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**50c**



*Photography by L. A. Fell*

***EUCALYPTUS YOUNGIANA***

## GROW A EUCALYPT

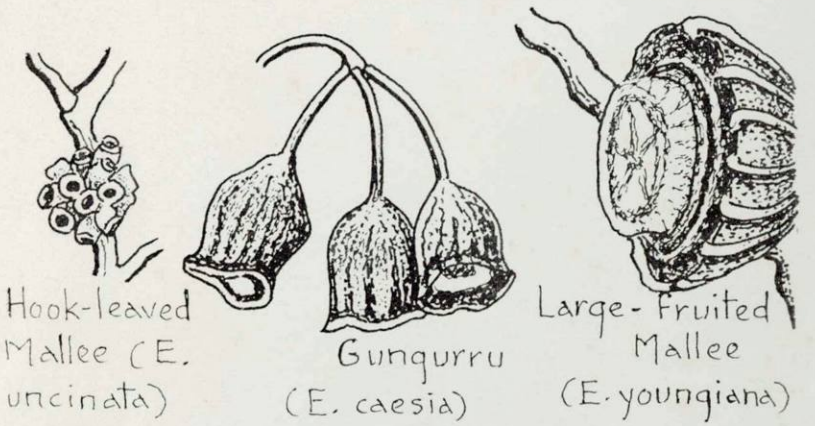
# TREES WITH A HUNDRED THOUSAND LIVES

*The magic of wildflower series for the young in spirit by Nuri Mass*

When is a gumtree a shrub? When it's a mallee.

Well, that's not altogether true, of course, because mallees do usually look like trees, in their own special kind of way. But when you find them growing to less than three feet high—as some of them sometimes do—you might well be excused for thinking of them as shrubs.

Actually gumtrees in general, and perhaps mallees in particular, are very clever, resourceful trees. They *have* to be, to keep living, growing and multiplying, in spite of all the hardships they have to face.




Everyone knows what a gumnut is. Or *does* he? Gumtree seedboxes are always capsules, but of endless different shapes and sizes. They hold great numbers of seeds, and have a lid (or operculum) which falls off when the seeds are ripe. These sketches show only three of the many variations upon the "standard" gumnut.

Certainly in some parts of Australia, the soil is so rich and the air so moist that plants grow tall and thickly into actual rainforests. But for the most part it's a dry, brown land tormented by droughts and bushfires—the sort of conditions that would make life impossible for rainforests. Yet somehow, century after century, hundreds of different types of gumtrees have managed to survive here and even to flourish, creating their own wonderful kind of woodlands. And for the most part we just take all of this for granted, without stopping to think what a marvel it is.

Fire will race headlong through a gumtree forest, crackling and roaring, its hungry flames engulfing everything from the ground to the topmost branches. When eventually it burns itself out, there isn't a green leaf to be seen anywhere. The very earth looks burnt, every trunk is charcoal black, and whatever leaves remain clinging to their little charred twigs are crisp and brown. A dead forest indeed—utter desolation. Yet a few months later, those blackened trunks are all fuzzy with beautiful fresh green leaves, new shoots are growing up from the base of trees that have been "killed" and, like a miracle, the forest has come alive again. How has this happened? What is it, about so many of our gumtrees, that enables them to do this wonderful thing?

(Continued on page 18)

FEATURES IN THIS ISSUE OTHER THAN EUCALYPTS:

ORCHIDS—Page 32. Glossodia. An article on orchids appears in most issues.

GRASSES—Page 35. A report on research to develop our own hardy grasses.

PROPAGATION—A very simple method, using no special equipment, will give you assured results, see page 29.

# SMALL EUCALYPTS

*Recommended Mallee Type Eucalypts by L. A. Fell*

All so called Mallees are primarily small eucalypts and mallees only by environmental accident. This article on their domestication will therefore treat them all as small eucalypts and will only use the term 'mallee' as a descriptive definition, not as a botanical. No consensus can be found in the literature as to adaptions by eucalypts to changed environments so that any prognostications as to possible growth, morphological changes etc. must be on a personal experience basis only. The notes following are from the writer's experience in the field as a collector and as a grower of them in confined areas. The taxonomy is based on that of Pryor and Johnson in their 'Classification of the Eucalypts' 1971. There are 50 or 60 worthwhile but largely unknown small eucalypts suitable for cultivation in the eastern and southern climatic zones. The notes below exclude those commonly in use at present.

## The Problem

While taxonomists are continuing to simplify and bring some order into eucalypt nomenclature, academic botanists have given little or no help with solving the botanical problems limiting the domestication of this most colourful group. King's Park Botanic Garden in Perth, W.A., has collected numerous species of small eucalypts in one environment whence some critical evaluations can be hazarded. The question J. H. Maiden always asked himself "How much variation do I require to constitute a species or a variety", has not yet been finally answered in this genera. Eucalypts are a dynamic race with widespread hybridisation possibly leading to new species. In spite of the fact that eucalypts have been known for around 175 years there are wide gaps in our knowledge of the conditions necessary for optimum growth and survival of these small eucalypts. Maiden made a wise observation when he remarked that "one's observation of a plant is one-sided unless one has met it in the bush".

In further detail these problems of cultivation, growth and ecology will be discussed below. No eucalypts will be commented on which need intensive tending for survival or satisfactory growth in the given climatic conditions. This will disqualify some of the more flamboyant small trees from W.A., i.e. *E. macrocarpa,* the hybrid *E. rhodantha, E. woodwardii,* the hybrid *E. torwoodii, E. erythrocorys, E. kingsmillii* and so on. In addition most of the so called primitive eucalypts *(E. tetraptera, E. preissiana* etc.) will be omitted. As the sub-tropical eucalypts would not grow even in King's Park, discussing them here is a waste of time. Without further trial none of the trees discussed here is recommended for use as street trees.

A common name for many of these small eucalypts is 'mallee'. In Western Australia a number of aboriginal names are used for individual trees or groups which are visually similar; moort, marlock, mallet, morrel etc., but except perhaps in their own district they have neither botanical nor descriptive value. Blakely, however, frequently uses the term marlock to describe a single stemmed bushy tree such as *E. platypus.* True mallees grow from a large bulbous root stock known as a lignotuber from which several stems arise at ground level. Eucalypts grow in mallee form in regions of low rainfall, on plains country with light sandy soils. It is worth remembering that eucalypts grow small in difficult conditions because there is no choice otherwise. The triggering effect that causes a eucalypt to grow several stems from a ligno tuber is unknown as almost without exception ALL eucalypts have some form of lignotuber. Fire, grazing, insect attack, die-back through drought, or any other destruction to ground level causes mallee-type growth

from the lignotuber. In King's Park where we had every W.A. small eucalypt NOT ONE GREW AS A MALLEE. In the writer's arboretum on the Gippsland Lakes, Vic., with 60 species, again not one grows as a mallee. In general eucalypts change their form and growth habits to adjust to a change in environmental conditions and the manner of this change cannot be forecast.



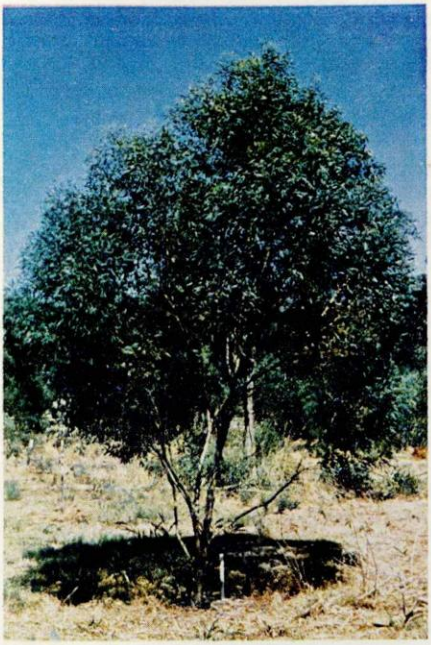
*Photography by F. W. Humphreys*

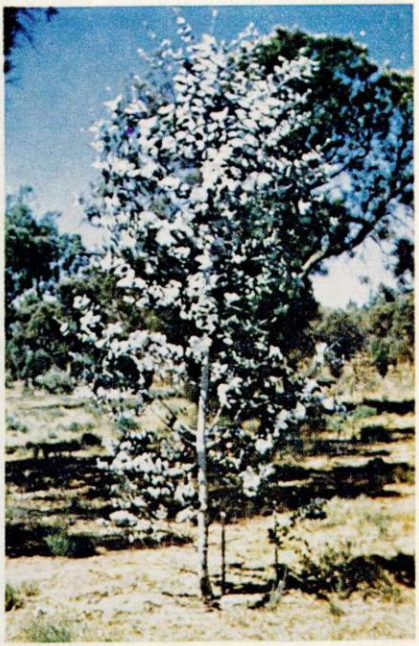
## *EUCALYPTUS DESMONDENSIS*

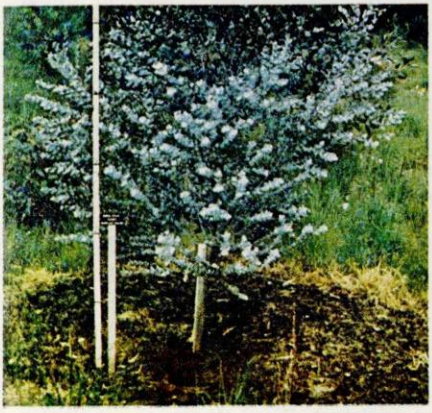
A Group I small tree as listed on page 7. A good ornamental with open habit, good foliage, buds, fruits and very attractive in flower. Occurs on shallow soils with a hard clay subsoil and is suited to both deep and shallow soils ranging from sandy loam to clay loam.

## SOME HARDY SMALL TREES

These would give your garden a real boost









Top Left: *E. burdettiana*—4 years old. Group III.

Top Right: *E. eudesmoides*—4 years old. Group III.

Lower Left: *E. albida*—3 years old. Group I.

Lower Right: *E. transcontinentalis* flowers and foliage. Group III.

## Biochemical Interactions

As with all plant life there are certain influences which affect the growth of eucalypts, some of which, through lack of research, are inadequately understood. Some 40 years ago in EUROPE it was discovered that fungal associations within the soil played a critical part in the healthy growth of pines on poor soils. It was recently stated by BARBOUR "that the presence of certain fungi is of critical importance to many higher plants because the fungi play a symbiotic role with their roots, the fungus gains carbohydrates and the root gains mineral nutrients". It has been estimated that 80% of plants have mycorrhizal fungi associations, not necessarily confined to their own species. Some biologists go so far as to say that it would seem logical to regard the root mass of a forest as a single functional unit, a mutual benefit society. It is known that mycorrhiza play an important function in the growth and health of some eucalypts and that the absence of this association may be the reason for eucalypt failure to thrive in certain areas. On the reverse side more attention is being paid to the effects on survival and growth by chemical and bacterial inhibitors within the soil. For instance, among many other plants, it is well known that perennial rye grass releases an inhibitor reducing growth around the plant. It is only comparatively recently that the damage to eucalypt root systems by the fungus *Phytophthora cinnamomi* has been assessed and investigated. It is now realised that stability and diversity in plant communities can in large measure be caused by biochemical interactions.

It must follow therefore that the movement of eucalypts to a different environment can upset the ecological balance and can be unrewarding without skilful assessment of all the interacting factors.

## Survival Procedures

In a very definite way eucalypts changed to a different environment should be treated like any other crop. Their needs for water, food, cultivation and protection should be fulfilled as far as knowledge is available.

In the King's Park eucalypt Arboretum in Perth, Western Australia, about 40% of the eucalypt seedlings failed to grow on. Of this number, 20% died probably through faulty transplanting techniques; the balance remained alive but did not grow. This last group are those unable to adjust to the changed biochemical interactions in a different and harsh environment, and will be found in any such situation. No small eucalypts should be planted as single specimens except in cultivated, weed and grass free ground on a three months fallow. They should be planted in groups of 2 upwards, not necessarily the same species, and be top-dressed with 3 to 5 ozs. of a complete fertiliser at planting. In the first year or two the plant should be watered when necessary preferably through a tin sunk beside the seedling. If the plant has not made upwards of 1m growth in the first 12 months there is something wrong which should be investigated. Many of these mallee like trees do not stand the usual snipping type of pruning without dieback. If pruning is necessary the plant should be cut back to the lignotuber at ground level. Seed capsules however should be cut off at the peduncle before the seed ripens. These plants are subject to ALL the insect pests and fungi associated with plant growth but some are more resistant than others to particular pests etc. These trees will live to an age of 100, are picturesque, botanically interesting, and attract birds etc. The majority of them are NOT obtainable from nurserymen and must be grown from seed.

