, Sydney, 2158. Tel. 651-1962. Specialising in *Grevillea*. Open weekends. Weekdays please ring first.

Cranebrook Native Nursery — R23 Cranebrook Road, Cranebrook, N.S.W. Tel. (047) 77-4256. Four miles north of Penrith, between Tadmore and Taylor Roads. Open 10.00 a.m.-8 p.m. Closed Sundays.

Denovans Nursery — 188 Marco Ave., Panania, 2213. Tel. 77-8891.

Forest Native Nursery — 9 Namba Road, Duffy's Forest. Tel. (02) 450-1785. We specialise in a wide range of native plants. Catalogue \$4.50 posted. Open 7 days.

Floralands — Parry's Nurseries Pty. Ltd. Kariong via Gosford, 2250. Tel. (043) 40-1142. Preservation by cultivation. Send \$1.50 for descriptive catalogue.

Kentlyn Native Plants — 96c George's River Rd., Campbelltown, 2560. Tel. (046) 25-1583. Open 7 days.

Telopea Valley Nursery — George Downes Drive, Kulnura, 2250, 1.5 km past Kyola Road. Rare and unusual natives. Phone: (043) 76-1318 (best at 9.00 a.m.). Send S.A.E. (230 x 100 mm) for list. Regret no mail orders. Closed Tuesdays.

Wirrimbirra Native Nursery — Hume Hwy. between Bargo and Tahmoor E. side 2574 (3 km N. from Freeway entry). Wide range including unusual plants. Tel. (046) 84-1112.

Wirreanda Nursery — end of Wirreanda Rd., Ingleside, 2101. Tel. (02) 450-1400. Over 20,000 advanced and semi-advanced native trees, shrubs, ferns and indoor plants. Public and trade welcome. Open 7 days. Send S.A.E. for list.

Deanes Orchid Nursery — Specialist in Australian Native Orchids, 29 Hemers Rd., Dural, 2158. Tel. (weekdays) (02) 651-1798. Nursery closed Friday. Plants sent anywhere. Please send for descriptive list.

Wildflower Nurseries in Queensland

Fairhill Nurseries — Fairhill Rd., Yandina, 4561. Tel. (071) 46-9193. P.O. Box 100. Trees, shrubs, ground covers, climbers, ferns, palms and orchids for the sub-tropical and tropical east coast. Extensive display gardens 8.30 a.m. to 5 p.m. anyday. Catalogue \$1.50.

Lakkari Native Plant Nursery — Specialist growers of Australian Plants, retail & wholesale. Large range available. Browse through our display gardens. Many selected natives unique to Queensland as well as new cultivars and hybrids. *Grevilleas*, and rainforest species our speciality. Catalogue \$1.50 posted. Open 6 days (closed Saturday only). 477 Redland Bay Road, Capalaba, Queensland. Tel. (071) 206-4119.

Utingu Native Plant Nursery — (Bob and Glynis Dawson) — 37 Sorbiston St., Wellers Hill, 4121. Tel. (07) 397-5706. Open 7 days. Wholesale and retail, specialising in Australian native plants with a large variety of *Grevilleas* and other indoor and outdoor species.

Wildflower Nurseries in Tasmania

Banksia Nurseries P/L — Waratah Hwy., Elliot 7325. Tel. (004) 36-3128. Open 7 days, 9-5. Grower of rare and common Australian native plants. Available in most sizes at certain times of the year. Advanced and tube lines a speciality. Send S.A.E. for list.

Wildflower Nurseries in Victoria

Austraflora — The nursery with the "Native Know How" — Belfast Rd., Montrose 3765. Tel. 728-1353. Mon.-Sat. 9-5.30 p.m. Sun. 10-5.30 p.m.

Belbra Nursery — Box 12, Halls Gap, 3881. In the heart of the Grampians. Large range of Australian natives. Closed Wednesday only.

BOOKS ON WILDFLOWERS

This is a mail order service of books, the price including a discount of 10% plus postage. You may be able to buy the following books a little cheaper and some groups in the society are offering certain books at a bigger discount so if you want to shop around after reading my reviews, then do so. However the service we offer will be convenient and any small profit made is reinvested in the production of Australian Plants. You may pay a little more through this service but the donation will be well used.

