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Photography by Frank Hurley

Blocks by courtesy of John Sands Pty. Ltd.

STYPHELIA TRIFLORA

EPACRIS FOR GARDENS

by F. J. C. Rogers

Victoria became the first State to officially recognise a floral emblem when on the 11th November, 1958 the pink form of *Epacris impressa* (Common Heath) was proclaimed by the State Government. Common Heath is widely distributed throughout the southern part of Victoria and extends into South Australia as far as the Mt. Lofty Ranges, into New South Wales to about the Clyde River and to Tasmania. It is commonly found on moist heathland and other areas which may be quite wet during winter but equally dry during summer.

It is easy to determine if a heath specimen is *Epacris impressa* because of the five small indents at the base of the floral tube. It is these indentations which give the plant its specific name and as it is the only species in the genus with this characteristic it should be easily identified.

Common Heath forms a slender shrub up to 3 feet high with many slender tough stems and numerous small pointed leaves. The flowers may be in a dense cluster or sparsely spread along one-side of the stem. They appear over a long period from May to November. These flowers vary from white through pink and orange to deep crimson. Plants which have white flowers are usually earliest flowering.

The growing of Common Heath in gardens has, at times, proved difficult because plants often do not live long. Better flowers and longer life can often be obtained by hard pruning. This may be done by cutting the flowers and using them for decorative purposes, or by pruning hard after flowering has finished.

(Continued page 140)

PAST ISSUES OF "AUSTRALIAN PLANTS" AVAILABLE

Because of the vast wealth of our flora there is very little repetition of previous information. VOLUME No. 1, issues 1-12, no longer available bound but issues 1, 5, 6, 7, 8, 9 are available at 45c each, \$2.85 incl. postage.

VOLUME No. 2, issues 13-20, all available only fully bound at \$6.00 plus 20c postage. And in this volume is also "A Descriptive Catalogue of Western Australian Plants".

VOLUME No. 3, issues 21-28, all available only fully bound at \$6.00 plus 20c postage, including also "Catalogue of Cultivated Australian Native Plants" valued at \$3.00.

VOLUME No. 4, issues 29-36, all available only fully bound at \$6.00 plus 20c postage, including "Western Australian Plants for Horticulture—Part 1" valued at \$3.00—see below.

VOLUME No. 5, issues 37-44 all available only fully bound at \$6.00 plus 20c postage including "The Language of Botany", a valuable reference to words and terms.

Other Books by the Society

WEST AUSTRALIAN PLANTS FOR HORTICULTURE is the latest book by this Society available from the editor for \$3.00 plus 20c postage. The format of the book generally is to have simple but adequate descriptions (using simple features that anyone can distinguish) of three species in one genus with a full colour plate of one of them on the opposite page. Directions as to cultivation are given for each species. Hundreds of West Australian wildflowers are also described. This is the style of book we recommend and is excellent value at this low price. It is proposed to produce more in this series on wildflowers from other states if readers will support us by buying the first one, providing the money to produce the next one.

"West Australian Plants"—A Descriptive Catalogue (2nd Edition)

This fine book was one of the first produced by the Society and has been so widely acclaimed and received that a reprint has been necessary. The number of colour plates has been doubled but the real value of the book even for those who have a copy of the first edition is that fully revised, it is the only reference ever produced to the entire flora of Western Australia. New additions include the grass and fern families but the many hundreds of species added and names revised make this book a must for anybody interested in growing the western wildflowers.

Available from the Editor, 860 Henry Lawson Drive, Picnic Point, 2213 for \$3.00 plus 20c postage.

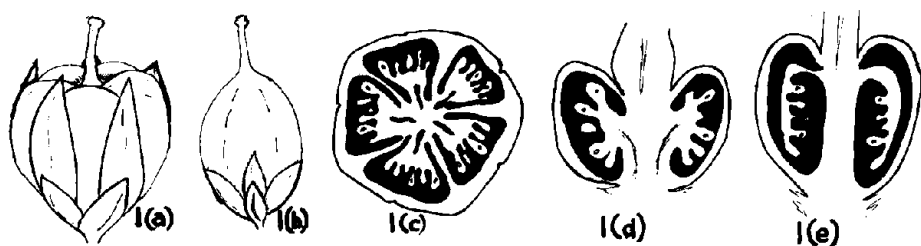
EPACRID WILDFLOWER FAMILY

by Betsy Jackes, Townsville, Qld.