## Notes on the Species

Comment and description is subjective. Observations were made in four environments, in the field, in King's Park, Perth, at Metung on the Gippsland Lakes, and in a suburb 12 km east of Melbourne, and extend over 30 years. The first group (Group I) treated are those not usually subject to extreme apical dominance, often growing as shrubs and not more than 4m in height.

## Group I

*E. albida.* Juvenile leaves opposite, very glaucous sessile, spathulate. Retained for from 2 to 3 years when, from the top of the plant, emerge light green narrow lanceolate adult leaves. Picturesque and unique. W.A.

*E. anceps.* Ssp of *E. congoblata.* Common around the Stirling Range. W.A.

*E. annulata.* Smooth stemmed attractive tree. Grows in the granite cracks on Mt. Clarence above Albany, W.A. A free flowering honey producer.

*E. cylindriflora.* Slender white stems with attractive umbels of creamy flowers.

*E. cooperana.* A spreading mallee like, small tree. Probably the most free flowering of all mallee types. Leaves sub-glaucous, narrow lanceolate. Honey. Sand plain around Albany, W.A.

*E. diptera.* A unique tree. Brown buds form along the stems like pimples in threes. Coriaceous green lanceolate leaves. Poor root hold. W.A.

*E. doratoxylon.* On this small tree the narrow pale green leaves remain opposite for the life of the tree. On dry ridges in the Stirlings National Park, W.A. An attractive garden shrub.

*E. decurva.* Sandplain south of the Stirling Range. Large pale yellow buds stand out from the dark green lanceolate leaves. A dense foliage. W.A.

*E. desmondensis.* Glaucous leaves droop almost to the ground. Burgundy coloured buds show above foliage. W.A. Colour plate page 4.

*E. ewartiana.* A slow growing tree with dark green coriaceous leaves from dry country in S.A. & W. Named after Professor Ewart of Melbourne University.

*E.* x *erythrandra.* Hybrid. Prefers damp sandy soil. Its parents are *E. incrassata* x *E. tetraptera* and seedlings are a mixture of these two. W.A.

*E. foecunda* syn. *E. leptophylla.* Thin stemmed almost whipstick mallee type. Attractive blotched bark. Eastern wheat areas. Honey. W.A., S.A., Vic.

*E. kybeanensis.* Rare alpine shrub at 1000m. Very dark green coriaceous leaves. Slow grower and difficult. V.

*E. grossa.* Unusual buds and capsules on a straggling tree with coarse mid-green big leaves. W.

*E. gardneri.* In the Stirling Range, an unusual form of this tree grows, to only 2m. The leaves are almost purple making this an unusual plant. See page 9.

*E. gillii.* Restricted to the northern Flinders Range and just across the N.S.W. border. A stiff awkward tree with glaucous leaves and numerous clear yellow flowers. From a very low rainfall.

*E. coronata* syn. *E. mitrata.* A delightful small tree from the granite complex, the Mount Barrens, west of Esperance. W. Honey.

*E. redunca.* A sandplain species around Gnowangerup-Ongerup in S.W. agricultural areas of W.A.

*E. uncinata.* A useful tree from north and East of Albany, W.A. Will grow well in dry infertile sands.

*E. websterana.* Ssp. of *E. orbifolia.* A decorative eucalypt with bright yellow flowers, from the eastern gold fields, W.A. Difficult to raise from seed.

*E. xanthonema.* A rather delicate looking plant with thin mid-green leaves inclined to weep. Hardy. W.A.

## Group II

Across the southern States a group of small trees is common to them all. These, under the given environmental conditions, provide the bulk of the eucalypts in the areas called the "Mallee". They form nevertheless a useful group for confined areas out of their usual habitat. They are among others, *E. calycagona, E. viridis, E. congoblata, E. diversifolia, E. incrassata, E. gracilis,* the *E. oleosa* group, *E. pileata,* and so on. Most of these are honey bearing. These have been described in past issues.

## Group III

Finally there is a group of small trees up to 12m when growing as a single trunk. By cutting back to the lignotuber after a few years will make mallee like growth. These trees are listed on page 10.

## Group IV Ornamental Mallees

These are mentioned on pages 11 and 13 where the difficulty in growing them is examined. The easier of this group are listed and include *E. preissiana*, *E. crucis*, *E. tetragona* (opposite) and *E. tetraptera* on the rear cover.



**EUCALYPTUS PREISSIANA**

This colour plate appeared on page 96 of Volume 5 labelled *E. crucis*. However, the leaves of *E. crucis* are almost orbicular, not so leathery and the stamen colour is creamy or pale yellow.

Glaucousness or grey blueness in eucalyptus leaves is a characteristic often modified by soil and climatic conditions. Maiden, the great botanist, recognised this clearly. In the Eastern States the 'bluegum complex' are usually very glaucous in their first few years. In East Gippsland *E. polyanthemos* is glaucous under harsh conditions, but in the wetter forests is softer and greener.





*Photography by L. A. Fell*

Top: A mature tree of *Eucalyptus tetragona* as found at its extreme western limit.

Bottom: *Eucalyptus gardneri.* In the Stirling Range, an unusual form of this tree grows to only 2m. The leaves are almost purple making it an unusual plant.

## Group III

Finally there is a group of small trees up to 12m when growing as a single trunk. The bulk of this type are West Australian, they are extremely decorative and by cutting back to the lignotuber after a few years will make mallee like growth. They are almost without exception honey bearers.

*E. buprestium.* Sand plain at the foot of the Stirling Range. Little known but attractive tree with large capsules.

*E. corrugata, E. le souefii.* Larger trees. Glaucous with deeply ribbed buds. From stony, rocky soils, Kalgoorlie.

*E. eudesmoides, E. sheatheana.* From hot dry country. Very glaucous. Both flower when young. Need protection against leaf eating caterpillars.

*E. megacarpa.* A single stemmed small tree. An attractive shape but so far much neglected by growers.

*E. transcontinentalis.* The largest of the *oleosa* group with sub-glaucous leaves and canary yellow flowers. Colour plate on page 12.

SERIES *CORNUTAE*

This series contains many of the most versatile eucalypts from the S.W. of Western Australia, available to growers.

*E. burdettiana.* An outstanding small tree to 7m. Flowers profusely in late winter attracting honey birds.

*E. cornuta.* East of Albany. W.A., grows in thickets on granite or gravelly loams as a small tree. As a single stem grows to 20m.

*E. eremophila.* Grows as far south as the Pallinup R. Mixed type with some ssp. and pink flowered forms. W.A.

*E. macrandra.* Probably the best yellow flowering tree in W.A. Grows in thickets or as a single tree to 7m. Common along the Pallinup R. east of Albany.

*E. megacornuta.* Very decorative but must be kept free of capsules or it will split.

*E. platypus.* Grows to 7m singly or in thickets. A remarkably good shade and shelter tree much neglected here. The former variety *'heterophylla'* is now thought to be a hybrid.

SMALL TREES FROM EASTERN STATES

*E. cosmophylla.* Well shaped, large coriaceous leaves. Flowers in early winter, provides nectar and honey.

*E. glaucescens.* Small silvery leafed tree from Alpine regions in N.S.W. and Victoria. Better than *E. crenulata.*

*E. lansdowneana.* Eyre Peninsula where it shows mauve flowers in early winter. Flowers when young. To 6m.

*E. microtheca.* Coolabah. Burke's tree on Cooper's Creek. A dense semi-weeping shady tree, rough bark at the base. The W.A. type has a creamy white stem. To 12m.

*E. neglecta.* Endemic to the Omeo district, Vic. at 700m. An unusual round topped large leaved small tree to 4/5m.

*E. pauciflora.* The Snow Gum. On the lowlands a picturesque tree showing red branchlets clearly.

*E. pulverulenta.* Glaucous to ash coloured leaves to 10m from tablelands of N.S.W. Far better than any of the blue gums for confined areas.

*E. smithii.* Eastern Victorian and N.S.W. highlands. Grows as a mallee type to 5m on the edge of the Little River gorge, East Gippsland, in a rain shadow.

*E. stellulata.* Black Sallee. An alpine tree with upper smooth olive green bark, easy to grow.

## Group IV The Small Ornamental Mallees of Western Australia

The basic problem affecting the successful cultivation of the ornamental Eucalypts endemic to Western Australia, outside their natural environment, lies in an almost total ignorance of their genetic capabilities.

The writer has seen Eucalypts on the shores of the Sea of Gallilee, in the Tripolitanian Oasis in North Africa and in southern Italy, where the soil, climate and absence of pests allow full play to their genetic capabilities, in each case presenting a more robust, healthier tree. All over the world, except apparently in Australia, Eucalypts are tried for survival under a variety of environmental conditions which tests their genetic elasticity. Before recommendations are made about the treatment of Eucalypts in any given environment comprehensive field tests are needed which are designed to allow the shrub to develop its full genetic capacity to sustain dynamic growth.

In the past the academic botanists in Australia have failed completely to give any lead in this area, apparently being satisfied with meaningless glasshouse tests which have merely proved the experimenters' ingenuity and not the shrubs' capacity for adaptation. On the other hand the Western Australian Forestry Department, in the 40-in. rainfall areas of the S.W., has tested over the years, with very positive results, a series of fertiliser treatments in order to increase seedling growth. From 3 to 5 ozs. of mixed fertiliser is applied to the seedling at planting and spread around it on the soil surface.

(1) Problems in the south-east with ornamental Eucalypts from W.A. In a variety of locations over many years the writer has tried to grow these shrubs to an acceptable standard of form and flower, in line with W.A. standards, and has almost invariably found it an unrewarding exercise. South and east of the Great Divide as a garden subject for an amateur, despite an odd success, these attempts can be described as a non-event. A careful search in the bigger "native" gardens around Melbourne, Maranoa, Royal Botanic Gardens and Monash University, etc., will seldom disclose any viable plants of those mentioned below. Any comment on the handling of the more difficult shrub Eucalypts at this point of time would be a value judgment, as we simply do not have the information to tell us how they will behave under different environmental conditions. In King's Park, Perth, with all the "know how", etc., there was better than a 50 per cent failure rate in transplated seedlings of these shrubs. The problem of developing improved forms of these shrubs is the present impossibility of vegetative propagation. The only way available now is the long-time and laborious one of testing seedlings of geographic races and re-selecting for suitability. As this activity smacks of "applied" botany it is unlikely academic circles will help.

(2) There are about a dozen of these shrubby Eucalypts endemic to W.A. from the Semi-arid or the Arid Zone and these are mentioned below. In the writer's opinion, bearing in mind the standard required, the following are not worth trying in the south:—

*Eucalyptus erythrocorys, E. macrocarpa, E. rhodantha, E. stoatii, E. youngiana, E. pyriformis, E. kingsmillii, E. woodwardii* and *E. Torwoodii.* These are considered on page 13 as Group V.

This leaves us with:—

*E. caesia.* A wonderfully adaptive small tree. Will grow almost anywhere and retains the flower colour. Highly recommended.

*E. forrestiana.* A useful shrub, but seldom has much colour in the buds and capsules, S of the Divide. At its best at Kaniva.

*E. tetraptera* and *E. preissiana.* These make reasonably satisfactory growth, but never show either the size or colour of capsules and flowers as they do on the sandplain around Bremer Bay, W.A. See colour plate—rear cover.

*E. Torquata.* Usually a pale imitation of specimens from Spencer Gulf in S.A. or at Coolgardie in W.A.

*E. crucis.* Possible as a foliage shrub provided it is protected from scale and rust. Would prefer *E. tetragona.* See page 8.

The above shrubs are all difficult seedlings. They should be tested with increasing amounts of fertiliser (other conditions being optimum) if they do not do well. Failures are due to weak seedlings, incompetent planting methods, poor site selection and failure of maintenance. Although from dry areas, changes in soil-water relations often indicate a need for more water on new sites.



