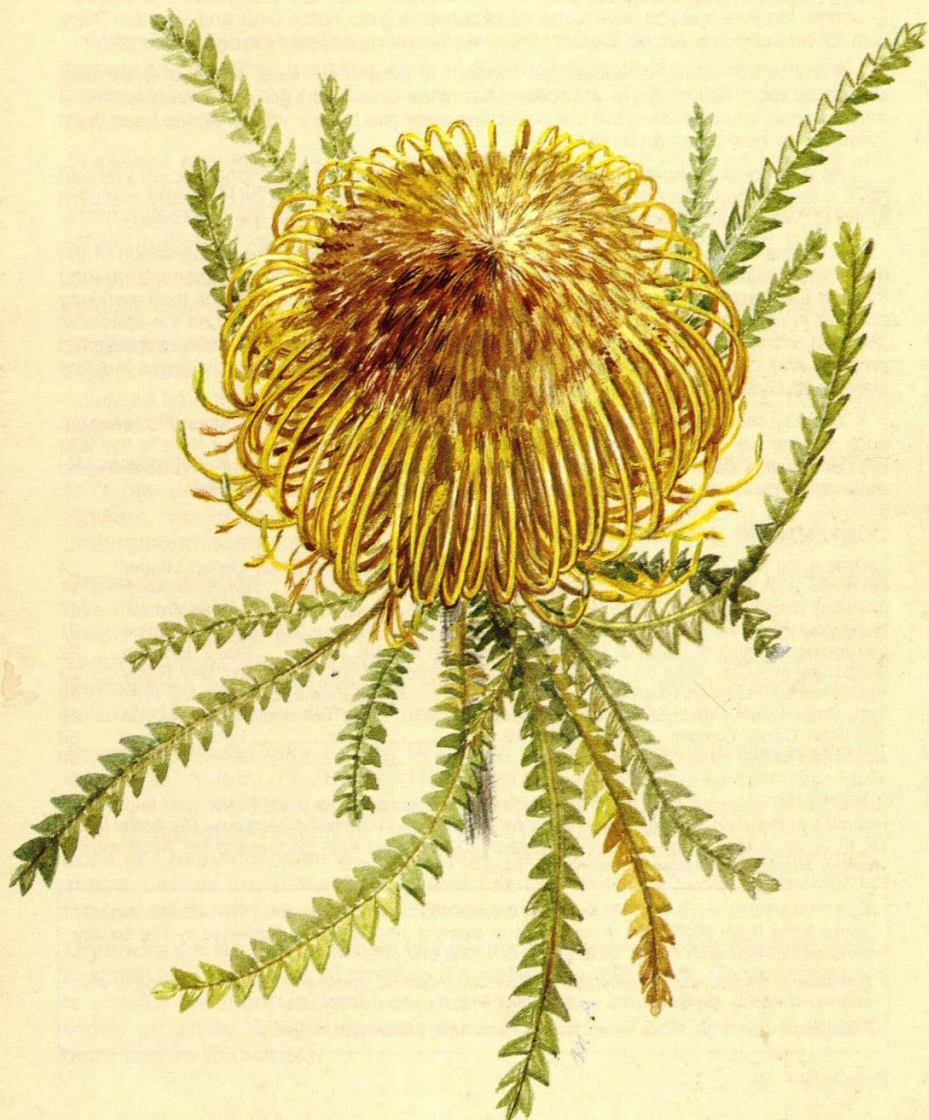


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Landscaping with Wildflowers

While this issue features the Proteaceae, *Dryandra*, Waratah and Smokebush, the reliable Kangaroo Paw cultivars and the use of native grasses are also important components of any landscaping creation. Three successful wildflower gardens, one on sand, one on clay and another featuring grasses are also described with special guidance for the home gardener.

The first issue of a new volume is really a basic guide to cultivation of wildflowers in gardens. If you follow the advice given for *Dryandra* and Waratah, you can grow most wildflowers very successfully.

The Society is Involved in Conservation of the Australian Flora

An urgent concern is conservation. The Australian flora is under threat of extinction. Conserve the flora and you have a chance of conserving our native birds and animals. There is much an individual can do. Contact the State Secretary as listed inside the rear cover.

Many of the issues of immediate concern to people are local issues and are best served by local action. Form an action committee or support groups already active. It may surprise some readers but our politicians want you to be involved and to keep them informed on how they can assist.

As a major society, nation wide, we are deeply involved in national issues that can have a major impact on the future of Australia, even the world, and on the future standard of living. We are involved in effecting major initiatives far beyond the year 2000.

A critical area where our expertise is of exceptional value is the conservation of the flora in the wild and in available reserves. For this we need scientific research funded through the Australian Flora Foundation. Some groups prefer to do things their own way and this is certainly better than nothing. They would be well advised to use the specialist services of the Foundation, available without charge, if necessary on their own selected projects and using their local scientists. This has been done with great success in some states with assurance of adequate scientific support and final reporting.

An area where the Australian Flora Foundation is very active is scientific research such as that described on page 28. A solution to the decimation of our flora in the wild is to encourage commercial farming by solving propagation and cultivation problems and developing more desirable and consistent forms for the world export trade.

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COVER PLATE — *Dryandra formosa* is widely grown and used as a cut flower (see page 43). It responds to this hard pruning and containment of the bush to desired dimensions. The flower heads are to 10 cm across, bright and showy. One of 200 paintings from *Discovering the Wildflowers of Western Australia* by Margaret Pieroni, see page 4.

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Landscaping with *Dryandra*

by Margaret Pieroni
Leader, Dryandra Study Group

Perhaps I am biased — but I believe that the genus *Dryandra* contains the most diverse and attractive foliage in the Australian flora. As well, there are species for every place or purpose in the garden. One of the beautiful features of many of them, and also of other genera in the Proteaceae is the colourful new growth, usually in summer. Species with fern-like leaves such as *Dryandra nervosa*, *D. shanklandiorum*, *D. preissii*, *D. blechnifolia* and several other similar, as yet unnamed ones have new leaves that resemble furry fern-fronds of orange, pink or rich purple-pink. For their use in floral arrangements, see page 43.

GROUND COVERS

Of the prostrate species, many have underground stems, upright leaves, and flowers that emerge from the ends of the branches under the soil around the perimeter of the plants. These are ideal rockery or ground-cover species. Recommended are:

Dryandra tenuifolia — There is a prostrate form (we know as No. 53) with almost entire leaves which has long trailing branches, that forms an ideal ground-cover plant up to 3 m in diameter. It has very attractive flowers like small proteas, in late winter. Photo on page 9, usual form on page 13.

Dryandra obtusa — Very attractive rigid glossy leaves, flowers with long colourful bracts. Hardy in cultivation spreading to 1 m or more. Photo, page 4.

Dryandra pteridifolia — Long, blue-green pinnate leaves, spirally twisted. Flower colours vary — the prettiest have a pink perianth with a coppery-coloured limb and yellow style surrounded by brown velvety bracts. This is not common in cultivation but is doing well at Cranbourne, Victoria.

***Dryandra* No. 41** (aff. *pteridifolia* / *calophylla*). Has shorter pinnate leaves similar to *D. pteridifolia* but not so twisted or prickly. New growth is a rich purple-pink. Flowers, similar in shape to *D. calophylla* are a dusky pink, at the ends of underground, scaly stems. It is growing well in my garden and at Cranbourne.

Dryandra mīmica — A rare and endangered species. Leaves are similar to *D. nivea* but with curved sinuses giving them a “scalloped” appearance. Golden yellow flowers are produced in summer. There is a need to introduce this species into cultivation in order to ensure its future. It grows well in the Perth metropolitan area but does not set seed in gardens possibly because it is pollinated by animals such as honey possums. Photo on page 9.

Dryandra blechnifolia — and ***Dryandra* No. 22.** *D. blechnifolia* (previously known as a form of *D. pteridifolia*) occurs in the Stirling Ranges area, *D. No. 22* in the Perth area and north in the Badgingara region. They differ from *D. pteridifolia* mainly in having the style shorter than the perianth which does not relax on opening, thus giving the inflorescence a “shaving brush” shape. Leaves are similar to *D. pteridifolia* but variations occur in the width of the leaf-lobes within populations. Photo on page 8.

***Dryandra* sp. No. 3.** The leaves of this species are similar to *D. blechnifolia* but only half the size, about 30 cm long. The lobes are quite wide. The inflorescence is smaller but more colourful and generally more numerous. This has been widely grown by Study Group members. It is hardy. Plants spread to three or more metres in diameter.



△ *Dryandra obtusa* (J. Simmons)

▽ *Dryandra nivea* (F. W. Humphreys)



Discovering the Wildflowers of Western Australia

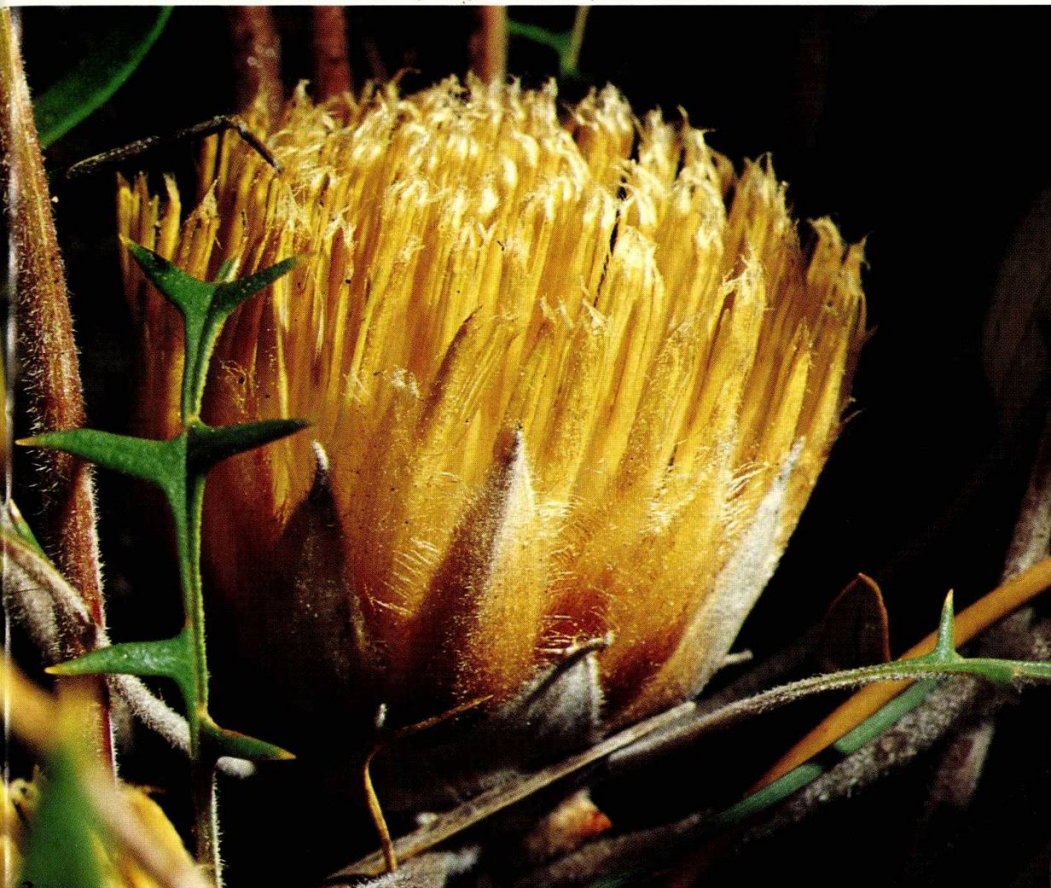
by Margaret Pieroni

The cover plate of this issue is from the above book. There are over 200 similar illustrations of wildflowers as seen by the eye of this talented artist. She loves to roam the western scrub. This 45-page book of her paintings with simple descriptions, will, in her words "serve as an introduction to the wildflowers of Western Australia for the reader who does not necessarily wish to read 'technical' descriptions in order to identify them". A very colourful, nicely presented book available for \$12.00 as instructed inside our rear cover.



△ In the garden of Margaret Pieroni — *Dryandra obtusa* bottom left, with *D. nivea* on the right in front of *D. nervosa*.

▽ *Dryandra nervosa* from the Sitrling Range — Photos by M. Pieroni.





Dryandra groundcovers

Dryandra calophylla — Leaves are dark green, almost white on the reverse side. Numerous, small, dull-coloured flowers are produced around the perimeter of the plant from below the soil. It is well-known and hardy.

Dryandra bipinnatifida — There are two distinct forms — East of Perth on the Darling Scarp plants have long bipinnate leaves with flat lobes. Those of the common form which is widespread in the south-west are hairy and half the size with narrow, revolute

lobes. Flowers are large, surrounded by even longer, fleshy bracts. The foliage is very unusual and attractive making up for the infrequent flowering of this species.

Dryandra tortifolia — This is very much like a prostrate form of *D. nivea* but with shorter, narrowly-lobed leaves which form a V to the midrib. Flowers vary in colour and are similar to *D. nivea*.

Dryandra nivea — Prostrate species *D. nivea* comprising Nos 26, 27 and 29 with similar "honey-pot" flowers. Often occurring in various colour combinations, these differ mainly in the size and colour of the triangular leaf lobes. Photograph on page 4.

Dryandra lindleyana — A suckering species, and ***Dryandra stenoprion*** are also recommended. Both have flowers like *D. nivea*.

DENSE MOUND-SHAPED SHRUBS

Some of the loveliest *Dryandra* for foliage, form neat, dense, rounded shrubs which often hide their flowers within the bush at the base of the leaves. Recommended are:

***Dryandra nervosa* and *D. aff. nervosa* (No. 39).** Leaves are long, pinnate and twisted. Those of *D. nervosa* have flat lobes while those of No. 39 are narrow, revolute and prickly. Both have cream and light brown inflorescences similar to *D. blechnifolia*, but No. 39 has miniature floral leaves. Also previously known as *D. pteridifolia*, *D. nervosa* is deservedly popular in cultivation for its tangled, fern-like leaves forming a neatly-shaped shrub to about 1 m × 1 m and proving hardy. See photographs on page 8.