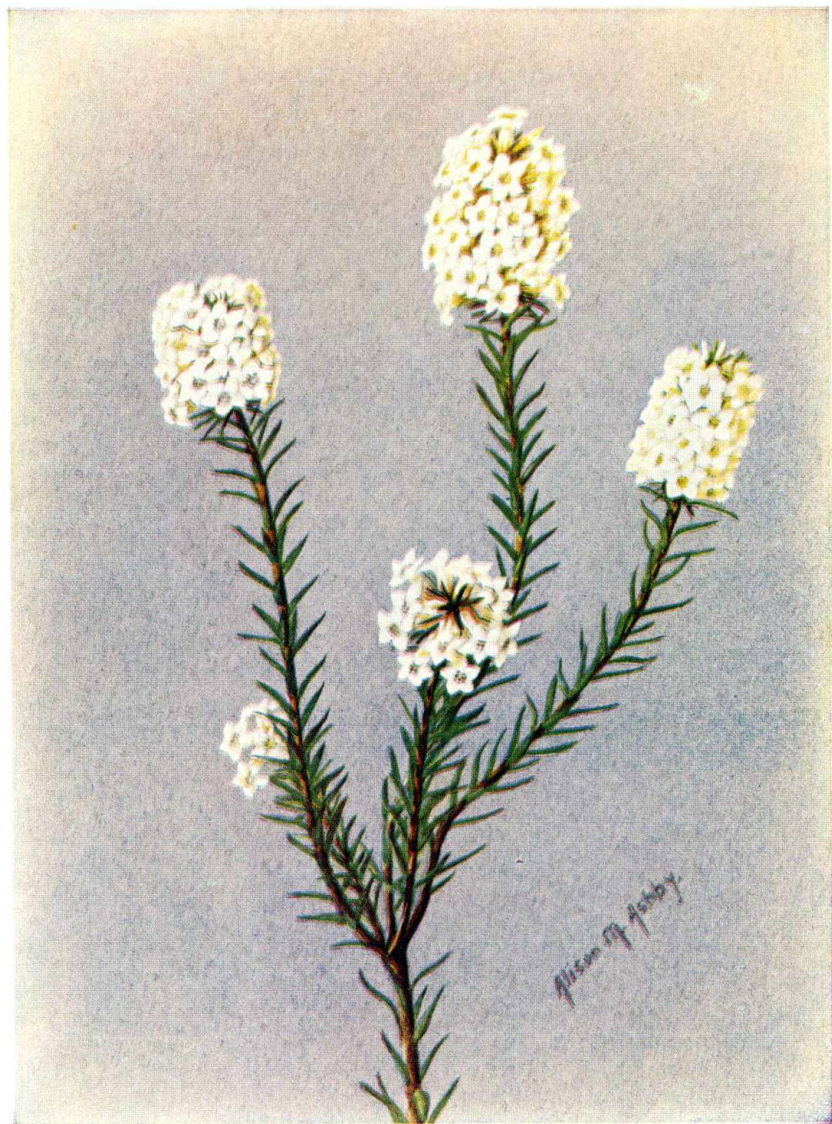
The family Epacridaceae, which is probably better known as the Australian Heath family, incorporates a large number of small heath type shrubs, some of which have a high horticultural potential. Most nature lovers will be familiar with the sharp leaves and tubular five petalled flowers common to this family. Victorians will be familiar with the "Common Heath" which is their floral emblem as illustrated on page 97. Sydney people may be familiar with the *Styphelia* as shown on the front cover. Widespread in temperate areas are the "whitebeards" of *Leucopogon* and colourful species of *Astroloma*. An outstanding Tasmanian species is the "Giant Heath" or "Grass Tree" *Richea pandanifolia* described with the other *Richea* in No. 39 issue.

Robert Brown first described the family in 1810 dividing it into two tribes based on characteristics of the fruit; the *Epacrideae* and the *Styphelieae* as shown in the sketches below. The plants of the first section *Epacrideae*, have been described in previous issues, especially No. 25 issue of Vol. 3 and in most issues since. The species have been described a genus at a time, just as this issue describes and illustrates in colour, the beautiful *Styphelia*. They are summarised on page 99 together with a simple key to the genera in such a manner that a beginner or student may follow it.

The second section *Styphelieae* is introduced on page 102 and all species of *Styphelia* are illustrated and described.



- 1(a)—a capsular fruit typical of the plants in the tribe *Epacrideae*. Note that the style is inserted in a depression on top of the ovary.
- 1(b)—a drupe typical of the fruit of genera in the tribe *Styphelieae*. A drupe is a succulent fruit consisting of a fleshy outer wall and a hard inner layer enclosing the seed.
- 1(c)—a cross section of the capsule of 1(a) showing several ovules that will mature to seed, in each section (loculus) of the ovary.
- 1(d)—a longitudinal section of the capsule showing how the ovules are attached to the central column (by placentas) at its centre. This is characteristic of most genera in the tribe *Epacrideae*.
- 1(e)—In three genera (*Richea*, *Sphenotoma* and *Dracophyllum*) the placentas carrying the ovules are attached to the top of the central column as shown in 1(e). For this reason some botanists place the two genera in a separate tribe.