*Photography by C. J. Winn*

## *EUCALYPTUS TRANSCONTINENTALIS*

EUCALYPTUS STUDY SECTION

This is a study section for Eucalypts under the leadership of L. J. Daniels, Research Station, Box 201, Biloela, Qld 4715. These study groups operate by mail exchanging advice, seed, etc., and we hope eventually resolving some of the problems in cultivation. No special experience is necessary, just a keenness to grow Eucalyptus. Write to the leader enclosing stamp addressed envelope.

## Group V The Magnificent Mallees

As mentioned on page 11, the incredibly beautiful, large flowered small eucalypts have been difficult to cultivate. Now is the time to attack this problem. Those who wish to help or offer advice should contact the study group leader mentioned opposite.



*Photography by F. W. Humphreys*

### *EUCALYPTUS RHODANTHA*

*E. macrocarpa.* Leaves crowded, opposite, thick and silvery grey, ovate and stalkless. The buds are single without a pedicel, fruits hemispherical, large.

*E. pyriformis.* Leaves alternate, light green, ovate-lanceolate with a flat stalk. Up to three grey buds on thick pedicels. Fruit pendulous, ribbed, woody.

*E. youngiana.* Leaves alternate, lanceolate, thick, pale green. Three buds to the umbel, thick pedicels and peduncles, strongly ribbed and coarse fruits. Rough bark low on the stem. See cover colour plate.

These last two need a botanical determination to differentiate them accurately. None of these magnificent shrubs does well on the Eastern slopes

# COLOURED EUCALYPTS IN BRISBANE

*by M. W. Hodge*

Few trees can equal Eucalypts—the spectacular display of *Eucalyptus ficifolia*, *E. torquata* and *E. leucoxylon rosea*, the unique flowers of *E. erythrocorys*, *E. macrocarpa* and *E. rhodantha*, the attractive seed pods of *E. ptychocarpa* and *E. miniata*, the buds of *E. torquata*, *E. erythrocorys*, *E. pachyphylla* and *E. kingsmilli*, and the beautiful trunks which gave many species their common names.

Unfortunately some species are too large for horticultural purposes in suburban gardens but they are very desirable in parks and large gardens. The smaller, coloured Eucalypts are generally more popular with growers on small allotments, but unfortunately the most desirable species are sometimes not the most suitable climatically.

Brisbane's mainly summer rainfall, averaging about 1.15 metres (45 inches) per year (but last year—1974—in excess of 2 metres—80 inches) plays havoc with many of the smaller Eucalypts which are indigenous to the drier, less humid areas of the Continent.

Some of those which I regard as unsuited do survive here, but that is all that could be said of them. They are very poor by comparison with specimens of the same species grown in suitable districts. There have been odd specimens of some of the difficult species producing mediocre displays but generally they succumb during the humid summer months. I must emphasize that most of what I have noted is of Brisbane and environs and although it would probably apply to other districts of similar climate, it is not indicative of the whole state. Conditions in Queensland west of the Dividing Range are quite different and the small coloured Eucalyts, many of them from West Australia, are a pleasure to see. Soil conditions certainly have some effect but the main reason for failure here in Brisbane appears to be the climate.

Species which died within a few months of planting in my garden include *E. forrestiana*, *E. caesia*, *E. erythronema*, *E. grossa*, and I do not know of adult specimens of any of them in Brisbane. *E. ficifolia* survived for 2-3 years but died before flowering and *E. calophylla rosea* grew to about 4.5-6 metres (15-20 ft.) and flowered for two seasons before suddenly dying.

Three specimens of *E. torquata* grew quickly and flowered well. One specimen flowered continuously for many months. They grew to 2.5-3 metres (8-10 ft.) in height but became so unsightly that it was necessary to remove them after unsuccessfully trying a number of corrective remedies.

*E. orbifolia* grew to about 4.5 metres (15 ft.) and flowered for three seasons. It became infested with scale which I attempted to correct by severe pruning but this caused its death.

I have attempted four specimens of *E. macrocarpa* and found that they grew well during the dry weather but generally died back during wet periods. Three specimens have succumbed but the other has persisted for about three years. One of the now dead plants grew quickly to about 1.8 metres (6 ft.) in height but did not flower.

*E. rhodantha* grew to about 2.5 metres (8 ft.) and flowered for three or four seasons before dying at approximately six years of age. It was worth growing for the large spectacular flowers which were up to 100 mm (4 inches) in diameter. I managed to collect a small amount of seed from this plant but unfortunately all the seedlings died during a wet period.

*E. erythrocorys* reached about 4.5 metres (15 ft.) in height and produced some magnificent flowers. The flowers were up to 70 mm (2¾ inches) in diameter and the yellow stamens mixed with the unusually shaped red-capped buds made a striking contrast. This specimen gradually died back during the winter months when it was shaded by a large Callistemon.

*E. tetraptera* grew well for some time but died after pruning in an attempt to produce bushy growth. Colour plate on rear cover.

*E. ficifolia* has received more attention in the past than other coloured species. The few which survived long enough to flower eventually died, in spite of their former healthy appearance. I would advise intending growers to ignore *E. ficifolia* in this climate.

## NORTHERN EUCALYPTS

*E. pachyphylla* is a dwarf cream-flowered species with flower buds which may be red, green or red-capped. One plant now in flower progressed very little for the first two years after planting but has produced satisfactory growth in the past year. I do not know the fate of other specimens planted in Brisbane so it too early to evaluate its potential.

*E. miniata* is a rather variable species sometimes found as a stunted tree but more frequently as a large tree of more than 15 metres (50 ft.) in height with a trunk diameter near the base of more than 450 mm (18 inches). Plants seen in North Queensland had rather flaky papery bark and seed pods which were among the largest of the Eucalypts. In contrast I have been reliably informed that in some districts in the Northern Territory the seed pods are much smaller and the bark is of a different texture. This species has flowered in Townsville and Brisbane gardens but it does not adapt readily to the latter. Some losses are known to have occurred during winter and during prolonged rainy periods in clay soils.

*E. phoenicea* is an orange flowered species rather similar to *E. miniata*. Very few of these have been tried in home gardens but the few known specimens in Brisbane have shown slower progress than *E. miniata* and appear to be affected more by the winter temperatures. By reputation this species is among the most beautiful of the Eucalypts.

*E. pruinosa* has cream coloured flowers and glaucous ovate leaves. Plants observed in North Queensland in districts near the southern end of the Gulf of Carpentaria were stunted and rarely exceeded 5 metres (16 ft.) in height. The foliage was badly affected by leaf chewing insects but the few plants observed in Brisbane gardens have not suffered to the same degree. There appears to be little trouble in establishing it here.

*E. setosa* (pink form) does well here during the summer months but there have been losses reported during winter, especially in frost-prone areas. The two adult trees in my garden have survived and flowered for a number of years and, in fact, one of them is probably the first to flower in Brisbane. Seedlings have been raised from this plant and one appears to be a hybrid resembling *E. ptychocarpa*. The tree itself is inclined to be rather spindly and is unlikely to be regarded as a thing of beauty but the flowers make up for this. The pink flowers occur during mid summer and provide nectar for birds when few other plants are in flower. For best results plant in a well-drained, sunny, frost-free position.

*E. ptychocarpa* (pronounced here as "tie-kho-karpa") is a red, pink or white flowered species with unusually large leaves. The large leaves are generally produced in more moist conditions and may grow up to 125 mm (5 inches) wide and up to 540 mm (21 inches) long in extreme cases. Clusters of 50 or more flowers of 50 mm (2 inches) or more in diameter have been reported. It grows to 5-8 metres (16-26 ft.) in height and the flowering period is mainly late summer and autumn although plants are known to have flowered almost throughout the year. This species receives the common name of Swamp Bloodwood and actually thrives in Brisbane's hot wet summers. Introduced by a Nurseryman approximately 10 years ago, this species has become a firm favourite and the demand for plants still appears to exceed the supply. Small plants are affected by leaf chewing insects but the damage to adult trees is insignificant. Flowers first appear when the tree is 3-4 years old. Most plants grown from seed collected in gardens produce red or pink flowers but a few white specimens are known. It will take severe pruning and, in fact,

one 6 metre (20 ft.) specimen was pruned to about 100 mm (4 inches) above the ground and within a short time dozens of new shoots appeared from the ligno-tuber. These coppice shoots are not unusual with this species and often puzzle growers—whether to remove them or not. The choice is the grower's, either to have a single-trunked or multi-trunked tree. Where the shoots are left many will eventually wither and leave a few strong growths.



*Photography by M. W. Hodge of a plant in a Brisbane garden*

## *EUCALYPTUS PTYCHOCARPA*

While many enthusiasts will still try their skill on some of the more difficult species, the most reliable and rewarding species for this climate is *E. ptychocarpa.* Others such as *E. setosa, E. miniata, E. phoenicea* and *E. erythrocorys* may prove to be satisfactory in specific localities where one or more conditions exist suitable for their survival, but other species such as *E. ficifolia, E. erythronema, E. caesia* and *E. forrestiana* seem rather hopeless in Brisbane with present knowledge.

# Small Eucalyptus Forest Garden

*A report from the Editor*

Half of my half acre block is a natural Eucalyptus forest. It had, when I first purchased it, many small eucalypts. I have reported on it in a past issue. You could easily create one using any of the strong growing Eucalypts, especially those native to your area.

I find it best to keep the trees relatively small and when they reach about 10 metres high with a trunk of 30cm diameter I cut them down at the base. They sucker again eventually reaching 10 metres and are again cut down. This keeps me in firewood through the winter and prevents the trees getting too large and dominating the forest.

Jim Webb of Canberra has had a lot of experience in this and has published an article in our No. 50 issue, page 270, giving a new transplant method for Eucalypts. I sought his advice on my practice and his reply was:

"The problem of shooting from stumps is that you are not always 100% sure the stump will shoot. (My experience has been that four out of five will shoot which is all I need.) The rule is that the younger and smaller the tree, the better are the chances. Summer cutting also improves your chances and, of course, if the species is a ligno tuberous bearing species your chances are further towards 100%. The closer to the ground level the cut-off point is the better; 30 to 60cm seems to be O.K. in my experience, but 10 to 20cm is better.

Leave the resulting shoots alone until they are up to 60cm tall, then thin to six or so, then later remove the strongest, i.e. the tallest. These strong shoots have a poor attachment whereas the slower grown ones are more firmly attached and do not come away as readily from the trunk. If you leave a large number of shoots, the regrowth will be smaller in height but have a larger outline than if you thin to one."

This way I always have clumps of nice young trees with fresh red "gum tips".

To maintain a fresh, leafy forest with splendid colour in the spring I have found that:

1. As my soil is sandy on a dry ridge and the trees are thirsty, I have to water, using fixed sprinklers.
2. The fallen leaves we allowed to build up and those raked off the driveway are laid on the boundary areas, keeping weed growth down.
3. Heavy pruning of undershrubs is necessary after each spring flowering.
4. The choice of plants appears limited as trees provide shade and soak up moisture. However, I can produce a very colourful display.

The whole area contains hundreds of *Chorizema cordatum* plants. They are very easy to strike from cuttings—I put down 50 cuttings in a 10cm pot and strike 30 of them. They flower profusely for a long period. Cut back very severely after flowering is finished. In amongst this riot of yellow-orange-red colour to one metre high I have other plants. *Acacia* are always rewarding especially *Acacia drummondii.* The mint bushes provide mauve and white—any seem to grow, the best being *Prostanthera discolor, P. sieberi, P. incisa* and a form from Rylstone.

This year *Kennedya macrophylla* flowered profusely and did not require much watching to keep from climbing. *Eutaxia obovata* is widely planted also as it grows so readily from cuttings.

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Extract from "The Garden at Casa di Sole, East Portlemouth, Salcombe, England", an article in the Journal of The Royal Horticultural Society.

"We would like to mention three favourites—*Eucalyptus pulverulenta* for its glaucous blue round leaves, *E. cordata* for its good shape and beautiful coloured young growth and *E. maculata* for its red branches and tinted leaves."