Dryandra drummondii — Leaves of the typical *D. drummondii* have wide, rather obtuse, spreading lobes. Flowers form at their base building up in successive years into a neat, rounded mound to about 1 m × 1 m. A much larger form with rusty-hairy new growth occurs. This flowers later, in summer, and the flowers have crimson styles rather than the yellow of the typical species. A spectacular foliage species with beautiful, though almost hidden flowers, it is widespread in cultivation. Four or five different taxa may be found in this group. Two of them are dense shrubs with upright stems and shorter leaves with triangular lobes. Flowers are produced in winter. They are more conspicuous than those of typical *D. drummondii* because of the different growth habit which forms a less formal mound shape.

Dryandra brownii — This species has been confused with *D. nivea* from which it differs, having wider leaves with more obtuse, spreading lobes, and with *D. arctotidis* and the similar *D. tortifolia*; the flowers of all three resemble those of *D. nivea*. *D. brownii* has been widely grown and, though it is sometimes shy to flower it is a good, compact small shrub to 0.75 m.



Dryandra dense mound-shaped shrubs

Dryandra subpinnatifida — There appears to be two distinct forms. The western form (near Boddington and west of Darkan) is a mounded shrub with extremely attractive foliage held horizontally. Leaves are entire except for the lower part and the petiole which have short, prickly lobes. This form flowers earlier, in late winter, and is very floriferous with showy, bright yellow flowers. The form from Dryandra Forest is a taller, less formal shrub, equally spectacular in flower, later, in spring. Both are growing well at Cranbourne. Popular in cultivation they seem to be very hardy. Photograph on page 12.

Dryandra shanklandiorum — Blue-green leaves are similar to *D. nervosa* but not as twisted, with longer, flat lobes. Mature shrubs may become over-large — more than 1.5 m × 2 m and the bush tends to lose its neat shape so pruning may be necessary with this species. The flowers are similar to *D. pteridifolia* but much larger — possibly the biggest in the genus. (Some others have a larger inflorescence because of longer bracts). They are very numerous, within the bush, quite beautiful but with an unpleasant odour. This species has been widely grown and is hardy. Seed of *D. shanklandiorum* has been sold as *D. preissii*.

Dryandra nivea — Typical *D. nivea* is usually a sprawling, small shrub but there is a large mounded form with extremely long leaves which grows in swampy areas south and east of Bunbury. Plants grow to 1.5 m × 1.5 m or more. The flowers, which may vary in colour within a population, are well hidden within the bush. I do not know of this particular form in cultivation.

***Dryandra* No. 28 aff. *nivea*.** Quite widespread in the south-west, it is distinguished by its very narrow leaves and known as "mound nivea" because of its form. Flowers are the typical honey-pot shape, and colours vary from bright yellow to red on the styles and grey, light brown to rich rusty-brown on the perianth limb with various colour combinations occurring in the same population.

***Dryandra* No. 16.** — This species grows on laterite hills east of Lake King. It resembles *D. nivea* in leaf though the leaves are more robust. The stiff, straight golden yellow flowers are unlike those of *D. nivea*. Seed capsules are long and narrow and very sticky. Plants form mounds to 1 m × 1 m. I have not succeeded in growing this one but at least one Study Group member has done so very successfully.



△ *Dryandra blechnifolia*
Photo W. H. Payne

▽ *Dryandra* species aff. *D. nervosa*
Photo M. Pieroni



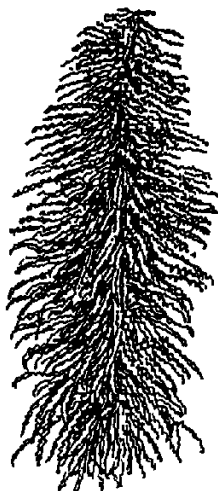


△ *Dryandra* aff. *tenuifolia*

Photos M. Pieroni

▽ *Dryandra* *mimica*





COLUMNAR SHRUBS

Several species form tall, narrow shrubs with long, narrow reflexed leaves which give them a "shaggy" appearance. Most of the following have more or less inconspicuous flowers.

***Dryandra* 47** aff. *D. plumosa* — (one population only in the Stirling Ranges) forms a neat tall shrub to about 2.5 m with similar, but longer leaves than *D. plumosa*. The flowers are quite attractive with long, silky hairs on the perianth limb and plumose bracts.

Dryandra seneciifolia — This is a small shrub to 1 m. Flowers are very small and dull. It has proved to be quick-growing in my garden.

***Dryandra* No. 4** aff. *D. seneciifolia* is similar but with shorter and more numerous lobes on longer leaves. This species grows to about 2 m forming a dense

column of foliage. Mature plants in the wild often fall under their weight but go on growing.

***Dryandra* No. 5** aff. *D. seneciifolia* (dubbed "giant seneciifolia") grows to about 1.5 m only, but the leaves are larger than *D. seneciifolia* and glabrous rather than hairy. The flowers are larger, and more showy, with red styles.

Dryandra conferta — This is a variable species which may attain a height of 2.5 m. Flowers are bright yellow and numerous on the main stem among long, narrow, reflexed leaves.

MEDIUM TO LARGE BUSHY SHRUBS

There are quite a number of good foliage dryandras with long leaves which form bushy shrubs ideal for screening a fence or providing a "hedge" effect. They branch from low on the plant and often their long leaves droop to the ground. They have long, short-lobed or wide fern-like leaves which not only provide attractively shaped plants but which are also very desirable in floral art. Many are quite rigid and long-lasting in a vase. They may be dried and the longevity enhanced by treating with glycerine. *Dryandra formosa*'s leaves turn a chocolate brown on top which contrasts with the pale underside.

Dryandra baxteri — Long, narrow, rather soft leaves are an attractive feature of this species which may grow to 2 m × 1.5 m. It branches from the base of the shrub with the leaves held more or less horizontally. Flowers are fairly large but dull coloured.

Dryandra mucroniata — Like the well-known *D. formosa*, this species is fast-growing but may be short-lived. Its flowers are pretty but not showy. It is well known in cultivation and quite hardy. Photograph on page 12.

Dryandra foliosissima — As its name suggests, this shrub is very leafy. Plants grow to about 2 m. The dense foliage is very long and narrow and turned downwards giving it a somewhat "shaggy" appearance which is nonetheless very appealing. The large inflorescence is bright pale yellow. ■

Dryandra

A Growing Guide for Beginners

by Tony Cavanagh, Dryandra Study Group

When I first began to grow *Dryandra* in the 1970s, the major problem I had was finding information about them (especially finding a complete and accurate listing of the named species) and obtaining seed. Fortunately, through the activities of the Study Group and with the publication of several major books and articles, much more information about the named species is readily available. The forthcoming revision by Alex George will probably expand the genus to around 120 species, sub-species and varieties and stabilise the group for the foreseeable future. Margaret and I plan to follow up the revision with an up-to-date popular book which will describe all species. Obtaining seed these days is also much less of a problem as several of the major seed merchants hold extensive stocks (up to 30–40 species) and of course the Study Group seed bank has a wide range of species available to members. Margaret is always glad of additional seed. Please ensure it is correctly named and indicate if it is of wild or garden origin. If you have doubts about its identity, send a few mature leaves and a flowering specimen if possible with the seed.

In this article I will attempt to summarise some of the major aspects of growing *Dryandra*. This will be followed by a list of hardy and reliable species as well as those which, while they may give some problems, are worthwhile persevering with.

Growing from seed

This is the most common (and for new growers certainly the easiest) method of growing *Dryandra*. Extraction of *Dryandra* seeds is the first problem as most species hold their seeds in hard, woody protective capsules that are retained within the dead flower head. They split to reveal the seed only after a fire. The capsules are often glossy and dark-coloured but in some species are matte or covered with fine hairs. There are exceptions such as *Dryandra squarrosa*, *D. nobilis*, *D. polycephala*, *D. praemorsa* and *D. sessilis* which shed some or all of their seed between seasons. Most of the seed supplied in the seed bank will still be in the capsule and will require extraction. *Dryandra* seeds are generally small and black (typically 3–5 mm across) with a thin, papery wing. Extracted seed requires no further treatment and should be sown in a well-drained, open mix as described below.

There are several ways of removing seeds from capsules. They may be heated in an oven at between 130°C and 170°C for 20 minutes and then cooled. (**Note: do not** use a microwave oven. This will simply cook the seeds and ruin them). The capsules will usually split and the seeds (normally only one, rarely two) can be readily extracted with tweezers, discarding the woody separator. For stubborn seeds, the above treatment may need to be repeated. A second method is to cut around the capsules with a pair of sturdy nail clippers, as shown below, and force open the portion containing the seed. The method is quick for small numbers of seeds and does avoid the problem of possible overheating of sensitive species.



▽ *Dryandra mucronulata*
Photo F. W. Humphreys

△ *Dryandra subpinnatifida*
Photo F. W. Humphreys





△ *Dryandra tenuifolia*
Photo F. W. Humphreys

▽ *Dryandra speciosa*
Photo M. Pieroni



Especially for species with small seed capsules, either of the above methods may not be satisfactory. A third technique used by Ross Hamilton in Western Australia was described to me by Margaret. The capsules are placed inside a dark green or brown glass jar and that jar is put into a clear one about half as big again. This whole lot is left in the sun and with the jars lying on their sides for as long as it takes for the capsules to open — only a very short time with *D. nivea*. The method is ingenious and makes good use of free solar power!

Seed sowing and potting up

As with all Proteaceae, a well drained seedling mix is essential. Commercial products such as Yates Seed Raising mix can be used but I prefer a mix of 70–80% coarse washed sand with the balance sieved peat moss and/or vermiculite or similar. Some pellets of slow release fertiliser can be added although this is not essential. Whenever possible, I do all my growing in the open, on the north or east side of the house. To prevent disturbance by rain splash it is advisable to cover all pots or trays with a layer of coarse gravel after the seed has been sown. Growing in the open has two main advantages. Seedlings do not require hardening-off but more importantly, such a technique minimises problems with the fungal disease damping-off. Fungal sprays such as Zineb can be used at fortnightly intervals if desired to prevent damping-off.

The best time to sow *Dryandra* seed is still a controversial question. In nature, most germination occurs in autumn, after the first rains and this is still the best guide for us. Certainly growers in both Western Australia and South Australia favour sowing seed in March–April. I have tried both this time and early spring, late August to early September, with mixed success in both. A wet, cold winter can mean slow germination and growth of seedlings with possibility of increased losses unless drainage of pots is perfect. On the other hand, while spring-sown seeds germinate relatively quickly, they may be too small to face a very hot summer and can literally be fried in their pots (I lost 80 plants in a heatwave one summer). Again, the best guide is your own knowledge and experience of your area. I suggest that spring sowing is probably better for southern Victoria and Tasmania while autumn is more suitable in other areas.

There are several reports in the *Dryandra* Study Group Newsletter on germination times for *Dryandra* seeds. They range from less than three weeks to more than three months, with the average being 5–8 weeks, so do not be too impatient waiting for seedlings to pop up! Experience appears to indicate that *Dryandra* should be pricked out when quite small, soon after the first true leaves have appeared. Again, it is vitally important that the potting mix be very well drained, especially for species such as *D. nobilis* and *D. ferruginea* which are very sensitive to wet mixes. A good quality commercial potting mix designed for native plants can be used if you can readily obtain it but I have found a scoria/coarse gravel and composted pine bark mix to be satisfactory. Otherwise a coarse sand, peat moss and soil or vermiculite mix is satisfactory. You may need to experiment with proportions to suit your climate and time of year but I cannot emphasise enough the importance of a well drained mix if you are to be successful with growing *Dryandra*. You will also need to add a small quantity of slow release, low phosphorus fertiliser to the pots (about a “pinch”, perhaps a dozen pellets) and if seedlings yellow, water them with a weak iron chelate solution every few weeks. Again experience seems to indicate that, unlike *Banksia* which do better when planted out well grown, *Dryandra* can be put into the garden when quite small, at 50–75 mm.

Growing *Dryandra*

Dryandra, like many other western *Proteaceae*, require good drainage in the garden. Perhaps only *D. tenuifolia* can tolerate some waterlogging but I work on the basis that they grow strongest and flower best when in a near full sun, well drained situation. Raised beds made from whatever local material is available including clay soils are an easy means of providing this. Even as little as 20 cm can make a major difference. Remember also that the home of many *Dryandra* is in thickets on laterite (heavy) soils so clay soils need not be a problem providing the drainage is satisfactory. In areas with some summer humidity, an open though not an exposed site is preferred, to provide some wind circulation around plants. The following are usually reliable.

Small reliable species — less than one metre: *Dryandra arctotidis*, *D. calophylla*, *D. drummondii*, *D. ferruginea* (can be difficult at the seedling stage), *D. fraseri*, *D. nivea*, *D. obtusa*, *D. tenuifolia*.

Medium reliable species — one to two metres: *Dryandra armata*, *D. cirsioides*, *D. conferta*, *D. cuneata*, *D. foliosissima*, *D. hewardiana*, *D. praemorsa*, *D. nervosa*, *D. sessilis*.

Unreliable but worth growing: *Dryandra baxteri* (beautiful foliage, seems to do best in a sheltered position), *D. bipinnatifida* (very slow growing), *D. carlinoides* (profuse flowers, very attractive shrub), *D. falcata* (very prickly, large attractive flower heads), *D. formosa* (well known and one of the best for flowers but may need summer watering), *D. kippistiana* (small plant, seems to do best in part shelter, attractive small flower heads), *D. longifolia* (large shrub to three metres, masses of yellow-orange flower heads, seemingly reliable), *D. mucronulata* (excellent foliage plant, may be troubled by too dry a situation), *D. nobilis* (large shrub, large orange flower heads but must have a warm, well drained position), *D. plumosa* (interesting foliage and flower heads, seems able to withstand extreme dryness), *D. polycephala* (one of the best but may be touchy unless in sand or deep, well drained soil), *D. quercifolia* (same remarks as for *D. polycephala* but very rewarding as it flowers when quite young), *D. seneciifolia* (worth growing for its foliage), *D. speciosa* and *D. subulata* are also worth trying, the former for its pendant flower heads, the latter for its fine, grass-like foliage. However, as the plants do not read the books, always be prepared to try any plant or seed you can obtain.

