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Photography by E. R. Rotherham

Grevillea banksii

THE PROPAGATION AND CULTIVATION OF AUSTRALIAN WILDFLOWERS

AUSTRALIAN WILDFLOWER CULTIVARS

The Australian Cultivar Registration Authority announces the official registration of two cultivars. *Grevillea* 'Robyn Gordon' described opposite is a hybrid cross between two exceptional Australian native plants. *Grevillea juniperina* 'Molonglo' as described below, on the other hand, is a form of a true species that has been developed for special horticultural characters.

A cultivar is a plant that shows outstanding horticultural potential whether it is the development of a very good form of a true species (or even the growing on of an exceptionally good form found by accident and maintained for our enjoyment) or is a hybrid of different species.

The first two registrations will serve as a guide for those who wish to submit plants for cultivar registration. In these cases the information supplied is ideal but some applicants may not be competent to meet this standard. Supply as much information as possible. Do not submit plants for registration that are not really worthy of a place among the horticultural gems we shall register or are not really exceptional forms.

The submission for *Grevillea* 'Robyn Gordon' was accompanied by good colour slides one of which appears on page 305. The flower is as described, resembling one of the parents *Grevillea bipinnatifida* but more open like a mainly one-sided *Grevillea banksii* so a good pictorial presentation is possible. *Grevillea juniperina* 'Molonglo' was not submitted with a colour slide so that we hope in the future to show a colour plate of the plant, the flower and another of a good species of *Grevillea juniperina*.

Grevillea juniperina 'Molonglo'

A Useful Grevillea Cultivar by D. Verdon, Canberra Botanic Gardens

The plant described below was developed during experiments in this field in 1964 by Mr. R. Willing of the A.N.U. Canberra. It has since been the subject of trials by the Research Section of the City Parks Administration at Canberra and over several years has displayed high frost and drought tolerance. These factors, together with its low spreading habit, contribute towards its suitability for planting on steep banks especially in cool districts. In addition its production of numerous apricot flowers in spring and again in autumn will further enhance these often bleak areas.

Description

A low spreading shrub to 1m high, 1m+ across; branches pubescent, arcuate to declinate the longer branches becoming decumbent; leaves 8-20mm long and 1-2mm wide, linear-subulate, somewhat angular, with pungent apices, the upper surfaces glabrous, the lower pubescent and almost hidden by the revolute margins; flowers apricot (R.H.S. Colour Chart 609/1 to 609/2) in sessile racemes, terminal on short lateral branches; perianth tubes 10-12mm long, silky pubescent outside; styles ca 30mm long red.

G. juniperina 'Molonglo' differs from *G. juniperina* (yellow flowered prostrate form) in its spreading not prostrate habit, its narrower, more pungent leaves with closely revolute margins and in its larger apricot flowers with red styles. It also differs from other forms of *G. juniperina* in its low spreading habit and in flower colour.

Parentage

Grevillea juniperina (upright red flowered form from the Canberra region) x *Grevillea juniperina* (yellow flowered prostrate form from the Western foothills of the Budawang Ranges, New South Wales).

The cultivar name 'Molonglo' was proposed by Mr. R. H. Powell, Research Arboriculturist of City Parks Administration in Canberra.

Editor's Note: There are many cultivars submitted for registration which shall be dealt with as soon as possible. It is proposed to register the "Clearview" and "Poorinda" Hybrids shortly. Will anyone who has good colour slides or prints of these or any other good cultivar, send them to the Editor as soon as possible.

Grevillea 'Robyn Gordon'

Submitted For Cultivar Registration by David N. Gordon, Glenmorgan, Qld. 4423

This plant first appeared in my garden of Myall Park, Glenmorgan in 1965 and appeared to be a spontaneous hybrid between *Grevillea bipinnatifida* and *G. banksii*. Both the assumed parents were growing in very close proximity to the seedling.

It is a low sprawling shrub which grows taller and spreads more than *G. bipinnatifida*, reaching a height of 1 metre and with a spread of 3 or more metres. Most of its leaves are bipinnatifid, and each lobe ends in a fine attenuated point. To the naked eye the leaf appears to be glabrous, but short silky hairs are scattered over the lower surface and a few can be found on the upper surface, particularly on or near the veins. The leaves are firm in texture, and the colour of the upper surface is darker than that of the lower.

The terminal racemes usually arch outwards and downwards, with most of the flowers on the upper side. The racemes are 13 to 15 cm long and contain about 100 flowers arranged in pairs along the rachis. On a flourishing plant further lateral racemes develop beneath the lower flowers.

This cultivar differs from *G. bipinnatifida* and *G. banksii* in the following characters.

<i>G. bipinnatifida</i>	<i>G. 'Robyn Gordon'</i>	<i>G. banksii</i>
HABIT Low prostrate shrub.	Sprawling shrub, 1 metre high with a spread of 2-3 metres.	Erect shrub or small tree.
LEAVES Bipinnatifid, 9-21 segments, each again divided into wide triangular lobes, ending in a spiny, pungent point.	Pinnatifid or bipinnatifid, those immediately beneath inflorescence pinnatifid; upper segments of other leaves broadly linear, lower divided again into 3-5 lobes; lobes ending in a fine attenuated point.	Deeply pinnatifid or pinnate, 3-11 broadly linear or lanceolate segments.
Texture harsh or rigid.	Texture firm but not leathery.	Texture firm or leathery.
Upper surface glabrous, scattered hairs on veins on lower surface.	Short, silky appressed hairs scattered on lower surface and a few on, or near the veins on upper surfaces.	Upper surface glabrous, lower with a dense covering of appressed silky hairs.
INFLORESCENCE Pendant, with most of the flowers on upper side.	Arching outwards and downwards with most of the flowers on upper side.	Erect.
Mixed tomentum of colourless, spreading hairs and spreading red hairs with red glandular tips.	Mixed tomentum of spreading red hairs with red glandular tips and closely appressed white hairs.	Dense tomentum of spreading, colourless hairs with glandular tips on rachis, pedicels and buds.
FLOWERS 1.2 cm long. Colour red. (R.H.S. Colour Chart 42B).	1.3 cm long. Crimson. (R.H.S. Colour Chart 52A).	1.5 cm long. Empire Rose. (R.H.S. Colour Chart 48C).
STYLE 3.7 cm long. Colour cardinal red. (R.H.S. Colour Chart 53B).	4 cm long. Cardinal Red. (R.H.S. Colour Chart 53C).	4 cm long. Cardinal Red. (R.H.S. Colour Chart 53C).

Grevillea 'Robyn Gordon'—Description

Closely appressed minute white hairs cover the rachis, pedicels, buds and the outer surfaces of the flowers. Widely spreading red hairs with red glandular tips are scattered over the young parts of the inflorescences. These glands disintegrate soon after picking and are difficult to see in a cut specimen, but the red stalks can still be seen on the pedicels and the rachis. In mature, open flowers the perianth is about 1.3 cm long and the outer surface is densely covered by fine closely appressed hairs. The colour of the outside of the buds is carmine rose, and the mature flowers are crimson. The curved styles are about 4 cm long and cardinal red.



Photography by M. Hodge

GREVILLEA BIPINNATIFIDA

One of the parents of the hybrid *Grevillea* 'Robyn Gordon'. The flower resembles that above possibly not as long but broader like the flower of the other parent *G. banksii* shown on the front cover. The foliage is not as hard as that above and more upright.



GREVILLEA 'Robyn Gordon'

The original plant on David Gordon's property. He continues:

It attracted my attention because it flowered prolifically and almost continuously. It has never set seed and all propagation has been by vegetative means (by cuttings). I distributed these in March 1968 to Alex Scott, Birkdale Nursery, Cleveland Road, Birkdale, Queensland, 4159, and to Sid Cadwell, Annangrove Road, Annangrove, N.S.W. 2153.

All plants now available from nurseries are progeny from the original cuttings distributed. The cultivar was named 'Robyn Gordon' in memory of my daughter Robyn who died tragically in 1969 at the age of 16.

This cultivar has been under trial since 1963 (11 years) and has proved itself stable in its growth habit, its floriferous nature and flower colour.

A botanical specimen has been lodged at the Queensland Herbarium (BRI 161690).

The viability of the pollen of *G. banksii*, *G. bipinnatifida*, and the hybrid have been tested by Mr. R. J. Henderson, Senior Botanist, Queensland Herbarium by examination in Lacto-phenol Aniline blue. The test showed the pollen of the first two is greater than 95% fertile and that of the cultivar is less than 1% fertile. It is also interesting to note that while *G. banksii* and *G. bipinnatifida* produced copious pollen, the quantity produced by the cultivar was negligible.

SUPERB WILDFLOWERS

The wildflowers in this issue make beautiful garden plants and are readily grown. The *Grevillea* and the closely related *Hakea* opposite enjoy good garden conditions as mentioned below.—Editor.

GREVILLEA IN QUEENSLAND by David Hockings

Grevillea banksii is a very hardy and dependable species in cultivation. The origin of the garden form is unknown. It will thrive in a range of soil types and is much more tolerant of hard setting soil and the seasonal wet than are southern and western species. It flowers for most of the year.

Grevillea bipinnatifida is hardier here than most western *Grevilleas* and it does reasonably well if grown in a sunny section or in a built-up position. It too flowers intermittently for much of the year.

G. x Robyn Gordon seems to have inherited the hardiness to our conditions of *G. banksii*, and perhaps disease tolerance. It flowers practically non stop, not just a few flowers at a time, but profusely.

HAKEA MULTILINEATA & H. BUCCULENTA

A report from Victoria by M. Fisch

Both have been successfully grown by members in southern Victorian gardens. I have both in my place, *Hakea multilineata* growing much more vigorously than *H. bucculenta*, both flowering regularly. Other growers insist that *H. bucculenta* is easier to grow.

I raised both varieties from seed, planted them out when only a few inches high, in well drained rather dry positions, both plants being mulched, and they survived the last two droughts without any watering. I had found out earlier that *Hakeas* don't stand fresh sawdust or fresh buzzer-chips. These materials have to be well "matured" before being used.

WILDFLOWERS IN MY GARDEN

Anthony Healey of Cabramatta, Sydney, included the following notes in a letter to the Editor. I hope he will not mind me using them here. He clearly realises the problems he faces, principally drowning of plants in shallow beds with poor drainage. When he uses raised beds incorporating much of that good dark soil, but properly drained, he will be very successful. His notes support the advice that the *Grevillea* and *Hakea* are hardy rewarding plants.

I live between Liverpool and Fairfield, an outer suburb of Sydney. The soil is dark with a heavy clay content and is only 1/4 to 1/2 metre deep over a gravelly clay base derived from shale. The land is very flat with negligible slope and poor drainage. Original vegetation was open forest of *E. maculata* and *Melaleuca*, short grass, prickly myrtles and *Acacia*.

The garden is only about 30 ft. square being limited by funds, exotic cultivation and couch grass. Most planting takes place in summer and was begun 3 years ago using 6" beds of good sandy bush soil for small plants and mounds mixed with the base material for larger trees.

The major cause of losses, almost always with plants less than a year old is drowning due to heavy rain causing sumps.

Successes:

Grevillea banksia, *G. hookerana*, *G. sericea* and a *Grevillea* cultivar. *Hakea salicifolia*, *H. teretifolia*.

Eucalyptus nicholi, *E. sideroxylon rosea*, *E. maculata*, *E. citriodora*.

Melaleuca armillaris, *Prostanthera nivea* var. *induta*, *P. pinifolia*, *Callistemon citrinus*, *Doryanthes excelsa*, *Macrozamia*, *Macadamia* (2 lb. nuts this year), *Anigozanthos flavidus*, *Banksia asplenifolia*, *Actinotus helianthi*, *Hardenbergia* and others.

Failures: Many.

Grevillea banksii grows well, sets seed and produces seedlings near the plants. I find it intriguing that at least 50% of the flowers on my *Grevillea banksia* have 2-5 stigmas separate, partly and totally joined, fully developed or vestigial—is this usual?

Hakea multilineata

And Its Allies With Two New Species Described by J. Maconochie

Hakea multilineata and its allied species have the following similarities: all are shrubs; leaves linear, flat with several to many nerves; inflorescence a many flowered raceme 2-10 cm long, enclosed in bracts at the bud stage; stigmatic cone long and narrow; fruit almost sessile.

In general, the flowers of *H. coriacea*, *H. francisiana*, *H. grammatophylla* and *H. multilineata* are very similar. *H. minyma* differs by having much smaller creamy-white flowers (pink to red in the other species).

H. bucculenta Gardn. is allied to this group of species in that it has a raceme of similar size, shape and colour, similar fruit, but differs in that its leaves are much narrower and uni-nerved.

When the number of veins per leaf is used in combination with inflorescence length and size, pubescence on rhachis, and fruit shape, then these species can be readily separated.

A KEY TO *H. MULTILINEATA* AND ALLIES

- | | | |
|--|-------------------------------------|---|
| 1A Leaves, flat, linear with one distinct central vein | <i>H. bucculenta</i> (W.A.) | 2 |
| 1B Leaves, flat, linear with several to many veins | | 2 |
| 2A Mature fruit with distinct bicarinate ventral suture, 10-20 main veins, mostly 15.
Inflorescence red, rhachis glabrous, raceme 1.0-3.5 cm.
Open flower 2.2-2.4 cm long | <i>H. multilineata</i> (W.A.) | 3 |
| 2B Mature fruit without bicarinate ventral suture | | 3 |
| 3A Rhachis of inflorescence tomentose, leaves coarsely striate
6-9 main veins, mostly 7.
Upper leaf surface with several main nerves, lower equal.
Raceme 2.2-3.8 cm.
Open flower 2.0-2.1 cm | <i>H. grammatophylla</i> (N.T.) | 4 |
| 3B Rhachis of inflorescence glabrous, leaves not coarsely striate | | 4 |
| 4A Inflorescence creamy white, 3.0-5.0 cm. long
Leaves almost smooth Main veins 14-17 mostly 15.
Open flowers 8-9 mm. long | <i>H. minyma</i> (N.T., S.A., W.A.) | 5 |
| 4B Inflorescence bright red 6-10.0 cm. long.
Leaves finely striate
Open flower 2.6-2.8 cm long | | 5 |
| 5A Main veins 5 to 8, mostly 5 or 7
Leaves 3-6 mm. wide | <i>H. francisiana</i> (S.A., W.A.) | |
| 5B Main veins 8 to 13, mostly 9 to 10
Leaves 6-16 mm. wide | <i>H. coriacea</i> (W.A.) | |

1. *Hakea bucculenta* Gardn.

Shrub to 2 m. high, several stems inflorescence pink to red, 8-9 cm. long, leaves narrow with one central vein 12-17 cm. long. Found in the Galena-Geraldton area of Western Australia. Colour plate, page 321.