TREES WITH A HUNDRED THOUSAND LIVES—*continued from page 2*

The fact is that the great majority of them have a secret, waiting sort of life which doesn't show itself while everything is going well, but which quickly sprouts into action in times of trouble. Until then—until it is called upon by the ravages of fire, animals, or such-like—it rests quietly and unnoticed in special parts of the trees known as lignotubers, naked buds, accessory and epicormic buds.

Lignotubers may be seen at the very beginning of a gumtree's life, as little knobs in the axils of its first leaves. These knobs join together around the stalk of the tiny plant, and proceed to put out a great many leafy shoots, just as ordinary stems would do, before going on to act in the most peculiar, *un*stem-like manner. Instead of staying above ground and growing upwards, they finally bend down and bury or half-bury themselves in the ground, the way roots do, and there they remain—quietly living, and storing away large quantities of food—while the rest of the plant continues to grow.

After a while, if nothing bad happens, we might forget all about the lignotuber of a gumtree. But we are soon reminded of it again should the tree be "destroyed" by fire or some other disaster, because a short time after this happens, lovely strong, new shoots appear from the base of the tree, growing out of the lignotuber and nourished by it. Nourished so well, in fact, with all of the lignotuber's stored food, that they are often even stronger than the plant's original shoots, and are therefore able to send even larger amounts of food back again into the lignotuber for storage against any future calamity.

But this isn't all. Tucked away at the base of every gumleaf, where it joins on to its stem, is a special kind of growing tip known as a "naked bud", which never does any growing at all unless the leaves of its tree get burnt or eaten. Then, it quickly shoots out into a new branch which in turn produces new leaves—and the tree goes on living and growing as vigorously as ever.

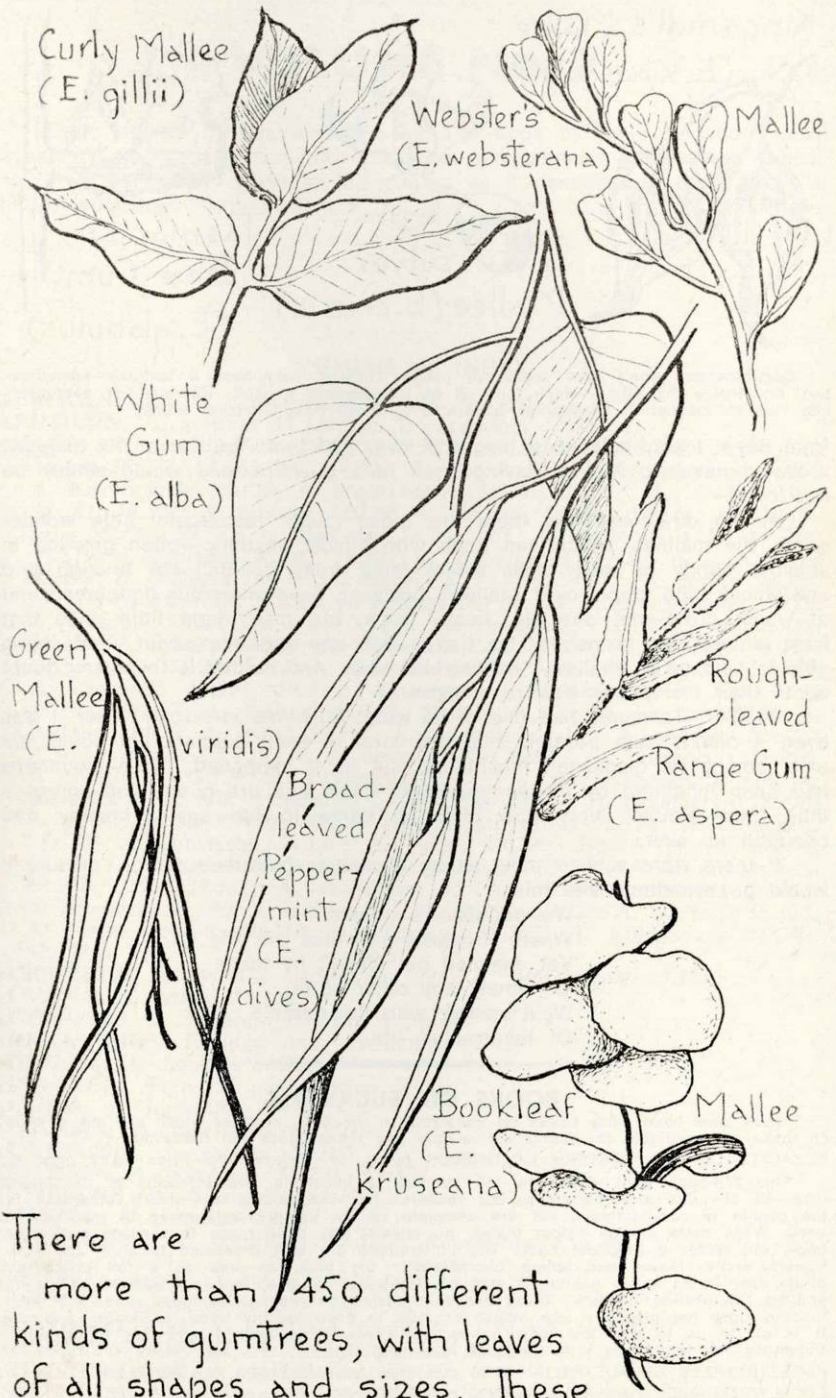
Yet even *this* isn't the end of the story. If bushfires happen to take a holiday, insects never do, and they find the delicate little new shoots of a gumtree very delicious indeed. Should these naked-bud shoots all be eaten away, there is still something else that a gumtree can do, for it has, at the base of every naked bud, a little pad of tissue known as an "accessory bud" which, if called upon, can soon produce several new naked buds.

Every leaf that a gumtree produces throughout its life shelters, at its base, one of these little pads, and even when the leaf falls—as it does after a year-and-a-half or so—the accessory bud isn't lost. A tiny piece of tissue, capable of sending out new buds, grows from the old leaf-axil, and finishes up, on the surface of the wood, as a little eye-shaped depression known as an "epicormic bud".

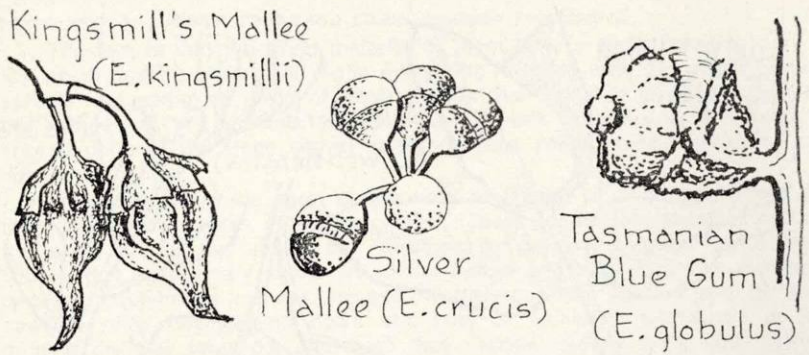
Considering the huge number of leaves that a tree must produce in the course of its life, imagine how many of these tiny epicormic rescue-workers it has, dotted around all over it, ready and waiting to bring it back to life again after calamities such as bushfires! We might indeed call it a tree with a hundred thousand lives—and that would be putting it only mildly.

There we have it, then: lignotubers, naked buds, accessory buds, epicormic buds. Yet the wonderful thing is that these many emergency measures never get out of hand. We never find our gumtrees overburdened with enormous amounts of growth that they cannot handle. This is because, while everything is going well, they produce hormones which hold the other type of growth in check; but of course, if these hormone-producing tissues are destroyed, the emergency growth is automatically released and, like eager reinforcements for an army in trouble, it immediately springs into action.

With so many means of rescue available to them, it's rather surprising that gumtrees do not always take advantage of them. But those that don't, are usually found growing in parts where fires do not normally happen—like the glorious, kingly White Mountain Ash *(Eucalyptus regnans)* which rears up




There are more than 450 different kinds of gumtrees, with leaves of all shapes and sizes. These sketches show a few of them.




Gum-blossoms don't have sepals or petals. Instead, they have a bud-cap—sometimes two, one inside the other—which falls off as the stamens expand. This cap, or operculum, can take all manner of shapes, as illustrated in these three sketches alone.

from deep, loamy soils to a height of over 300 feet. Yet, for all its majesty, it would have no way of saving itself in a bushfire, and would simply be destroyed.

At the other extreme, there are those tough, resourceful little wonder gums, the mallees, which can cope with almost anything—often growing in shallow, sandy or rocky soils where taller trees couldn't get enough grip and would soon topple over. Mallees, however, have enormous lignotubers out of which grow—not one big, heavy trunk, but many light little ones that look almost like branches. So there isn't any problem about their being able to hold on in shallow, "impossible" soils. And neither is there any doubt about their marvellous powers of survival.

In 1967, Tasmania had one of its worst bushfires in history. After it was over, it didn't seem possible that any form of even dormant life could still exist among its blackened mountains. But as it happened, those mountains had been inhabited by mallee-type snow gums and urn gums, and—given a little time—almost every one of them came to life again, healthy and beautiful as ever.

If there were such a thing as an Australian gumtree's song, I'm sure it would go something like this:

We populate a country
Where droughts and fires are rife.
Yet, maimed or "killed" by these
Or almost any other strife,
We'll answer with the miracle
Of resurrected life.

## BOOKS ON EUCALYPTS

There have been many books on Eucalypts in the past, most of which are out of print. Of those still available the Editor can supply and recommends the following:

EUCALPTS OF THE WESTERN GOLDFIELDS *by G. M. Chippendale*—Price $3.57 plus 95c

This 218-page book describes 115 species of Eucalypts, predominantly of the Mallee type—all of value and interest to our readers. The descriptions are clearly presented for the benefit of non-botanists, but are complete to the extent rarely given in this type of book. While there are 69 colour plates, no attempt has been made to produce a "pretty" book, but rather a practical book. The illustrations are well presented to show the buds, flowers, fruits, leaves and where characteristic the bark, as well as a full photograph of the tree in its native habitat. A map of distribution is given for each species. A chapter entitled "Cultivation Aspects" gives excellent advice on propagation from seed, but unfortunately does not give any new advice on how to grow healthy trees in Eastern Australia. It is up to us to find this way, but you will need this book if you are interested in Eucalypts. For tourists to W.A. the book is a must.

FORESTS TREES OF AUSTRALIA—$8.50 plus New Leaflets $10.00 plus 95c post.

EUCALYPTUS BUDS AND FRUITS—$2.00 plus 50c post.

A KEY TO THE EUCALYPTS—$2.50 plus 60c post.

A CLASSIFICATION OF EUCALYPTS *by Pryor & Johnson*—$3.30 plus 65c post.

# VOLUME No. 7

Each volume of Australian Plants is a book in itself presenting most aspects of the propagation and cultivation of Australia's wildflowers. Volume No. 7 is particularly good in this regard as it describes a wide range of plants amenable to cultivation.

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# SIMPLE PROPAGATION

*By D. Shiells, Shepparton, Victoria*

## CUTTINGS

I have only been interested in native plants for two years and propagating from cuttings for one year. I have been most successful initially using a "Stewart Propagator" available here commercially in Victoria. Other beginners might be encouraged to follow my methods.

I have since used a home-made propagator comprising simply an ice-cream container with a polythene bag inverted over the top and secured with a rubber band. This works as well as the commercial job, but does not look as neat. The only disadvantage is that the plastic bag tends to sag with condensation, although this does not affect the cuttings. You might like to contrive some device supported off the ice-cream container to hold up the plastic bag, such as crossed wire hoops. The polythene bag should have some air holes in it.

Clear plastic tubes with 2-3 holes drilled into the base are used to hold the cuttings. My tubes are 5cm long and 3cm diameter and are thrown out by the pathology department of a hospital. There are available small tubular plastic pots that are a little larger and hence not as many will fit in at the one time. The advantage of the clear plastic is that you can see the roots forming on the cuttings, as these are placed against the sides of the tube.

The cutting mixture is coarse sand and peat moss at a ratio of 4 to 1. This mixture is placed into the tube and immersed in water for 30 seconds. A nail is used to push holes into the medium down the sides of the tubes and the cuttings inserted into the holes. The number of cuttings per tube depends on the size of the cuttings—three to four being common.