Propagation by other techniques

There has been little experimentation on other methods of propagating *Dryandra*. I have grown a number of species from cuttings and Doug McKenzie has grafted a small number including some on to *Banksia* stock! Many of Doug's have not survived, a characteristic which is shared with grafted *Banksia* where the long-term success rate is probably less than 5%. In *Australian Plants* Vol. 15, page 369, Merv Hodge described his grafting technique which he has tried with several *Hakea* and *Grevillea*. So far as I know, there has been no additional work with *Dryandra* but I would welcome information from members on both success and failures. I can see grafting being useful for difficult or unreliable species (*D. baxteri*, *D. mucronulata*, *D. carlinoides*, even *D. formosa*) on such relatively hardy rootstock as *D. fraseri*, *D. praemorsa*, *D. nervosa*, *D. shanklandiorum* and *D. armata*. However, there are no really hardy *Dryandra* equivalent to *Hakea salicifolia* or *Grevillea robusta* and all are susceptible to *Phytophthora cinnamomi*.



△ *Dryandra carlinoides*

▽ *Dryandra subulata*



Dryandra from cuttings

I have found that the cooler months are the best times for taking *Dryandra* cuttings — May and early June, also August and September. Most species are slow to root and some, especially those with thick or hairy stems such as *D. praemorsa*, *D. nobilis* and *D. sessilis* and some of the dwarf species such as *D. calophylla* where cutting material is difficult to find, have proved nearly impossible. Species with smooth, glabrous stems are easier.

The choice of cutting material is probably the most important single factor but often we are limited by what is available. Wherever possible, active new growth is used; this can be softer in the cooler months where the chance of drying out or wilting is less but material taken in the warmer months should be firm. I use a rooting hormone but there is no evidence one way or the other that it is necessary. A well drained mix is essential (90% coarse washed sand and up to 10% sieved peatmoss) as is cleanliness in preparing pots and cuttings. I have had no experience with growing under regular misting or using bottom heat but I suspect that fungal infections would be a major problem, possibly corrected by regular sprays with a fungicide. I use a cold frame on the north side of my house. This is covered with shade cloth in the summer and I water once a day in cool weather, up to two or three times in summer. I have also installed some mist jets which can be operated in warm weather to provide a moist atmosphere when needed. Some species take longer than six months to develop roots. The success rate is often less than 50%.

Probably about 20 species have been grown from cuttings but only a few can be classed as relatively easy. These include *Dryandra fraseri*, *D. nivea*, *D. tenuifolia*, *D. formosa* and *D. squarrosa*. Some success has been had with *D. erythrocephala*, *D. cuneata*, *D. mucronulata*, *D. seneciifolia*, *D. armata*, *D. arctotidis*, *D. hewardiana*, *D. kippistiana*, *D. speciosa* and *D. falcata*. I was lucky with *D. plumosa* and the pink form of *D. quercifolia*. ■

Growing waratahs

by Ross Worrall*

The New South Wales waratah (*Telopea speciosissima*) is the State's floral emblem. The crimson inflorescence, which is formed from numerous individual flowers and surrounded by large bracts, is sought after both as a garden specimen and a cut flower. The plant occurs naturally in the Central and South Coast districts and the Blue Mountains region of New South Wales on poor, deep sandy soils (over 1.5 m) derived from sandstones.

Yields from commercial planting can be high, with 20,000–50,000 blooms annually produced after five years in high density plantings. However, these yields are often not realised. High yields will depend on the use of selected clonal material, optimum environmental conditions (such as soil and climate) and good cultural practices. Prices for blooms can vary greatly, depending on quality and time of flowering. Returns in 1992 ranged from about \$0.50 to \$4.50 with an average mid season return on the Sydney flower market of \$3.50. Production and marketing costs should be taken into account when calculating potential nett returns. After establishment, a planting can be expected to remain productive for 30 to 40 years.

*This article is based upon Agnote DPI/102 issued by The NSW Agriculture and Fisheries Department. Ross Worrall is Senior Research Horticulturist at the Research Station at Gosford, NSW.

Propagation of Waratah by Seed

Waratah seed germinates readily, providing it is fresh (under six months old). If refrigerated at 5°C, however, it will remain viable for at least two years. Seed is harvested from about April in the warmer areas, and from about June in the cooler areas. Collect pods when they begin to turn brown and allow them to open in a well-ventilated area.

Sow the seeds thinly (about 1.5 cm between seeds) on to trays filled with a coarse, well-drained sterile medium such as perlite. Cover the seeds with about 5 mm of medium. Drench the trays with a general purpose fungicide.

Transplant the seedlings either at emergence (2½–4 weeks) or until at least 6–8 leaves have expanded, as the young seedlings are easily damaged. Transplant them into 5 cm tubes. A suitable medium for the tubes is a mixture of one-third peat and two-thirds coarse sand or perlite, sterilised and adjusted to a pH of 5.5 with dolomite.

Fertilise the seedlings weekly with a solution containing 0.2 g/L of a general purpose soluble fertiliser such as Aquasol® or Thrive®. Do not over-fertilise.

When seedlings are about 150 mm high they can be transplanted into the field, after hardening off. However, losses will be a lot less if the seedlings are first grown-on in larger containers (1 litre, 125 mm or above). A suitable medium for the larger pots is 33 per cent (low P) composted hardwood sawdust, 33 per cent aged pine bark fines and 33 per cent coarse sand — all adjusted to a pH of about 5.5. Add 0.5 kg of IBDU and 4 kg of 4–5 month Nutricote® (or 8–9 month Osmocote®) per cubic metre. This fertiliser treatment should be sufficient to last them until they are transplanted into the field. They are normally ready to transplant six months after potting up, and preferably in spring or autumn.

Young waratahs are very susceptible to moisture stress, therefore great attention needs to be paid to watering of the pots. However, avoid over-watering of pots as this favours development of damping off diseases such as *Pythium*, *Phytophthora* and *Rhizoctonia*. These may be partially controlled with fungicide drenches. Some fungicides may be phytotoxic to the seedlings, so use these with caution, never exceed the recommended rate and always read the label. Keeping out diseases by good hygiene is always the best means of control.

Seedlings take at least two years, and usually three years, to flower. And there are large variations in vigour, leaf shape, inflorescence shape, size and colour and possible disease resistance.

Propagation Vegetatively

Cuttings as a means of propagation have many advantages over seedlings. They allow selected desirable clones to be established, and they flower in the first year after planting into the field. Selected clonal material will usually out-perform seedlings in the field. Terminal or stem cuttings may be taken. Spring is the optimum time for taking cuttings, just after growth has started. Cuttings taken during winter will be slow to strike. Make the cuttings 15 cm long with 4–5 leaves attached. Dip the cuttings in a systemic fungicide to control infections of *Guignardia citricarpa* (Black spot of citrus). Failure to do so may result in high percentage losses, especially if the cuttings are taken from plants in a cultivated area. Treat the basal 5 mm of cuttings for five seconds with 2,000 ppm IBA (in 50% ethanol solution) or with semi-hardwood hormone powder (0.3% IBA in talc). Do not use higher rates as a delayed toxicity may occur.

Use of intermittent mist to strike the cuttings will usually give the best results. Use a coarse, well-drained medium (such as perlite). Bottom heat (24°C) will also speed up root formation. A strike rate of close to 100 per cent should be achieved in 4–5 weeks if cuttings are taken at the optimal time and are in good condition (i.e., just after growth has started in spring) and then are correctly treated. When struck, transplant the cuttings into containers of 1–2 litres, using the medium and fertilisers suggesting for seedlings in pot sizes of 1 litre or above. After about six months in the pots, the waratahs will be ready for transplanting into the field.

Culture — Soil Aeration

Soil aeration is perhaps the most critical aspect in the successful cultivation of the waratah. They grow naturally in sandy soils over 1.5 m deep. However, it has been demonstrated that they will grow in a wide range of soil types, provided the soil is well-drained. For example, they thrive on well-drained red basaltic clay soil in the Silvan (Victoria) area. A site with a mild slope can often greatly improve drainage.

Shallow soils, particularly those overlying an impervious sub-soil are not suitable unless provision is made for drainage. There is a dramatic improvement in the survival and growth rate of plants when shallow soils are drained. Poorly structured clay soils (such as those derived from shale in the Sydney basin) are generally unsuitable.

Aspect for Best Cultivation of Waratah

Although they occur naturally in a woodland situation, waratahs grow and flower best in the full sun. Plants grown in heavy shade are generally not vigorous and produce few inflorescences. Plants which are heavily shaded or on southerly slopes can flower 2–4 weeks later than those in the full sun. Waratahs should be protected from strong winds, especially at flowering.

Planting of Waratah

Early spring or early autumn planting is preferred. Waratahs should be planted at least 1.5 m apart, and 2 m apart where vigorous selections are used. Close spacing results in weak plants and few flowers. Inter-row spacing will be determined by the cultural methods to be used.

Dig in fertiliser *around* each planting hole — not in direct contact with the root system. Take particular care when applying fertilisers to young seedlings as they are extremely sensitive to them. Use 100 g (per plant) of blood and bone or other slow release organic fertiliser. The original pot level should be level with the surrounding soil. Water thoroughly. It is essential that the plants be kept moist (not waterlogged) until the root system becomes well established. This usually takes two months, when the plant is actively growing.

Use a soil drench, at least initially, to control both *Phytophthora* and *Rhizoctonia*. Most losses will occur in the first three months. Good weed control is essential. Use mulches, weed mats and, as the plants become larger, contact herbicides.

Irrigation

Waratahs can be established in higher rainfall areas without irrigation. However, it may be required to ensure high quality blooms during a dry spring and to minimise bract browning. Micro jet irrigation with one nozzle per plant (or per 2–3 plants if in offset rows) has proven to be both satisfactory and reasonably economical, especially on the sandy soils.

Fertilisers

Addition of some fertiliser is required to achieve maximum production. After establishment, waratahs are not particularly sensitive to high rates of fertilisers, unlike many of the *Proteaceae*, although it is safer to use slow release fertilisers (e.g., most organic fertilisers) at low rates. Use of organic fertilisers has the advantage of providing a wide range of nutrients as well as stimulating proteoid root development. Waratahs respond to applied phosphate, especially on soils derived from sandstone. Use 9 kg/ha P annually (on a root zone area basis). Do not exceed this rate without prior experimentation. Apply it as single super phosphate (about 100 kg/ha) or in another form such as fowl manure or blood and bone (at a higher rate because of restricted availability of P).

Application of high levels of immediately available nitrogenous fertiliser may result in a high death rate, especially in young plants. A slow release form, such as coated slow release fertilisers or an organic fertiliser, is better. Use up to 600 kg (dried) fowl manure per ha or 300 kg blood and bone per ha, twice a year (early spring and early autumn), after the plants are established.

There is only a limited response of waratahs to potassium fertilisers. Proteoid root development is inhibited by high levels of N and P. If they are not present reduce the rate of fertiliser application.

Pruning

Regular pruning of the plants is essential. **Annual pruning.** During harvesting or immediately after harvesting, remove excessive growth and short stems. The aim is to produce flowers with stems at least 30 cm long for the next flowering season. If the number of shoots left is excessive, flowers will be of poor quality and have short stems. However, do not prune heavily as this will weaken the plant. Pruning later in the season may remove next year's flowers. **Rejuvenation pruning.** At intervals of about 10 years prune the plants severely, mainly to reduce the height of the plant. This makes picking easier and encourages the development of longer stems. This will reduce the yield of inflorescences for the next 2–3 years so it should be done on a rotational basis.

Bract Burn

One defect of inflorescences often encountered is browning of the bract tips. This appears to be related to environmental conditions, particularly water stress. To minimise burn, maintain the water supply to the plants during bud development and opening and protect them from strong winds. Covering with very light shade cloth and selection of resistant clones has also been reported to reduce the incidence of burn.

Post Harvest Handling of Waratah

Flowering mainly occurs from early September to late October, depending on locality. Stems need to be at least 0.8 m long to obtain the best price. The optimum stage for harvesting inflorescences of the waratah is when they are fully mature (with no more than 5% of the individual flowers open). When harvested at this stage they have a vase life of about 13 days at 20°C. They will keep longer at temperatures lower than 20°C, and temperatures higher than 20°C will cause a greater reduction in their subsequent vase life.

Storage at 0.5° for 9–10 days will reduce their subsequent vase life by about 30 per cent. This is the maximum permissible reduction in the vase life recommended by many workers. Where flowers stored at high temperatures (e.g., 20°) and high humidities (e.g., in a plastic bag during transport) it is essential to treat the inflorescences with a fungicide to prevent the development of *Botrytis*. A wide range of floral preservatives has been tested to date but they may not greatly improve the vase life of inflorescences. However, some of the commonly used preservatives may prevent stem plugging. ■

Kangaroo Paws In Horticulture

by W. H. Payne

Australian Kangaroo Paws have been widely used in horticulture throughout the world. These unique plants from Western Australia have been featured in *Australian Plants* since their use in horticulture in the 1960s. Our Volume 16, pages 47–89 describes all the wild species and provides notes on their cultivation. Many forms bred for cultivation are also described.

The Bush Gem series of Kangaroo Paw have been successfully grown for many years, the forms being especially bred for reliable cultivation. Modern propagation techniques and research have now generated for our enjoyment, the new series of Bush Gem Kangaroo Paws known as the new Eureka Range. All will fit nicely into a reasonable garden situation, the small ones being especially suited for pot culture. They may be brought indoors for that special occasion but require full sun for peak flowering.

Compact	Bush Lantern	Yellow stem/yellow flower	20–40 cm
	Bush Twilight (PVR Pending No. 94/066)	Vibrant orange/yellow red flower	20–40 cm
	Bush Splendour (PVR Pending No. 94/061)	Deep red	20–40 cm
Small	Bush Ranger	Bright red	30–50 cm
	Bush Illusion	Pink/orange	30–50 cm
	Bush Ember (PVR Pending No. 94/065)	Crimson orange/pink tinge	30–50 cm
	Bush Sunshine (PVR Pending No. 94/064)	Bright yellow	30–50 cm
	Bush Heritage (PVR Pending No. 94/063)	Vibrant red/orange	30–50 cm
Medium	Bush Gold	Bright yellow	60–100 cm
	Bush Emerald	Red and green	70–120 cm
	Bush Ochre (PVR Pending No. 94/062)	Bronze	60–100 cm
	Bush Nugget	Red stem/yellow flower	50–80 cm

Commercial Support for Horticultural Research

A contribution by Biotech/Bush Gems

With each purchase of a Bush Gem Kangaroo Paw you will be contributing to research into our wildflowers by The Australian Flora Foundation. The AFF intends to develop this method of funding with similar support from other wildflower plant breeders. You will note that each plant label and pot containing a Bush Gem Kangaroo Paw carries the logo (a wattle) of the Australian Flora Foundation. Look for this logo when purchasing your plants in the future.