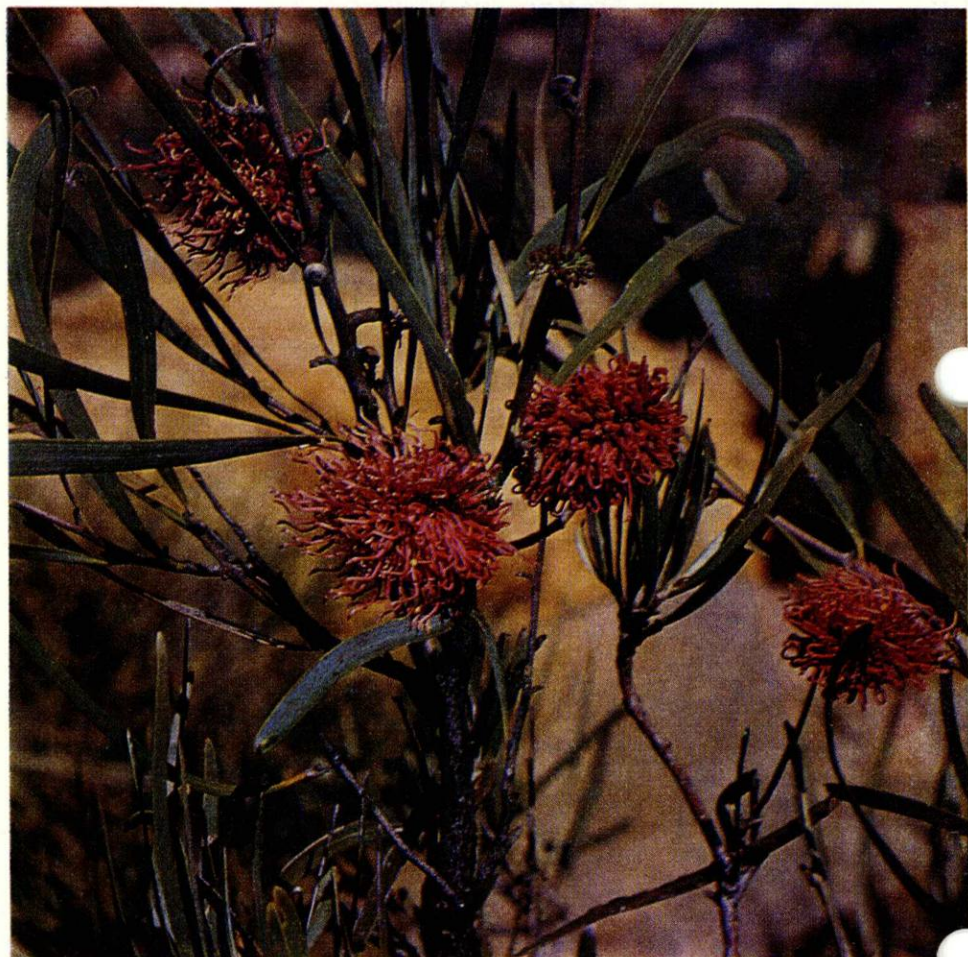
2. *Hakea coriacea* Maconochie

Shrub or small tree to 3-4 m. high, several stems, inflorescence pink to red, 6-10 cm. long, leaves flat to 1.5 cm. wide. Bonnie Rock-Cowcowing-Mullewa Area, Western Australia. Colour plate, page 309.

Shrub to 3 to 4 m high, leaves linear, flat, coriaceous, with a fine pubescence on the interveinal area, 9-22 cm long mostly 14-17 cm, 6-16 mm wide, mostly 8-10 mm with 8-13 nerves. Inflorescence pink-red, rhachis glabrous 6-11 cm long, a raceme of many flowers. Flower glabrous 23-25 mm long, pedicel 2-3 mm long, perianth 7-8 mm, style glabrous 19-21 mm, stigmatic cone 1.5 mm long. *Torus* slightly oblique, gland semi-annular. Bracts glabrous or sometimes puberulous with ciliate margin, caducous. Fruit woody, shortly pedunculate (2-3 mm) about 18 mm long, 12 mm wide and broad, wall smooth with a few small pustules or sometimes with small fissures. Closely related to *H. francisiana* but differs in greater number of nerves and wider leaves.

3. *Hakea francisiana* F. Muell.

Shrub or small tree 2-3 m. high, several stems, inflorescence deep pink to red, 6-10 cm. long, leaves flat about 0.5 cm. wide. Widely distributed in south-west South Australia and Western Australia. It has been confused with both *H. coriacea* and *H. multilineata* and is commonly cultivated in the eastern states. Colour plate, page 348.



Photography by R. W. Burbury

HAKEA GRAMMATOPHYLLA

4. *Hakea grammatophylla* (F. Muell.) F. Muell.

Shrub to 1 m. high, few stems, with pink to red inflorescence and flat leaves. Restricted to the Macdonnell and George Gill Ranges in N.T.

5. *Hakea minyma* Maconochie

A shrub 1-2 m. high, multi stemmed, inflorescence creamy white, leaves flat almost smooth. Found mostly on sand plain areas in south-west of N.T., South Australia and Western Australia.

Shrub 1-2 m tall, with several main stems. Leaves erect, flat, linear, elongate, smooth, glabrous, rigidly coriaceous, 8-15 cm long, 5-8 mm wide, with 14-17 nerves (mostly 15). Inflorescence a raceme with numerous flowers, rachis glabrous 3.0-5.0 cm long. Open mature flowers 8-9 mm long. Perianth creamy-yellow, glabrous; torus about 1 mm long, 0.5 mm broad, horizontal to slightly oblique. Ovary almost sessile, glabrous, 1-1.5 mm long; style glabrous, filiform, 5-6 mm long; stigma glabrous, erect, conical, 1 mm long. Gland ovoid-globular, at base of ovary. Fruit ovoid-globular, 2-2.5 cm long, 1-1.5 cm broad; pedicel 1-3 mm or less; beak strongly developed, often curved. Wall smooth with small pustules, coloured beige to light tan, the latter colour often more pronounced on beak. The beak is often lost from fruit older than twelve months and the wall becomes grey in colour. Fruit then 1.9-2.0 cm long and 1.4-1.6 cm broad. Seed body 8 mm long; wing 1.7 cm long, black, rhombic or angulato-ovate in shape, decurrent along one side.

6. *Hakea multilineata* Meisn.

Shrub 1-3 m. high, often with one or two well developed main trunks. Leaves flat with numerous veins, inflorescence red about 1-3.5 cm. long. Fruit with ridges on either side of the line of dehiscence. Restricted to the south-west (Bruce Rock-Lake Grace-Victoria Rock) corner of Western Australia.



Photography by F. W. Humphreys

HAKEA CORIACEA

This species is described on page 307 and is closely allied to *H. multilineata* which is very similar in appearance to the picture above except that the 'flower' head is pink to red. All are beautiful shrubs and a report on cultivation is given on page 306 or in the following article. Propagation is also easy and is described on page 321.

HAKEA

by K. Stuckey

Hakea amplexicaulis. A very interesting Hakea because of the large 6-8 inch flat, prickly toothed sessile leaves which are broadest at the deeply cordate base, the rounded lobes clasping the branch. New growth and margins of young leaves are rusty red on this upright sprawling shrub of 8 feet. White tinged pink-brown flowers in the leaf axils are attractive in September but it is very shy of setting seed, at least in cultivation. It likes a well drained, open but protected situation. Forest country, S.W.-W.A.

Hakea auriculata. A spreading shrub about 2 feet high and 6-8 feet across, the 2-3 cm flat sessile leaves are broad and prickly toothed at the end, tapering to a narrow waist, then broadening at the base where the leaf becomes stem clasping. The white flowers are in axillary clusters during October/November.

Hakea baxteri. Is generally of very upright habit to 10 feet, and notable mainly for its foliage, the stiff leaves being 2-3 inches broad and fan shaped, the broad rounded end being undulate. Flowers are rusty-white in the spring. A hardy shrub which could be used to good effect in garden landscaping.

Hakea bucculenta. The flowers of this Hakea are probably the most brilliant of all Hakeas, the scarlet 3-4 inch spikes start flowering in June and further flowers develop through to October. This upright shrub has long narrow linear leaves which do not greatly obscure the flowering spikes. In cultivation it needs good drainage and open, full sun situation.

Hakea ceratophylla. This shrub is remarkable for the immense variation in leaf forms on the one shrub. The flat 3-4 inch leaves are usually irregularly lobed, only occasionally entire, or may be lobed on one side only. This shrub attains a height of 5 feet and is rather spreading, white flowers are born in the upper axils in Oct./Nov.

Hakea circumdata. A spreading rounded shrub of 5 feet and 6-8 feet across, the one inch terete leaves are semi-stiff and pointed. The flower clusters are terminal and very numerous, at first appearing pink and later developing purple and rusty-red tonings. It flowers during July and August and has a strong honey sweet perfume.

Hakea cinerea. A shrub worthy of cultivation for its form and colour. The 4-6 inch stiff, oblanceolate leaves are ash grey, giving the 7-8 feet upright shrub a glaucous appearance. The bright yellow flowers are also very attractive, being born axillary on the upper branches, the more mature flowers turn orange giving a mixture of yellow and orange at the one time. Flowers Sept./Oct.

Hakea commutata. This can be a useful shrub in cultivation as it flowers in November or when most other species have finished flowering. It is a shapely rounded shrub of 5 feet with stiff, terete leaves 2-3 cm and are dark green. The flowers are small but very numerous in the upper axils and are cream with red pedicels.

Hakea conchifolia. 'Shell leaved Hakea'. A dainty little Hakea of 2-3 feet with orbicular, incurved leaves giving a shell like appearance. The flowers are usually white, in some forms are tinged red, axillary or at the bottom of the shell and not very obvious, but very intriguing on close inspection. The ripened fruits are very tiny and probably the smallest of the genus. It prefers an open situation with good drainage.

Hakea corymbosa. In its habitat in the south west of W.A. this shrub is usually only 2-4 feet high, compact with a dense, somewhat flattened head, while in cultivation it can develop into a more branching shrub of 7 feet. The 2-3 inch leaves are very stiff and prickly pointed, and the lime yellow flowers appear among the leaves of the flattened head of the shrub in Sept.

Hakea costata. A branching shrub of 4-5 feet with stiff, narrow, under half inch leaves which are very prickly. The white flowers are axillary towards the end of the branches making 'spikes' of a foot or more and very showy. Flowers in August and September and likes well drained sandy soil.

Hakea cristata. An upright shrub with stiff, 2-3 inch prickly toothed leaves, the white flowers are axillary towards the ends of the branches. Flowers in July and likes well drained sandy soil. The specimen I have is growing in a crowded and shady site and I feel it could be a much better shrub with more room and light.

Hakea cucullata. The 'hood leaved' Hakea. This is a very worth while Hakea for cultivation, especially the deep pink flowered form. The handsome cup shaped leaves are always attractive and when they have a cluster of bright pink flowers at the base, the combination is perfect. This is one of the fastest growing Hakeas and the flat juvenile leaves give no hint of the orbicular, concave leaves to come at maturity, it has an upright habit of growth to 10 or more feet, and likes sandy soil and 25 inches or over of rainfall. Colour plate in Volume 5, page 344.

Hakea elliptica. Is a shapely shrub of 8-10 feet, the dark green foliage covers the shrub from the ground up. The oval leaves are attractively veined, sessile on the branches and make reasonably dense cover. The white flowers in the upper leaf axils are very pleasing amid the dark green foliage.

Hakea erinacea. A stiff upright shrub with short, stiff, terete leaves divided several times, the flowers are small but numerous, are usually white but in some forms can be tinged pink. Flowers in July.

Hakea falcata. A bushy, upright shrub to 4 feet with flat, almost linear leaves 2-3 inches long. It has white flowers in the upper axils in early spring. It is not showy in flower but makes a shapely shrub.

Hakea ferruginea. An upright rounded shrub of 6-7 feet, and 2 inch heart shaped leaves are mid green and do not make a dense cover. The white flowers occur in the upper leaf axils in October.

Hakea flabellifolia. A very interesting foliaged little shrub of 18 inches to 2 feet. The fan shaped, leathery leaves are somewhat similar to *H. baxteri* only with a longer petiole. It has several branches from the base and has an open, straggly appearance. The small flowers are axillary and a pale yellow-green.

Hakea francisiana. A large shrub or small tree that will grow in acid soil types but prefers alkaline soils. The most usual form has long narrow linear leaves 6-8 inches with parallel veins, sometimes with shorter and broader leaves. The flowers are in axillary racemes 3-4 inches long and can vary in colour from white to scarlet. Colour plate on page 348.

Hakea fraserii. Optimistically I planted this inland species 14 years ago in our poor sand and cool climate with the result that it has only grown 5 feet in all that time. In Dave Gordon's garden in inland Queensland I saw younger specimens 15 feet high and covered in panicles of white flowers.

Hakea invaginata. This is an outstanding small shrub of about 4 feet, upright in habit with terete 4-6 inch leaves slightly striate. The flowers are usually a lovely soft pink in the upper axils, fairly closely spaced making a spike of flowers about 6 inches long. One form has brilliant mauve-pink flowers. It appears to prefer a well drained, open situation.

Hakea laurina. The 'pin cushion Hakea' has been cultivated extensively for many years and has proved adaptable to many soil types and situations. It is best in an open situation but should have some protection from strong winds as it is rather prone to be blown over in excessively rough weather, especially in light textured soils. It is being used in Adelaide as a street tree.

Hakea lehmanniana. Is remarkable for the steely blue flowers born in the upper axils in mid-winter. The short, stiff, very pungent pointed leaves make flower picking or seed collecting a very painful operation. It has a dense habit of growth to about 4 feet.

Hakea lissocarpha. A spreading small shrub of 2-3 feet with stiff, terete, divided leaves. The numerous spreading branches make a fairly dense cover of about 5 feet across. The flowers are numerous and usually white but in some forms are tinged pink. Colour plate on Volume 5, page 373.

Hakea nitida. A robust shrub with forms that can vary in leaf shape and the time of flowering. The form with entire flat leaves appears to be more upright in habit and flowers several weeks earlier than the form with irregular prickly teeth bordering the leaf and it also flowers more prolifically. The white flowers are borne in numerous axillary racemes during September.

Hakea nodosa. Likes damp situations but will also thrive in dry well drained sites. It is one of the few *Hakeas* that has comparatively soft handling foliage, the crowded leaves are 1-1½ inches long, terete or slightly flattened and deep green. The growth habit is dense and rounded but more spreading and open with age. The yellow flowers are small but numerous in the upper axils and appear in early winter—May-June.

Hakea oleifolia. A strong growing upright shrub of 12 to 18 feet with flat, oblong lanceolate leaves about 2 inches long and soft to handle (compared to most *Hakea* species). The flowers are white in the upper axils in September. One specimen growing under low hung telephone wires has to be cut back 3-4 feet each year to be kept clear of the wires. It grows in semi-shade or open situation and would be useful for seaside planting.

Hakea orthorrhyncha. This *Hakea* does well in a heavy soil but here in poor sandy soil it has proved to be very slow growing and straggly. The bright red flowers in mid winter growing mainly on the old wood, can make a bright showing when there are very few flowers about.