The cuttings are prepared in the usual way, 7cm to 10 cm long, though 5cm or less are successful with small plants such as *Lechenaultia*. Remove all the leaves except the top 1-2cm of growth and cut the butt cleanly below a node (where a leaf has been removed) with a razorblade. A hormone powder (medium wood if available), readily available at most garden suppliers, appears helpful. Just dip the cut end of the cutting in and blow off the excess, leaving a film over the bottom ½ cm of cutting.

The tubes are placed in the ice-cream container, which has a small amount of water in it, no deeper than 2mm at any time. A plastic bag is slipped over the top to form a dome over the cuttings and secured around the ice-cream container with an elastic band.

The best results seem to be obtained from maximum light and a temperature of 20-28°C. In the winter months my propagators are placed on our kitchen windowsill, inside and facing east, receiving the morning sun. For the rest of the year they are outside, out of direct sunrays but in good light.

The propagators are checked regularly for rooting and dead material is removed. If you do not have clear tubes this is not so easy. Some people give the cuttings a gentle tug, but it would probably be all right to invert the pot and tap the "ball" out to inspect after a few weeks, replacing carefully if good rooting has not been established. Cleanliness is important. Once a week the tubes are removed and the container cleaned thoroughly with hot water. When the tubes are replaced the foliage is sprayed with "Benlate". This is a fungicide and is available in small sachets from most hardware stores, although most fungicides such as "Captan" would do. A sachet makes a gallon of spray when mixed with water. My cheap atomiser spray takes a little less than a pint to fill and that lasts about six weeks..

The containers should be kept clear of other crawling wogs from the ground.

When a cutting has rooted, the tube is immersed in water for 30 seconds, inverted on removal and the base tapped, the contents will slide out easily.

The cuttings with roots should fall away from the cutting mixture, although if intertwined if they were in too long, washing the mixture away under a tap will free the cuttings from each other.

The cutting is then potted out in a container with topsoil and river sand mixture, say in a 10cm pot or bag. A perforated bag is placed over the cutting and container for a week, and then the plant is hardened outside for another few weeks before planting.

Advantages of the system are:—

(1) The most inexperienced beginner is assured of results without fancy facilities.
(2) The roots can be seen when the cutting has started if clear tubes are used.
(3) The propagator is portable and can be moved to suit the sun or taken inside behind a window in winter.
(4) Cuttings can be removed and replacements made without disturbing other tubes.
(5) If necessary the propagator can be left unattended for at least two weeks.

Species of the following genera have been rooted in this way: *Boronia, Banksia, Bauera, Brachycome, Callistemon, Calothamnus, Correa, Darwinia, Dampiera, Eremophila, Eremaea, Grevillea, Hibbertia, Kunzea, Lambertia, Lechenaultia, Micromyrtus, Melaleuca, Myoporum, Oxylobium, Prostanthera, Pultenaea, Regelia* and *Verticordia.*

The rooting time varies. Sometimes species may not root, but next time all cuttings of that species will root, due possibly to the time the cuttings were taken. Most cuttings set during the cooler months take from two months upwards. Last summer some cuttings rooted within a week, but the overall losses were higher.

## SEEDS

It is nice to see the seeds first shoot, and you know then it is good seed and is going to grow. It saves months of futile watering of a seed-tray or pot with sterile seed. My method is particularly successful with larger seed, especially pre-treated hard seed such as Acacia and the pea-flowered plants.

Soak papier-mache egg-containers in water until they hold the moisture—up to 12 hours. Drain, spray with Benlate and drain again.

Place seeds on the bottom of one half of a container—up to 10 in each egg receptacle, depending on the size of the seed. With the top of the container detached from the bottom and reversed, sit it snugly over the bottom half, pressing the seed between the two halves. Secure with two elastic bands and place in a plastic bag, held shut with an elastic band to seal in the moisture.

The container in the plastic bag is not placed in sunlight, but on a bright airy shelf inside the house.

The seeds usually shoot in one or two weeks. When the root is twice the length of the seed place on top of soil with the root pointing down, in a 10cm pot containing two parts topsoil to one part of river sand. Cover the seed to a depth of 2-3 times its diameter, with washed coarse sand, and keep moist.

EDITOR REPORTS ON THIS METHOD:

I hope to have a more complete report in the next issue. I had good success with this method and make the following suggestions:

1. With the new egg boxes in Sydney you will need two to obtain a pair of 12 wells.
2. With seed that germinates readily after treatment, see opposite, results are rapid and you have seed sprouting in all directions. The use of the fungicide is hardly necessary.
3. I put in all the seed I had of some species, up to 40 if they fitted, and removed them as they germinated.
4. You will need to inspect every few days so that the shoots do not get long and twisted or dive into the cardboard egg box.

TREATMENT OF SEED BEFORE PLANTING.—Editor

There is much to be learnt about the treatment and sowing of seed. I am hoping country people will have taken note of our appeal for seed in the last issue, and we will have a good range of seed coming in for study. It would seem that for germination purposes seed may come into categories which include:—

(1) The fine seed of species in the family Myrtaceae, which includes the eucalypts, bottle brushes (*Callistemon, Melaleuca, Calothamnus*), the pompoms (*Kunzea* and some *Melaleuca*), etc. This seed is almost as small as dust. If sprinkled on a pot containing a clean washed sand, lightly covered with more sand, and kept very moist by frequent watering or standing the pot in a tray of water, it will germinate freely. This is good news for people with gardens with good soil to a heavy clay, as these plants are easy to grow and flower well. Seed is readily available for a good range of species, as many hold their seed in capsules on the branches of the bushes. Simply remove last year's capsules, place in a paperbag to be left on a windowsill and you will get more seed than you can use. As always there are exceptions, but usually the bushes will not flower as well in gardens of light soil without continued feeding and pruning. The index to Vol. 7 in this issue refers to many species that will grow in a wide range of rigorous conditions. The plant size ranges from dainty little bushes such as *Eremaea* to the mighty Eucalypts. This issue presents some small Eucalypts for your landscaping effects.

(2) The hard seed of the family *Fabaceae*—this includes the pea-flowered plants and of the *Mimosaceae*, that comprises principally the Wattles. Seed of the wattle is fairly readily available, but seed of the pea-flowers sets and falls in early summer, and we need some members to collect it. However, there is some seed for purchase commercially, and as it can be germinated readily there is once again no excuse for members not to spend a little time to grow a good range of plants for the garden. The objective is to get water through the hard outer coat of the seed, so that the dormant seed inside can swell and grow. The simplest method is to place the seed in a cup and pour boiling water on it. After a few days the seed will swell and be ready for planting. Use the egg-carton method described opposite for certain results.

(3) Seed that appears to germinate quite readily without treatment. Using a method such as the egg-box method we need to obtain a list of these. Much seed is not viable and will not germinate, and this seed is not readily detected by the beginner. If proper records were kept we would get a reasonable idea when to give up waiting in some cases. See Seed Germination Reporting Scheme on page 34.

(4) As with the hard-coated seed above, some seed is protected either by a protective sheath or by a chemical substance on its jacket. A classic example is the beautiful *Eriostemon australasius* that has defied reliable germination for years and succumbed only to repeated washing and cleaning of its shell as described on page 256 of issue No. 50. There are reports of continued frustration in the germination of *Eremophila* seed, but when the Emu eats the fruit and passes the seed, small plants spring up from the droppings. These cases and the frustration of nature by artificial means to germinate the seed need to be properly recorded. See "Seed Germination Reporting Scheme" on page 34.

(5) Some seed is protected and no doubt distributed by a fluffy or feathery cloak. Some when it settles, if viable, readily germinates, but others, and unfortunately these include many very beautiful shrubs, defy us to germinate them. We need a visual method, such as the egg-box method above, to study this problem, so if anyone has a similar method that has proved successful then please report it. Meanwhile let us report our results as announced on page 34.

## STUDY GROUPS

ORCHID STUDY GROUP

Those interested in orchids may like to join our Orchid Study Group by writing to Brian Muffet, 23 Marulda Street, Aranda, A.C.T. 2614.

BANKSIA STUDY GROUP REPORT

At a cost of $1.00 plus 20c postage to meet expenses, the third Banksia Group Study Report (45 pages) may be obtained by mail only from the group leader, Trevor Blake, 12 Little John Court, Vermont, Victoria, 3133. This report has a complete description of all Eastern *Banksia* species together with leaf prints and maps of their distribution. There are detailed accounts of frost and salt tolerance, germination and grafting trials. The location of W.A. species is also given. Seed is available for members who wish to join this group.

EUCALYPTUS STUDY GROUP

This group has been reformed under the leadership of L. J. Daniels, Research Station, Box 201, Biloela, Qld., 4715. Readers wishing to join in the work of this group may contact Mr. Daniels for advice, seed, etc. All contact is by correspondence and enthusiasm, not experience, is the only requirement for a new hobby.

FERN STUDY GROUP

In spite of a few false starts, the fern group is now very active. Mr. Steven Clemesha has now accepted the leadership of this group and may be contacted by mail at 18 Wesson Road, West Pennant Hills, N.S.W., 2120. If you are interested in growing ferns and learning about them then join the group.

BLANDFORDIA STUDY GROUP

We have a group studying Christmas Bells. Seed is readily available. Here is a group a beginner can join as Christmas Bells can even be grown in a pot. Who will help Don McNair, 42 Ingall Street, Mayfield, N.S.W. 2304, to grow bigger and better Christmas Bells?

## MINT BUSHES

To illustrate a proposed book on the genus Prostanthera—the Mint Bushes—we urgently need good colour slides. Specimens of the following species should be sent direct to G. W. Althofer, 60 Thornton Street, Wellington, N.S.W., 2820; *Prostanthera linearis, P. decussata, P. altro-violacea, P. ringens, P. canaliculata, P. scutata, P. tysonii, P. wilkieana, P. eckersleyana, P. campbellii, P. nudula, P. chlorantha, P. rugosa, P. staurophylla, P. magnifica, P. arenicola* and *P. albo-hirta.*

If any readers know where there will be a flowering specimen next season, please advise George Althofer.

# GROWING GLOSSODIA

*by M. Clements*
*Canberra Botanic Gardens*

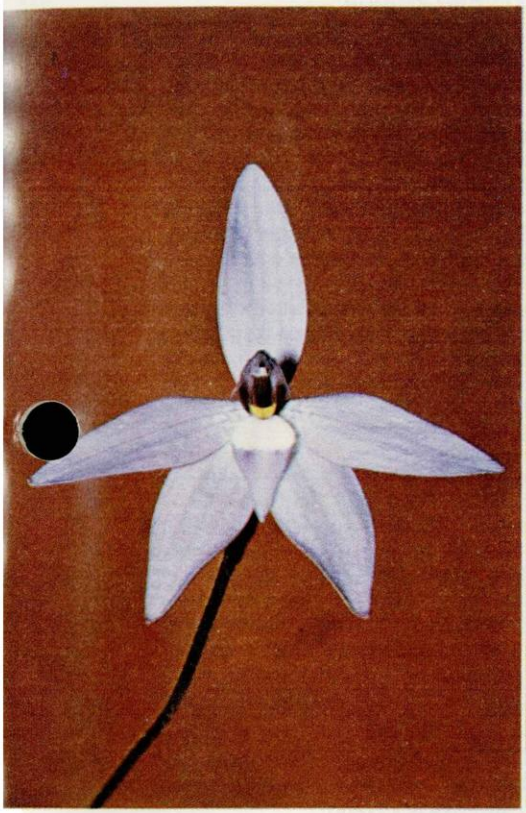
The genus Glossodia R.Br. is a small one having but two species, both of which are easily recognisable and distinguished. The distribution varies, with *G. major* having the greatest range extending from S.E. of Queensland to Eyre Penninsular in South Australia, while also occurring in Tasmania. *G. minor* is more limited in its range, only occurring in the coastal strip from S.E. Queensland to Eastern Victoria.