Flowering Trees

F. D. Hockings and C. A. Daniels

An interesting small book by two Society members, David Hockings and Ted Daniels. This 86-page 19x13 cm book describes 125 species of trees (predominantly northern) in the Australian Flora, certainly those most suitable for garden culture. Clear, simple descriptions illustrated by sketches. The book is one of a series and it is not usual to review such commercial general books. However, you may purchase this book or others in the series, from the Editor, Australian Plants for \$4.95 plus \$1.15 postage each. Others available include, "Bonsai", "Growing Fruit Trees", "Lawn Care", "Pests and Diseases", "Propagation Of Trees And Shrubs", "Pruning Trees And Shrubs", with notable authors such as Pax Lindsay.

Hand Books Of The Flora Of Papua New Guinea

The New Guinea flora has affinities with that of tropical Australia. As such these books could be a valuable reference to some. Volume 1 by J. S. Womersley (\$26.00) and Volume 2 by E. E. Henty (\$30.00) is available from the Editor — Australian Plants by mail. Postage being \$2.00 each volume.

The Vegetation Of Australia

Incredibly the same publisher, Cambridge University Press of England has produced two books on the same subject, "The Vegetation of Australia" by Noel Beadle (£50.00) the originator of the excellent reference book "Flora Of The Sydney Region" and "Australian Vegetation", Edited by R. H. Groves (£27.50), of CSIRO, a collection of papers by specialist scientists. Both are exceptionally well prepared and a valuable reference for the student.

"Vegetation Classification In Australia", with Gillison & Anderson as editors, is another new book produced by Australian National University Press, P.O. Box 4, Canberra, ACT, 2600, and available from them at a special introductory offer of \$12.00 post-free.

The same subject has been handled in a limited way in Volume I of the Flora Of Australia, available for \$15.00. The flora will be our reference in future issues.

Books On The Flora (Some including fauna) of Discrete Areas

For Australia	
Flora Of Australia — Volume 1, Introduction	\$15.00
Australian Plant Genera — The only botanical reference to all genera	\$11.30
For N.S.W.	
Flora of the Sydney Region" — The well known Beadle Student's Flora	\$35.00
"Plants of Western N.S.W. — 752 pages, colour illustrated by N.S.W. Herbarium	\$50.00
"Plants of N.S.W." — A census of Cycads, Conifers and Angiosperms ...	\$20.00
"Kosciusko Alpine Flora" — Costin, Gray, Totterdell and Wimbush	\$29.00
For Queensland	
"Native Plants Of Queensland" by Keith Williams	\$32.00
"Wildflowers Of Tropical Queensland" — A Wilderness in Bloom by Hinton	\$9.00
"National Parks of Southern Queensland" by Mackness	\$15.00
For Victoria	
"Handbook to Plants in Victoria", Willis — Vol. 1 \$24.00; Vol. 2	\$32.00
"Flowers and Plants of Victoria and Tasmania"	\$26.00
For South Australia	
"Flora of South Australia", Black — Part 1, \$20.00. Parts 2-3 and 4 each	\$9.00
For Northern Territory	
"North Australian Plants," Harmer	\$8.00
"Flora Of Central Australia" Aust. Systematic Bot. Soc.	\$37.00
For Western Australia	
"Flowers and Plants of Western Australia"	\$26.00
"West Australian Plants — A Descriptive Catalogue", Beard	\$10.00
"West Australian Plants For Horticulture" — Part 1 and Part 2	\$10.00
For Tasmania	
"A Guide To Flowers and Plants Of Tasmania", Ed. M. Cameron	\$25.00

About Specific Groups of Plants

Ferns — "Australian Ferns & Fern Allies". Revised & Enlarged. Jones & Clemesha	\$22.00
Eucalypts — "Eucalypts" Vol. 1 and Vol. 2, by Stan Kelly	\$24.00
"A Gardener's Guide to Eucalyptus", by Ivan Holliday	\$18.50
Mint Bush — "Prostanthera" — "The Cradle of Incense" — Althofer	\$16.40
Wattles — "Acacias of N.S.W." Armitage	\$10.00
"Acacias Of South Australia" — Whibley	\$10.00
"Aquatic Plants Of Australia" — H. Aston	\$25.00
"Useful Wild Plants In Australia" — A. B. & J. W. Cribb	\$16.00
Darwinia and Homoranthus — A Guide to — T. L. Blake	\$8.00
"Seaweeds of Australia", Ed. 1; Christianson	\$20.00
Carnivorous Plants — Slack	\$20.00
Plants Of Prey — Erickson — Insectivorous plants of W.A.	\$15.00

On The Cultivation Of Australian Plants For All States

Australian Plants—The best reference. Bound volumes 2-9, @ \$15.00 plus \$1.00 post.	
For details of previous issues see inside the rear cover.	
"A Horticultural Guide To Australian Plants" — Sets 1-6 @ \$3.00 each; Set 7	\$6.00
"Encyclopaedia Of Australian Plants" Volume 1 — Elliott & Jones	\$36.00
"Australian Native Plants" — Wrigley & Fagg	\$37.00

Past Issues of "Australian Plants" Available

Because of the vast wealth of our flora there is very little repetition, each volume becoming a valuable reference book in itself. Each volume has a separate abridged index. A composite index of volumes 1-8 is available for \$2.00 plus 60c postage. Bound in hard-cover form, beautifully presented with gold-lettered green vinyl covering, each volume has bound with it another Society book as indicated below and is available for \$15 plus \$1.50 per volume.