Hakea pandanycarpa. Notable mainly for having the largest fruit of all the *Hakea*, 2-2½ ins. dia. The development of the hard woody fruit is interesting; the first year an elongated normal looking *Hakea* fruit develops; the second year it becomes 3-4 times as large and slightly roughened; the third year it again increases in size and develops conical corky protuberances all over the large ovoid fruit. The shrub is upright and rather slender, the 3-4 inch flat leaves are somewhat leathery and sparse, also the flowers are not numerous, being axillary in the upper axils and reddish brown.

Hakea petiolaris. A hardy upright shrub of 8-12 feet, the 2-4 inch ovate leaves are glaucous. The 'pin cushion' flowers are purple-white and appear in May-June. This species could be useful in landscaping where its upright habit and glaucous appearance could be used to advantage.

Hakea platysperma. Notable mainly for the large 2 inch globular fruit and the large seed surrounded by a circular wing. It is an upright shrub to 6 feet with thick upright terete leaves, with numerous small yellow/brown flowers in the axils.

Hakea prostrata (syn. *H. glabella*). This species can vary in form from being low and spreading to a stout upright shrub of 12 feet. Evidently the prostrate form was collected near the coast where strong winds etc. kept it low whereas the inland form developed into an upright shrub and was known as *H. glabella*. The 2-3 inch leaves are broadest at the apex and taper to the stem clasping base and are usually prickly toothed. The creamish flowers are born in the leaf axils and are very attractive. This *Hakea* is shy in setting seed and usually sheds the seed within 12 months.

Hakea pycnoneura. A rather weak shrub 6-8 feet with long linear leaves which have prominent margined and centre veins. The flowers are of the small pin cushion type and purplish in colour.

Hakea recurva. A stiff, stout, shrub and needs to be treated with respect as the stiff 2-4 inch terete leaves are very sharply pointed. The white flowers are showy in the leaf axils.

Hakea roei. A shapely upright shrub of 6-8 feet with flat, 2-3 inch upright growing leaves. The axillary flowers are comparatively large and vary in colour from white to a beautiful soft pink. The pink form can be recommended for cultivation in an open sunny position, it flowers in October.

Hakea rostrata. An upright but open shrub of 4-6 feet with 3 to 4 inch terete leaves and prickly but not closely spaced. The flowers are white and appear in October. This, and the following species *H. rugosa* are commonly called 'kidney bush' because of the likeness of the fruit to the shape of a kidney, the apex of the fruit is closely reflexed to about the middle.

Hakea rugosa. An upright and denser shrub with stiff 1 to 2 inch terete leaves and very prickly. The white flowers are very numerous making the whole of the upper portions of the shrub a mass of white flowers. This shrub prefers damp situations and a heavy soil type, or a shallow sandy loam over clay. Both *H. rostrata* and *H. rugosa* recover quickly from burning.



Photography by F. W. Humphreys

HAKEA RUSCIFOLIA

Hakea ruscifolia. Can vary in growth habit from an upright bushy shrub to one with only several long slender branches to 10 feet. The white flowers are born freely, being terminal on the very short lateral branches that surround the main branches, thus making a long continuous spike of flowers. Hence the common name of 'Candle or Spike Hakea'.

(Continued on page 326)

THE MAGIC OF WILDFLOWERS

A Series for the Young in Spirit by Nuri Mass

THOSE DIFFERENT, LOOK-ALIKE COUSINS

They are not twins, yet to look at them, you might often think they were. We are talking, of course, about Grevilleas and Hakeas, which belong to the flower-family Proteaceae. A most interesting and beautiful family, running into great numbers, and named after the sea-god Proteus because its members often look so different from one another that you would scarcely guess they were even distantly related. (Proteus, they say, could change his shape into almost anything he wished). After all, who could imagine that such different-looking flowers as the Mountain Devil, Banksia, Geebung, Waratah, Needlebush, Flame Wheel, Silky Oak, Drumstick and Conospermum all belonged to the same family?

Yet, as we've said, amongst all of these different-looking ones, the Hakeas and Grevilleas can often be very alike indeed.

To be sure, you will never find a Hakea growing to the size of a huge Silky Oak tree—the Silky Oak being one of the most famous Grevilleas—and neither will you find it creeping along flat against the ground as does another of the Grevilleas. In other words, Hakeas are rather sedate by comparison with their Grevillea cousins. They don't fly from one extreme to another. They just stay in the middle, as bushes.

But if you take one separate little flower from a Hakea and one from a Grevillea, you might find it quite difficult to tell for certain which is which. It's a quaint-looking little flower, with its four petals joined together into a tube, and its four stamens joined to its petals—up towards the top—and its pistil pushing out through a slit in the petal tube, and hooked over with its stigma-end caught inside, just where the stamens are. However, when the pollen in the stamens is ripe, the tips of the petal-tube roll back, and the pistil straightens up, bringing the pollen with it—right out into the open, where it can easily be brushed up against and carried to other flowers by visiting honeyeaters or other small creatures.

It looks strange indeed to see pollen on its own flower's stigma rather than inside its stamens. But it's quite all right. These clever little flowers haven't made any mistakes. It's only after their own pollen has been safely carried away that their stigmas ripen ready to receive new pollen from other flowers.

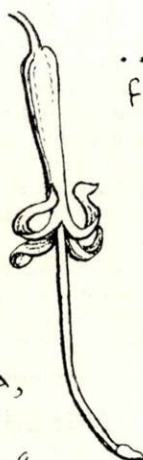
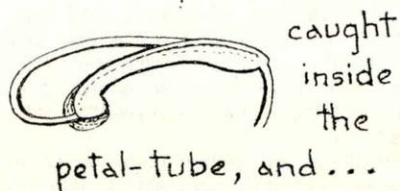
It's no use thinking that we might tell Hakeas and Grevilleas apart by their colours, for you can find each of them in almost *all* the colours—pink, red, purple, yellow, grey, white. But if you have an eye for detail, you might notice that the petal-tubes of Grevilleas are often hairy inside, whilst those of Hakeas are not. You might also realise that the flower-groups or inflorescences of Grevilleas are mostly to be found at the ends of stems whilst those of Hakeas usually prefer to arrange themselves up and down *around* stems. And while Hakea bud-groups are enfolded by pretty little leafy scales which fall off when the buds expand into flowers. Grevillea bud-groups never seem to have any such thing.

However, it's in their seeds and seed-boxes that we find the *big* differences between these flower cousins.

For instance, Hakea seeds always have little papery wings which help to carry them far and wide on even the lightest breeze. But it's only the very rare Grevillea that has a seed wing, and when this does happen, the wing encircles the seed instead of—as with Hakeas—stretching out from one end of it.

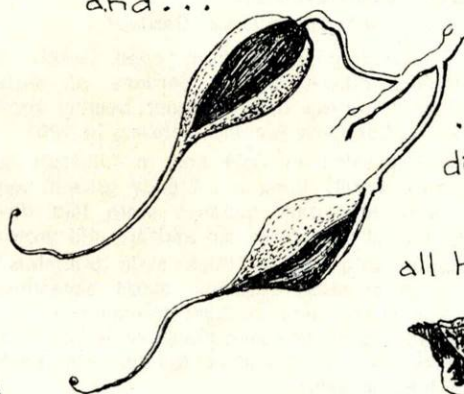
Then, Grevillea seed-boxes look rather like elfin canoes, with the dried, curled-over remains of the flower's pistil adding an extra touch of impishness.

A bud of either *Hakea*
or *Grevillea*, with
hooked pistil, its stigma

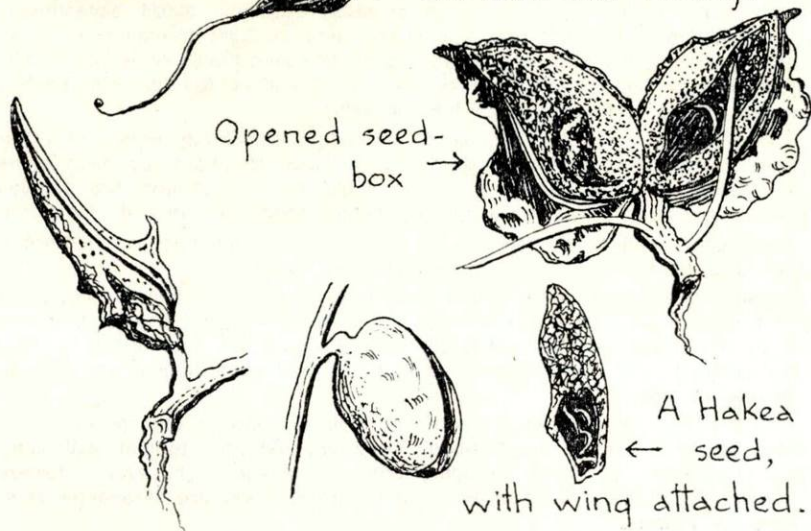


... an unfolded
flower, with
petal-lobes
curled back,
and the tip
of the
pistil freed
from them.

Dainty little boat-shaped
seed-boxes of a *Grevillea*,
and...



... (below), three
different types of
Hakea seed-boxes,
all hard and woody.



Hakea seeds-boxes can also look impish sometimes, only in a different way, with long pointy "noses". Others are just big roundish knobbly things, others are oval and fairly smooth, and so on. But whatever their size or shape, they are mostly hard, solid and woody—never thinly brittle or sometimes hairy as Grevillea ones are—and of course, when they split open into halves, out fly their two little winged seeds.

We've mentioned already that the Silky Oak tree is one of the most famous Grevilleas, but our bushlands are scattered abundantly with ever so many other kinds of them—grey, white, red, pink—and these are usually nicknamed Spider Flowers. On the other hand, some of our commonest Hakeas are nicknamed Needlebushes because of their very narrow, sharply-pointed leaves. And the densely-clustered flowers of these are creamy-white, delicate and threadlike. Yes—needles and thread.

We have noticed already that Grevilleas are rather more adventurous than Hakeas are, in the way they grow; and they are also a little more adventurous in *where* they grow, for Hakeas never leave Australia, whilst a few—a *very* few—of the Grevilleas are known to go overseas as far as New Caledonia.

Our names are Grevillea and Hakea—and we
Are quite as alike as cousins could be.
But if you are thoroughly watchful and smart,
There are plenty of ways you can tell us apart.

Hakea verrucosa

*Growing Native Plants—Canberra Botanic Garden**

Warty-fruited Hakea is an interesting shrub from open, sandy and gravelly habitats in West Australia, little-known in gardens of eastern Australia. Its attractions are winter flowering and compact healthy growth of medium size. It was introduced to Canberra Botanic Gardens in 1963.

Plants raised from seed were planted in light soil in full sun near trees and during drought years they merely hung on. Steady growth began when sprinklers were installed and later bark mulches were laid down. Several survivors are up to 1.5 m high at nine years old and are still growing.

These are upright, rigid shrubs with several thick main branches at ground level. These branch densely at short intervals, aided occasionally by frost killing a few half-ripe tips which acts as light trimming. In some Canberra districts it would be advisable to cover young plants on winter nights. Hessian can be supported on stakes, clear of the plant, for the cold reaches any part of the plant where the hessian rests.

The leaves are thick spines 6 cm long resembling those of other 'needle' *Hakea* spp. and very healthy, impervious to attack by most pests and diseases. A safe garden position should be chosen and the species makes an excellent barrier as a lightly trimmed hedge to 2 m high if desired.

In general effect the foliage is pleasant with its healthy, mid-green colour and lighter tip growth in summer and autumn.

Plants can flower while young and a specimen was seen to flower at 30 cm high when about a year old. On a watered plant the season can start in late April and last till September; it is at its best during a long period between June and August. In extreme cold with dryness the display is sparse or absent.

At best the shrubs are massed with delicate flowers among the sharp spines, stemless on the hard wood. They are narrowly tubular with long styles, scentless and waxy, hanging softly in clusters of several flowers or fanning out almost in a wheel 6 cm across. Bees are frequently seen visiting the flowers.

A few small woody fruits are seen some years. Apart from seed, half-ripe cuttings can be used in propagation. The species is not yet well enough known to be in plentiful supply, but can be bought from some specialist nurseries. No special soil requirements are known, but the plants should be put in sunny positions for good flowering.

The shrub has recovered from drought and also from spells of bad drainage, as during a rainy spell when the root-rot fungus, *Phytophthora cinnamomi*, caused some die-back. This had a similar trimming effect to frost and did no permanent damage to established plants.



HAKEA VERRUCOSA

This colour plate was prepared to show the full character of the flower and the variation in colour on the one plant although not very successfully. The full bush is shown in colour in the book below—Editor.

* This article is reprinted from Volume 4 of the series of booklets entitled "Growing Native Plants", produced from and available only from The Canberra Botanic Gardens, Canberra, A.C.T. You may order by mail by sending 80 cents to the Gardens direct—not to the Editor. The style of the articles in these excellent booklets will be appreciated from the above article. Volume 4 is the latest issued and all four make 100 pages of valuable advice, well illustrated in colour.

PERIODS OF SEED GERMINATION

by Anthony Cavanagh

As a raw amateur to the fascinating business of raising native plants from seed, one of my major problems has been finding out just how long it takes for a given type of seed to germinate. While there are numerous factors which will influence germination time such as temperature, amount of light, free draining nature of the soil, whether the seed has a hard impermeable coat or not etc., it is well established that some seeds germinate much more readily and quickly than others and the above factors may tend to lengthen or shorten the average time required. For instance, the seed I find easiest and quickest to germinate is "Sturt's Desert Pea" *Clianthus formosus* which I can raise in 2-3 days. On the other hand I have been told that the Tasmanian *Cyathodes acerosa* can take up to 3 years to germinate! Faced with extreme ranges such as this, the ordinary amateur gardener may well be throwing out his pots of apparently unsuccessful sowings whereas another few weeks and the seeds would have germinated.