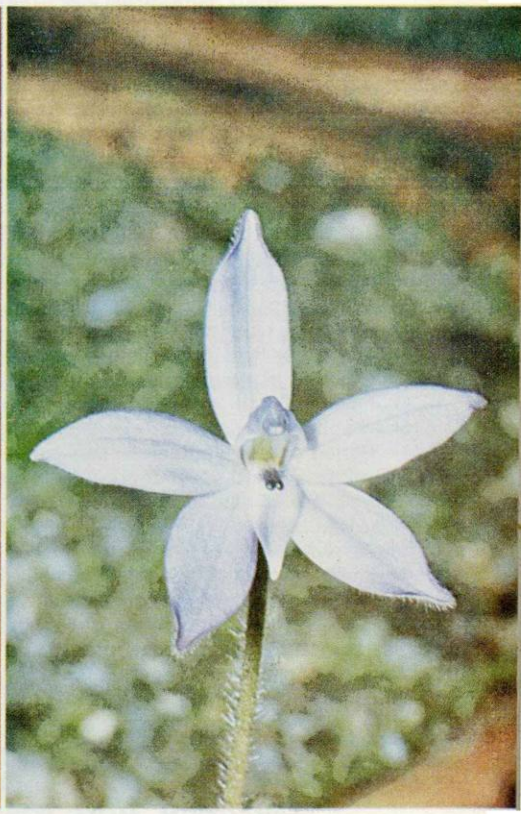
The two can be readily separated mainly by the differences in the basal appendages or calli on the labellum. *G. major* has a single appendage which divides towards the end and is generally yellow in colour. *G. minor* has two basal callic or appendages which are dark purple in colour and run parallel to one another, ending abruptly in a globular shape.

Both species are rarely grown in cultivation. However, unlike most other terrestrial species they do not multiply vegetatively and it is therefore not necessary to provide for expansion when planting. I find that a 6" plastic pot is an ideal size for growing both species. Good drainage is essential and should be attended to before adding the potting mix.

The two species can be grown outside in the open but do better under shade cloth. Care should be taken not to allow them to get too wet or have them in humid conditions as this will lead to rotting off at ground level.

*G. major* R.Br. can be grown in various mixtures. Washed river sand mixed with compost in equal amounts, or slightly more sand than compost, and a thin layer of leaf mould or eucalyptus saw-dust on top, seems to produce the best results. There are varying colour forms in which this orchid occurs, ranging from quite a deep purple to pure white. These produce an attractive display if properly cultivated.





(On left) *Glossodia major* R.Br. clearly showing the horn like basal calli, which are usually yellow, and its more elegant appearance which distinguishes it from *G. minor*.

(On right) *Glossodia minor* R.Br. In comparison has two dark basal calli running parallel to one another along the labellum. The labellum is also more abruptly turned down than that of *G. major* as well as being stouter in all the segments of the flower.

*G. minor* R.Br. can be grown in a similar mix as *G. major* but seems to prefer a well drained sandy soil with leaf mould on top. As with *G. major*. The leaf mould should only be applied in summer while the plants are dormant. Though generally smaller in flower size these plants still make an attractive display when properly cultivated.

Finally, it should be remembered that in most States orchids are protected by law and permission in writing is needed before collecting can take place.

## COLOUR SLIDES OR PHOTOGRAPHS

To adequately illustrate "Australian Indigenous Orchids—Part 2" in 1977, which will describe and illustrate the remaining orchid species, that is the terrestrial of the southern half of Australia, it will be necessary to have hundreds of colour prints of the orchids, both close-up of the flowers and of the plant. Colour prints are now easier to work with but slides can be used. We can meet film expenses if competent photographers will go to the trouble—contact editor.

## SEED GERMINATION RECORDING GROUP

We intend to record any information we can on seed germination thanks to the offer of Nancy Evans, 49 Dandenong Avenue, Carlingford, N.S.W. 2118.

The reports by Tony Cavanagh in our No. 59 issue of his germination results, following hundreds of trials, has led to many enquiries as to why this sort of information is not given more prominence. It is thanks to the perseverance of Tony and his meticulous recording that we are prompted to take another look at our objectives and query our successes. Tony is too valuable a worker to be tied with this lengthy Australian-wide study (he is leader of our Dryandra Study Group—Mr Tony Cavanagh, 2 Wilkinson Street, Ocean Grove, Victoria, 3226), and we are indebted to Nancy Evans for offering to take on this recording.

Now it is up to all of us to prepare proper records and report:—

(1) Name of species planted and source of seed. Age if known.
(2) Any prior treatment before planting.
(3) Number of seeds planted (estimate for fine seed).
(4) Facilities and method used, soil, etc.
(5) Number of days between planting and germinating.
(6) Period of year planted and number that came up. Add any other information that you consider relevant. Report on all the methods you have heard used.

Those readers who are in the business commercially, will you be patient and helpful when Nancy writes to you? If you have any trade secrets you want to keep to yourself to preserve your business, then save them, but see they are recorded before you "kick on"; but you can contribute a lot in many ways. Not that we will look forward to our nurserymen "departing", as I feel sure that those in the industry are as dedicated as any of us and they have our sincerest appreciation for all they are contributing. I hope this scheme will stimulate home propagation, but I have no doubt it will also increase the nursery business.

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REPORTS OF INTEREST—I am sorry, their origin has been lost—Editor.

## SPHAGNUM MOSS FOR PROPAGATION

It has been known for some time that sphagnum moss improves the germination of seedlings. In part the favourable response is due to physical characteristics such as good aeration, and good moisture holding capacity. There is also apparently a fungistatic effect of sphagnum moss because damping-off usually does not occur when sphagnum moss is used as a germination medium. We were curious about the fungistatic agent and we made a number of extracts to see if we could separate it from the sphagnum moss. We found that there was in fact a substance, which could be extracted from the sphagnum moss, which prevented the growth of damping-off organisms. We also found associated with the sphagnum moss a bacterium, which when grown under culture conditions, produced a substance which inhibited the growth of organisms such as *Pythium*, and *Rhizoctonia* which can cause damping-off in young seedlings. It may be that the bacteria is the actual source of the fungistatic material associated with sphagnum moss. It is commonly recommended that the sphagnum moss should not be sterilized prior to its use because much of the fungistatic effect is lost. It could well be that the loss is due to the killing of the bacteria in the sterilization process.

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## NATIVE GRASSES

To cope with the wide range of climatic conditions, often very harsh, usually with a need to conserve water, it is desirable that we take a good look at our native grasses for ground cover or lawns. Will readers please advise the editor of any experience in this regard or of any species they consider could be suitable.

# NATIVE GRASSES

## FUTURE HORTICULTURAL SUBJECTS?

*by R. H. Powell, M.A. (Agric.); (Line drawings by T. E. Frey)*

Ever more insistently people ask "how about our Australian native grasses for lawns?" Before discussing likely species it is necessary to consider the reasons why these grasses have not yet been used for this purpose. Firstly most Australian gardeners, in line with European concepts, consider a lawn unworthy of the name unless it is always green and resilient, which means that a prejudice exists against the browner hues of our rather wirey native grasses. On the debit side also is the fact that the exotic grasses, like perennial rye grass, the fescues, the bents and the blue grasses are preferred because all establish very rapidly and reliably and in appropriate mixes knit especially well together to form a turf; their seed is plentiful and inexpensive, whilst their culture is well understood after hundreds of years of growing them. These are the major reasons presently favouring the exotics to the exclusion of our native grasses.

To redress the balance between the exotic and native grasses the possible advantages of the latter must also be stated. Our native grasses are generally better adapted to survive the drought stress of our low and seasonally poorly distributed rainfall, which is a "built in" advantage that has accrued to them over thousands of years. These grasses, once we learn more of their culture, obviously have potential for areas where irrigation is unavailable or severely restricted. Presently most of the exotic turf grasses fail in these conditions.

Aesthetically, grasses like *Themeda australis* (Kangaroo grass), provide an excellent contrast, both colour and texture wise, to the grey and bluish green of the Australian native flora, particularly the gums. In such situations lush swards of species like Perennial Rye grass and White Clover look very inappropriate.

The extent to which the culture of some of our native grasses will assist in conserving our resources remains to be seen. Certainly they will grow with the addition of less fertilizer than the exotics; indeed a heavy application of phosphate is perhaps the best way of getting rid of them. Our native species have adapted themselves to growing in phosphate deficient Australian soils unlike the exotics.

Since the Australian native grasses produce less bulk of top growth than the exotics mowing of the former may be relatively infrequent. This is likely to prove a useful advantage especially for low maintenance areas. Indeed several native grass species look well uncut, particularly Kangaroo grass, Red Leg and Stipa, though in areas much frequented by the public the 'unshorn' look may be unacceptable. However if repeated mowings are made the native grasses may disappear, some being particularly susceptible to close cutting. Obviously much remains to be learnt about cutting height and frequency tolerances of the native grasses.* There is indeed much room for experimentation by the Australian plantsman which must begin by his obtaining enough viable native grass seed for a trial. By experimenting a demand will be created on the commercial firms to start marketing seed of suitable native grass species.

Which of our native grasses have the greatest potential for garden and amenity use? It is generally agreed that *Themeda australis* (Kangaroo

* This forms a part of the current study of the utilization of native grasses for amenity purposes now being undertaken in Canberra by CSIRO Plant Industry and the Department of Capital Territory on behalf of NCDC.

Grass) is likely to be the most desirable and interesting of our native grasses for garden and amenity use. Other grasses to be considered here are *Bothriochloa macra* (Red Leg), *Microlaena stipoides* (Weeping Grass), *Stipa spp.* (Corkscrew or Spear grasses) and *Danthonia spp.*

*THEMEDA AUSTRALIS* (Figure 1)

*Type of Grass:* A dense tuft-forming species which grows mainly during the summer months. It is hardy for it will withstand frosts occurring up to the 1000 m. level.

*Distribution:* Kangaroo grass is found in many parts of Australia and also in the Highlands of New Guinea; it may be synonymous with the South African occurring *Themeda triandra.* Its wide distribution demonstrates its ability to adapt to very different environments.

*Distinctive Characters:* Both the leaves and the flowering heads are eye-catching. The former, which are harsh to the touch and up to 25 cms long by 4 mm broad, have a prominent keel along the midrib.

The flowering heads are noticed because of their chaffy pointed bracts which enfold clusters composed of groups of sterile spikelets with a single fertile one interposed between them, whose inner husk bears a dark brown corkscrew shaped bristle, 4-6 cm long, and whose base is needle sharp and carries many dark brown silky hairs. When in flower the culm may be up to 1.4 m long, though there is considerable variation in the dimensions of all plant's parts according to ecotype.

*Aesthetic Features:* The foliage is at its best during spring and summer when it becomes an attractive mid-green or in some types a pale bluish green. In droughts and autumn the uppermost part of the leaves take on a distinctive purple brown tinge, whilst in wet seasons the new growth following mowing is yellowish green. In the winter months the foliage becomes brown and almost dormant. When uncut the purple flowering stalks carrying the heavily loaded inflorescences are a very appealing sight especially when swayed by the wind.

*Likely Uses:* Kangaroo grass, is unlikely to be of use for lawns because it will not survive close mowing or hard wear. However it should have a ready use in the native garden and for dryland areas like Reserves, Nature Trails, roadsides and the like.

*Problems to be overcome:* The yield of seed per plant is very low and it does not usually germinate immediately. Much more knowledge of the requirements of Kangaroo grass in the field is required to ensure reliable establishment. It is certainly a slow starter which makes it subject to weed competition especially from rapid growing annual grasses like *Digitaria sanguinalis* (Summer Grass). The seed would best be sown in late spring or early summer because it has a high temperature requirement for germination.

From preliminary experiments in the Research area of Canberra's City Parks Administration it has been shown that a clump of *Themeda australis* may be divided into a number of sections most of which will grow, which provides speedier establishment. Investigations into the growing of Kangaroo grass in mixtures with other Australian native grasses like *Bothriochloa macra* are also being made in the current study.

If nature has been able to clothe so much of Australia with this handsome grass it should be possible to know more exactly its requirements. When this is done Kangaroo grass will find a horticultural niche.