- VOLUME Nos. 1 and 2. Not to be reprinted because of low demand.
VOLUME No. 3. Issues 21-28, bound with "Catalogue of Cultivated Australian Plants".
VOLUME No. 4. Issues 29-36, bound with "W.A. Plants For Horticulture—Part I".
VOLUME No. 5. Issues 37-44, bound with "The Language of Botany".
VOLUME No. 6. Issues 45-52, with "West. Aust. Plants for Horticulture—Part II".
VOLUME No. 7. Issues 53-60, bound with "North Australian Plants".
VOLUME No. 8. Issues 61-68, bound with "The Cradle of Incense".
VOLUME No. 9. Issues 68-76, bound with Australian Plant Genera.
VOLUME No. 10. Issues 77-84. Individual issues only available at \$2.00 post free.
VOLUME No. 11. Issues 85-92. Each issue to date available at \$1.50 post free.
Binders for separate issues of Australian Plants are out of stock.

Other Books Published by the Society:

- "WEST AUSTRALIAN PLANTS", 'A descriptive catalogue' by Dr. J. S. Beard, \$9.00 plus \$1.00 postage. The only complete reference to the flora of Western Australia.
"WEST AUSTRALIAN PLANTS FOR HORTICULTURE", Parts 1 & 2, by K. Newby, each \$9.00 plus \$1.00 postage. A valuable guide to the plants with horticultural potential.
"NORTH AUSTRALIAN PLANTS", by Jenny Harmer, \$9.00 plus \$1.00 postage. The most comprehensive reference to plants to the Darwin area available.
"CRADLE OF INCENSE", The Genus '*Prostanthera*' by G. W. Althofer, \$15.00 plus \$1.40 postage. The only reference to our Mint Bushes, the genus '*Prostanthera*'.
"THE LANGUAGE OF BOTANY", by C. N. Debenham, \$7.20 plus \$1.00 postage. An outstanding reference to botanical terms with examples from Australian flora.
"AUSTRALIAN PLANT GENERA", by J. A. Baines, \$9.90 plus \$1.40 postage. The only reference to the whole of the flowering plant flora of Australia.
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"FRIENDS AND FOES IN YOUR GARDEN" — D. Hocking, \$24.95, post free.
The best guide on pest and disease control of plants in your garden.
"AUSTRALIAN INDIGENOUS ORCHIDS", by A. W. Dockrill. I have some copies left, slightly damaged, for \$30.00 each, post free.

The Society for Growing Australian Plants

The Society is for people interested in the Australian flora, its preservation and cultivation in the wild, in parks, and in public and private gardens. Preservation of our magnificent flora will, in the long term, depend on the knowledge accumulated, on its cultivation under a wide range of conditions. We hope to learn more about this by cultivating wildflowers in the garden, encouraging research on this aspect, and to record this in "Australian Plants". Enquiries for membership should be directed to:

- SOCIETY FOR GROWING AUSTRALIAN PLANTS—N.S.W. REGION:**
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Price Increase

A substantial increase in price is necessary for us to survive. Your continued support will be appreciated.



***Eremaea pauciflora* backed by a Smoke Bush, *Conospermum* sp.**

This type of picture is usually avoided as the principal objective of our publication is to feature plants for, and hopefully in, or from, a garden situation. However there are a number of points that concern the theme of this issue.

1. The vivid orange of the *Eremaea* contrasts well with the white of the smoke bush behind it and both are flowering well.
2. We need floriferous white flowered shrubs such as the *Conospermum*. There have been references in past issues but not enough. Who can report?
3. The picture shows the growing conditions of much of the Western Australian flora. It can however be most misleading. The *Eremaea* is probably growing from an old thick woody root which reaches down deep into the soil even to clay or limestone. Not shown are the many generations of seedlings or plants that have not survived. We could never replicate the growing conditions shown, nor the weather, but it is hoped to find a reliable way of growing our wildflowers as well as this in the average to good garden conditions — Editor.