TABLE 1

Germination Times—October-March
Sowings—Ocean Grove, Victoria

Plant	Days	Notes
Acacia	33	Abraded and soaked hot water, 12 hours.
Anigozanthos humilis	24-37	} Lightly abraded, soaked hot water up to 2 days.
Anigozanthos manglesii	23-28	
Anigozanthos viridis	28	
Banksia coccinea	29	Poor germination.
Banksia robur	22	
Banksia speciosa	42	Good germination, sown late April.
Beaufortia elegans	10-12	
Blancoa canescens	37	Abraded and soaked hot water, 24 hours.
Boronia viminea	37	
Brachysema aphyllum (upright)	5-7	As above.
Brachysema aphyllum (prostrate)	14	No treatment.
Burtonia scabra	21	Abraded, soaked in hot water.
Chorizema dicksonii	8	Abraded and soaked in hot water 12 hours.
Clianthus formosus	2-3	As above, soaked for 36-48 hours.
Conostylis setosa	33	As above, soaked overnight.
Dryandra cirsioides	35	
Dryandra formosa	39	
Dryandra pteridifolia	34	
Eremaea ebracteata	11	
Eremaea violacea	10-12	
Eucalyptus ficifolia	12	
Eucalyptus rhodantha	9	
Gossypium sturtianum	10	Abraded, soaked overnight hot water.
Hardenbergia comptoniana	10	Abraded, soaked in hot water.
Hardenbergia violacea	12-15	Abraded, soaked in hot water.
Hemiantra pungens (upright)	12	
Hovea trisperma	25	Abraded, soaked hot water, 12 hours.
Hypocalymma robustum	37	Germinate for a long period after initial plants.
Isopogon dubius	34	End of seed cut off, soaked in hot water.
Kennedia coccinea	10	} Abraded, soaked in hot water.
Kennedia prostrata	26	
Kunzea baxteri	24	
Melaleuca steedmanii (blue)	10-12	
Regelia velutina	15-18	
Stylidium amoenum	37	
Swainsona canescens	11	} Abraded, soaked hot water, 2 days.
Swainsona maccullochiana	6	
Telopea speciosissima	22	Germinate for a long period.
Thysanotus multiflorus	23	Covered with dry leaves and fired.
Trachymene caerulea	21	Abraded, soaked in hot water.

NOTES:

- (1) Times of soaking in hot water (e.g. 12 hours) refer to total soaking time. Hot water was poured over abraded seed and allowed to cool. Seed was removed 12 hours later.
- (2) Times given are those for germination of the first seed in each batch. In some cases, seedlings continued to germinate for upwards of 6 weeks later.

TABLE II
Germination Times—Sowings at Various
Periods—Geelong District, Victoria

Plant	Days	Notes
<i>Acacia iteaphylla</i>	24	} Soaked in near boiling water
<i>Acacia cardiophylla</i>	21	
<i>Acacia vestita</i>	14	
<i>Banksia brownii</i>	42	Poor germination
<i>Banksia coccinea</i>	21	
<i>Banksia collina</i>	49	
<i>Banksia ericifolia</i>	35	
<i>Banksia speciosa</i>	35	
<i>Banksia victoriae</i>	35	Soaked in near boiling water.
<i>Burtonia scabra</i>	21	
<i>Callistemon "Harkness Hybrid"</i>	21	
<i>Callistemon pinifolius</i>	21	Soaked in near boiling water.
<i>Callistemon rigidus</i>	21	
<i>Calothamnus quadrifidus</i>	14	
<i>Calothamnus rupestris</i>	21	
<i>Calothamnus villosus</i>	28	
<i>Cassia odorata</i>	28	Soaked in near boiling water.
<i>Casuarina littoralis</i>	21	
<i>Chorizema ilicifolium</i>	14	Soaked in boiling water.
<i>Dillwynia sericea</i>	60	
<i>Dryandra cirsioides</i>	21	No treatment.
<i>Dryandra formosa</i>	28-35	
<i>Dryandra praemorsa</i>	21-28	
<i>Grevillea asparagoides</i>	49	Seed peeled before planting.
<i>Grevillea bipinnatifida</i>	42	
<i>Grevillea fasciculata</i>	95	
<i>Grevillea leucopteris</i>	21-35	Seed peeled before planting.
<i>Hakea baxteri</i>	28	
<i>Hakea cucullata</i>	21-28	
<i>Hakea elliptica</i>	28	Poor germination.
<i>Hakea kippistiana</i>	14-21	
<i>Hakea laurina</i>	14	
<i>Hakea sericea</i>	14-21	Soaked in near boiling water.
<i>Hakea undulata</i>	28	
<i>Helichrysum davenportii</i>	10	
<i>Isopogon cuneatus</i>	42	Soaked in near boiling water.
<i>Isopogon formosus</i>	21-28	
<i>Isotoma petraea</i>	11	
<i>Kennedia prostrata</i>	14-21	Soaked in near boiling water.
<i>Kennedia rubicunda</i>	14	
<i>Kunzea baxteri</i>	14	
<i>Leptospermum scoparium</i> var. <i>rotundifolium</i>	14-21	Poor germination.
<i>Melaleuca cardiophylla</i>	14	
<i>Melaleuca gibbosa</i>	21	
<i>Melaleuca huegelii</i>	21	Soaked in near boiling water.
<i>Melaleuca lateritia</i>	21	
<i>Melaleuca nematophylla</i>	21	
<i>Melaleuca nodosa</i>	14	Soaked in near boiling water.
<i>Melaleuca "Payne's Hybrid"</i>	14	
<i>Melaleuca striata</i>	14-21	
<i>Melaleuca wilsonii</i>	21	Poor germination.
<i>Phymatocarpus porphyrocephalus</i>	21-28	
<i>Ptilotus helipteroides</i>	5-10	
<i>Ptilotus manglesii</i>	35	Poor germination.
<i>Ptilotus obovatus</i>	14	
<i>Regelia inops</i>	21-28	
<i>Schoenia cassiniana</i>	5	Soaked in near boiling water.
<i>Swainsona galegifolia</i>	14-21	
<i>Thysanotus multiflorus</i>	14-21	
<i>Waitzia aurea</i>	5	Soaked in near boiling water.
<i>Xanthorrhoea australis</i>	21	

The major problem I found when trying to discover more about germination times is that there is virtually no information on this point. Writers of articles on growing many hundreds of Australian plants in past issues of the journal almost always gloss over times while they concentrate on describing the soil mix, how the seed should be sown and then when and how to transplant the seedlings after they have germinated!

After a few initial mix-ups, I decided to keep records of germination times for all seed I attempted. The tables reproduced in the following pages are based on these records and also on information supplied by members of the Geelong S.G.A.P. In addition I have checked through Vols. 2-6 of "Australian Plants" and a number of issues of Vol. 1 and extracted the

relatively small number of entries there which give germination times. These are shown in a separate table together with any other information such as date of planting, area of Australia etc. which may be of interest.

TABLE III

*Germination Times: Information from S.G.A.P.
Journal* and Newsletter, Victorian Region*

Plant	Days	Notes
<i>Acacia deanli</i>	6	3 (69) Moist peat in bottle
<i>Actinotus</i>	21-28	3 (65)
<i>Anigozanthos bicolor</i>	33	2 (135) W.A. autumn sowing.
<i>Anigozanthos flavidus</i>	25-30	No treatment to seed, germinated in open.
<i>Anigozanthos humilis</i>	20-33	
<i>Anigozanthos manglesii</i>	25-33	However, with cold weather germination may take up to 50 days.
<i>Anigozanthos pulcherrimus</i>	39	
<i>Anigozanthos rufus</i>	30-33	
<i>Anigozanthos viridis</i>	25-36	
<i>Anigozanthos preissii</i>	44	
<i>Banksia</i>	13d-6 mths.	4 (15) North Queensland.
<i>Banksia</i>	21-42	5 (356) Nursery propagation, Vic.
<i>Banksia aemula</i>	44	5 (22) Sowings Mar.-Aug., using Yates Seed Raising mix and 4" peat pots in full sun.
<i>Banksia dentata</i>	88	
<i>Banksia ericifolia</i>	20	
<i>Banksia oblongifolia</i>	31	
<i>Banksia repens</i>	67	
<i>Bellenden montana</i>	56	3 (105) Sown April, Tasmania
<i>Billardiera</i> (pink)	12 mths.	S.G.A.P. Vic. June '72 Sown Victoria
<i>Cyathodes acerosa</i>	27 mths.	As above.
<i>Conifers</i>	21-56	4 (255)
<i>Epacris impressa</i>	12 wks.	2 (103) Sown Sept., Victoria. Moist soil.
<i>Eremophila</i> —various	20-58	4 (253) W.A. Poor germination some species.
<i>Eremophila maculata</i>	42	2 (221) Sown Sept.—usually difficult.
<i>Eucalyptus</i>	10-21	2 (54) W.A. Sown Sept.-Oct.
<i>Eucalyptus</i>	7-10	2 (59) N.S.W. Can take up to 3 weeks.
<i>Eucalyptus</i>	10-14	4 (72) Alpine and Sub-Alpine, Devon U.K.
<i>Eucalyptus</i>	6-14	4 (129) U.K. germinated at 60°F.
<i>Eucalyptus</i>	2-6	4 (129) U.K. Seed stratified.
<i>Eucalyptus ficifolia</i>	=10	2 (196) Bog method, N.S.W.
<i>Eucalyptus erythrocorys</i>	=10	2 (196) Bog method, N.S.W.
<i>Eucalyptus kruseana</i>	=10	2 (196) Bog method, N.S.W.
<i>Eucalyptus macrocarpa</i>	=10	2 (196) Bog method, N.S.W.
<i>Eucalyptus macrocarpa</i>	10-18	4 (301) California U.S.A.
<i>Eucalyptus oleosa</i>	28	5 (22) Mar.-Aug.—Full sun, Vic.
<i>Eucyphia lucida</i>	42-56	3 (253) April sowing, Tas.
<i>Gompholobium grandiflorum</i>	Approx.	2 (196) Seed soaked
<i>Gompholobium latifolium</i>	42	
<i>Gompholobium pinnatum</i>		
<i>Grevillea</i>	28-30	2 (83) Peeled seed, vermiculite.
<i>Grevillea bipinnatifida</i>	1-12 mths	S.G.A.P. Vic. June '72. Sown Vic.
<i>Grevillea annulifera</i>	15 mths	As above.
<i>Hakea</i>	9	4 (15) North Queensland.
<i>Hakea leucoptera</i>	27	5 (22)—Mar.-Aug. Full sun.
<i>Hakea multilinea</i>	59	As above.
<i>Hypocalymma robustum</i>	21	4 (137) W.A. April-May and Aug.-Sept. Slow germination, up to 1 year.
<i>Hypocalymma angustifolium</i>	21	
<i>Iso Pogon dubius</i>	31	5 (22) Mar.-Aug., full sun.
<i>Kennedia beckxiana</i>	21-28	3 (68) Seed treated in bleach.
<i>Kennedia procurrens</i>	32	5 (22) Mar.-Aug. Full sun.
<i>Macropidia fulliginosa</i>	41	2 (135) Seed stratified 6 weeks.
<i>Nothofagus gunnii</i>	42-56	3 (66) March sown, Tasmania.
<i>Pimelea</i>	43-60	3 (163) W.A. Difficult to germinate.
<i>Pimelea microcephala</i>	30	3 (163) W.A. Difficult to germinate.
<i>Pimelea decora</i>	21	5 (22) Mar.-Aug. Full sun.
<i>Telopea speciosissima</i>	14-21	3 (14)

* Under notes, reference is made to the Journal Number and page e.g. 5 (22) refers to Volume 5, page 22.

A note on time of planting might be in order here. Many Western Australian seeds can be planted in Autumn but the general level of Autumn temperature in Western Australia is somewhat higher than in Southern Victoria and there are more warm days. I have found October to about middle February a good time here, though young seedlings need careful watering and some shelter in the very occasional heat waves which occur at this time. Cyclonic rains and flooding in February can also cause problems.

Special thanks are due to Mr. Doug McKenzie and Mr. Peter McNeil of the Geelong S.G.A.P. for providing information for this article.



Photography by F. W. Humphreys

HAKEA BUCCULENTA

Propagation by Seed

For the small quantity of plants required, I find plastic 1 lb. margarine containers excellent. These measure approximately $3\frac{1}{4}$ " x $3\frac{1}{4}$ " x $3\frac{1}{4}$ " deep and so are ideal for native plants which develop a long tap root early on. Soil mixtures vary but I usually employ about 50% coarse washed sand, 30% black sandy loam and about 20% peat. About $\frac{1}{2}$ " of a proprietary seed raising mix is scratched in to the top one inch, the pot is soaked in bucket of water, seed is spread on the surface and then lightly covered with $\frac{1}{4}$ - $\frac{1}{2}$ " of the seed raising mix. A $\frac{1}{8}$ "- $\frac{3}{16}$ " layer of fairly coarse, washed gravel completes the picture, the pot being watered by light hose spray and then placed either in a cold frame which gets 4-5 hours of sun a day or, in colder weather, out in the open under glass. Both the seed mix and gravel cover seem to assist the more difficult seeds by keeping them moist in an otherwise well drained medium and preventing washing out of fine seed. The gravel probably also stabilises temperatures a little more.

FURTHER COMMENT ON PLANT COLLAPSE

by P. B. Beaumont

I was very impressed by the article on plant collapse in Vol. 6 page 52 of "Australian Plants". As a former research chemist in industry and a horticulturist, my dual interests have contributed to experimentation of the subject. Everything mentioned (especially perfect drainage) is pertinent. Another factor in control of *Phytophthora* attack is a definite tendency among members to overplant.

In their natural state most native plants are spaced because of a dense overstorey, rough terrain, culling by bushfires, drought, disease, animals and nutrient availability. If we grow them under conditions where they have better water, food and shelter than in an overcrowded environment which reduces air circulation and shuts out the light, the plants may be susceptible to attack of fungi because of:

- (a) unthriftness in plants competing against each other for available food.
- (b) Collar rot and damping off due to lack of light and poor aeration.

Another benefit of proper spacing is that mulches can be kept right away from the base of the plant and used around the feeding roots which is where the moisture is most required, particularly if a fertilizer is being used. If I am asked to remodel or to design a landscape for a property, the maximum size of all plants is carefully considered to ensure adequate spacing.

Collar Rot

Collar rot is usually caused by planting too deep or by lack of aeration or light. Keep mulch at least nine inches away from the stems and at all times make sure that transplanted subjects are never planted lower than the height they are in the original pot. The problem is also reduced if the lower laterals are removed as the plant grows so that there is at least 18" of clear stem or trunk. Adequate spacing will allow fertilizing to be done around the feeding area of the plant and not near the trunk.

Nematode Control

- (a) Drainage—I agree that Dexon is excellent for 'damping-off' in seedlings but for nematode infestations in the open ground I have found a completely different approach, cheaper, more effective, and longer lasting. Adequate drainage must be installed, the first essential for success.
- (b) Control by use of a trap crop—It was found some years ago that the summer legume *Crotalaria spectabilis* could become infested with large numbers of the root knot larvae but would not allow these larvae to mature. This measure of control is of practical importance because it may be possible to then utilize the legume as a green manure crop which would provide nitrogen as well as organic matter to the soil.
- (c) Control by use of correct fertilizer balances—first a comment on Dr. H. Heinmann's notes which the editor placed immediately after the discussion on Plant Collapse. There is an error in the last line which should have read "may" instead of "many". I have done a lot of experimenting with various NPK ratios. The thick walled colenchyma and sclerenchyma cells depend on potassium and phosphorous salts for their development and they provide the strength and rigidity to all parts of the plant. These salts also play a very important part in the structure of the vascular tissues, if these are strong then the formation of the giant cells is inhibited to the detriment of the nematodes.

When experimenting with plants (or anything else) a control must be used, and if you have access to the fertilizer list of the Department of Agriculture you would notice that most of the NPK ratios in commercial fertilizers have the available nitrogen as the highest figure. If you have plants infected by nematodes and there is a PK ratio lower than the N figure then the chances are, that the plants will be more susceptible to attack.