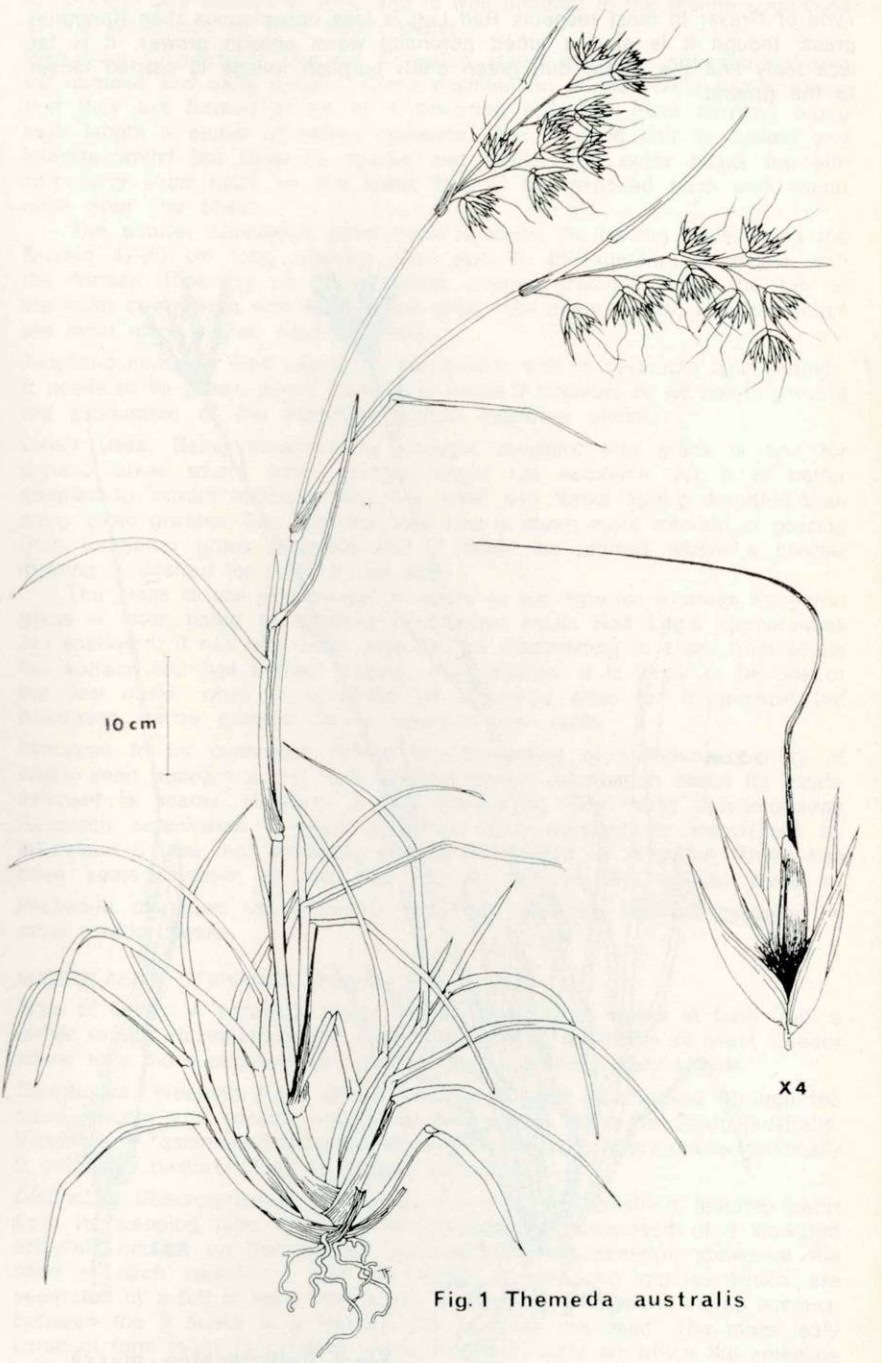


Fig. 1 Themeda australis

*BOTHRIOCHLOA MACRA* (Figure 2)

*Type of Grass:* In most respects Red Leg is less conspicuous than Kangaroo grass, though it is also a tufted perennial warm season grower. It is far less leafy and the rather dull green often purplish foliage is carried closer to the ground.

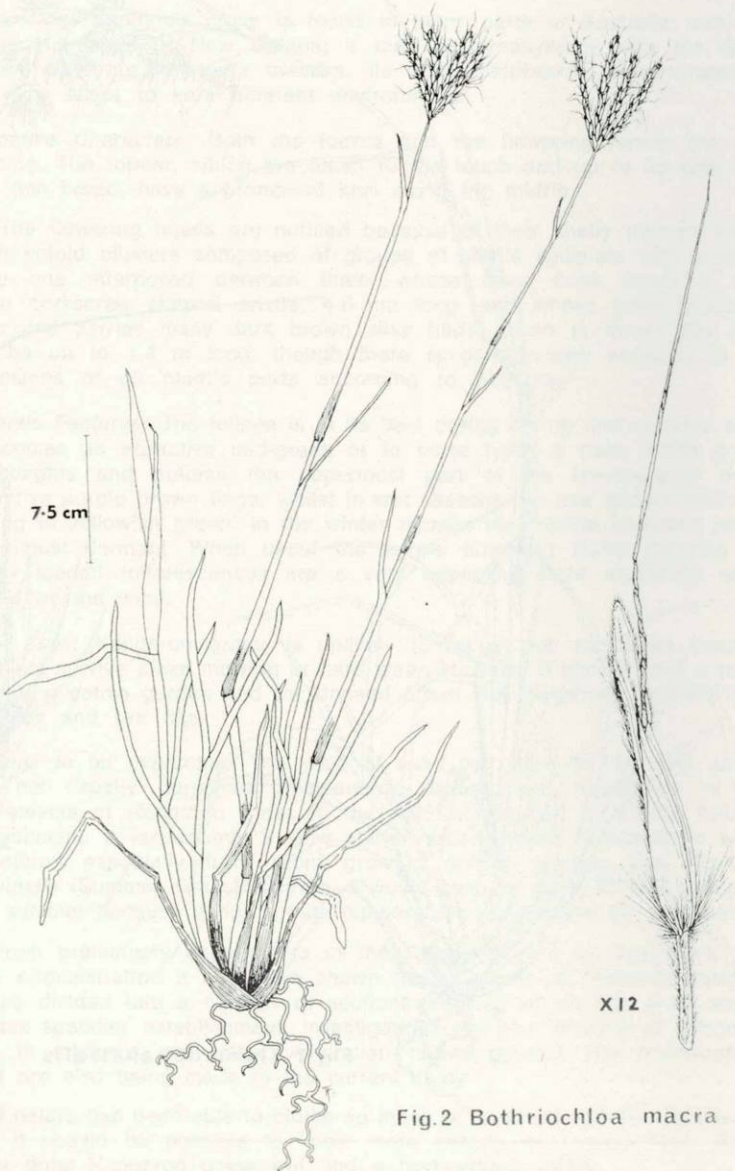


Fig.2 Bothriochloa macra

*Distribution:* It has a considerable range extending from south east Queensland to northern and eastern Victoria and is well adapted to the testing conditions of the tablelands of New South Wales.

*Distinctive Characters:* The red flowering stalks are very noticeable during the summer and early autumn. Close examination of the flower heads shows that they are formed of up to 4 flowering branches each carrying along their length a series of paired spikelets. One of each pair is stalked and infertile whilst the other is sessile and fertile. The outer husks are stiff and carry short hairs on the lower half of the exposed back and longer ones near the base.

The shorter concealed inner husk is found by tracing back along the twisted 17-20 cm long 'whisker like' awn to the junction it makes with the former. Ripening of the spikelets occurs gradually from the top of the culm downwards with seed being shed over many weeks. The internodes are most often angled near the base.

*Aesthetic Features:* Red Leg looks particularly well in savannah type settings. It needs to be grown where mowing is timed if possible so as not to prevent the production of the attractive purple flowering stalks.

*Likely Uses:* Being exceptionally drought resistant this grass is one for dryland areas where other grasses might not establish, for it is better adapted to extract moisture from the lower soil levels during droughts than many other grasses. The fact that Red Leg is much more tolerant of grazing than Kangaroo grass suggests that it might be utilized where a shorter mowing is desired for most of the year.

The grass is less preferential in regard to soil type for whereas Kangaroo grass is often noted as growing in discreet areas Red Leg's appearances are scattered; it has also been observed as establishing in areas from which the surface soil has eroded through over grazing. It is likely to be one of the few easier ones to establish on disturbed sites for in general the Australian native grasses rarely colonize raw soils.

*Problems to be overcome:* Whilst the harvesting of sufficient quantity of viable seed appears to be fairly straightforward information about its establishment is scanty. However a trial sowing by City Parks Administration Research established 7 years ago has been satisfactorily maintained by infrequent 6 cms high mowings without fertilisation or irrigation. There has been some invasion of this 250 sq. m. plot in the moister parts by *Paspalum dilatatum* but generally the Red Leg has resisted invasion by other exotic weeds.

*MICROLAENA STIPOIDES* (Figure 3)

*Type of Grass:* A perennial warm season grower that varies in form from a rather weakly rhizomatous one producing variable quantities of erect slender stems to a more compact one producing low growing leafy shoots.

*Distribution:* Weeping grass grows from south east Queensland through the more eastern and coastal regions of New South Wales to South Australia, Victoria and Tasmania. It is native also to New Zealand, where characteristically it colonizes pasture close to hedges or scrub.

*Distinctive Characteristics:* This grass has few distinguishing features apart from its weeping type flowering panicles loosely composed of 1 flowered spikelets carried on filament-like pedicels. Lens examination shows at the base of each spikelet a pair of minute 1 mm long glumes which are separated by a tuft of hairs from a pair of awned 2-3 cms long sterile lammas; between the 2 husks is a thinner one covering the seed. The more leafy compact form tends to produce weak stemmed culms on which the spikelets are almost concealed by the uppermost leaf sheaths. Superficially weeping grass resembles a coarse type of Bent grass.

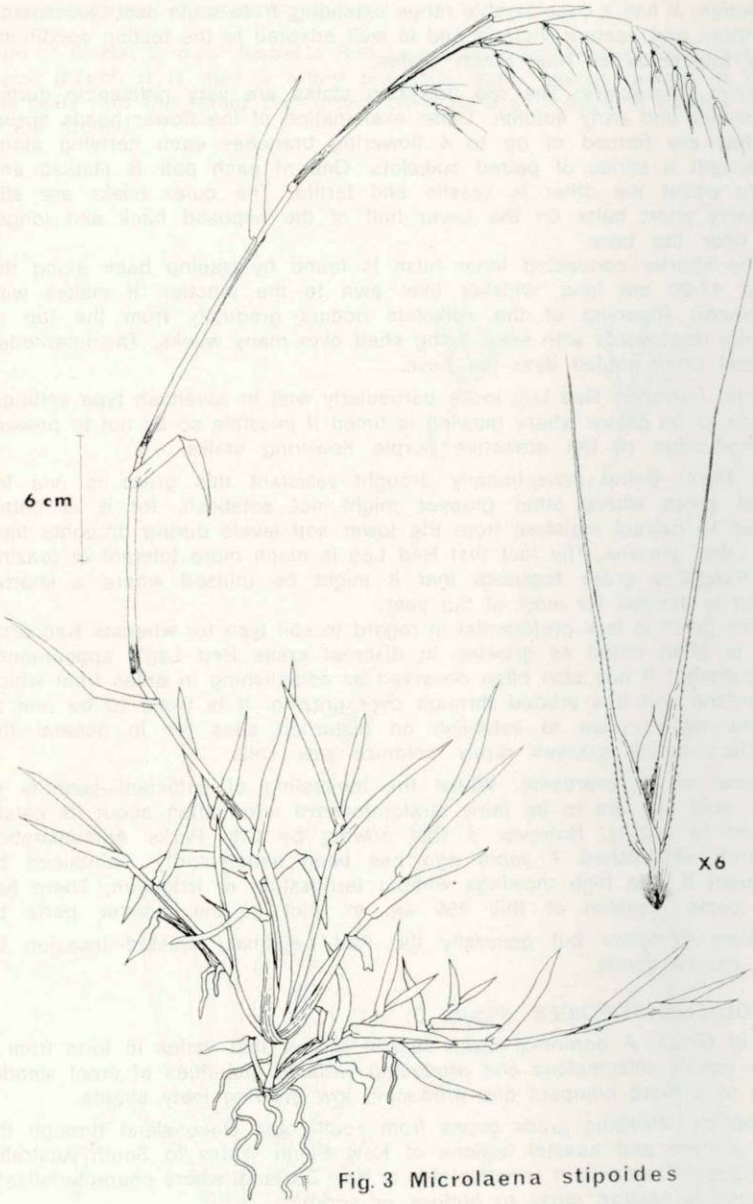


Fig. 3 Microlaena stipoides

*Likely Uses:* The grass prefers more fertile soils and likes the moisture and shade it finds in thinned forests. Weeping grass will certainly fail on dry exposed sites, but it has distinct possibilities for woodland areas and similar shaded sites.