One reason the Bush Gem series of plants has proven so reliable over the last 10 years is because of the initial research and development work by Mervyn Turner, at one time a Study Group Leader of the Society. This work has been developed further by Biotech carrying on the philosophy of Merv Turner, "careful selection and breeding must not only be directed to produce better plants but they must also be hardy and reliable in a wide range of garden situations". The new range of Bush Gem Kangaroo Paws are indeed hardy and beautiful, a tribute to the development of this new generation of Kangaroo Paw and to the late Merv Turner.

Gardening in Sand at Tongala

My Garden No. 17

by Sheila Johnson,
Goulburn Valley, Victoria

My garden is on the lower west side of a large sandhill, the soil having a pH of 5–6. It is sheltered on the south by large Mahogany trees, *Eucalyptus botryoides*. The garden comprises a grassed lawn with shrubs placed as the mood seizes me. The grass is kept back from around new plants until they are well established and then we mow right up to the trunks of mature plants.

The deep sand is conducive to deep rooting as it retains moisture well down. To get the young plants to grow down to the moisture and prevent them dying of thirst meanwhile, I water younger plants by a trickle hose weekly.

My method of soil preparation before planting is to dig in well a half bucket of compost or a low phosphorus potting mix. This forms a raised bed to 10 cm high. I keep this clean until the plant is established. I obtain some of my plants from a nursery but prefer growing my own from seed, especially the larger seed such as *Banksia* and *Hakea*. Each seed is planted separately in a small tube in a native seed raising mix. The tubes are in foam boxes under glass frames until large enough to pot on. I pot on to 7 cm tubes or pots in New Earth Potting Mix (low P). I water in with a fungicide (Benlate) and place under shade cloth protection until large enough to plant in the garden.

The first planting was 12 years ago and yielded *Acacia*, *Hakea*, *Callistemon*, *Eucalyptus*, *Banksia aemula* and *B. ericifolia*. Over the years the following have been added: *Banksia coccinea*, *B. menziesii*, *B. dryandroides*, *B. occidentalis*, *B. prionotes*, *B. spinulosa*, *B. ornata*, *B. violacea*, *B. repens*, *B. caleyi* and *B. petiolaris* (all flowering last season, most flowering in their first year); *Eucalyptus erythrocorys*, *E. eximia* ssp. *nana* and *E. macrocarpa*; *Acacia implexa*, *Melaleuca elliptica*, *M. fulgens*, *Hakea bucculenta*, *Myoporum floribundum*, *Dryandra formosa*; with smaller species of *Correa*, *Verticordia chrysantha*, *Hypocalymma robusta* and others in an area mulched with woodchips nearer the house. In the centre of the shrubbery, I have a small patch of everlastings, *Helichrysum* species, which self sow and come up each year. I collect some seed and fill in the gaps after weeding. The patch receives a cover of fine mulch every spring. See photographs on page 41.

Last year I planted out *Banksia nutans*, *B. burdettii*, *B. sceptrum*, *B. lullfitzii*, *B. baueri*, *B. audax*, *B. ashbyi*, *B. pilostylis*, *B. laevigata* and *B. leptophylla*. I gave these plants some protection over winter. I have made domes comprising wire circles wired together, 25 cm wide and 30 cm high, covered with hessian. They are very sturdy and when pegged to the ground with wire pegs, do not blow away or move. Now, a year later, all plants are doing well and generally doubled their height.

I have lost quite a few plants over the years, especially *Grevillea* which blow over in strong wind. I find a little pruning keeps them happy and in good shape. The species that are doing well include *Hakea*, *Banksia*, *Callistemon*, *Grevillea*, *Beaufortia* and *Dryandra*. Recent plantings of *Eremophila*, *Thryptomene*, *Persoonia* and *Anigozanthos manglesii* are doing well.

I planted *Banksia occidentalis* twice and lost them; the third time success. It is now a beautiful tree 3 m high and covered in bright red flowers during the months of January to April. This reinforced my motto: "If at first you don't succeed, try, try again. The flower arrangement on page 44 has my flowers. ■

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uncinatum 17:124P, **125D, 126L**
varium 17:114D, 115L
Chrysocephalum (criz-o-SEFF-a-
 -lum) apiculatum 17:348**CD**
baxteri 17:348C, **374CD**
semipapposum 17:350**CD**
Cissus (SISS-us) Vitidaceae
antarctica, hypoglauca 17:258C
Claoxylon (clay-OX-il-on)
tenerifolium 17:263**CD, 264P**
Commelina (com-el-EEN-a)
cyanea 17:267D
Conostylis (co-no-STY-lis)
candicans 17:338C, 341C
Correa (CORR-ee-a) Rutaceae
 17:80C (growth retardants)
alba 17:80C
 'Western Pink Star' 17:55D
 'Betty Fawcett' 17:55D
 'Candy Pink' 17:55D
 'Coliban River' 17:55D
 'Dusky Bells' 17:55D
 'Inglewood Gold' 17:55D
 'Pink Blush' 17:55D
reflexa 'Fat Fred' 17:61P
Craspedia (cras-PEED-ee-a) Aster.
globosa 17:157P, 163C
Crassula (CRASS-yoo-la) Crassul.
globosa, helmsii 17:157P **158C**
Crinum (CRY-num) Amarylid.
asiaticum 17:35**CDL**
Crowea (CROW-ee-a) Rutaceae
 17:80C (growth retardants)
 * *exalata* 17:80C
 'Pink Blush' 17:55D
 'White Star' 17:55D
Cyclosorus (sy-clo-SOR-us)
interruptus 17:150C, 159C
Cyperus (sy-per-us) Cyperaceae
gymnocaulos 17:149C, **159C**
lucidus 17:159C, 162C, 185P
mirus 17:159C
vaginatus 17:159C, 162C
Damasonium (dam-a-SO-nee-um)
minus 17:149**CD**
Dampiera (dam-pee-EER-a)
diversifolia, linearis 17:338C
Darwinia (dar-WIN-ee-a) Myrt.
hypericifolia, oldfieldii 17:338C
Daviesia (da-VEE-zee-a) Fabaceae
laevis 17:103DL, 105D
rhombifolia 17:93P
Dendrocnide (den-drok-NY-de)
coralodesme, cordata 17:271CD
moroides, photiniphylla 17:271**CD**
Deplanchea (de-PLAHN-she-a)
tetraphylla 17:134D, 137P
Dianella (di-a-NELL-a) Phormi.
caerulea, longiflora 17:163C
 'Peninsular Perfection' 17:55D
tasmanica 17:163C
Dicksonia (dick-SO-nee-) Dicksoni.
antarctica 17:150C, 162C, 165P
Dioscorea (di-os-COR-ee-a)
hastifolia 17:30CL, 31D
Diplarrena (dip-la-REEN-a)
latifolia 17:151C, 162C
 'Amethyst Fairy' 17:372**CD, 373P**
Dodonaea (do-do-NEE-a) Sapind.
 all species 17:189-233
Dolichandrone (dol-ic-AND-ro-nee)
alternifolia, filiforme 17:135-6D
heterophylla, spathacca 17:135D
Dracophyllum (drac-o-FILL-um)
minimum 17:151C
Dryandra (dry-AND-ra) Proteaceae
nana 17:338C

- Elaeagnus* (ell-ee-AG-us) *Elaeagn.*
triflora 17:257P, **258CD**
Elatine (el-a-TI-nee)
gratioloides 17:149CD, **158C**
Elatostema (el-a-to-STEEM-a)
reticulatum 17:268P, **269CD**, 270C
stipitatum 17:270CD
Eleocharis (ell-ee-o-KAR-is)
sphacelata 17:151C
Entada (en-TAH-da) *Fabaceae*
phaseoloides 17:261P, 262CD
Epilobium (ep-ee-LO-bee-um)
pallidiflorum 17:159CD
Eremophila (er-e-MOFF-il-a)
Germination studies 17:70-75
bowmanii, *ericalyx*, *forrestii*,
fraseri, *gilesii*, *glabra*, *latrobei*,
longifolia, *maculata*, *X duttonii*,
margarethae, *miniata*, *nivea*,
scoparia, *spectabilis*, *sturtii*.
Erichsenia (eric-SEEN-ee-a) *Fab*
uncinata 17:105D
Eucalyptus (yoo-ca-LIP-tus) *Myrt.*
accedens 17:339C
caesia 17:341C
citriodora 'Marion' 17:339C
crucis 17:341C
erythrocorys 17:339C, 341C
erythronema 17:339C, 341C
ficifolia 17:339C
forrestiana syn. *E. stoatei* 17:341C
kruseana 17:341C
lehmannii 17:341C
leucoxylen 17:335C
macrandra 17:341C
marginata 17:47D, 339C
nutans 17:341C, 337P
sideroxylen 17:339C, 341C
tetragona 17:341C
torquata 17:339C, 341C
Euchilopsis (yoo-ky-LOP-sis) *Fab.*
linearis 17:105D
Eucryphia (yoo-CRIFF-ee-a)
lucida 'Ballerina' 17:372CD, 373P
Euroschinus (yoo-ro-SKY-nus)
falcata 17:249CD
Eutaxia (yoo-TAX-ee-a) *Fabaceae*
obovata 17:339C
Gahnia (GAHN-ee-a) *Cyperaceae*
sieberiana 17:162D, 165P
Garcinia (gar-SIN-ee-a) *Clusiaceae*
brassii 17:275CD
dulcis 17:275CD
gibbsiae 17:275CD
hunsteini aff. 17:275CD
mestonii 17:275CD
riparia 17:274C, 275CD
warrenii 17:274C, 275CD
Gastrolobium (gas-tro-LO-bee-um)
appressum 17:104D
Gleichenia (gly-KEEN-ee-a)
dicarpa, *microphylla* 17:159C
Glyceria (glis-ERR-ee-a) *Poaceae*
australis 17:149CD, 151C
Goodenia (good-EEN-ee-a)
elongata 17:162C
Gratiola (gray-ti-O-la)
peruviana 17:150C
Gunnera (GUN-er-a) *Haloragid.*
cordifolia 17:158C
Hakea (HAKE-ee-a) *Proteaceae*,
hookeriana, *multilineata* 17:339C
orthorrhyncha, *petiolaris* 17:339C
purpurea 17:339C
Hardenbergia (hard-en-BER-jee-a)
comptoniana 17:47C, 338C
Helichrysum (heel-ee-CRIS-um)
now Bracteantha, *Chryscephalum*,
Ozothamnus, or *Lawrencella*
rutidolepis 17:350CD
Hibbertia (hib-ER-sha) *Dilleni.*
hypericoides 17:338C
pedunculata 17:84C, 85P
Histiopteris (his-tee-OP-ter-is)
incisa 17:159C, 162C
Hyalosperma (hy-al-O-sperm-a)
cotula (*Helipterum*) 17:351CD
praecox syn. *H. praecox* 17:351CD
simplex syn. *H. simplex* 17:351CD
Hypocalymma (hy-po-cal-IMM-a)
angustifolium, *robusta* 17:338C
Hypsophila (hip-SOFF-il-a) *Celastr.*
dielsiana 17:268P, 269CD
Isotoma (is-so-TO-ma) *Campanul.*
fluvitilis 17:158C, 162C, 164P
Isotropis (i-so-TRO-pis) *Fabaceae*
cuneifolia 17:104D
Jacksonia (jack-SO-nee-a) *Fab.*
restioides 17:3CDPX, 104D, 117P
Jansonia (jan-SO-nee-a) *Fabaceae*
formosa 17:104D
Johnsonia (jon-SO-nee-a) *Liliaceae*
acaulis 17:5P, 6D
inconspicua 17:5P, 6D
lupulina 17:3C, 4P, 6D
pubescens 17:3CDX, 4P, 6D
teretifolia 17:1P, 6D, 9P
Juncus (JUNK-us) *Juncaceae*
**caespiticius* 17:149CD, 159CD
pallidus, *pauciflorus* 17:162C
planifolius 17:159C, 162C
sarophorus 17:162C, 163C
Kennedia (ken-EED-ee-a) *Fabaceae*
coccinea 17:47C
nigricans 'Minstrel' 17:58D
Lachnostachys (lack-NOS-ta-kis)
eribotrya 17:339C
Laportea (la-PORT-ee-a) *Urtic.*
interrupta 17:270D
Latrobea (la-TRO-be-a) *Fabaceae*
brunonis 17:105C
Lechenaultia (lesh-en-AULT-ee-a)
biloba 17:338C
formosa 'Tango' 17:338C, 341C
Lepidosperma (lep-id-o-SPERM-a)
longitudinale 17:149CD
Leptorhynchus (lep-to-RINK-us)
squamatus, *tenuifolius* 17:350CD
Leptosema (lep-to-SEE-ma) *Fab.*
aculeatum 17:104D
Leptospermum (lep-to-SPERM-um)
continentale 'Horizontalis' 17:58D
juniperinum, *petersonii* 17:58D
nitidum 'Copper Sheen' 17:58D
'Pink Cascade' 17:58D
polygalifolium syn. *L. flavescens*
'Copper Glow' 17:59D
'Pacific Beauty' 17:59D
laevigatum 'Raelene' 17:59D
Leucophyta (loo-co-FY-ta)
brownii (*Calocephalus*) 17:350CD
Lobelia (lo-BEEL-ee-a) *Lobeli.*
trigonocaulis 17:84CD
Ludwigia (hud-WIDJ-ee-a) *Oragr.*
peplodes 17:148P, 149CD,
151C, 158CD, 162C
Luzula (LOOZ-yoo-la) *Juncaceae*
alpestris 17:151C
Lycopus (LY-co-pus)
australis 17:150C, 159CD
Lythrum (LY-thrum) *Lythraceae*
salicaria 17:145P, 159CD
Macropidia (mac-ro-PID-ee-a)
fuliginosa 17:24C, 338C
Macrozamia (mac-ro-ZAY-me-a)
riedlei 17:338C
Marattia (ma-RAT-ee-a) *Marattic.*
salicina 17:159C, 162C
Marsilea (marz-ILLee-a) *Marsile.*
angustifolia 17:159C
drummondii 17:159C, 162C,
181P, 184P
mutica 17:161P, 165P
Mazus (MAY-zus) *Scrophulari.*
pumilio 17:162CD
Medinilla (med-ee-NILL-a)
balls-headleyi 17:276CD, 284P
Melaleuca (mel-a-LOO-ca) *Myrt.*
calothamnoides 17:127DL
coccinea 17:338C
conothamnoides 17:45P, 127DL
huegelii 17:338C, 339C
linariifolia 17:339C
violacea 17:338C
Mentha (MENTH-a) *Brassicaceae*
australis, *diemenica* 162C, 163C
Milligania (mill-ig-AIN-ee-a)
densiflora 17:151C
Mimulus (MIM-yoo-lus)
gracilis 17:148P, 149C, 150C
Mirbelia (mer-BEEL-ee-a) *Fab.*
dilatata 17:104D
Montia (MON-ti-a) *Portulacaceae*
australasica 17:151C, 158CD
Mucuna (mew-KEW-na) *Fabaceae*
gigantea 17:254CD, 256P
Myoporum (my-o-POR-um)
parvifolium 17:338C
Myriophyllum (mirr-e-o-FILL-um)