On one landscaping assignment, I unknowingly planted a large area with *Myoporum parvifolium* and the area turned out to have a nematode infection. It was five months before the plants began to show signs of trouble and when I lifted one out to examine, the root knot was fairly far advanced. Half the area was injected with Nemagon 90 and the other half with a 6:12:8 NPK. The whole area was watered heavily (essential with Nemagon) and the plants were not checked for two months.

The plants responded well indicating that the nematodes were inactive. Ten plants were removed from each area and the galls cut out with a razor blade. Some of the larvae in the Nemagon treated area were still living while those in the fertilized area were all dead. I consider that this speaks for itself but stress that this method should only be used with some caution. The use of potassium alone could be lethal to plants. We have a lot of experimenting to do on this yet.

Conclusion—What method is best? I have used *Crotalaria* in large areas and small areas; the nematode population was decimated. The legume was dug in as a green manure crop and Nemagon 90 was used as a safety measure before replanting.

I disagree very strongly with the statement that after injection with Nemagon 90 the soils should be sealed with a garden tool or boots, because as you said earlier, the infection could be spread in this way. I use a piece of wood tacked onto the end of a short garden stake and burn it immediately after use. I then sterilise all tools used in the area with a 0.01 soln. of formalin and wash the surfaces and soles of boots and shoes I happen to be wearing.

Used correctly, formalin is an excellent sterilant for both soils and pots. If pruning fungus infected material I use a 0.001% soln. and dip secateurs or saws into this to prevent the transfer of spores to uninfected wood. This makes the job slower but the results have proved the method is successful as I have successfully struck cuttings from the material that had been so treated.

TESTING NATIVE PLANTS FOR SUSCEPTIBILITY TO *PHYTOPHTHORA CINNAMOMI*

A report by the Victorian Research Institute, Burnley, in their programme of "Research on Diseases of Ornamental Plants"

One approach to the control of *P. cinnamomi* is to obtain information on the relative susceptibility of native plants, and in poorly drained soils, to grow only those which have some resistance.

Tests to date have been done on *Grevillea* and *Banksia*. In the group of *Banksia* tested, *B. caleyi* and *B. collina* showed strong resistance. Less resistant species were *B. media*, *B. marginata* and *B. grandis*. Susceptible species were *B. lehmanniana*, *B. occidentalis*, *B. coccinea* and *B. brownii*.

Of the *Grevillea*, *G. globata* and *G. brevicuspis* showed strong resistance to the disease. Less resistant were *G. robusta*, *G. sericea*, *G. gaudichaudii*, *G. parva*, *G. parvifolia* and *G. thelemanniana*. None of the *Grevillea* tested was completely susceptible.

TROUBLES WITH GREVILLEA AND HAKEA

While they are easily grown, they have their natural enemies as mentioned above. The essential precautions are to stake well if exposed to wind so that the roots will not be weakened and exposed and to keep leaves and mulch away from the trunk as it enters the ground.



Photography by M. Hodge

PTEROCERAS HIRTICALCAR

The striking feature of the flower, the sepals and petals being more or less outlined with chocolate brown, can be clearly seen in the photograph.

GROWING PTEROCERAS

by B. Muffet, Canberra Botanic Gardens

The genus *Pteroceras* Hassk. may be not known to many Australian Orchid growers. The two species which represent this genus in Australia were formerly known as *Parasarcochilus hirticalcar* Dockr. and *Parasarcochilus spathulatus* (Rogers) Dock. Orchadian 4 (1973) 77.

Pteroceras hirticalcar (Dockr.) Garay. This species recorded from the McIlwraith Ranges of Cape York is very well suited to cultivation. It seems at home on a number of hosts and flowers anytime from September to January in cultivation. The seed pods will remain intact on the plant for 12 months or more. Raising this species from seed has not been tried here as yet. *P. hirticalcar* seems to favour a reasonable amount of shade, say 64%, and should be rested during the winter months. Feeding with Aquasol, Fish Emulsion or Nitrasol during the growing period gives favourable results.

Pteroceras spathulatus (Rogers) Garay is a species of more temperate regions and should be grown cooler and well shaded. It often grows in hanging moss in its natural habitat where it remains well shaded and fairly moist. It does not have such a well defined dormancy and can be rested for a much shorter period than the previous species. A smaller and less vigorous plant than *P. hirticalcar* (Dockr.) Garay it should be kept moist and a slab of fine tree fern fibre seems to be an ideal host.

Feeding as for the previous species and as no seed pods have been allowed to develop on this plant no comment can be offered regarding seed production.



Photography by M. Hodge

PTEROCERAS SPATHULATUS

The close-up photography necessary to illustrate the flowers of our lovely tiny orchids does not give any idea of the plant. However the outstanding features of the flower, such as dark greenish brown sepals and petals with a small midlobe of the lip which is with a purple tip, can readily be seen.

ORCHID GROWERS—WILL YOU PLEASE ASSIST—see page 334.

BOOKS ON AUSTRALIAN ORCHIDS—see page 346.

HAKEA—continued from page 313

Hakea smilacifolia. An attractive little shrub of 4-5 feet with flat incurved and very undulate leaves with attractive vein markings. The white flowers are borne at the base of the leaves and somewhat resemble the flowers and habit of *H. conchifolia*.

Hakea strumosa. An upright small shrub of 4-5 feet with upright growing 2-3 inch terete leaves which are grey-green in colour. The small axillary flowers are red in colour and make an attractive combination with the rather glaucous foliage. It flowers in Sept./Oct.

Hakea suaveolens. An erect shrub of 6 to 10 feet, most of the leaves are pinnate, the erect segments are one to two inches long. The small white flowers are in dense racemes in the upper axils. This appears to be a hardy shrub and adaptable to varying soil types and situations.

Hakea scoparia. A bushy shrub 6-8 feet with terete leaves up to 8 inches long and distinctly grooved. The flowers are in a dense axillary cluster making a pin-cushion type flower and purplish red. It flowers in August.

Hakea trifurcata. An upright shrub when young but spreading when older, the not very stout branches arching outwards, especially at flowering time with the extra weight of the flowers. The slender terete leaves are simple but mostly divided into three segments. Also there are flat oval leaves of a light bright green which leads to an interesting speculation as to whether this species is in the midst of evolving the terete leaves to cope with more arid conditions or would the flat oval leaves be a means of camouflage for the fruit which is the same shape and colour as the oval leaves? The flowers are white, small but numerous and occur in August/September. This shrub would be improved with fairly heavy pruning.

Hakea undulata. An upright shrub with ovate oblong leaves, prickly toothed and undulate with distinct vein markings. The flowers are white in the upper axils, and this shrub sets seed prolifically. In cultivation it has not survived more than ten years in my experience.

Hakea varia. The variable leaved *Hakea* has a form with narrow deeply pinnate recurved leaves which is very attractive. It has an upright habit to 8 feet and is covered in creamy white flowers in September, the flowers are terminal on little lateral branchlets and also some are axillary. This *Hakea* is outstanding for its form, interesting foliage and prolific flowering.

Hakea verrucosa. This is a most desirable *Hakea* for cultivation as it makes a bright showing of pink and red in mid winter. It has an upright habit of growth to 6-7 feet with 2-3 inch terete leaves. Colour plate, page 317.

Hakea vittata. A small shrub of about 18 inches with stiff 2-3 inch terete leaves and rather spreading and straggly in habit. The white flowers are not showy and this shrub can not be recommended for cultivation except for a shallow, stony situation where better plants will not grow.

Hakea victoriae. The 'Royal Hakea' and an extract from Rica Erikson's book "The Drummonds of Hawthornden" gives an excellent description of this outstanding plant. Drummond describes this newly discovered *Hakea* in a letter to Hooker—"The most conspicuous parts of the foliage of this superb plant are its bracts. These make their appearance with the flower buds when the plant is three or four years old. They are borne in regular whorls . . . Each whorl is a year's growth of the plant after it bears its first flowers . . . The first year they are yellowish white in all the centres of the bracts, and the same colour appears in the veins, and in the teeth which grow on the margin; the second year what was white . . . has changed to a rich golden yellow; the third year the yellow . . . changes to rich orange, and the fourth year the colour . . . is changed to a blood red. The green which has a remarkably light and luminous appearance the first year varies annually to deeper and darker shades."

This *Hakea* is easy to grow in cultivation but unfortunately does not produce the rich colours it does in its native habitat where it struggles in poor gravelly soil, standing up like sentinels open to wind and weather.

PLANTS FOR INLAND PLANTING

Our previous issue was devoted to plants of the dry inland principally of the Alice Springs area with many inland plants shown in full colour. One of the articles on the cultivation of plants in the dry conditions of our inland and in small towns and on homesteads was by B. V. Curtis. Mr. Curtis has had considerable experience in the growing of Australian wildflowers under very rigorous conditions on his property "Wilga Park" where he has an eight acre arboretum devoted to a natural wildflower garden. You may inspect his plantation, 3 miles off Murray Valley Highway on turn off to Woarkool Junction, 44 miles north of Swan Hill, Victoria.

Many of the plants he describes in his article in the last issue are not well known and for the benefit of readers he briefly describes them in this follow-up article—Editor.

Plants listed in text. The locations given are very limited.

Abutilon leucopetalum. Lantern Bush, medium shrub, grey velvet leaves and yellow hibiscus like flowers in summer, collected at Lightning Ridge, N.S.W. Grows readily from seed but lives only about 6 years.

Acacia acanthoclada. Harrow Wattle, a very dwarf wattle found in Northern Victoria, small oblique leaves and thorny appearance.

Acacia acinacea. Gold Dust Wattle, a small shrub with small leaves but very showy in springtime, for heavier soils. Colour plate Vol. 5, page 152.

Acacia aneura. Mulga, there are several distinct varieties of this inland tree, it will flower three times per year if it has adequate moisture, it is not a soil robber as are many other acacias so is suitable for associated plantings.

Acacia brachybotrya. Grey Wattle, often wrongly termed mulga, a tall vigorous growing shrub with red bark and oval leaves, very attractive in September.

Acacia brachystachya. Umbrella Mulga, a dense low spreading tree from the stony ridges of the inland. An excellent wind break species.

Acacia burkittii. Sand Hill Wattle, tall shrub with soft needle foliage, and mulga type flowers (catkins).

Acacia calamifolia. Wallowa, a dense medium shrub with soft foliage, spectacular when in flower.

Acacia continua. A dwarf shrub usually found as an understory, foliage consists of small hooked spines, it is colourful in spring and grows from S. Australia to Mootwingee in North Western N.S.W.

Acacia deanei. Fern Leaf Wattle, a small tree from Central N.S.W., the flowers are insignificant but the fern like leaves are often admired.

Acacia decora. Graceful Wattle, a very attractive medium shrub from the rocky ridges of Central Western N.S.W., a brilliant flowering species.

Acacia hakeoides. Hakea Wattle, a medium shrub occurring in Central N.S.W. and Victoria. Hakea like leaves, some are narrow, its brilliance in spring makes it an ideal garden species.

Acacia leptopetala. A medium wattle from Central Western N.S.W. The flowers are sparse and the foliage dense with soft grasslike leaves.

Acacia ligulata. Small! Cooba. This large and vigorous wattle grows widely in the inland usually on sand. It is suitable for a windbreak in large plantations.

Acacia loderi. Nealia, a tree up to 25' occurring in the lower western part of New South Wales. The soft narrow foliage is glaucous and often pendulous, it seldom seeds and suckers freely.

Acacia montana. Mallee Wattle, also grows locally in sand, has small rigid leaves and spreading habit.

Acacia pendula. Weeping Myall or Boree, a very attractive tree grows up to 25 ft. high with silvery pendulous foliage. Grows on the inland plains from the Riverina of N.S.W. to Central Queensland, needs plenty of space and ideal for planting along avenues.

Acacia rigens. Nealie, medium shrub with small needle like foliage and showy in the springtime, grows locally in deep sand.

Acacia strongylophylla. Skeleton Wattle, a low rambling shrub from Central Australia, it has short spines on the stems and also on the ends of the small oval leaves which are crowded and grow in three ranks around the stems which give the skeleton effect. Colour plate, Vol. 7 page 260.

Acacia triptera. Spur Wing Wattle, a rambling medium shrub common in the central west of N.S.W., it has no leaves but in their place flattened hooked spurs, in spring the flowers are prolific.

Acacia wilhelmiana. Mist Wattle, a medium shrub growing locally in sand, the leaves are small and almost terete, the foliage is dense with a misty appearance; it is a desirable garden specimen but in the wild is attacked by galls insects after about eight years.

Alstonia constricta. Quinine Tree, common in the central and upper Darling of N.S.W., has dense foliage and dark green leaves similar to a citrus it is often found in rocky water courses and makes a good background tree in large gardens.

Angophora melanoxylon. Coolabah Apple, a very attractive tree, grows up to 40' high and resembles *Euc. coolabah*, grows readily from seed but needs plenty of space, collected by the writer at the Gundabooka Range, Bourke.

Ardiana hookeri Mallee Bitter Bush, a small shrub occurring mallee scrub after fires, grows rapidly and is extremely hardy, dense attractive foliage.

Atriplex nummularia. Old Man Salt Bush, a rugged and very drought resistant species from the inland, grows on a wide range of soils but usually in vast thickets on flood country, it was often used for hedges around inland homesteads. It has a vigorous root system and should be planted well away from lesser shrubs.

Baeckea behrii. Short leafed Broom Bush, a medium broom-like shrub with small white flowers, in Northern Victoria it grows on the crests of mallee sandhills.

Bauhinia carronii. Bean Tree, grows up to 30 ft. high along the Diamantina and Coopers Creek, foliage is in the form of pairs of kidney-shaped leaves easy to propagate and grow.

Bertya mitchellii Olive Bertya, a tall shrub growing locally on sand in mallee scrub.

Billardiera sericophora (syn. *B. cymosa*). Sweet Appleberry, a very attractive climber with bright green leaves and small mauve flowers, it grows locally on mallee scrub, it could be perhaps classed as a medium sized climber.

Brachychiton populneum. Kurrajong. This well known tree is one of the most drought resistant; it will make growth in moist deep soils.

Bossiaea walkeri. Cactus Pea. This is a medium sized leafless shrub with cactus-like stems, in July it bears a profusion of red pea flowers; it grows in south-western N.S.W. and also in Northern Victoria, possibly being this state's rarest shrub.

Callistemon brachyandrus. Prickly Bottle Brush, a scrubby shrub which grows along the creeks of the lower Murray, the brushes are comparatively narrow and the leaves small and rigid.

Callistemon macropunctatus. Scarlet Bottle Brush, ranges from Central Victoria to the Flinders Ranges. It prefers low situations and may grow up to 20 ft. high.

Callistemon teretifolius. Bearded Bottle Brush, a showy low growing species from the Flinders Ranges. The leaves are usually terete, prefers loamy clays. Colour plate in Volume 5 page 333.