*Problems to overcome:* Whilst by no means a prolific seeder it produces a useful proportion of viable seed, which has been offered by the New Zealand seed trade. A trial plot of weeping grass has been mown and maintained over a number of years in Canberra but it has gradually been invaded by Couch, Oxalis and Summer grass.

A more robust rhizomatous selection is required which is capable of producing a closer knit turf to exclude faster growing weeds. In Canberra *Microlaena stipoides* has been noted as being brown and dormant each winter for periods varying from 105-120 days, but this may vary with ecotype selection.

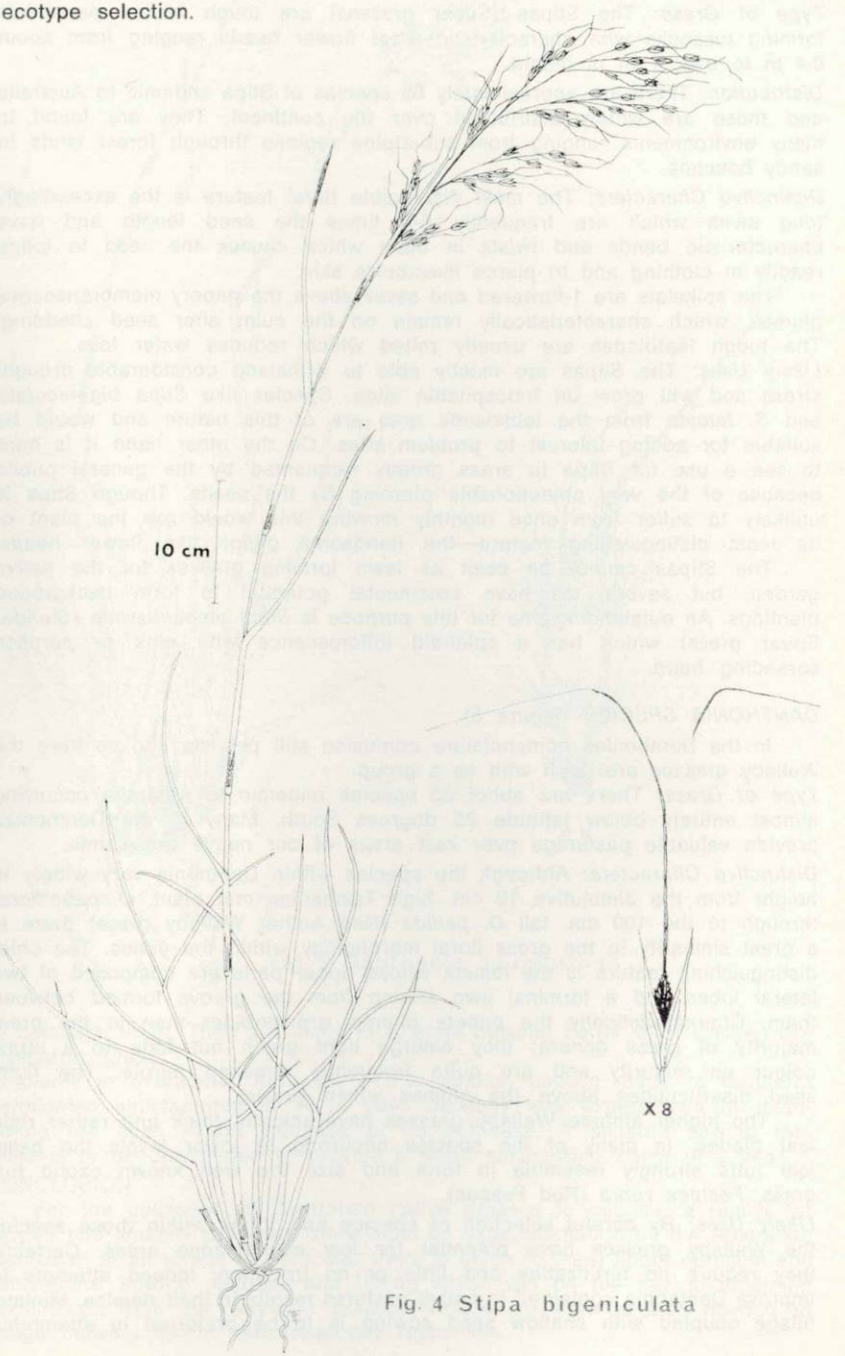


Fig. 4 Stipa bigeniculata

*STIPA SPECIES* (Figure 4)

These grasses are dealt with generically rather than specifically because much confusion still exists over nomenclature. Fortunately the species have broadly similar morphology and growth habits.

*Type of Grass:* The Stipas (Spear grasses) are tough leaved perennials forming tussocks with characteristic erect flower heads ranging from about 0.4 m to over 1 m in height.

*Distribution:* There are approximately 55 species of Stipa endemic to Australia and these are widely distributed over the continent. They are found in many environments ranging from sub-alpine regions through forest lands to sandy beaches.

*Distinctive Characters:* The most discernible floral feature is the exceedingly long awns which are frequently 5-6 times the seed length and have characteristic bends and twists in them which causes the seed to lodge readily in clothing and to pierce livestock's skin.

The spikelets are 1-flowered and sever *above* the papery membranaceous glumes, which characteristically remain on the culm after seed shedding. The tough leafblades are usually rolled which reduces water loss.

*Likely Uses:* The Stipas are mostly able to withstand considerable drought stress and will grow on inhospitable sites. Species like *Stipa bigeniculata* and *S. falcata* from the tablelands area are of this nature and would be suitable for adding interest to problem sites. On the other hand it is hard to see a use for Stipa in areas greatly frequented by the general public because of the very objectionable piercing by the seeds. Though Stipa is unlikely to suffer from once monthly mowing this would rob the plant of its most distinguishing feature—the handsome plume like flower heads.

The Stipas cannot be seen as lawn forming grasses for the native garden, but several do have ornamental potential to form background plantings. An outstanding one for this purpose is *Stipa elegantissima* (Slender Spear grass) which has a splendid inflorescence with pink or purplish spreading hairs.

*DANTHONIA SPECIES* (Figure 5)

In the Danthonias nomenclature confusion still persists and so here the Wallaby grasses are dealt with as a group.

*Type of Grass:* There are about 33 species endemic to Australia occurring almost entirely below latitude 25 degrees South. Many of the Danthonias provide valuable pasturage over vast areas of our native grasslands.

*Distinctive Characters:* Although the species within Danthonia vary widely in height from the diminutive 10 cm. high Tasmanian mat plant, *D. pauciflora*, through to the 100 cm. tall *D. pallida* (Red Anther Wallaby grass) there is a great similarity in the gross floral morphology within the genus. The chief distinguishing feature is the lemma whose upper parts are composed of two lateral lobes and a terminal awn arising from the groove formed between them. Characteristically the papery glumes are broader than in the great majority of grass genera: they emerge light green but fade to a straw colour on maturity and are quite frequently streaked purple. The fluffy seed disarticulates above the glumes which persist.

The higher altitude Wallaby grasses have smooth, thick and rather rigid leaf blades. In many of the species occurring at lower levels the basal leaf tufts strongly resemble in form and size the well known exotic turf grass, *Festuca rubra* (Red Fescue).

*Likely Uses:* By careful selection of species and forms within those species the Wallaby grasses have potential for low maintenance areas. Certainly they require no fertilization and little or no irrigation; indeed attempts to improve Danthonia contained in native pastures results in their demise. Minimal tillage coupled with shallow seed sowing is to be preferred in attempting

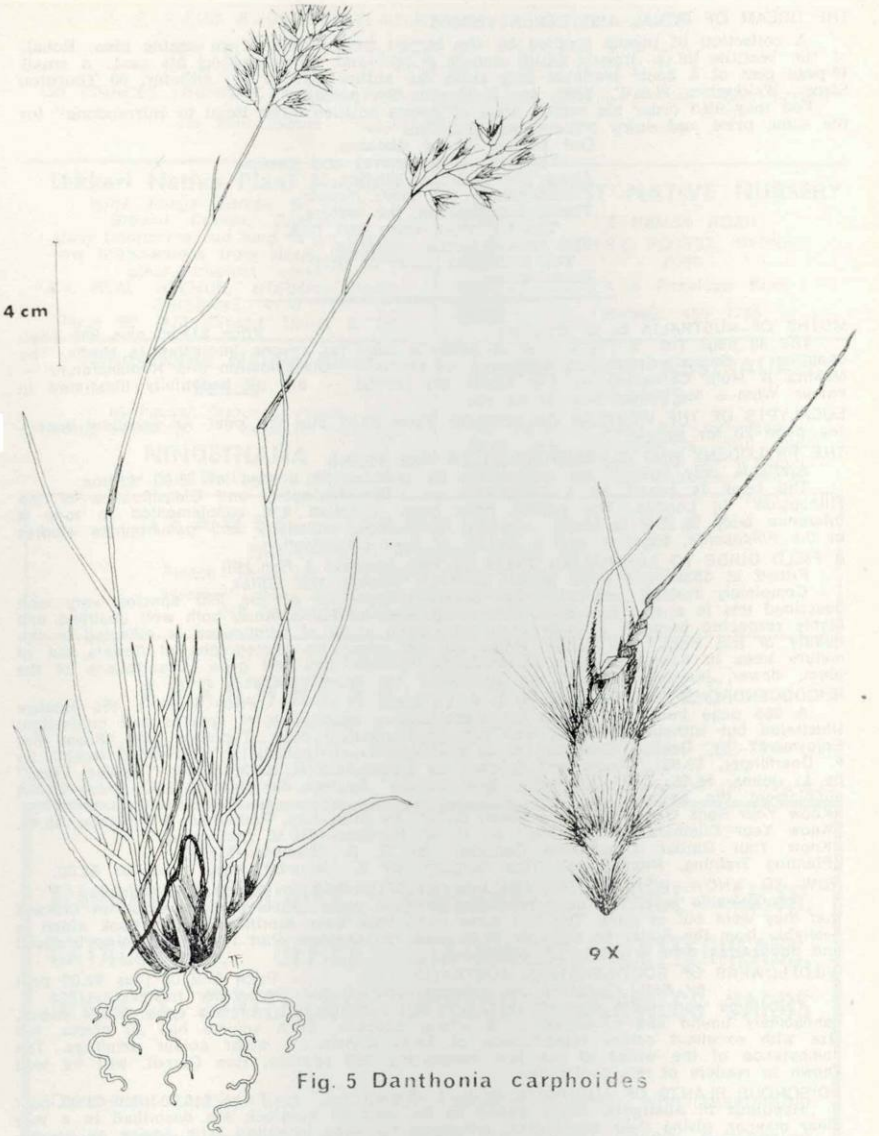


Fig. 5 Danthonia carphoides

to establish them. They are likely to tolerate mowing better than species like Kangaroo grass.

*Problems to overcome:* Although a trial autumn sowing made in Canberra germinated satisfactorily in 10-15 days difficulty was experienced in distributing the seed evenly because of its fluffiness. A suitable sowing rate remains to be determined to provide a weed surpressing cover in a year.

CONCLUSION

For the utilization of Australian native grasses to become a reality for garden and amenity purposes there must be experimentation by the Australian plantsman at all levels. In particular there is much to learn about optimum soil cultivations, sowing methods and timing which will be the key to obtaining germination from our wayward grasses. Follow up work is also needed to gauge mowing height and frequency responses.

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***EUCALYPTUS TETRAPTERA*—see page 11**

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