- papillosum* 17:149C,160P,184,5P
verrucosum 17:152C
- Nelumbo* (nel-UM-bo) Nymphae.
nucifera 17:144P,149C,150C
Neosepicaea (nee-o-see-pis-EE-a)
jucunda, *viticoides* 17:134**SD**
Nephrolepis (nef-RO-lee-pis)
cordifolia 17:165D
Nertera (NER-ter-a) Rubiaceae
granadensis 17:151C,162**CD**
Nutysia (NEWT-see-a) Loranth.
floribunda 17:339C,341C
Nymphaea (nim-FEE-a) Nymph.
gigantea 17:145P,151**CD**
Nymphoides (nim-FOY-deez)
geminata 17:145P
indica, *montana* 17:149**CD**,165P
Olearia (o-lee-AIR-ee-a) Aster.
canescens 17:354**CD**
phlogopappa, *ramulosa* 17:350C
Orthrosanthus (orth-ro-SANTH-us)
multiflorus 17:338C,341C
Ottelia (ot-ELL-ee-a) Hydrocharit.
ovalifolia 17:144P,149**CD**,
150**CD**, 151C, 152C
Oxylobium (ox-ee-LO-bee-um) Fab.
alpestre 17:104D,105D,117P
Ozothamnus (o-zo-THAM-nus)
spp. were *Helichrysum*
alpinum, *costatifolium* 17:350**CD**
ledifolius 17:350**CD**
Palaquium (pal-ACK-we-um)
galactoxylon 17:279**CD**,281P
Pandanus (pan-DAN-us) Pandan.
monticola 17:278**CD**,280P
Pandorea (pan-DOR-ee-a)
jasminoides, *pandorana* 17:59D
Patersonia (pat-er-SO-nee-a) Irid.
occidentalis 17:338C
Persicaria (pers-ee-CAIR-ee-a)
decipiens, *praetermissa*
17:149**CD**, 151C, 158C, 162C
Persoonia (per-SOON-ee-a) Prote.
chamaepestis 17:84D,85P
oxycoccoides 17:84CD
Philydrella (fill-i-DRELL-a)
pygmaea 17:38**CD**,39L
Philydrum (fill-I-drum) Philydr.
lanuginosum 17:149**CD**,151C,
152C, 159**CD**,162C
Phragmites (frag-MY-teez)
australis 17:149**CD**,151C,152C
Pimelea (pim-MEEL-ee-a)
all species described with cult.
17:290 - 330**CDXP**
Pipturus (pip-TEW-rus) Nyctagin.
argenteus 17:270D,272**CD**
Pittosporum (pit-OS-por-um)
phylliraoides 17:339C
Platytheca (plat-ee-THEEK-a)
verticillata 17:339C
Pleiochygnium (ply-o-JIN-ee-um)
timoriense 17:251**CD**,260P
- Poa* (PO-a) Poaceae
drummondiana 17:30CD
Podolepis (pod-o-LEEP-iss) Aster.
jaceoides, *lessontii* 17:351**CD**
rugata 17:350**CD**
Pollia (POLL-ee-a) Commelin.
crispata 17:267**CD**
macrophylla 17:265P,267**CD**
Potamogeton (pot-a-mo-JEE-tun)
crispus 17:149CD,151C
Pratia (PRAY-ti-a) Campanulaceae
darlingensis, *pedunculata*
17:162**CD**
purpurascens 17:162**CD**
Proiphys (PROY-fiss) Amaralid.
alba 17:35CDL,38CD
Prostanthera (pros-TANTH-er-a)
cuneata, *lasianthus* 17:60D
Pultenaea (pul-ten-EE-a) Fabaceae
17:105D
Ranunculus (ran-UNG-kew-lus)
collinus, *muelleri* 17:151C
inundatus 17:164P,
undulosus 17:162C,163C,
Restio (REST-ee-o) Restionaceae
tetraphyllus 17:150C,159C,185P
Rhagodia (ra-GO-dee-a)
nutans 17:339C,341C
Rhodanthe (ro-DANTH-ee) Aster.
spp. transferred from *Helipterum*
anthemoides 17:351**CD**
'Paper Cascade' 'Paper Star'
17:344**CD**,345**CD**,351CD
'Paper Baby' 17:351**CD**
chlorocephala, *manglesii* 351,4D
Rhodospaera (ro-do-SFEAR- a)
rhodanthema 17:249**CD**
Salacia (sal-AY-see-a) Hippocrat.
chinensis 17:255**CD**,257P
Samolus (SAM-o-lus) Primulaceae
repens 17:150C
Santalum (SANT-al-um) Santal.
acuminatum 17:339C,341C
Scaevola (SEE-vo-la) Goodeni.
humilis 17:84**CD**
Schefflera (SHEFF-ler-a) Arali.
actinophylla 17:339C
choenia (SHO-nee-a) Asteraceae
cassiniana, *filifolia* 17:354**CD**,360P
Schoenoplectus (skeen-o-PLECT-
us) 11 species 17:149**CD**,151C
Schoenus (SKEEN-us) Cyperaceae
maschalinus 17:159**CD**,162C
Semecarpus (sem-ee-CAR-pus)
australiensis 17:242P,248/9**CD**
Spirodela (spy-ro-DEEL-a)
punctata 17:151**CD**
Spyridium (spy-RID-ee-um)
'Austriflora Nimbus' 17:60D
Stawellia (staw-WELL-ee-a)
diomorphantha 17:17**CD**
gymnocephala 17:18**CD**
Stenochlaena (sten-o-CLEAN-a)
palustris 17:159C
Stirlingia (stir-LIN-jee-a) Protaceae
latifolia 17:338C
Stylidium (sty-LID-ee-um) Stylidi.
petiolare 17:38**CD**,39L
Stypandra (sty-PAN-dra) Phormi.
glauca 17:12P,17**CD**
Swainsona (swain-SO-na) Fabaceae
behriana 17:120P
formosa (Clianthus) 17:342**CD**
swainsonioides 17:121P
Tecomanthe (tec-co-MANTH-ee)
hillii 17:134D,136P
Telopea (tel-O-pe-a) Proteaceae
oreades 'Errinundra White' 60**CD**
Templetonia (temple-TO-nee-a)
retusa 17:338C
Tetrastigma (tet-ra-STIG-ma)
nitens 17:259**CD**,260P
Thryptomene (thrip-TOM-e-nee)
calycina 17:166**CDX**,168P 370C
saxicola 'Coral Lace' 'Ivory Lace'
'Talbot Star' 17:167**CDX**,170CX
'Mingemew' 17:60D
Thysanotus (thy-sa-NO-tus)
multiflorus 17:338C
Todea (to-DE-a) Osmundaceae
barbara 17:150C,159C
Tribonanthes (trib-o-NANTH-eez)
longipetala 17:32P
variabilis 17:38**CD**,39L
Tricoryne (try-co-RY-nee)
elatiar 17:18CD
Triglochin (try-GLO-kin) Juncagin.
procera, *striata* 17:149**CD**,151C
Tristanopsis (tris-TAIN-ee-op-sis)
laurina 'Fiona Matthews', 'Golden
Summers', 'Purple Haze' 17:172P,
173,174**CDX**
Typhonium (ty-FO-nee-um)
brownii 17:30**CD**
Typha (TY-fa)
domingensis 17:151C
Urodon (yoo-RO-don) Fabaceae
capitatus 17:105D
Urtica (URT-ic-a) Urticaceae
incisa 17:270**CD**
Utricularia (yoo-tricyoo-LAIR-ee-a)
gibba 17:157P,181P
Vallisneria (val-is-NEAR-ee-a)
spiralis 17:149**CD**,151C
Verticordia (ver-te-CORD-ee-a)
chrysantha, *lindleyi*, *monadelpha*,
nitens, *plumosa* 17:338/9C
Viminaria (vim-in-AIR-ee-a) Fab.
junceae 17:104D
Viola (VY-o-la) Violaceae
betonicaefolia, *hederacea* 17:162C
Westringia (west-RIN-jee-a) Lami.
'Poerinda Pavane' 17:60D
'Wynyabbie Gem' 17:62D
Xanthorrhoea (zanth-o-REE-a)
preissii 17:338C

Gardening in a clay area on a suburban house block

by Geoff and Bev Rigby
Newcastle, NSW

Our Garden No. 18

When we first moved into our new home, 23 years ago, we were faced with a house and block of land with no trees, lawn or plants of any type. Our first priority was to establish a lawn so that we could reduce the amount of dust and clay carried into the house and to provide an area for our son to play.

Within a short period of time, after visiting several friends who had established native gardens, we were attracted to establishing our own native garden. Probably the main reason for choosing to grow native plants was a perception that such a garden could be established in a relatively short time and require only limited maintenance, once established.

Our block of land had very little top soil and was essentially clay all over, and so it was necessary to make some beds by firstly removing some of the clay and adding some imported soil (in the early stages this consisted of a local black sandy loam). Bush rocks were used to build up the beds approximately 20 cm above the original clay level. We soon came to learn that perhaps the single most significant ingredient for success with native plants in clay soils is good drainage (at least for many of the plants to which we were attracted). It also became apparent that although clay soils can be a real problem in this respect, we were fortunate in having a significant slope from the back of the house to the front. With the past history of trees and earlier plants that grew on the block before the house was built, roots and other ground formations provided vesicles and paths for water to drain quite well. In fact after heavy showers of rain, quite large amounts of water seep through these holes to the roadway soon after the rain starts. This effective drainage is clearly illustrated by the *Telopea speciosissima* which we planted in one of the garden beds on a sloped section of the garden and has continued to grow well and flower each year for the last 18 years. Although its growth has been slightly retarded in recent years by the influence of roots from a conifer in the garden next door, this interference has been compensated for by a reasonable amount of watering (using an occasional good soaking) coupled with a regular application of a slow release fertiliser. There is no doubt that removal of clay and subsequent filling of the bed with imported soil can result in waterlogging after periods of heavy rain on level areas, but on a sloping area where drainage is readily achieved, this practice is probably preferable to attempting to blend the clay with imported soil since the former will provide a better growing medium for the plants. This garden is featured in the photographs on pages 36 and 37.

Having established our first set of beds, it was necessary to choose plants to start our garden. Our kitchen at the side of the house faced north-west and our very first planting was a *Eucalyptus scoparia* which we hoped would provide some shade for the kitchen. Needless to say, some 20 years later this beautiful specimen now has a trunk some 40 cm in diameter and is 15 m high, providing plenty of shade.

We chose a range of small rockery plants and medium sized shrubs for our initial beds including *Bauera rubioides*, *Crowea saligna*, *Grevillea juniperina*, *Correa alba*, *Callistemon citrinus* and *Melaieuca incana*. We also soon planted a row of *Callistemon citrinus* 'Harkness' to cover one of the fences and provide some privacy from the adjacent house which is quite close to the fence. A small pool was constructed from concrete reinforced with fine wire mesh to provide a feature in front of the *Eucalyptus scoparia* and to blend in with the rockery beds in this area.

While the *Eucalyptus scoparia* remained small, these plants grew quite well since they received sufficient early morning and late afternoon sun. However, after several years, the amount of sun significantly diminished and growth and flowering became quite poor. This early rockery area became quite shaded and several of the plants died, including some of the *Callistemon citrinus* 'Harkness'. Consequently, the whole area was redeveloped as a "semi rainforest area" with a range of ferns, orchids and a few small plants which could cope with these conditions. A misting water spray system was installed to provide regular watering of the area, which has now become one of the real features of our garden. A wooden pergola along the fence is now a replacement for the row of *Callistemon* and provides hanging space for a range of ferns in hanging baskets, on boards or in pots. The *Eucalyptus scoparia* and a 10 year old *Casuarina cunninghamiana* are excellent hosts for several *Platyserium superbum* specimens. One interesting feature of this rainforest area is that the majority of the plants in this area have been grown in large pots. This means that they can be easily moved if necessary. Several large *Asplenium australasicum* specimens occupy a large proportion of the ground area and have grown very well in these shaded conditions. Other plants include *Thomasia macrocarpa*, *T. petalocalyx*, *T. purpurea*, *Correa baeuerlenii* and *C. alba* (attractive foliage in this location, but with limited flowering), *Platyserium bifurcatum*, *Adiantum aethiopicum*, *Dendrobium gracilicaule* and *D. linguiforme* (attached to the *C. cunninghamiana*) and *Davallia pyxidata*. The *Thomasia* species, especially *T. macrocarpa* has proven very valuable in this environment, since they flower really well in the shaded conditions. Not many of our native plants have this ability. Several plants of *Rhododendron lochiaie* growing in large pots have a special significance for us and occupy pride of place in one section of this area. These specimens were given to us by Peter and Hazel Althofer several years ago as tiny seedlings about 2 mm in size and have now grown to almost 1 m in height. They have been grown in an open mixture of fine gravel (about 3 to 5 mm top size) and fine well weathered pine bark. Regular watering and an occasional trimming and application of slow release fertiliser or blood and bone, have proven to be beneficial. The large elongated dark green leaves of a specimen of *Toona australis* provide an attractive contrast to the other plants. This plant was initially grown in a pot, has now reached a height of 2.5 m and has obviously extended its roots into the clay.