Blocks by courtesy of the South Australian Museum from a painting by Alison M. Ashby. Copies of this picture may be obtained from the S.A. Museum, Adelaide, S.A.

EPACRIS LANUGINOSA Labill.

This Epacris may be found in Victoria and Tasmania and as shown above is 3/5 its natural size.

EPACRIS IMPRESSA (Opposite)

The beautiful heath of Victoria that is found in a range of colours from white to the reds opposite. The range of colours is shown on the colour plate on page 104 of issue no. 15 together with articles on propagation and cultivation.



BOTANY FOR BEGINNERS

For those who would like to understand at the elementary level, the section of botany that is concerned with the description of plants and their identification we produce here a simple illustrated description of the key opposite.

Once it has been decided that the plant belongs to the plant family *Epacridaceae* (most people with any interest in wildflowers could guess this much) and that it belongs to the tribe *Epacrideae* as described on page 95:—

Section 1 of the key (number on left hand side) leads us, after examination of the leaves, to look next either under section 2, 8 or 10 (number on right hand side of the key). The first line indicates that if the leaves are petiolate (joined to the stem by short stalks or petioles), sessile (joined without a short stalk or petiole) or are stem clasping but not sheathing (joined only at one small point) as indicated in sketches 1, 2 opposite, then we must next turn to section 2 of the key.

The second alternative of section 1 is where the leaves are sheathing, adnate (joined to the stem for a portion of its circumference) see 1.7 opposite, and we would need to look next at section 8 of the key. However if there are scars on the stem where the leaves have fallen off then we should look to section 10 instead. This latter alternative is principally for Tasmanian readers as you will see that this section is only for *Richea* and *Dracophyllum* and the West Australian *Sphenotoma* and if they find a mature fruit the seed inside will be arranged as shown in end sketch.

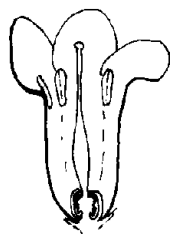
Section 2 of the key has been introduced to distinguish the rare genus *Wittsteinia* which is described and illustrated in our No. 32 issue. A sketch of the flower is not included opposite but where the key says ovary inferior as distinct from all the other genera it means that the ovary is enclosed in the receptacle below the petals and not inside them as shown for other genera opposite.

Section 3 of the key uses the bracts to distinguish between the genera in Sections 4 and 7 of the key. The bracts are leaves, often different to the normal leaves of the plant, that surround the base of the flowerhead. The difference is illustrated in the sketches 3.4 opposite where they are imbricate (overlapping) and enclose the lower portion of the floral envelope or the corolla, and 3.7 where they are small and distinct from the flower or corolla.

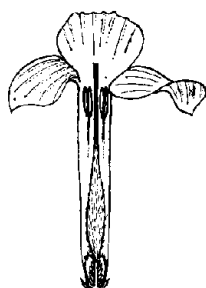
Section 4 uses the shape of the lobes on the end of the corolla as shown in 4.5 and 4.6 opposite.

Sections 4.10 use the features of the flower and its parts and a flower of each genera is given below to illustrate the key features.

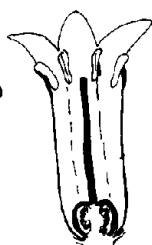
See page no. 117 for sketch of other species.



EPACRIS



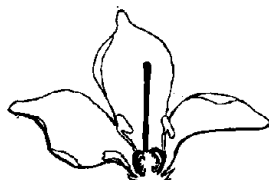
LYSINEMA



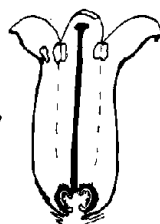
COSMELIA



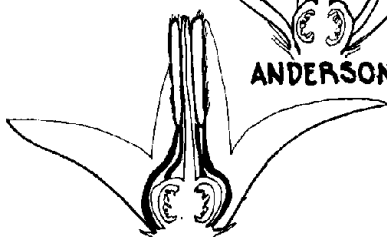
ANDERSONIA



RUPICOLA



ARCHERIA



SPRENGELIA

EPACRIDACEAE

by Betsy M. Jackes

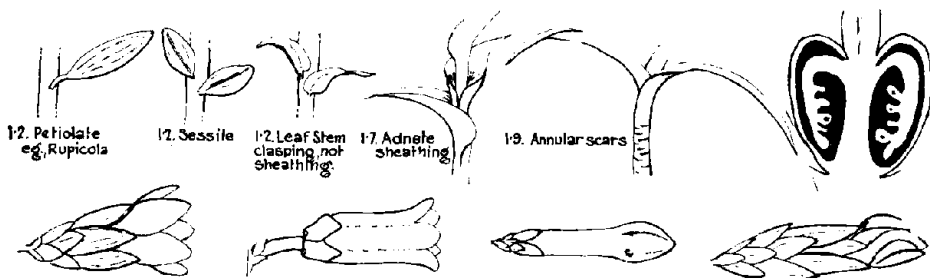
A Simple Guide to the Genera of the Tribe Epacrideae in the Plant Family Epacridaceae

The introduction to the plant family on page 95 describes how the genera are divided into two tribes and those of the tribe Epacrideae may be distinguished from each other by using the simple key below and the sketches of a flower of each genus opposite.