Callitris preissii. Murray Pine. Prefers deep sand, if propagating seed look for superior parent trees.

Callitris columellaris, syn. *glauca*. Native Pine, probably in every mainland state, ideal for avenues near homesteads or on the edges of large gardens, does not compete for moisture like the Eucalyptus.

Calostemma luteum. Yellow Garland Lily, grows near streams and water-courses, from the Murray to Cooper's Creek. It makes leaf growth during the cooler part of the year, rains in Feb. or March brings up a flowering head in seven days. It is easy to establish, seeds sprout on top of moist soil in autumn and winter.

Calostemma purpureum. Purple form of above.



CALOSTEMMA LUTEUM (Yellow) and CALOSTEMMA PURPUREUM

Calytrix tetragona. Fringe Myrtle, a showy heath-like shrub, in Victoria it ranges from the gravel soils of the central districts to the sandhills of the Mallee. Colour plate in Volume 3, page 169.

Cassia artemisioides. Silver Cassia, a small shrub with several forms, the most showy of which is grey in colour and has eight pairs of leaflets.

Cassia nemophila syn. *C. eremophila*. Desert Cassia, a medium shrub with only one pair of leaflets. Colour plate in Volume 7, page 289.

Cassia oligophylla (very similar to *C. desolata*). I consider this my best Cassia, it is a dense medium shrub with a rounded profile, each leaf has four pairs of leaflets and it flowers all the year and consequently always has pods, it also grows in north-western N.S.W.

Cassia phyllodinea. Mulga Cassia, an upright medium shrub which grows in shallow soils of north-western N.S.W. The leaves are single phyllode, it does not flower as much as some of the other species.

Cassinia arcuata. Drooping Cassinia, a soft shrub with terete leaves. It bears masses of bronze flowering "spikes" in mid-summer, extensive among old gold diggings of central Victoria, where it is called Chinese Bush.

Cassinia laevis. Curry Bush, similar to above but with longer leaves, common in central N.S.W.

Casuarina cristata. Belah. This large inland tree is a strong competitor for moisture so is more suitable to larger plantations, young trees usually have a graceful straight trunk.

Casuarina muellerana. Slaty Sheoke, a shrubby tree from the sandy soils of Western and Mallee districts of Victoria, the foliage has a reddish sheen, it needs plenty of space.

Clematis microphylla. Small Clematis, a vigorous twining climber which occurs locally among mallee scrub, the seeds are attached to white feather-like awns often referred to as Old Man's Beard. The plant may die back in dry times but will regrow after rain.

Codonocarpus cotinifolius. Mallee or Mustard Wood. A quick growing small poplar-like tree, regenerating after fires. Its range extends from northern Victoria to Central Australia. A good specimen tree but difficult to propagate.

Crinum flaccidum. Darling Lily, also found along streams of inland Australia usually on low sandy rises, the large bulb forms on the clay horizon. It has a similar growth pattern to the Garland Lily, but the leaves are larger and the flowers are white and up to three inches across.

Cryptandra propinqua. Silky Cryptandra, a small heath-like shrub with small white flowers.

Dianella laevis. Pale Flax Lily. This tough lily occurs locally on heavy loams often in box woodlands, the flowers are pale mauve and small.

Dianella revoluta. Spreading Flax Lily, usually occurs in large clumps on sandhills and around mallee trees, the flowers have black anthers.

Dodonaea cuneata. Wedgeleaf, and *stenozyga*, Desert Hop Bush, are good medium shrubs. (Hopbushes, these grow readily from seed).

Eremophila alternifolia. Scented Emu Bush, also a vigorous medium species, it blooms all the year and has spotted cerise flowers.

Eremophila bignoniiflora. Bignonia Emu Bush, small open tree grows near watercourses, white to pink tubular flowers with five large lobes.

Eremophila duttonii. Budda Bush, a tall dense symmetrical shrub from Western N.S.W. The flowers are green to orange and possibly largest in the genus, blooming in late winter only.

Eremophila gilesii. Giles Emu Bush, a low shrub with dark foliage and large purple flowers. An outstanding shrub that will, in ideal conditions, bloom all the year. Colour plate in Volume 7, page 277.

Eremophila glabra. Dwarf Emu Bush, a variable species. There are some excellent creeping and prostrate forms with green, yellow and red flowers which are ideal ground covers.

Eremophila latrobei. A medium shrub from the inland ranges. Flowers are pink and red, blooms through the cooler parts of the year if kept moist, a very showy species.

Eremophila longifolia. Berrigan Emu Bush, small tree with dense foliage, orange tubular flowers and currant-like fruit, a good species for birds.

Eremophila maculata. Spotted Emu Bush, a medium shrub with red to orange and yellow spotted flowers, easy to propagate from cuttings and fast becoming popular. A recommended species for beginners.

Eremophila polyclada. Twiggy Emu Bush, a stemmy medium shrub which prefers clay soils; it bears a profusion of white spotted flowers with large "ragged" lobes.

Eremophila santalina. Sandalwood Emu Bush, a tall shrub from the lower Flinders Range, the flowers are small, bell-like, and resemble a mass of snow drops.

Eremophila scoparia. Silvery Emu Bush, a vigorous medium shrub with small mauve flowers most of the year and a profusion in spring.

Erythrina vespertilio. Batwing Bean Tree from Northern and Central Australia, well known for its bright red beans. It is frost tender and small trees should be wrapped in bag during winter.

Eucalyptus intertexta. Gum Coolabah, an attractive tree, grows up to 50 ft. high in central western N.S.W. It has clean white bark on limbs and upper trunk, and prefers loamy soils.

Eucalyptus melanophloia. Silver Iron Bark from the Barwon and Upper Darling districts of N.S.W. The leaves are glaucous and usually opposite, grows up to 40 ft. high.

Eucalyptus ochrophloia. Yapanyah, a box-like tree with clean red upper trunk and branches, it grows along the Paroo River and is now recognised by apiarists as an outstanding honey producer.

Eutaxia microphylla. Eutaxia, a small heath-like shrub from mallee scrublands, the foliage is small and twiggy and it bears a profusion of small brown and gold pea flowers in spring.

Eutaxia microphylla var. *diffusa*. Eutaxia. This is a spreading shrub up to three feet across, golden flowers and leaves are also larger than previous species, grows easily from seed.

Exocarpos aphyllus. Leafless Ballart, a small twiggy tree usually associated with belah forest, some of this species are root parasites.

Flindersia maculata. Leopard Wood, described by the late Dr. C. E. W. Bean (author and historian) as the "Ash of the inland". It is a pendulous tree with a spotted trunk, fresh seed will germinate readily but the plant is slow growing, I have had best results on red clay loams.

Geijera parviflora. Wilga, a large dense spreading and symmetrical tree from the 10-20 inch rainfall belt of Eastern Australia; it is ideal for roadside or avenue planting or as a specimen in an open area, grows readily from seed and prefers loamy soil and thrives on temporary flooding. It is pollinated by blowflies so perhaps is better not planted near houses.

Glycine clandestina. Twining Glycine, a dense small climber, lotus type leaves and small purple pea flowers, it grows readily from seed.

Gossypium sturtianum. Desert Rose, the floral emblem of the Northern Territory, it also ranges into N.S.W. It grows rapidly in summer and has beautiful hibiscus-like flowers, frost tender when small and needs pruning when old. Colour plate in Volume 7, page 300.

Grevillea huegelii. Comb Grevillea, a local shrub with spiked leaves and red flowers in spring or autumn according to season.

Grevillea ilicifolia. Holly Grevillea, an attractive medium shrub with holly-like leaves and reddish brush type flowers. Also a local species.

Grevillea lavandulacea. Lavender Grevillea, a small grey shrub with pink flowers.

Grevillea rosmarinifolia. Rosemary Grevillea. The mallee form is only a small shrub, foliage is fine and needle-like and flowers red.

Grevillea glabella. Rankins Springs Grevillea, very similar to previous species, the flowers are scarlet. Incorrectly known as *G. rankinsii*.

Grevillea pterosperma. Desert Grevillea, found locally on deep sand, shrubs on good situations may grow up to 20 ft. across. It has slender leaves and white flowers in spikes.

Grevillea juncifolia. Fire Bush, a tall shrub which grows on the sand ridges of the northern inland. It has long slender leaves and sprays of orange flowers. Colour plate in Volume 3, page 13.

Hakea vittata. Beaked Needlewood, tree up to 20 ft. sparse needle foliage and cream spidery flowers.

Hakea leucoptera. Silver Needlewood, large shrub or tree, grey needle foliage, bears dense sprays of cream spidery flowers. Can be a magnificent garden shrub.

Hakea divaricata. Cork Wood from Western N.S.W., has thick grooved bark and multi-spined foliage.

Hakea suberea. Long Leaf Cork Wood, similar to previous, but spines on foliage are much longer. Colour plate in Vol. 7, page 265.

Halgania lavandulacea. Lavender Halganian, a most attractive small shrub with bright glossy green leaves and small blue flowers. Occurs locally in limey soils usually under mallee.

Hardenbergia violacea. Sarsparilla, a popular climber with purple pea flowers. It occurs naturally on rocky hills and ranges in Eastern Australia.

Heterodendrum oleaefolium. Cattle Bush, a small spreading tree relished by stock, it usually grows in Pine or Belar woodland.

Hibiscus farragei. Rose Mallow, a rapid growing medium shrub with rose tinted leaves and purple hibiscus flowers, it becomes straggly and needs pruning after a couple of years. Correct name *Radyera farragei*—page 269.

Hibiscus huegelii. Native Hibiscus, the mauve flowers of this shrub appear after the spring flush, like the previous species it has tough limbs but brittle roots, they need substantial stakes through the plant to prevent snapping off in high winds.

Indigofera australis. This attractive medium shrub occurs from the Northern Flinders to the Eastern Ranges, it has composite leaves and masses of mauve flowers in early spring.

Jasminum lineare. Desert Jasmine, a woody climber from the inland, it suckers freely sometimes forming large clumps, one seen by the writer was 50 yards across.

Kochia brevifolia and *K. pyramidata*, these salt bushes are tough small shrubs.

Kochia sedifolia the Pearl Salt Bush has grey foliage, highly recommended.

Kochia tomentosa. Another Saltbush, regenerates freely and has had to be removed from among other shrubs because it is too vigorous.

Leichhardtia australis, Alunqua or Native Pear, a vigorous climber with cucumber-like fruit. It shoots from ligno tubers after summer rains and can be propagated from seed.

Leptospermum laevigatum. Green Tea Tree, a form of the well known coastal species. It occurs in Northern Victoria on the crests of sand ridges.

Marsilea drummondii. Nardoo Water Fern, grows prolifically on inland swamps after summer rains, ideal for around ponds.

Melaleuca acuminata. Mallee Honey Myrtle, a tall shrub with white flowers, occurs locally in deep sand. Colour plate in Vol. 7, page 12.

Melaleuca adnata. Honey Myrtle. A tall bushy shrub general appearance similar to *acuminata*, but with separate flowering spikes.

Melaleuca decussata. Cross Honey Myrtle, large shrub with purple flowers, occurs in low situations in Central Victoria. Colour plate Vol. 7, page 33.

Melaleuca halmaturum. Kangaroo Paper Bark, a small dense tree noted for its tolerance of saline and water-logged situations.

Melaleuca glomerata. Desert Paper Bark, a small tree with papery bark and soft needle foliage. It ranges from north-western N.S.W. to Western Australia.

Melaleuca pubescens. Moonah, a small bushy tree with white flowers in January, grows widely on different soils.

Myoporum platycarpum. Sugar Wood, a small or medium tree often called Sandalwood, highly drought resistant.

Myoporum montanum. Water Bush, a medium shrub with lanceolate leaves. It grows along water courses in the inland, very suitable for hedges.

Myoporum deserti. Turkey Bush, a small dense and very hardy shrub.

Myoporum parvifolium. Creeping Myoporum, an excellent ground cover plant which thrives in clay soils, very suitable for stabilising banks and cuttings.

Erodiophyllum elderi

by R. W. Phelps, Loxton North, S.A. 5333

This photograph was taken of a plant growing in station country south of Hannahill in S.A. I would say that out there it would be an annual. However, in the garden of a S.G.A.P. member in Loxton, it has survived and flowered for at least two years. I also have a plant which flowered last spring and summer and looks as though it may go through the winter and flower again. My garden is on a red sandhill (about 12 feet of pure sand) and my plant does not look nearly as good as those we saw in the wild, growing on heavy red soil. Nor do the flowers attain the same size. I intend to try some on a lower, loamy situation. Black (Flora of S.A. where it is described as a herb 15-30 cm high) says it often grows on flooded flats.



Photography by R. W. Phelps

ERODIOPHYLLUM ELDERI

We found plenty of large corky seed-pods wherever plants were growing. Those collected were put in a jar in the sun, and heated in the fry-pan, but showed no sign of releasing their seeds. I eventually cut through them with a knife, and prised out the seeds from under horny scales. They germinated quickly with no special treatment. Cuttings take root just as easily, so propagation is no problem.

OTHER DESERT DAISIES

My experiences with other *Compositae* are: I am attempting to grow *Olearia magniflora*, a sparse shrub up to 1 metre in height with elegant purple flowers. I collected the seed at Alawoona in the Murray Mallee district, in a flat area where water lies for a while after rain. Although I tried several times without success to grow this plant from cuttings, I feel that in more expert hands it could be done. At my second attempt at growing it from seed, I got 120 to germinate, and pricked out about 40. Many faded away without growing any larger, and any which I have planted in my deep sand have also died. Those planted in loam are apparently established and beginning to do well but have not reached the flowering stage.

Olearia picridifolia, which in "Australian Plants" Vol. 7, No. 55, was described as an annual, is described in Black's Flora of S.A. as an erect grey-tomentose shrub. I have seen it growing among limestone rocks and in sand over limestone. Its flowers range from pale blue to purple. Cuttings strike very easily and quickly, but have not yet reached the flowering stage in my garden.

THE GENUS ERODIOPHYLLUM—Notes from R. D. Royce

Erodiophyllum acanthocephalum Stapf

Spreading herb up to 40 cm high. Leaves alternate, thin, obovate in outline, 6-12 cm long, deeply dissected into narrow dentate lobes which are sparsely pilose beneath. Flower heads solitary on peduncles 10 cm or more long, subglobose, ca. 1.5 cm diameter, with blue to pale violet ligules ca. 2 cm long; outer rows of florets female, each subtended by a receptacular bract which ends in a stout spine that recurves with age.

Found in the eremean area of Western Australia between Sandstone and Laverton.

Erodiophyllum elderi F. Muell. or Koonamore Daisy

This species is found in western New South Wales through South Australia to the Nullarbor Plain area of Western Australia. It differs from *E. acanthocephalum* in having more densely pilose leaves and in the receptacular bracts which although pungent do not end in a spine.