The second stage of the garden development involved a bed at the front of the house directly in front of the brick wall. This area has virtually no slope and on occasions suffers from poor drainage after long periods of rain. Some of the initial plants, including *Banksia spinulosa*, *Schefflera actinophylla*, and *Grevillea* 'Robyn Gordon' died or became too large for this area and have been replaced by *Callistemon citrinus*, *Melaieuca lateritia*, *Graptophyllum excelsum*, *Baeckea virgata* (dwarf form), *Helichrysum diosmifolium*, *Myoporum parvifolium* and a dwarf form of *Banksia spinulosa*.

A relatively small bed on the sloped section of the block near the footpath was enlarged about three years ago and is now home to a wide variety of plants. Like the rainforest area, this garden gives us great joy, especially in spring time when it is a mass of colour. However, selection of appropriate plants ensures some colour all year round and provides a continual source of material for indoor floral arrangements. Species found especially useful in this regard include, *Crowea* 'Festival', *Correa reflexa* var. *reflexa* and *Helichrysum ramosissimum*. This bed (which is on a well sloped area) was created by firstly removing about 30 cm of clay and refilling with a 50/50 mixture of coarse river sand and sandy loam. A generous amount of mulch (in the form of well rotted mushroom compost and wood bark) was added. This garden receives the afternoon sun. Only a small number of plants has died in this garden and the current list includes several *Correa* species, *Crowea* 'Festival', *Crowea* 'Poorinda Ecstasy', *Eriostemon australasius*, *Thomasia macrocarpa*, *Chrysocephalum ambiguum*, *C. baxteri*, *Asterolasia mollis*, *Eremophila maculata*, *Pseudanthus pimeleoides*, *Anigosanthos flavidus*, *Conystylis seorsiflora*, *Cryptandra scortechinii*, *Dampiera purpurea*, *Kennedia prostrata*, *Lambertia formosa*, *Lasiopetalum baueri* and *Diplolaena angustifolia*. A rather large specimen of *Baeckea virgata* which was planted soon after the original garden was formed, provides some shade at the north-western corner and is very attractive when covered in a mass of white flowers in summer. One added feature of this garden has been the inclusion of a number of hollow concrete containers to provide a barrier between the lawn and the garden at the top of the bed. These are slightly higher than the garden level and have been filled with a range of soil mixes which permit a wider variety of plants to be grown. In particular, various species of *Lechenaultia*, *Crowea*, *Helichrysum* and *Pimelea ferruginea* have been grown and maintained with relative ease. Watering (in the form of good soakings) is only undertaken during long dry periods. A good layer of fine wood chips and leaf mulch (regularly collected from the falling leaves of the larger trees) and liberal regular helpings of a slow release fertiliser have been found to be beneficial in maintaining moisture and promoting growth. Regular pruning of plants has been practised to maintain attractive specimens. This has been especially important for specimens of *Correa*, *Crowea* and *Eriostemon*.

One added joy of this and some of the other beds has been the emergence of self sown plants from several of the species present in the garden. In particular, plants of *Correa*, *Crowea*, *Thomasia* and *Helichrysum* and self-propagated regularly.

In an attempt to grow a range of Gosford sandstone species, especially *Boronia*, another garden was constructed along the northern side of the block at the front. After the clay had been removed, the majority of the garden was filled with coarse sandstone sand from the Gosford area in an attempt to simulate desirable conditions. A small amount of mulch was initially added, although this was kept to a minimum. The area is well drained. Several *Boronia* species were grown initially. However, it was found difficult to maintain them for more than a couple of years at a time. It was also found that this sand was difficult to wet, with the water easily running off the surface without penetrating the surface. The addition of extra mulch and a generous layer of surface mulch has improved the ability of this garden to accept water. A specimen of *Darwinia fascicularis* has been an attraction in this garden and has continued to grow and flower well for many years.

Other plants currently growing in this garden include *Correa lawrenciana*, *C. 'Dusky Bells'*, *C. backhousiana*, *C. backhousiana* 'Marion's Marvel', *C. glabra* 'Inglewood Gold', *C. decumbens*, *C. pulchella* 'Mannii', *C. schlechtendalii*, *Homoranthus flavescens*, *Callistemon subulatus*, *Persoonia pinifolia*, *Orthrosanthus laxus*, *Brachyscome multifida*, *Rhagodia baccata*, *Chrysocephalum ambiguum*, *Anigosanthos* 'Dwarf Delight', *Zieria cytisoides*, *Banksia integrifolia*, *Grevillea barklyana*, *Alyogyne huegelii*, *Doryanthes excelsa*, *Thomasia sarotes*, *Chorizema cordatum*, *Crowea saligna* and *C. 'Festival'*.

Several attempts to cultivate some desirable species in the various gardens have been unsuccessful. However, these have often been grown successfully in pots where suitable soils and other desirable conditions can be provided. Examples of some of these species have included *Dampiera diversifolia*, *Boronia serrulata* and *Nematolepis phebalioides*.

Some of the native vines have been used to advantage to trail over fences or trellises and to give added colour when in flower. Notable examples include *Hibbertia scandens*, *Tecomanthe hillii* and *Pandorea pandorana*.

And so after over 20 years, what have we learnt about gardening with native plants, what would we do differently if we were starting again and what advice could we give to beginners? Perhaps the most important things we have realised is that **things will change**. Some perfectly healthy plants will die for no apparent reason; some plants which should not grow in our area thrive to a ripe old age; some plants grow very spindly; some plants do not flower . . . and so on . . . We need to be prepared to accept this fact and if one of our favourite plants does die, then we should see it as an opportunity to grow something else or to try growing another plant in another location or perhaps in a pot rather than in the garden. We ought not be too concerned about changing our garden to accommodate changes. ■

Wildflowers as Garden Cultivars

W. H. Payne
Continued from previous issue

Callistemon 'Country Sprite' is a seedling of *Callistemon* 'Glasshouse Country' (an F2 hybrid of *C. recurvus* × *C. salignus*) selected in 1986 from a batch of seedlings by Mrs E. J. Morgan. It is a fairly loose, open shrub to 4–5 m tall. The new growth is coppery pink. The leaves are narrowly elliptic to narrow-oblongate, 42–64 mm long, 5.9–8.6 mm wide with slightly recurved leaf margins. The flower spike is moderately open to relatively dense, ca. 35 mm wide. Stamens ca. 44–50, ca. 15 mm long, pink at the tip (48C), pale at the base. Anthers yellow. Style exceeding stamens, pale green. Flowering period mostly spring and late summer.

It differs from *C. 'Glasshouse Country'* with slightly redder and larger flowers, with prominent pale green styles, darker larger leaves. It differs from *C. recurvus* with paler flower colour with stamens pale at base, paler, longer and wider leaves. As with *Callistemon* 'Tin-Sal Glow' there is a superficial resemblance to pink forms of *C. sieberi* (syn. *C. paludosus*). It is a vigorous grower with medium frost tolerance and a high resistance to drought.

Callistemon 'Perth Pink' was selected from a batch of *C. salignus* seedlings growing as street trees near Herdsman Lake, Western Australia. It is a tall open shrub to 4 m tall. Leaves are lanceolate to 80 mm long. The deep pink flowers are borne in clusters at the ends of the branches in spring. It may flower sporadically at other times of the year. Filaments: (55B); style tip: (154A); style: (52A).

***Lechenaultia* 'Park Pride'** originated in the wild near western entrance to Fitzgerald National Park. It appears to be a putative natural hybrid of *Lechenaultia floribunda* × *Lechenaultia tubiflora*. It has an open prostrate habit 40–120 mm high by 150–250 mm wide with potential to become wider. Short vertical flowering branches arise from the main horizontal branches which radiate from a single stem. Leaves are green, 5–6 mm long and terete. Flowers tubular, tube 10 mm long, split to base along upper surface, pale purple pink (77C). Lobes five, 6–8 mm long, lower three winged, upper two pointed with reduced wings, cream (153A) pink inner and wings. Sepals five, free, green, 4 mm long, 1 mm wide. Stamens five, filaments 4 mm long, anthers basifixed, yellow. Stigma, indusium 2 mm broad, purple pink, held at mouth of corolla tube. Style 10 mm long. Fruit 12–15 mm long, terminated by persistent sepals. Perpetual flowering in cultivation. It is characterised by its prostrate habit with significantly improved vigour over purported parents. The flower shape is intermediate between *L. floribunda* and *L. tubiflora*. Colour is distinctive, not observed in either parents or other *Lechenaultia* species.

***Leptospermum* 'Lemon Frost'** arose from seed of *Leptospermum petersonii* and is presumed to be a hybrid between *L. petersonii* and a form of *L. polygalifolium*. It was first raised in Cairns, Queensland. It is a shrub ca. 2 m × 1.5 m. The leaves are bright green, dense, approximately 24 mm long × 2 mm wide on a short petiole to 1 mm long, sparsely hairy when young but soon becoming glabrous, apex acute, base narrowed, with conspicuous oil glands, lemon scented. The flowers are solitary, approximately 20 mm across, more or less sessile, petals white (155B) and approximately 5 mm long. The flowering season is from late spring to early summer.

In general, *Leptospermum* 'Lemon Frost' has a habit which is intermediate between the two parents. It is more upright than *L. petersonii* and much denser than *L. polygalifolium*. It has finer leaves than *L. petersonii*, although still lemon scented, and flowers more prolifically. The flowering habit more closely resembles *L. polygalifolium*. It is said to have good drought hardiness. It flowers prolifically and forms a dense shrub of suitable size for most gardens.

***Lomandra longifolia* 'Peak Alone Limeglow'** was found as a seedling in the bed of the Turross River near Peak Alone, New South Wales. It grows to a height of 40 to 45 cm and up to 1 m across. The minute cream and brown flowers appear from September to October. The main difference between this cultivar and the usual form of the species is the yellow (154C–7D) variegation of the leaves (146A). It is said to be a more compact plant than the usual form. It will grow in almost any soil and aspect, and has proven to be particularly hardy in cultivation. As a pot plant it may be kept indoors. It is moderately frost and drought hardy. It is very useful as a colourful accent plant.

***Melia azedarach* 'Lady Gwenda'** differs in its variegated foliage, all other features as for *Melia azedarach*. The variegation is irregular, with some leaflets almost totally yellow (8C) while others are the usual green (147A). Yellow striations are also on the fruits. It is hardy to frost, primarily because of its deciduous nature. In areas of severe frost, newer growth on branchlets is killed, thus inducing lower laterals to shoot. This makes the form of the tree lower and more spreading when grown in colder climates. It is moderately hardy to drought. It is a useful species for providing summer shade, with the added advantage of being deciduous in winter. The fruits are attractive to birds. ■

To be continued in the next issue.

Tree Smokebush²

Conospermum triplinervium

by Beng Tan¹ and
Monica de Vos
School of Environmental Biology,
Curtin University of Technology

In Vitro Germination and Propagation

Smokebushes (*Conospermum* spp., family Proteaceae) are highly sought after in the cut flower trade. They are the native answer to *Gypsophila* — the small cottony white inflorescences make an excellent filler to accentuate the vibrant colours of larger feature flowers in floral arrangements.

There are some 50 species of *Conospermum* all of which are described in *Australian Plants* Vol. 15, most of which are found in the south west of Western Australia. Some species are harvested by licensed pickers for the cut flower trade, including *C. triplinervium*, *C. incurvum*, *C. crassinervium* and *C. stoechadis*. No smokebush species has been domesticated, and this does not augur well for the wild flower industry in the long term.

The general pressure on natural smokebush populations from bush picking, combined with ignorance of their management, will see an inevitable decline of some species. At Curtin University some of our research efforts are towards the conservation of native flora, and part of that effort is in propagation techniques. This article is a report on our recent effort at propagating the Tree Smokebush (*C. triplinervium*).

Germinating the Tree Smokebush by conventional sowing appears to be a futile exercise — and, intuitively, this should apply equally to other *Conospermum*. The fact that very few seedling recruits can be found in the vicinity of mature bushes is circumstantial evidence for poor germination, although loss to foragers and seedling mortality may also be partly responsible. Seed set is typically low, in percentage terms, but the absolute number borne by a mature shrub can be quite significant, amounting to several thousands. Sterile fruit drop prematurely, leaving only seeded fruit to ripen on the branches till the end of the fruiting season (December-January). These can be trapped in mesh-cloth bags if a supply of viable fresh seed is required, say, for a germination trial.

Preservation of our Flora

Scientific Research

The Society has a major commitment to the preservation of our wildflowers. One primary objective is to eliminate bush picking by developing forms that can be grown commercially. This requires research such as above organised through The Australian Flora Foundation.

¹Dr Beng Tan of the Curtin University of Technology, Perth, Western Australia, is especially conscious of the threat to the survival of our unique Australian flora, being a leader in the research necessary to commercially propagate and cultivate the best forms for horticulture. This research will then be applied to the restoration of wild plants back into areas where they originally grew and into reserves and gardens.

²*Conospermum*, the group of Smokebushes (all described in *Australian Plants*, Vol. 15, pages 69–92) is a group of wildflowers being decimated by wild picking. In a vase of flowers the smoky white *Conospermum* (some are a delicate blue) with contrasting black centres is a long-living decoration on its own or a perfect foil for more colourful flowers. A recent discovery has indicated that one *Conospermum* species may provide vital treatment for control of the AIDS virus. The major impediment to commercial cultivation is the extreme difficulty in propagation, hence the vital significance of the above work of Beng Tan, hopefully a scientific breakthrough.