The wildflowers in these genera are quite dainty, often colourful and are ideal for garden cultivation. They are described a genus at a time and illustrated in full colour in previous issues. Full instructions on propagation and cultivation of the plants are also given.

KEY TO THE GENERA OF THE TRIBE EPACRIDEAE

- | | |
|--|----|
| 1. Leaves petiolate, sessile or stem clasping but not sheathing; placentas sessile or nearly so | 2 |
| Leaves with an adnate sheathing base which falls off with the leaf, leaving the branches smooth or scarless | 8 |
| Leaves with an adnate sheathing base, which falls off with the leaf leaving annular scars on the denuded branches; placentas suspended from an ascending recurved column | 10 |



3.4 Bracts imbricate

3.7

4.5

4.6 Bud contorted

- | | | |
|--|--------------|----|
| 2. Ovary inferior | Wittsteinia | 3 |
| Ovary superior | | |
| 3. Bracts imbricate on the calyx, passing into the sepals | | 4 |
| Bracts or bracteoles at a distance from or scarcely reaching the calyx and distinct from the sepals | | 7 |
| 4. Corolla-lobes imbricate, not contorted in bud | | 5 |
| Corolla-lobes imbricate, contorted in bud | | 6 |
| 5. Stamens inserted at the throat of the corolla-tube except in some young buds; filaments short; anthers attached above the middle | Epacris | |
| Stamens inserted at the base of the corolla-tube; stamens adnate, connivent around the style but not cohering | Rupicola | |
| 6. Leaves spreading acuminate with pungent points. (Eastern) | Woollisia | |
| Leaves small, erect and acuminate, or spreading and obtuse (Western) | Lysinema | |
| 7. Stamens adnate to the corolla-tube; leaf margins serrated | Archeria | |
| Stamens free; leaf margins with blunt teeth | Prionotes | |
| 8. Stamens adnate to corolla-tube | Cosmetia | |
| Stamens free | | 9 |
| 9. Corolla-tube very short; spreading lobes more or less imbricate; anthers usually connivent or cohering in a ring around the style, the filaments markedly incurved (Eastern) | Sprengelia | |
| Corolla-tube cylindrical; lobes erect, recurved or revolute, bearded inside, valvate in bud; anthers not connivent or cohering around the style, the filaments not markedly incurved (Western) | Andersonia | |
| 10. Corolla circumsciss near the base, calyptriform, the lobes not opening | Richea | |
| Corolla not circumsciss, the lobes spreading | | 11 |
| 11. Longitudinal folds not present on base of corolla-lobes; inflorescence a compound raceme or panicle | Dracophyllum | |
| Longitudinal folds present on the base of the corolla-lobes; inflorescence a simple spike or head | Sphenotoma | |

For a clear understanding of the botanical terms used above refer to "The Language of Botany" on page 101.



Blocks by courtesy of the South Australian Museum from a painting by Alison M. Ashby. Copies may be obtained from the S.A. Museum, Adelaide, S.A.

STYPHELIA TRIFLORA Andr.

The artists impression above shows the flowers at 3/5 their natural size. A full colour photograph is on the front cover of this issue.

STYPHELIA

These beautiful wildflowers are illustrated in full colour on the cover, opposite and below. The species are described and illustrated by simple line drawings on the pages following. They are related to the beautiful Epacrid heaths previously mentioned and illustrated but belong to the tribe Styphelieae of the plant family Epacridaceae as described on the next page.

The Sydney area is fortunate to have the two most colourful species shown here and these are described with other Sydney area species on page no. 125.

The cultivation of *Styphelia* in the garden does not seem to present many problems, preferring a reasonably drained soil of good to light texture. The difficulty is obtaining the plants. Efforts to get the seed from the capsule have been frustrated by nature's way in protecting the seed and most success has been achieved by adopting nature's way and using fire to open the capsule.



Styphelia tubiflora

THE LANGUAGE OF BOTANY

Do you know the meaning of the terms used by botanists? This jargon is necessary to adequately describe the plants. Do you know the various forms of plant life? Do you know how plants grow? Do you know the meanings of plant names? All this information is contained in the form of a dictionary with all the words you wish to check arranged alphabetically in the book "The Language of Botany". The first edition was so well received that it sold out. The second edition has been completely revised and enlarged and includes many more sketches. We try to keep the articles in "Australian Plants" as simple as possible and with this book you can understand the more technical articles and identify the wildflowers in the bush, yourself. The book is so well written and so adequately covers the language of botany "it has been accepted as a standard reference by Universities, Horticultural Colleges and Schools. Available from the editor for \$1.50 plus 15c postage. Exceptional value.