ORCHID GROWERS WILL YOU PLEASE ASSIST

Brian Muffet is leader of our Orchid Study Group. You may join the group by writing to him at 23 Marulda Street, Aranda, A.C.T. or see him with the collection at the Canberra Botanic Gardens, Canberra, A.C.T. Alternatively you could forward notes on cultivation and slides either to him or the Editor on the following genera which will appear in the coming issues of "Australian Plants"—*Acriopsis*, *Glossodia*, *Phreatia*, *Malaxis*, *Peristeranthus*, *Eriochilus*, *Robiquetia* and *Spathoglottis*. If you do not have good colour slides or colour prints can you arrange to get good photographs over the current flowering season?

We are now very active on native orchid study so will you please assist?

BOOK ON AUSTRALIAN ORCHIDS—see page 346.

PLANTS FOR INLAND PLANTING—continued from page 332

Myoporum debile. A prostrate plant with crowded leaves and pink fruit, although native to eastern Queensland it has adapted well to a drier situation.

Morgania glabra. Blue Rod, an erect herb with bright blue flowers in autumn, occurs naturally around swampy areas.

Olearia floribunda. Heath Daisy, a small dense shrub with fine twiggly leaves, and profuse small white flowers resembling snow, it ranges naturally from northern Victoria to the Snowy Mountains and is highly recommended.

Olearia lepidophylla. Clubmoss Daisy, a small heathland shrub, grey scale-like leaves and profuse white flowers in early autumn.

Olearia magniflora. Splendid Daisy, a very showy small shrub with large purple flowers, it occurs locally under mallee in limey soils.

Olearia pimeleoides. Pimelea Bush daisy, a common and widespread bush often in Belar forests, with large distinct white daisy flowers in spring.

Olearia teretifolia. Slender Daisy Bush, the flowers are insignificant but the shrub is bright green and very dense, it grows on sandy heathland.

Olearia rudis. Azure Daisy, a straggling shrub with larger leaves than any of the previous and with very large flowers, mauve, in spring.

Pandorea doratoxylon. Wonga Vine, Spearwood Bush. A vigorous vine that grows among boulders and cliffs of inland ranges, cream tocoma flowers, aborigines used canes for making spears.

Parsonsia eucalyptophylla. Woodbine, a vigorous climbing vine with eucalypt-like leaves. It is most effective around a dead tree trunk and is found in Western N.S.W.

Petalostylis labicheoides. Butterfly Bush, a large shrub resembling Tree Lucerne, it has orange "butterfly" flowers, from inland Australia. Best time to grow from seed is November. Transfer seedlings to permanent site so that they will be past frost danger by next winter. I have a specimen which grew 20 ft. across in four years.

Phebalium bullatum. Desert Phebalium, one of the showiest heathland shrubs, it becomes a golden mass in spring, slow growing. Colour Vol. 6:292.

Pittosporum phylliraeoides. Weeping Pittosporum or Locket Bush, a pendulous small tree found widely throughout the inland with distinctive locket-shaped orange-coloured fruit.

Prostanthera aspalathoides. Scarlet Mint Bush, a compact small shrub with scarlet lobed tubular flowers; strikes from cuttings. Colour Vol. 6: 141.

Prostanthera striatiflora. Striated Mint Bush, an upright small shrub from the Flinders Ranges and north-western N.S.W. The flowers have large lobes, are white with pink striations.

Ptilotus atriplicifolius. An upright small plant with small mauve flowering heads, common in parts of Western N.S.W.

Ptilotus nobilis. Yellow Tails, a perennial herb which grows up to 18" high and 21" across with yellow cylindrical brush-like flower heads up to 4" long. Grows in good seasons in inland Australia particularly on stony ranges.

Ptilotus exaltatus. Pussy Tails, similar in appearance to the previous, except flower heads are mauve. It grows readily in either sand, loam or gravel. Seed germinates better if extracted from the awn. Colour Vol. 4:112.

Ptilotus exaltatus var. *semilanatus* bears no close resemblance to the former. It is a small erect twiggly plant with small bristle-like mauve flower heads. It is always in bloom and was collected by the writer near Tiboburra, N.S.W.

Rhagodia nutans. Nodding Salt Bush, a species of creeping Salt Bush which often trails over fences and is quite attractive in autumn when it is covered with orange fruit, leaves are spade shaped.

Rhagodia spinescens. Hedge Salt Bush, a blue-leaved shrub from the Salt Bush Plains, it is a very suitable undershrub for mature Eucalyptus.

Santalum acuminatum. Quandong, a small tree with edible red fruit which can be used for making pies.

Santalum murrayanum. Ming or Bitter Quandong similar to the previous, the fruit is very attractive but edible.

Santalum spicatum. A quandong from the western half of Australia, the fruit is paler than the former.

Santalum lanceolatum. Plum Bush or Northern Sandalwood, an excellent and fast growing specimen tree up to 15 ft. high, grows in inland and northern Australia.

Spyridium subochreatum. A small upright shrub from sand heath situations, the foliage is neat and compact. The flowers are minute in rust coloured clusters.



TEMPLETONIA RETUSA

Templetonia retusa. Cockey's Comb, an attractive shrub with wedge-shaped leaves and prolific red pea flowers with long lobes, it grows westward from the Flinders Range. A valuable, hardy winter flowering plant.

Templetonia egena. Desert Broom, a broom-like shrub with bronze pea flowers, it occurs in belah forests and on heavy soils.

SPARE A SPOT FOR THE SANTALUM

by B. V. Curtis

The humble sandalwood, once cut into billets and exported to be burned for incense in oriental temples, can be more fittingly used for trees of beauty and interest in large gardens.

There are four members of this genus in Australia and the one most commonly known is *Santalum acuminatum* or "Quandong", a small tree usually no more than ten feet high with a dense crown of pale green leaves. It has attractive fruit usually about an inch in diameter, but larger in good seasons. When ripening they change from green to bright red. The flesh



Photography by B. V. Curtis

SANTALUM ACUMINATUM

is edible and was used by the pioneers for jam or pies. Liberal additions of sugar are advised for this. The fruit was a food for the aborigines who also ate the kernel. This species grows widely though never in great numbers throughout inland Australia, in all districts of approximately 20 mm to 40 mm rainfall. It was sometimes grown along fences in inland station gardens.

Very similar to the preceding is *Santalum murrayanum*, the Bitter Quandong or Ming. By comparison this tree is often taller, more open with pendulous foliage, the leaves being a bluish green. The fruit is also bright red and usually more numerous than the Quandong, which makes the tree very attractive, the flesh is bitter and the endocarp also less pitted than the former. Its range is also similar except that it is more restricted in W. Australia, mostly to the South West Province, usually growing among mallee.

Also similar to both these is *Santalum spicatum*, "Fragrant Sandalwood", the tree is bushy in habit but the fruit is smaller, not fleshy and is yellow when ripe, the endocarp is smooth. It ranges from the Northern Flinders Range westward across the southern and south western parts of the continent.

Distinctly different is *Santalum lanceolatum*, "Northern Sandalwood", "Plum or Cherry Bush". This is usually only a small tree with a straight single trunk and pendulous branches, making it an excellent specimen tree. The most showy tree I have seen of this species was a natural specimen which grew in the garden of Lenroy Station, on the Paroo River in Western N.S.W., it was six metres high. The fruit is edible and a cherry colour when ripe, but very small, usually no more than 1 cm in diameter. This tree is more numerous than the other species and is found mostly in the northern inland, ranging from the Kimberleys of Western Australia, Central Australia to Western Queensland and New South Wales. Two isolated occurrences in northern Victoria qualify it for that States rarest tree.

Propagation of *Santalum* spp. is not difficult provided a couple of problems are understood.

The endocarp of the first three species described, is very hard and in natural conditions does not germinate until there has been prolonged wet conditions. Reasonable results can be achieved by sawing a nick into the hard shell with a hacksaw and placing nick downwards in pots, in summer shade. Alternatively reasonable results may also be obtained by collecting a handful of old seasons endocarps and planting together in the proposed permanent site and keeping well watered.

Santalum lanceolatum germinates readily. It is possible to cut through the shell with a knife.

The other point to bear in mind is that *Santalum* spp. are root parasites and must have a host when small, but they also need usual moist soil conditions to survive when small. I have observed seedlings dying in natural conditions in dry times.

I have achieved good results by planting with another small shrub when very small. If they are to be kept in the nursery for some time, transplant into a container with the other species and later plant out both in the normal way. Host plants that I have used include *Dodonaea*, *Eutaxia*, Salt-bushes, Twining *Glycine* and *Eremophila sturtii*.

With regard to the latter host plants, a seed of *Santalum lanceolatum* was placed in the pot with the small host *Eremophila sturtii* (they often grow together naturally). The *Santalum* later grew to six feet and fruited in two years, the host plant is stunted. Two other plants placed in ripped ground without hosts went yellow and died. *Santalum spicatum* and *S. acuminatum* by comparison have only grown thirty inches in two years. *Santalum* spp. may also reproduce by suckering.

AUSTRALIAN TREE FERNS

by Stephen Clemesha with sketches by Ray Best

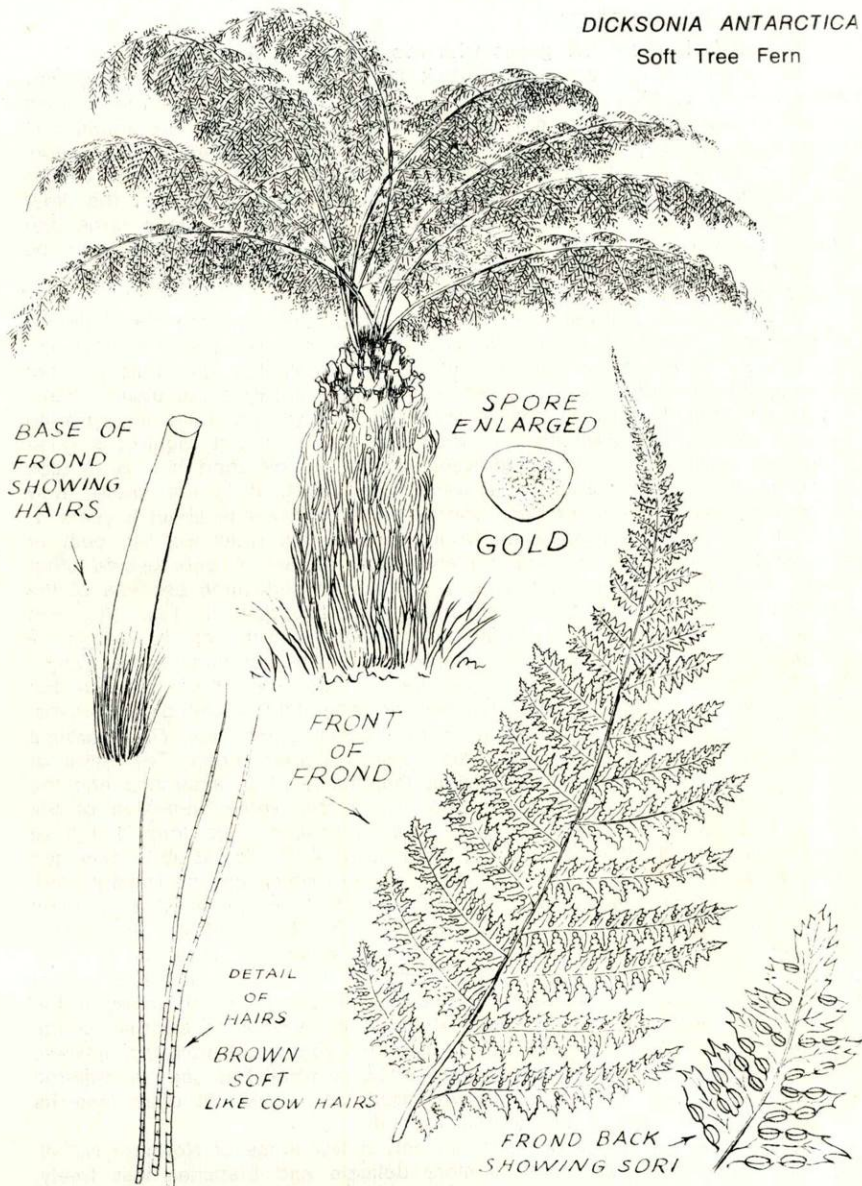
Our No. 57 issue was devoted to ferns where the first article in a series on ferns described all the Australian Tree Ferns. The practical experience and competent observations by Steven Clemesha will assist readers in their cultivation. Our next issue will have an article on the cultivation of ferns—Editor.

For the purposes of this article tree ferns are those species which produce trunks 4' high or more and does not include smaller ferns which sometimes form short trunks.

Australian tree ferns belong to 2 genera which can be distinguished by:

DICKSONIA ANTARCTICA

Soft Tree Fern



1. The material covering the bases of the young fronds and crown of the plant. In *Dicksonia* this is hair-like while in *Cyathea* it is scales. These scales are flaky or papery and are narrow triangular in shape.

2. The Stipes (frond bases). If the covering scales or hairs are ignored the stipes of *Cyathea* are covered in short spines or pimples while in *Dicksonia* the stipes are smooth.

3. The Sorus or spore bearing structure. In *Dicksonia* this is marginal and protected by a lobe of the pinule (leaf segment) and an inner piece of similar shape. This appears as a 2-valved cup. In *Cyathea* the spores are round brown masses which are not marginal.

THE *DICKSONIA* SPECIES

Dicksonia is a smaller genus with two species in Australia.

D. antarctica has a massive trunk up to about 2' thick. It is greatly thickened by rootlets especially at the base. Its frond butts are clothed in soft brown hairs which are shed as the frond uncurls. The fronds are harsh and thrice pinnate giving a finely divided appearance. The spore capsules are small. The great weight of the trunk of this plant often causes it to fall when the growing tip will often turn upright and grow as the older fallen part decays. The soft trunk is often the home of many ferns and other epiphytes. Epiphytic ferns, orchids, cacti and bromeliads can be raised on living plants in cultivation. This fern has been commonly used as a supply of tree fern fibre in the past.