³*Geleznowia verrucosa* shown in the photograph opposite has exceptional potential as a cut flower, a rockery garden plant, and a potted plant. Dr Beng Tan has recently published a scientific paper outlining his research and frustration in not achieving a satisfactory result. This unique plant has only one chance for long-term survival — success with scientific research to lead to successful propagation and cultivation. It seems that this will not be likely unless we can find a sponsor for such research. **Do you care** enough about wildflower conservation to sponsor this crucial study. Others may be able to "lie down in front of bulldozers" and more actively participate in conservation. Your contribution could be even more telling in the long term by sponsoring scientific research. Enquiries should be directed to the Editor or to The Australian Flora Foundation.



△ *Geleznowia verrucosa*.⁹ Intensive research (reported elsewhere) by Beng Tan has confirmed that this spectacular plant is almost impossible to propagate, especially from almost non-existent viable seed, and to cultivate. It is being ripped out of the bush for cut flowers and if we do not do something, it will be extinct. The Australian Flora Foundation would correct this and make it available for horticulture if someone would sponsor the necessary research.

▽ Tree Smokebush, *Conospermum triplinervium*, a mature tree in full bloom, 2 m × 3 m. Plate 1.



Fruit and Seed Structure

The *Conospermum* fruit is a non-dehiscent cone-shaped nut (approx. 3 mm across the top). The periphery of fruit top is ringed with stiff silky hairs, with the central locus of the top displaying a tuft of similar hairs. The coned fruit wall is densely covered with shorter hairs, which when rubbed off, reveals a smooth, hard brittle coat (similar to that of acorn). The nutty fruit wall is an impervious barrier to water uptake, thereby preventing germination in intact fruit. Each fruit contains a single seed, which assumes the cone shape of the fruit. The seed coat is membranous. The largest embryonic tissue are the two massive oily cotyledons which are also rich in proteins, but devoid of storage starch. The seeds of native proteaceous species are characteristically rich in both lipids and proteins but devoid of starch.

In vitro Germination Experiments

The role played by the fruit wall in preventing germination was studied in an experiment. A sample of fresh fruit with 82 per cent seed viability (determined by tetrazolium staining of dissected seeds) was split into three treatment groups: (1) control — fruit wall left intact; (2) fruit wall partially fractured (with a pair of fine pliers without damaging the enclosed seed); and (3) fruit wall completely removed to yield a whole naked seed. The fruit or seeds from the three groups (40 units each) were surface-sterilised with dilute bleach, washed several times with sterile water and germinated in petridishes on agar-gelled basal tissue culture medium containing Murashige & Skoog's (M&S) mineral salts plus 2 per cent sugar. The plates were incubated in darkness at 20°C and observations for germination were maintained for 40 days.

The results from this experiment, summarised in Table 1, clearly demonstrated that germination is prevented by the impervious fruit wall. Twenty-eight out of 40 **naked seeds** (72%) germinated, which suggested that all viable seeds, which had not succumbed to endogenous bacteria (3/40 in this case) had germinated. In contrast, only two **intact fruit** (5%) germinated, but it is possible that these two fruit had hairline fractures. A good portion (18/40 or 45%) of **fractured fruit** germinated, but as is the case with intact fruit, a significant proportion (>50%) of fruit could not be completely disinfected with bleach treatment. The hairs on, and crevices in, the (fractured) fruit wall are potential traps for fungal spores and bacteria.

Table 1. Effect of fruit wall treatment on *in vitro* germination in *C. triplinervium*. Germination conducted at 20°C; final score after 40 days.

Treatment	Germination (%) [No.]	Contamination (%) [No.]
Left intact	5.0 [2]	87.5 [35]
Fractured	45.0 [18]	52.5 [21]
Removed	72.0 [28]	7.5 [3]

This experiment indicated that maximum germination is obtained by germinating naked seeds *in vitro* — providing the seed used is fresh and viable. Hence, when the same experiment was repeated with an old commercial seed lot no germination was recorded; tetrazolium testing corroborated the zero viability of this old seed lot.

Effect of Temperature and Gibberellin

A second experiment was conducted to compare the speed of *in vitro* germination at two temperatures (15°C and 20°C) and the effect of a known germination stimulant, GA₃ at 5 ppm. Between 39 and 50 naked seeds were assigned to four treatments, viz.: (1) 15°C/no GA₃; (2) 15°C/plus GA₃; (3) 20°C/no GA₃; (4) 20°C/plus GA₃. Germination response was compared for up to 20 days. [The experiment had to be terminated due to cross-contamination from infected non-germinants].

First germination, indicated by radicle emergence, was first observed after seven days at 20°C, and two days later at 15°C. Germination was significantly faster at the higher temperature (Fig. 1), approaching the potential maximum after only 20 days. At the lower temperature, only about 40 per cent of seeds, or half the potential maximum, had germinated during this period. Gibberellin at the concentration tested exerted a mild stimulatory effect on germination but statistically this improvement was not significant.

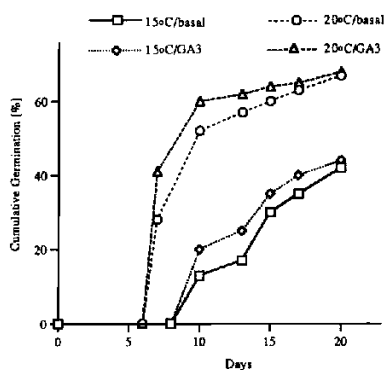


Fig. 1. Effect of temperature and gibberellin on *in vitro* germination in *C. triplinervum*.

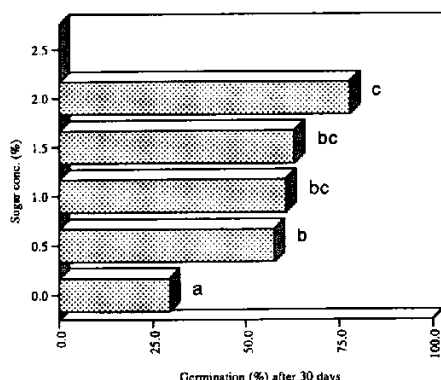
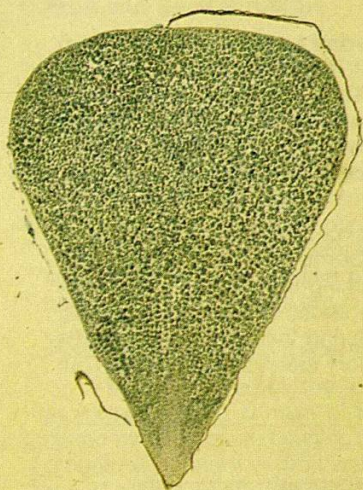


Fig. 2. Effect of sugar concentration on *in vitro* germination in *C. triplinervum*. The b series are not significantly different.

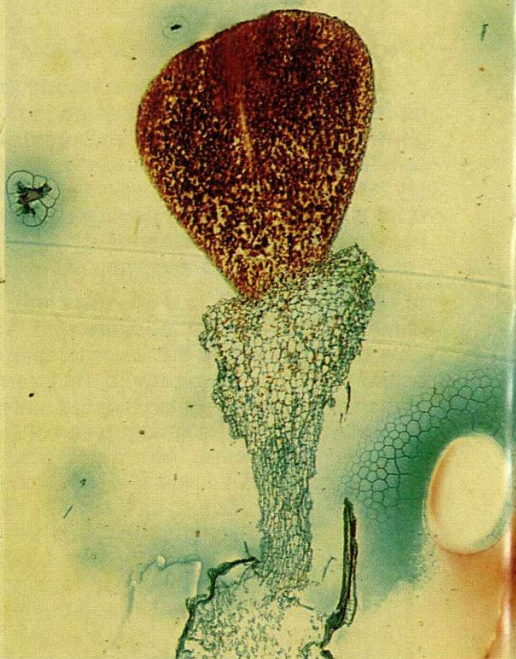
Effect of Sugar in Germination Medium

The Smokebush seed stores considerable lipids (and proteins). In oily seed fatty acid oxidation is the principal biochemical process generating a pool of high-energy, two-carbon metabolites to meet the high energy and anabolic demands of the germination process. The artificial germination protocol in these experiments substitutes endogenous lipids with exogenous sucrose. The small, soluble sugar molecule is rapidly metabolised compared with stored lipids, which must first be broken down via decarboxylation. This may account for the speed with which germination proceeds under *in vitro* conditions. Considering the rapid mobilisation and metabolism of sugar, sugar level should have an effect on *in vitro* germination. A third experiment was therefore conducted to test this proposition. Thirty seeds each were assigned to five germination media containing 0 per cent, 0.5 per cent, 1.5 per cent or 2.0 per cent sucrose and germination was compared after 30 days.

The beneficial effect of sugar was evident (Fig. 2). A steady improvement in germination was obtained by increasing sugar level, up to 2 per cent. The germination value at 2 per cent sucrose approximated the indicative maximum of about 80 per cent.

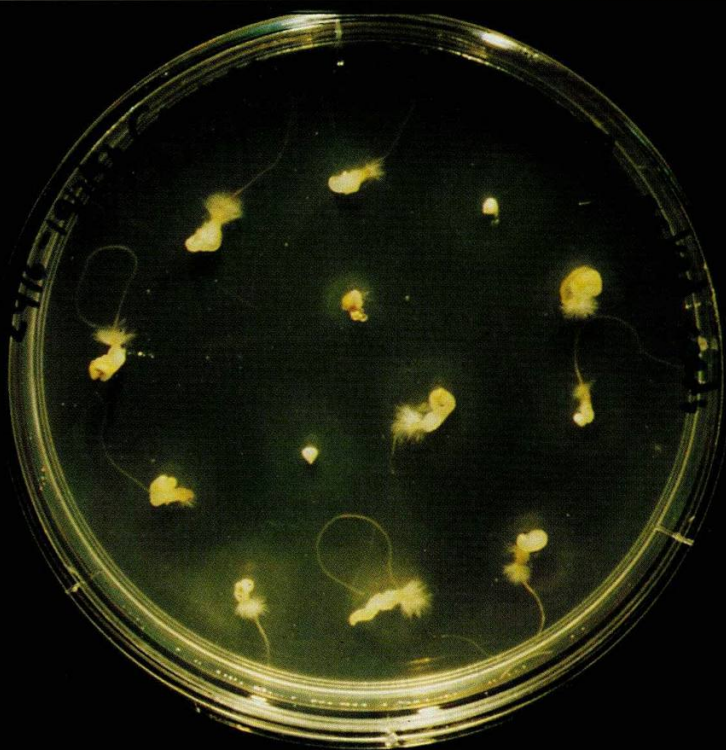


△ Histological section of top-shaped embryo
2 mm × 1.5 mm revealing abundant storage
proteins in cotyledons. Plate 2.



△ Incipient germination of naked seed *in vitro*;
note spongy radicle. Plate 3.

▽ Successful germination of naked seeds *in vitro*. Plate 4.





Morphological differences between *in vivo* (plate 5, above) and *in vitro* germinant (plate 6, below).



Statistically speaking, the germination value obtained with zero sugar in the medium (29.6%) is significantly lower (at the 5% level of Probability) than all other corresponding values where sugar was added. Within the "plus sugar" cohort, germination at 2 per cent sugar (77.8%) is significantly better than at 0.5 per cent (57.7%).

Increasing the medium's sugar concentration to supra-optimal levels should see a plateauing off at or near the theoretical maximum value of around 80 per cent, after which germination is likely to decline due to osmotic shock.

The osmotic role of sugar was also underscored in a separate experiment which attempted at germinating naked seeds on moistened filter paper. No germination resulted even though fresh seed was used. After about a week, most seeds had deteriorated and appeared "marshy". A histological study revealed that the membranes of cotyledon cells had lost their integrity under these conditions. This observation begs the question: how is seed germination affected by water uptake in nature? Seed germination, as observed on moist filter paper, probably does not occur when the seed is encased in fruit. If it can be assumed that only fruit that has been fractured by heat from fire, or from weathering, is competent to germinate, wall fracturing permits two conditions critical for triggering off germination to occur, namely, exposure to air (oxygen) and entry of water. Water uptake will be measured and tempered by the seed's hydrophobic properties and the tight fruit cavity (note: the seed generally fills the whole cavity). The fruit wall will however, maintain the physical integrity of the embryo in the early stages of germination; therefore seed disintegration is improbable in the field or under similar *in vivo* germination conditions.

Morphological Differences Between in vitro and "Normal" Germinants

A seedling germinated from a fractured fruit on moistened filter paper provided an opportunity to compare this seedling with those obtained from germinating naked seeds *in vitro* on a sugar-containing agar medium. Several morphological differences were evident. Assuming that the former resembles more closely a field germinant, *in vitro* germinants are "spongy" in appearance, especially the cotyledon tissue at the radicle end. The radicle is long and thin with a mat of root hairs appearing precociously in upper region proximal to the cotyledons. The "normal" seedling, by contrast, possesses a long, rigid hypocotyl terminated with two firm cotyledons; the radicle is stout and root hairs are not evident in the early stages. Some of these morphological differences are probably conditioned by the chemical and physical conditions of germination. Sugar, for example, may be responsible for "sponginess". Histological sections (Plate 2) revealed cells of the radicle and surrounding cotyledonary tissue to be highly vacuolated, probably as a result of sugar uptake, which in turn draws water into these cells by osmosis. Without exogenous sugar the hydrophobic, lipid-impregnated cells tend to be non-vacuolated.

***In Vitro* Propagation**

Mature Smokebush shrubs are usually not responsive to *in vitro* propagation. But, a sterile shoot culture can be established from *in vitro* germinants, or from field volunteer seedlings (say, after a bush fire). Seedlings normally harbour endogenous bacteria in their tissues, and so to improve the chances of successful establishment, many seedlings should be sampled. Both terminal and axillary shoots are suitable explants for this purpose.

A suitable establishment and multiplication medium is M&S medium supplemented with a weak cytokinin like kinetin (0.2–0.5 mg/L) plus GA₃ (0.2 mg/L) to encourage stem elongation. Axillary buds should sprout in this medium. These can be excised and subcultured to produce another crop of axillary buds and shoots, and the cycle goes on with each subculture. The larger and stronger shoots can be induced to root on M&S medium IBA at 1.0 mg/L. In this protocol the number of new shoots is determined by the number of axillary buds, or indirectly by the rate at which new nodes differentiate on the *in vitro* cultured shoot.

Adventitious shoots from basal callus are readily produced on M&S medium supplemented with a stronger cytokinin, e.g., BAP (0.02–0.05 mg/L). Excised adventitious shoots should however be raised on the weaker establishment medium.