Tribe STYPHELIEAE

EPACRIDACEAE—PART II

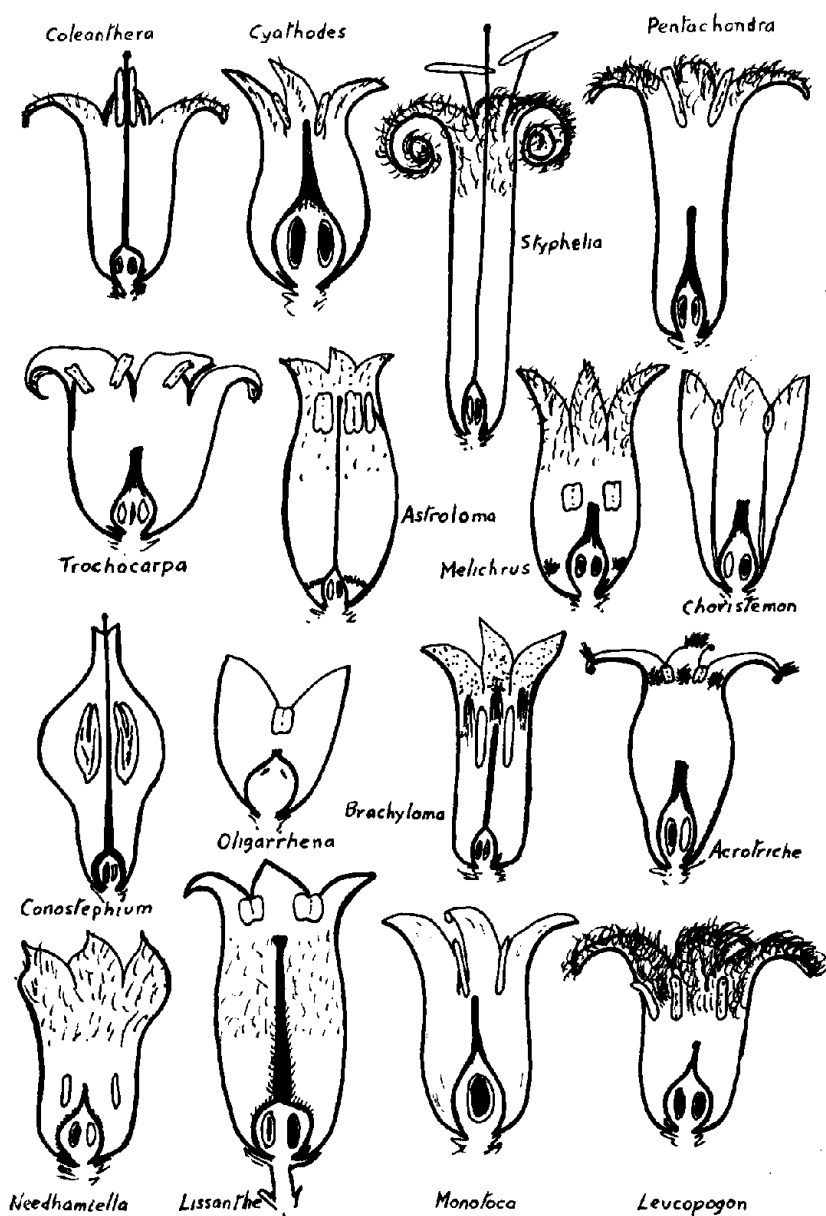
by Betsy R. Jackes

The diagnostic characters of this homogeneous tribe are: a terminal style; a single anatropous ovule in each locule of the ovary; and a drupaceous fruit sometimes separating into pyrenes.

The generic limits of taxa, to be used in this series, are those proposed by Robert Brown and later adopted by Bentham, rather than those by F. v. Mueller, chiefly because of convenience, although the author is not yet convinced that the latter is an improvement. However where appropriate the name according to Mueller's classification will be indicated thus—*Leucopogon rupicolus* White (*Styphelia rupicola* (White) Sleum.)—unless a new combination is required.