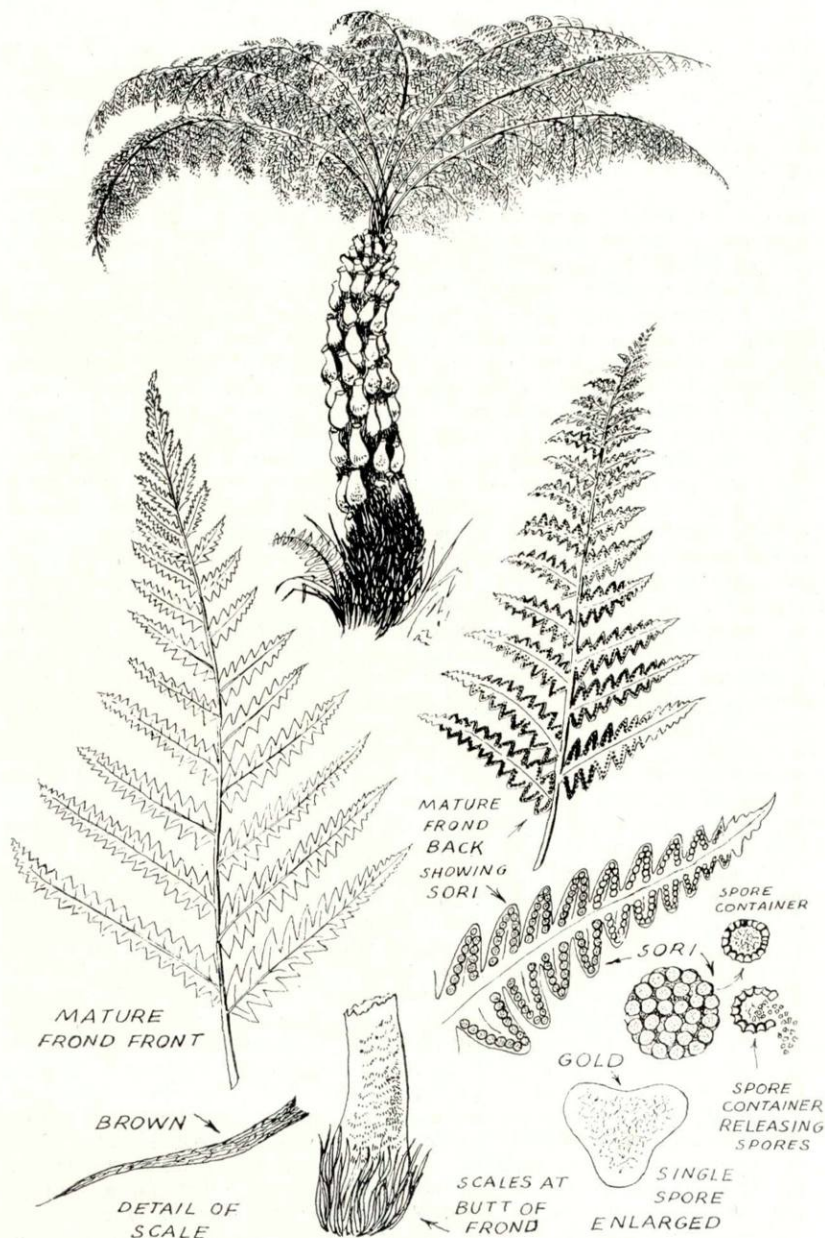
It is of easy cultivation in clay to sandy soil provided the latter is of reasonable standard. Unlike all other Australian species of tree fern the top section of the trunk can be cut off and replanted (the butt will not grow again). This often is attempted with *Cyathea australis* but plants almost always die after 2 years. Its growth in height is slow. The trunk only growing about 4" a year if conditions are good and less if not. It requires a good supply of water and for withered fronds to be cut off short if it is to look attractive. It is well suited to a waterlogged spot. It is not known how old plants have to be to produce spores but probably it is about 8 years or more. It can only be propagated from spores which grow well on peat or tree fern. In my collection young plants often appear in pots beside other plants. In Sydney this species is fairly common in cultivation because of the ease with which it can be transplanted. It is abundant in Tas., Vic. and N.S.W. and occurs also in South-east Queensland though is extinct in S.A. where it formerly grew at Mt. Gambier and "the waterfalls of Mt. Lofty". *D. antarctica* stands up to the cold better than any other tree-fern but requires plenty of water it being typically an inhabitant of wet gully bottoms.

D. youngiae. This is a much more slender plant than *D. antarctica* and its fronds are shorter, less harsh and a lighter green. The hairs of the crown are more rigid and persistent than those of *D. antarctica* and the spore capsule is much larger and they cover the whole underside of the pinule. The trunk produces buds. The above ground ones form a tuft of fronds which are capable of replacing the main trunk if it is cut off or damaged while the below ground ones slowly form runners which can be transplanted. When this is done they soon grow into new plants or grow up as a plant beside the main plants. Its spores grow easily and well on peat moss and plants reach a fertile age sooner than *D. antarctica* at about 5 years. The cultivation of *D. youngiae* is the same as that of *D. antarctica* except it can be cut back if considered to be too tall but it is not known if the replanted top will grow which seems doubtful in view of its slender nature. The plant burns under the heaviest frosts in Sydney but recovers quickly. This tree fern is a most attractive plant where a small tree fern is required and has the added advantages of producing an occasional offset and its ability to be cut back if considered too tall.

It is a rare species being found in only a few areas of Northern N.S.W. and Qld. The North Qld. form is more delicate and branches less freely.

THE *CYATHEA* SPECIES

The genus *Cyathea* is the world's main genus of tree ferns. Ten species (the reason I say 10 is I do not recognise *grevilleana* as occurring in Australia), are known from Australia. Many more occur in New Guinea. About 4 species are confined to Lord Howe Island.



CYATHEA AUSTRALIS—Rough Tree Fern—N.S.W. Tree Fern

In most species the butts of old fronds persist but in two they are shed leaving a neat scar on the rather smooth trunk. As in *Dicksonia* it is not known at what age most species produce spores but in most is probably around 8 to 10 years. It is delayed by heavy shade which often occurs in nature.

C. cooperi is the better known of the two species which shed their frond butts. It grows to about 40' high. The scales at the crown are of two types—1. small reddish brown ones and 2. larger whitish ones. Its fronds are large and attractive. Spores are produced in round masses from when the plants are 3 or 4 years old onwards. It is more frost tender than some but is a rapid grower and any damaged fronds are soon replaced. Under good conditions it grows about a foot a year and therefore is a good species for shading the more tender species. Like most tree ferns it will grow in full sun but is best if the base of the plant is well sheltered from sun and wind. It grows in most soil types including clay. This species is popular as garden plant because of its neat trunk and very handsome crown of fronds. *C. brownii* from Norfolk Island is related to it and from my specimens seems as though it will be similar in habit and use.

C. robertsiana. This plant is perhaps the most attractive of Australia's tree ferns. In its native habitat the trunk is often very slender in average specimens but better ones are thicker. The trunk is smooth and neatly patterned with fallen frond scars. The young curled up fronds are covered in brown scales all but a few of which are shed as the frond uncurls with the result that the plant does not appear to have a regular crown. The fronds lack the somewhat hard texture of the other tree ferns but instead are quite soft though are not thin in texture. They are a soft shade of light green and are finely divided. Their underside is covered in dense soft hairs however the scales at the young frond readily separate it from the *Dicksonias*. My cultivation experience with it is limited to a few small plants sent from North Qld. It is quite difficult to transplant and losses are likely to be high unless this is done with great care. Young plants from heavy shade can have trunks 4"-5" high and only as thick as pencil. This tendency should be discouraged by planting such a trunk deeper and packing hessian and peat moss around it for the thicker the trunk the stronger and better the plant. It requires a damp position and must not dry out. It needs protection from full sun but can take some broken sun and is about as frost tender as *C. cooperi*. I have only once tried spores of it and then at a time when I was inexperienced in raising them. They were placed on sand and failed to survive though it should be better on other media. This species grows in rain forest of north Queensland and chiefly in the mountains. It is a fairly fast grower.

C. australis has a trunk about 9" or more thick covered in rough frond butts. These are rough through the presence of pimple like tubercles. The scales of the crown are dark brown and shiny. The fronds are light green and sometimes glaucous beneath but never as much as in *C. dealbata* of New Zealand. It is easily identified by the rough trunk and brown scales. Growth is much slower than in *C. cooperi* but faster than in *Dicksonia antarctica*. Spores are easily raised on sand or better still tree fern fibre or sphagnum moss. It is hard to transplant unless most of its roots are taken with it. It will survive many years in cleared paddocks and tolerates dry conditions better than any other tree fern. It is damaged by frost but recovers quickly in spring. Though it can survive in drier conditions than the other species it burns more easily under them. It is fairly common in cultivation. It should have all withered fronds cut back short against the trunk and good watering or it will be a scraggy untidy plant. It is the most abundant *Cyathea*. S.E. Qld. to Tas.

C. woolfsiana resembles it but has darker, thinner, less divided fronds and the scales of the crown are darker and much thicker. It is a native of North East Queensland (chiefly the mountains). It appears to be of easy

cultivation from my limited experience with it as I succeeded in raising a few plants in sand even though the medium obviously did not suit it. I think it would be better raised on tree fern fibre and the young plants moved into pots of peat moss. It grows well and is a most attractive species which requires shade of harder fronded species or trees.

C. marcescens also resembles *C. australis* but its frond butts are darker (black) and look more like those of *C. cunninghamii*. Its scales are shorter, darker, thicker and more brittle. Its fertile fronds are more lobed than those of *C. australis*. It is easy to identify from fresh fertile fronds as its sori are noticeably more raised and pointed than those of *C. australis*. If this area is examined after spores are shed it will be seen to be different also if compared to *C. australis*. Most authors have referred to it having a skirt of dead fronds but the plants I saw lacked this in most cases while it was evident in some plants of other tree fern species in the area. This plant is known only from a few areas in Victoria where *C. australis* and *C. cunninghamii* grow also. It may be found in Tasmania.

C. cunninghamii is a more slender species than *C. australis* and its relatives though large plants of it are only slightly less so. Its frond butts are black and the scales of the crown are mainly pale, fawn and thin but often dark brown thick ones are present also. The fronds are thinner in texture than those of *C. australis*, and are numerous, fine divided and lacy. They are especially thin when the plant is young. The sori of this plant are enclosed in a globular cup which later splits irregularly. It is a very attractive species which occurs in Victoria, Tasmania and New Zealand. It is uncommon and disappearing from some areas as a result of fires and clearing of land. My spores of it failed in sand but those raised on peat were satisfactory while those on tree fern were better still. It requires more shade than *C. australis* and *C. cooperi* and reasonable wind protection. It also requires constant dampness but is well worth any effort to grow it. Reports from Victoria suggest it is difficult to transplant. Probably it would benefit from having damp material placed around its trunk when small to encourage it to thicken. Care should be taken to prevent too heavy a shading as it seems to like reasonable light though full sun is not desirable. It is best kept in a pot till fronds are about a foot long. Its soft delicate texture is very beautiful.

C. leichhardtiana. The trunk of this plant is very slender, often more so than in *C. cunninghamii*. Its frond butts are also black or nearly so as in that species but the two are easily distinguished by the presence of thorns on those of *C. leichhardtiana*. The scales of the crown also differ. In *C. leichhardtiana* they are very narrow and whitish. Its fronds are thicker in texture and a dark shining green. It appears to be a much slower grower (at least in cultivation than *C. cunninghamii* when young. Later it speeds up. *C. leichhardtiana* is appropriately called the Prickly Tree Fern. It extends from the north east corner of Victoria to the Eungella Range, North Queensland. It is common in rain forests often preferring a better drained position than most tree ferns. Very often plants are clothed from top to bottom in the remains of dead fronds. Though plentiful this species is not often cultivated. Plants do not transplant satisfactorily unless they are small and even then are slow to start growing properly. Its spores are easy to raise. Though its fronds are almost as thick as those of *C. australis* they burn easily so require protection from the sun. It grows satisfactorily in most soils though I do not know about sand and seems to like to be damp but reasonably well drained. Being a slender species the methods of thickening the trunk mentioned earlier would be beneficial. The main good point of this species is its dark shining fronds.

C. celebica closely resembles *C. leichhardtiana* and has similar scales and thorns but its fronds are thicker in texture and almost white underneath except when young. The plants I received have more scales on the main veins of the fronds than the corresponding ones of *C. leichhardtiana*. It

requires the same treatment as *C. leichhardtiana* when young but it becomes hardier later. Seems more sun tolerant than its relative and to be of more attractive appearance than it. It is possibly a slightly faster grower than *C. leichhardtiana*. It is known in only a few areas of North Queensland but occurs also in Papua and some Indonesian Islands. Its Australian distribution is further north than that of *C. leichhardtiana* and the undersides of the fronds of that species are light green and not whitish as in *C. celebica* except in young plants. The spores of it I received at the same time as those of *C. robertsiana* were tried on sand and failed and the same is true of those of *C. rebecca*.

The following two species are closely related to each other and belong to a different subgenus from those already treated. They are smaller plants much more slender and with shiny less divided fronds. Altogether they took very different, a young plant is not readily recognisable as a tree fern unless one is familiar with them.

C. rebecca is the commoner of the two. Its frond butts are dark in colour and its scales are narrow and dark. The crown is loose with only about eight fronds. These are shiny and less divided than in the other species. It is plentiful in North Queensland rainforest (coast and highlands). In cultivation I have found it fairly easy to grow if kept damp. Its growth is quite slow and so far it is showing no sign of forming a trunk. It has produced two offsets which are slowly increasing in size. It is well worth growing because of its distinctive appearance.

C. baileyana is closely related to *C. rebecca* but differs in having longer, broader leaf segments and the lower leaf segments of the frond are replaced by a wig like fibrous growth which gathers around the plant. It occurs in highland areas of North Queensland often with *C. rebecca* but is much less common than it. It is easily cultivated in the same way as *C. rebecca* and in cultivation continues to produce its curious wig like growths at the frond base. These are bright green when young and uncurl. This plant also produces offsets. Both these species are well suited to pot cultivation because of their small size.

Cyathea brownii. This species is confined to Norfolk Island but has recently been introduced into cultivation in Australia. Growth is rapid and it is quite hardy. It requires the same treatment as *C. cooperi*.

C. dealbata. This tree fern is the most plentiful and widely distributed of the N.Z. tree ferns. Its trunk and scales resemble those of *C. australis* but the fronds are dark shining green above but in mature plants pure white beneath. Spores of it are easy to raise but young plants require shade and no wind and are not as hardy as they look. *C. dealbata* is a slow growing species which when larger still requires a protected position.

Culcitia dubia is very easy to cultivate in any semishaded moist area but because it spreads so rapidly it becomes a nuisance in most situations. It can be propagated so easily vegetatively.

C. villosa is a species I have never seen so I can only guess how it would perform in cultivation. Its habit suggests it would not spread and become a nuisance and it probably would be hardy as far south as Sydney as most North Queensland mountain rain forests ferns are.

Todea barbara is a very easy fern to cultivate and will grow (in Sydney) in any reasonably damp position. It will grow well in sun or shade. Plants in nature become large and with many crowns. It is not known how long this takes in cultivation. Its spores are green and must be collected before they are shed. They hold their viability for only a few weeks. I have not attempted to raise them but see no reason why this should be difficult.

Leptopteris fraseri is a very difficult fern to cultivate as not only can it not stand even the slightest degree of exposure to sun or wind. It also does not form roots very readily. I can only grow it in a sheltered area where I raise young sporelings and even then I am not convinced that I will be successful. Perhaps plants raised from spores would be better.

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We feature *Hakea* (below) and *Grevillea* (on the front cover) in this issue with aspects of their cultivation. What is the difference between *Grevillea* and *Hakea*? See "The Magic of Wildflowers" on page 314.



Photography by L. Carman

HAKEA FRANCISIANA

A beautiful garden shrub. Pages 307 to 323 give advice on cultivation and propagation of this Australian wildflower.