It ought to be pointed out that the *in vitro* protocol does not allow for a selected mature shrub to be propagated. Adult shrubs and trees have generally been a bane for tissue culture propagators. Coppicing or induction of shoot juvenility with a growth regulator (e.g., gibberellin) can be an aid in some instances. In the case of smokebush, where a dependable *in vitro* germination protocol has now been demonstrated, the seedlings of shrubs with desirable horticultural characteristics may be the next best option.

Summary and Conclusion

Germination of fresh fruit (a nut) in the Tree Smokebush is prevented by the impervious fruit wall; fracturing of, or removal of the fruit wall, is a prerequisite to germination. The naked seed germinates readily on an agar medium containing salts and sugar, but will deteriorate if germination is attempted in a non-osmotic environment, such as on moistened filter paper. *In vitro* germination is significantly faster at 20°C than at 15°C; it is also mildly stimulated by gibberellic acid (5 ppm).

In vitro propagation via axillary and adventitious shoot budding is described. The same *in vitro* germination and propagation protocols should be applicable to most *Conospermum* species. ■

The Native Garden Doctor

by Phil Hadlington and Ted Taylor

The emphasis of this small book is to first provide the conditions for healthy growth of plants to enable them to withstand attack from pests, an appreciation that many pests represent an important food for birds and we should leave them if possible, an understanding of the value of nature's predators on pests and how to recognise them, and a chemical control as a last resort if the pest cannot be removed physically. One of a Mount Annan Botanic Garden Native Plant Series, available for \$17.00. ■

Ferns — A Comprehensive Guide

First published some years ago as *Ferns for the Home and Garden*, and now updated and reprinted under the above title, this attractive book will be of interest to fern enthusiasts. Those illustrations in colour are a valuable guide though many are small. The descriptions do include some Australian species. Retail price is \$39.95. ■

Palms and Cycads of the World — A Guide

by Lynette Stewart

A valuable reference for those interested in palms and cycads of the world. This is an attractive, well presented book. There has been an attempt to include a colour photograph of all the species described, even if many are quite small, and a line drawing showing a characteristic feature of each genus. Naturally, in a 247 page book, it has not been possible to include all of the world's species and unfortunately about one-third of Australia's species have not been included. This book is good value at \$49.95. ■



- △ The Rigby Garden described on page 23. From a start with a bare block except for lawn, we have changed the appearance of our home. Note especially the way in which the *Eucalyptus scoparia* has provided shade for the kitchen.
- ▽ Pockets in a section of the large garden at the front of the house have been created using hollow circular concrete containers which separate the garden from the lawn. These individual containers allow separate soil mixes to be used. Some of the plants seen growing here include *Lechenaultia formosa*, *Dampiera diversifolia*, *Thomasia pygmaea* and *Pimelea ferruginea*.





Along the northern side of our home, the early rockery garden above with a row of *Callistemon citrinus* 'Harkness' have been replaced by a mini rainforest and outdoor living area as the *E. scoparia* grew, as shown below.



The John Carter Garden

by Leon Horsnell, Canberra

Garden No. 19

John developed good screen plantings around his block. My part was to remove the lawn, put in paths and sitting areas and establish a woodland garden of small shrubs, grasses and herbs. This features native grassland/woodland species which include *Wahlenbergia communis* and *W. stricta*, *Chrysocephalum apiculatum*, *Bracteantha viscosa*, *Chrysocephalum semipapposum*, *Bulbine bulbosa*, *Brachyscome rigidula*, *Velleia paradoxa*, *Goodenia hederacea*, *G. pinnatifida*, various pea family plants and *Acacia*, *Grevillea*, etc. If I can use a local plant I do, but non-local plants are used for various horticultural reasons such as for shade, colour, wet, dry, etc.

The grasses I have used are *Themeda triandra*, *Poa labillardieri*, *P. meionectes*, and a range of Wallaby (*Danthonia*) grasses. It seems that some Wallaby grasses die back if dogs urinate on them. I use these to fill in the areas where a lawn would normally be or to give an area of interest but also to give a feeling of space.

The basic idea is to make something resembling what was originally there but to give it interest by adding many long flowering species such as bluebells, daisies and other herbs for summer colour, and *Banksia*, *Acacia*, etc. for winter colour. Thus the garden will be of some ecological interest and also appealing to gardeners, not necessarily native enthusiasts. ■

Australian Native Grass in Landscaping

Wide use is being made of Australian grasses in landscaping of sites such as on native strips, roadsides, sloping areas and for beautification at the Sydney 2000 Olympic Games site. This is largely due to the commercial operations of a company, AABULK (Lot 1, Ingold Lane, Clarendon, NSW 2756 — Phone: (045) 77 5912), and their Viro-Cell system. The grass has been pregerminated in propagation cells about 3 cm square, each cell providing a healthy vigorous clump ready for direct planting. Advantages of this system:

1. Seed in field conditions has extremely poor germination (often as little as 1%).
2. Weed invasion normally ensures young seeded native grass will not survive as weeds smother the grass. Viro-Cell native grass can be sprayed using selective herbicides, which kills weeds but not the Viro-Cell native grass. (Wait at least 2 months after planting).
3. Viro-Cell native grass can be planted and treated in such a way as to ensure weeds have difficulty competing.
4. Viro-Cell native grass is virus free.
5. It would take field grown native grass 6 to 12 months to reach the size of Viro-Cell native grass.
6. Native grass seed is very expensive. Too expensive to waste.
7. The cost of planting is from \$0.06 per square metre (large areas). The Viro-Cell native grass is planted by a specially developed machine. Small areas can be planted using a special roller, for a cost of around \$0.80 to \$1.00 per square metre.
8. Viro-Cell is unique as an exclusive absorption agent to ensure moisture retention after planting; the plants are weather hardened; the viro-cells are pre-fertilised with a specially developed fertiliser; each viro-cell is sprayed before dispatch with a formulation to enhance transplant growth as well as providing frost and heat protection.
9. Maintenance is low. It rarely or never needs mowing; it has a low fertiliser requirement; natural rainfall provides water needs (once established); it does not compete with native trees and shrubs; and it compliments the Australian landscape.

Preparation of Ground Before Planting

The area must be sprayed two times with Round Up, with a four-week gap between each spray. This is to ensure minimum weed competition. Before planting, the ground must be rotary hoed, to make planting easier. It is not necessary to improve soil quality, as native grass grows happily in poor soils. Unless of course the soil is too poor, or of clay base, in which case Gypsum may need to be incorporated. On difficult sites or for erosion control, after planting the native grass, a cover crop such as rye corn or millet may be hydro seeded. Another alternative is to plant the native grass in bitumen straw mulch. Viro-Cell native grass may be planted in Jute Master (a hessian erosion weed mat mesh).

Species of Australian Grasses Available

Wallaby Grass — *Danthonia caespitosa*, *D. linkii*, *D. richardsonii*, *D. setacea*. *Danthonia* will tolerate drought, poor soils including clay soils, sun and semi-shade. The grass leaf only grows to about 150–200 mm high, with beautiful distinctive seed head being produced twice yearly. Planting rate: 15–30 per m².

Kangaroo Grass — *Themeda australis*, *T. triandra*. Kangaroo grass is a summer growing, extremely drought tolerant popular Australian native grass. It grows on good to poor soils and is semi-shade tolerant. Occasional mowing will ensure a lawn type appearance. This is one of the most stunning native grasses and is also available in a dwarf form. Planting rate 3–20 per m².

Native Oat — *Themeda avenacea*. Larger than Kangaroo grass.

Weeping Grass — *Microleana stipoides*. This evergreen grass will form a beautiful traditional low maintenance lawn. Planting rate 20–50 per m².

Tussock Grass — *Poa labillardierei*. Planting rate 1–8 per m².

Water Couch — *Paspalum distichum* and *Paspalum paspalodes*. Planting rate: 4–20 per m².

Barbwire Grass — *Cymbopogon refractus*. Planting rate: 5–20 per m².

Blady Grass — *Imperata cylindrica*. This is an ideal grass for roadsides. It spreads by rhizomes, thus often only 3–5 per m² are needed for planting. They grow in areas characterised by drought, poor soil, moist soil and sand. They will also allow native trees and shrubs to thrive, thus making it an ideal low-cost roadside grass. Planting rate: 3–10 per m².

Slender Bamboo grass — *Stipa verticillata*. This grass makes a wonderful screen for borders, etc. Planting rate: 1–5 per m².

Other grasses available are:

Redleg Grass — *Bothriochloa macra*; Curly Mitchell Grass — *Astrebla lappacea*; Queensland Blue Grass — *Dichanthium sericeum*; Long-haired Plume Grass — *Dichelachne crinita*; Mat Grass — *Hemarthria uncinata*. For damp areas: Scented-top Grass — *Capillipedum* spp.; *Spinifex sericeus*, for beach erosion control.

Wetland Plants (as featured in Vol. 17 No. 136 issue of *Australian Plants*) *Cyperus exaltatus*, *Juncus usitatus*, *Phragmites australis*, *Triglochin* spp., *Typha orientalis*. ■

The Horticultural Use of Grasses

Generally Australian grasses are tufted adding charm to the landscape because of their form and rusty colour. There are trials of one species for use as a lawn after mowing but generally they are feature plants. The garden pictured on page 40 has incorporated grasses as described opposite. It is a pity the photographs do not adequately present the appealing effect. Over the next few issues other gardens featuring grass will be presented. —Editor.



The John Carter Garden featuring the use of grasses. See description on page 38.
The John Carter Garden — A garden of ecological interest?





The Johnson Garden at Tongala $\triangle$ back and ∇ front garden.



Management of Endangered Plants

Simon Cropper, CSIRO

This book seeks to bring together information from hundreds of books, journals and data bases to assist in the management of rare or threatened plants. Using 10 case studies as an example of the procedures defined in the book for the protection and care of endangered plants, this book is a valuable tool for those actively engaged in this work. Available for \$49.95 plus \$5.00 postage. ■

Wildflower Nurseries in Queensland

Fairhill Plants and Botanic Gardens — Fairhill Rd., Yandina, 4561. Tel. (074) 46-7088. Large range of trees, shrubs, ground covers, climbers, ferns, palms and orchids for the sub-tropical and tropical east coast. Extensive display gardens open 8.30 a.m. to 5 p.m. any day. New comprehensive catalogue \$14.00 posted.

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Annangrove Grevilleas — 98 Annangrove Road, Kenthurst 2156. Tel. (02) 654-1380. Wide range of natives including hundreds of different species in tubes — many hard to get. Ten per cent discount to SGAP members.

Bryants Native Plant Nursery — Cosy Camp Road, Bex Hill, N.S.W. 2480. Tel. (066) 28-4323. 15 kms north of Lismore. Open 7 days (from 11 a.m. on Sundays). Extensive range of trees, shrubs, groundcovers, rockery, grafted Grevilleas, rainforest plants. Excellent quality and service.

Camden Haven Wildflower Garden — At Kendall Country Living, 105 Kendall Rd. Kendall, N.S.W. 2439. Tel. (065) 59-4102. 1 km from Pacific H/way at Kew. Specialising in grafted natives and rare and unusual plants. Closed Tuesdays.

Dealbata (cold climate) Aust. Plant Nursery — off Bloomfield St., Dalgely, 2630. Tel. (064) 56-5043. Specializing in alpine and dry Monaro plants — grown from locally collected material. Phone to arrange visit.

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

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Sydney Wildflower Nurseries — South at Heathcote (02) 548-2818; West at Marsden Park (02) 628-4448; North at Terrey Hills (02) 450-1555. Excellent range of native plants, open 7 days.

Warlapendi Farm Nursery — Church Ave., Colo Vale (7 km north of Mittagong off F5, take Colo Vale exit). Tel. (048) 89-4327, Fax (048) 89-4092. Growers of frost hardy natives from tubestock to advanced. Open 7 days.

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Wildflower Nurseries in South Australia

Anne and Colin Dealtry — Lot 2, Trevilla Rd, One Tree Hill, SA 5114. Large range of tube-stock plants. Display Gardens. Open most of the time but phone to check. (08) 280-7079.

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Plants of Tasmania Nursery — 65 Hall St., Ridgeway 7054 (10 mins from Hobart). Tel. (002) 39 1583. Exclusively Tasmanian plants. Phone for opening hours or send business sized SAE for catalogue.

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Australian Wildflower Seed Suppliers

Nindethana Seed Service — Largest selection of native seed in Australia. RMB 939 Woonenup, W.A. 6324. Available in 50¢ pks, gram lots or kgs. Please forward a stamp-addressed envelope for free catalogue. Tel. (098) 54-1066 in business hours. Telex: AA 91938

R. Horner — 1 Grundy St., Alice Springs, N.T. 0870. Seed of trees and shrubs of Central Australia. Please send 45¢ stamp for a list.

Wildflower Society of Western Australia — P.O. Box 64, Nedlands 6009. A wide selection of Western Australian seeds is available at \$1.50 per packet, plus postage and handling of 45¢ for a number of packets. Send for a catalogue for \$2.00 plus 80¢ postage. A huge range of seeds at a price you can afford expertly collected, labelled and packed. A book "Hints on Growing..." 40 pages, \$3.80 posted.

Flower Arrangements

Dryandra by Margaret Pieroni

All of the *Dryandra* mentioned in this issue have long, short lobed or wide fern-like leaves which not only provide attractively shaped plants but which are also very desirable in floral art. Many are quite rigid and long-lasting in a vase. They may be dried and the longevity enhanced by treating with glycerine. *Dryandra formosa* leaves turn a chocolate brown on top which contrasts with the pale underside.

My glycerine treatment is as follows. Warm one part of glycerine and three parts water. Scrape the stems of the leaves about 2 cm around the cut ends and stand in the glycerine mixture for two or three days or up to a week depending on the size of the material and length of the leaves. Hang upside down until ready to use in your arrangement. ■

"Australian Plants", The Australian Flora Periodical

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Flower arrangement by Sheila Johnson — *Grevillea* 'Sandra Gordon' (yellow), *Melaleuca fulgens* (smaller red brushes), *Banksia coccinea* (red and white), *Banksia ericifolia* and *Banksia micrantha*, all grown in her garden, as described on page 22.