KEY TO THE GENERA OF THE TRIBE STYPHELIEAE

1. Anthers completely exserted 2
Anthers wholly inserted or partially enclosed within the throat of the corolla 7
2. Filaments enveloped in dense wool *Astroloma stomarrhena* 3
Filaments glabrous 3
3. Anthers connate in a cone around the style *Coleanthera* 4
Anthers free 4
4. Fruit a drupe 5
Fruit separating into pyrenes 6
5. Leaves alternate and clustered in false whorls *Cyathodes* 7
Leaves alternate and crowded but not whorled *Styphelia* 7
6. Fruit separating into 5 or fewer pyrenes *Pentachondra* 8
Fruit separating into 8-10 pyrenes rarely fewer *Trochocarpa* 8
7. Corolla-tube with scales or hairy tufts below the middle 8
Corolla-tube glabrous or without scales below the middle 9
8. Corolla-tube with tufts of hairs or hairy scales or a dense ring of hairs below the middle *Astroloma* 9
Corolla-tube with five glandular scales below the middle *Melichrus* 9
9. Stamens attached below the ovary which is 5-celled *Choristemon* 10
Stamens attached to the corolla-tube above the ovary 10
10. Stamens 2, corolla-lobes 4 *Oligarrhena* 11
Stamens and corolla-lobes 4-5 11
11. Corolla-tube conical in upper portion or entirely cylindrical with very small erect lobes; pubescent or somewhat hairy inside *Conostephium* 12
Corolla-tube not conical and without small erect lobes 12
12. Throat of corolla-tube closed by 5 hairy scales or reflexed hairs descending into the throat *Brachyloma* 13
Corolla-lobes without hairy scales or reflexed hairs 13
Corolla-lobes with reflexed hairs at tip and reflexed hairs in throat *Acrotriche* 13
13. Corolla-lobes broadly induplicate in bud *Needhamiella* 14
Corolla-lobes valvate in bud 14
14. Fruit, separable in pyrenes, usually 10 *Trochocarpa* 15
Fruit not separable into pyrenes 15
15. Corolla-lobes glabrous 16
Corolla-lobes pubescent 17
16. Fruit 1-2 celled *Monotoca* 16
Fruit 5-6 celled *Lissanthe* 16
17. Corolla coloured at least when dry, usually exceeding 1 cm. long, filaments often flattened *Astroloma* (3 sp.) 18
Corolla not as above 18
18. Bracteoles 3 or more, imbricate *Cyathodes* 18
Bracteoles 2, strictly opposite *Leucopogon* 18



HIBISCUS SPLENDENS

Colour plate from "Wildflowers of the Warm East Coast" by Vera Scarth-Johnson by courtesy of The Jacaranda Press. Price \$1.95 plus 25c postage from the Editor or your bookseller.

A NEW HIBISCUS HYBRID

Hibiscus 'Wirruna'. A large shrub, ultimately reaching four to five metres in height. Leaves are usually deeply five lobed, although simple and three lobed leaves also occur, and are mid greyish green with numerous hairs and prickles which also occur on the stems and pedicels. Flowers are large, solitary and axillary. Corollas are soft salmon (R.H.S. Colour Chart: Orange Group 29C) and their reverse is deeper (Red Group 37B). There is a bright red (Red Group 45B) blotch at the base of each petal giving the flower its red centre. The colour of the corolla can show variations in depth possibly caused by fluctuations in temperature or other environmental conditions.

The parents of this hybrid are *Hibiscus heterophyllus* (the yellow form known as 'Aureus') the yellow flower opposite, and *H. splendens* shown above.

It was raised by Mr. L. A. Craven of Black Rock, Victoria.

The name 'Wirruna' is an Aboriginal word which means 'sunset'.

A specimen of this clone has been lodged with the National Herbarium, Melbourne.

HIBISCUS "WIRRUNA" (Caption to colour plate opposite)

Shown with the new hybrid (orange red flower) is the species *Hibiscus heterophyllus* 'Aureus', the yellow flower. The colour of the hybrid *H. x 'wirruna'* is deeper than that which normally occurs but is within the range seen. *Hibiscus heterophyllus* 'Aureus' is a yellow form of the well known and widely grown *H. heterophyllus* usually having white to pinkish flowers.



MELALEUCA

MELALEUCAS FOR THE GARDEN by Ray Aitken

No genus of native plants is more neglected in horticulture than that of *Melaleuca*. Varying in height from shrubs of a few inches to stately trees of more than fifty feet, these plants are so diverse in colour form and texture and, indeed, flowering period, that it would be possible to plan an attractive garden, based entirely upon this single genus.

While germinating with astonishing ease, *Melaleuca* seedlings are however, susceptible to water moulds, other fungi and viruses. This is only so while the plants are very young, and as a general rule, once they survive to a height of two inches or so, they are very hardy. Propagation by vegetative means is also simple and quite successful. Once through the juvenile stage the plants are extremely easy to grow. They tolerate a wide range of soils, temperatures and general climate, are extremely resilient after pest attacks, and can resist both drought and flooding.

The colour range of *melaleuca* flowers is wide. There are a number of whites, pinks, mauves, scarlet, reds and a splendid assortment of creams and yellows to grow.

Should those readers who establish gardens east of the great flat plain find this article heavily in favour of West Australian *melaleucas*, one must crave some forbearance. The number of Western *Melaleucas*, if not truly astronomical, is at least multiplied by the great variations of form within single species and by the fact that in the West it is more or less impossible to travel out of *Melaleuca* habitat.

Any discussion of W.A. *Melaleucas* is of somewhat doubtful validity in certain areas owing to the sketchy nature of present taxonomy. The genus has not yet attracted as much attention as (say) *eucalyptus*. For this reason it is possible that many forms of a single specie may prove to have the status of varieties and in some cases, one hopes rarely, that of species.

As in the case of any other native plant the general acceptance of *Melaleucas* may be delayed by the non-selective nature of the production of plants from seed. Perhaps too many plant propagators have failed to produce desirable plant forms by this method and have tended to despair. For the commercial nurserymen there are valid economic reasons for dependence on seed. However *Melaleucas* propagate so readily by vegetative means that it is preferable to grow only by cuttings from superior plants. The only reservation appears to be with some dry country species. The percentage of 'strike', with desert forms is normally low, though when the plant is in cultivation this percentage rises and continues to rise with each successive generation of cutting grown plants.

Vegetative propagation of the wet land *Melaleucas* is comparatively simple. Indeed a worthwhile 'strike', is often obtained by standing the cuttings in a jar of water provided it is regularly changed to avoid stagnation. The best method would still appear to be preparation of four to six inch cuttings, treating them with one of the talc based proprietary hormone powders and setting them out in pots at the rate of 30 to 60 cuttings to each 6" pot. They thrive under mist irrigation and give a result comparable in vigour and speed of strike to that which may be achieved with *Callistemons*.

Editor's Note: This excellent article was submitted with others by Western Australian readers for publication in our last issue which was devoted to the West Australian wildflowers but there was not enough space.

Little appears to have been tried in regard to large branch cuttings although this method may prove well worth a trial. Certainly the trunk base shoots of *Melaleuca quinquinervia* can be grown effectively even when taken in lengths of two or three feet. Such, 'instant tree', type propagation may be interesting and rewarding to some patient home gardener.

Vegetative propagation makes it possible to perpetuate some of the rare and attractive field forms of some species. For example *Melaleuca steedmanii* has a number of 'link' forms or possible hybrids between itself and *Melaleuca radula*. Some of these are spectacular in flower but in most instances they are quite unreliable from seed.

No work appears to have been done with grafting *Melaleucas*. This is a field for some experiment as a number of the many dry-country *Melaleucas* have a restricted life when introduced to the garden though they appear to be long living in the wild. A short life, horticulturally, may be due to eventual root failure when a plant is removed from its specialised environment, particularly where the garden is much moister than the original environment. It would seem possible that if the desired 'type', could be given a sturdy long lasting 'wet country', *Melaleuca* root stock, its garden life would be increased. It seems probable that *Melaleucas* should unite readily. Experience indicates that though all *Melaleucas* have a life of sufficient length to warrant growing them, a number of the more decorative shrubs have a shorter life expectancy than the larger trees.

Paperbarks are gross feeders. Like *Callistemons* they have a dense fibrous root system and are capable of using large quantities of food. It is important to feed them from the surface. They thrive on liberal dressings of blood and bone and respond readily to inorganic fertilisers. Best results are achieved where the soil is kept moist, and this is equally important with 'dry country' *Melaleucas*.

The *Melaleucas* discussed here have been classified as those which may be called 'dry country' or 'wet country' plants with an overlapping category of 'intermediate'.

DRY—Situations in which rainfall is below 20 inches and normally long dry summers.

WET—Situations in which rainfall is in excess of 20 inches and there is normally a high water table. This category includes swampy and estuarine conditions.

INTERMEDIATE—Non swampy areas but those in which soil moisture may also be high in the summer months, e.g. mountain seepage. It should be re-emphasised that *Melaleucas* are very adaptable and that many dry country *Melaleuca* thrive under garden conditions with continuously moist soil; whilst almost without exception, the wet country *Melaleucas* have considerable drought resistance.

***Melaleuca armillaris*.** E.A. Int. shrub tree 20'. A swift growing plant occasionally much taller than the height given. Dense foliage of distinctive green. This plant is much used for hedges and wind breaks. Thrives on pruning.

***Melaleuca baxteri*.** W.A. Wet. Tree 30'. Rare. Highly ornamental particularly as a juvenile. Excellent paperbark clothing on trunk. Thrives in wet situations including saline soils. Widely tolerant and can resist drought. Masses of white bottlebrush type flowers.

***Melaleuca blaeriaefolia*.** W.A. Wet. Tree to 20' (normally 15'). Has dark foliage and rather stark silhouette. Good paperbark trunk. Grows in saline soils. Will live permanently in water of high salt content.



Photography by F. W. Humphreys

MELALEUCA MEGACEPHALA

Melaleuca citrinis. W.A. Int. Shrub to 5'. Comparatively rare. A shrub of open habit growing in selective situations, normally south coast of W.A. on peaks with granite underlay and considerable seepage. This plant has flowers of a striking yellow. The flowers are brilliant and may be seen from a considerable distance. Probably great potential as a garden subject.

Melaleuca conothamnoides. W.A. Dry. Shrub 4'. A very useful and attractive *Melaleuca*. Produces a profusion of pink or mauve pom pom flowers. Some forms almost blue.

Melaleuca cordata. W.A. Dry. Shrub 5'. Attractive foliage. Flowers similar to *M. conothamnoides*.

Melaleuca diosmifolia. W.A. Wet to Int. Shrub 6'. A splendid dense ornamental shrub. Beautiful and unusual foliage. Good in areas very close to the sea. Flowers green bottle brushes. Seldom flowers when grown in sandy soils but is worth a place in your garden for foliage alone.

Melaleuca elliptica. W.A. Dry to Int. Shrub 10'. Small leaved paperbark. Erect habit. Very large wine coloured bottlebrush flowers. These flowers are often 4" to 5" long and 2" to 3" wide. A proven garden subject.

Melaleuca exarata syn. *M. suberosa*. W.A. Int. Shrub 2'-3'. A tiny leaved shrub possibly unique in this genus. Clothes the whole of its somewhat angular stems with pink or near purple flowers which look like fairy floss. The flowers persist when dried so that the branches become ideal for dry arrangements.

Melaleuca fulgens. W.A. Int. Shrub 10'. Fairly open habit. Highly ornamental subject with large bottlebrush-like flesh coloured flowers. Close affinities with *M. radula* and *M. steedmanii*.

Melaleuca genistifolia. E.A. Tree 30'. Fine sturdy and shapely tree with very dense head. Flowers are white, rarely pink. In a good flowering period the tree may be completely clothed in white.

Melaleuca huegelii. W.A. Int. Shrub 8'. Occasionally this plant may be a tree to 20'. A shapely plant with very dense foliage. Flowers white in long tapering bottlebrushes. Rarely pink. Profuse.

Melaleuca hypericifolia. E.A. Shrub 8'. Shapely shrub. Attractive foliage. Weeping habit. Bottlebrush flowers, normally a pale pink.

Melaleuca incana. W.A. Wet. Shrub 6'. A green or grey shrub. Umbrella shaped and weeping with a clean off-white trunk. The grey forms of the plant are particularly attractive but do not necessarily come true from seed. Flowers profuse small cream to yellow bottlebrushes. Fine garden subject. Proven.

Melaleuca lateritia. W.A. Wet. Shrub 4'. A splendid ornamental called "Robin Red Breast Bush" because its bottlebrushes are the same shade as the breast of the Scarlet Robin.

Melaleuca laxiflora. W.A. Dry to Int. Shrub 4'. Generally grows on edge of water courses in dry country. A shapely small shrub similar in habit to *M. steedmanii*. Flowers are more open than those of the latter species. Normally a deep mauve. Bottlebrush type.

Melaleuca lehmannii. W.A. Wet. Tree 12'. Very shapely little tree. Foliage green of similar shade to *M. armillaris*. Very tolerant of saline soils and water. Flowers white, very profuse.

Melaleuca megacephala. W.A. Dry. Shrub 6'. A large, bold, globular shrub. Very drought resistant. Profuse pom pom (rarely bottlebrush) cream to yellow flowers.

Melaleuca nematophylla. W.A. Dry. Shrub 8'. Pine like green leaves of lush appearance. Splendid large pink or mauve pom pom flowers carried high. Perhaps one of the most ornamental of all the *Melaleucas*.

Melaleuca nesophila. W.A. Int. Shrub 15'. This *Melaleuca* is really a shrub-cum-tree. It may be pruned to create a clean trunked tree, or grown as a dense lush shrub with a substantial central trunk clothed from ground level. The plant is excellent under seaside conditions and has enormous capacity for flowering. Under garden conditions normally flowers twice a year. Very profuse pink to mauve pom pom flowers.

Melaleuca parviflora. W.A. Wet. Tree 30'. This is a fine large trunked irregularly shaped tree which grows normally in low lying land with a high winter water table. It requires some drying out period in summer and unlike *M. raphiophylla* does not thrive if grown in permanent water. However it is quite drought resistant when established in a garden. White flowers completely clothe the tree.

Melaleuca pentagona. W.A. Variable conditions. Shrub 8'. An intensely variable form. Foliage may be either terete or spatulate. Sometimes dense and globular. However has open forms. Flowers profuse small pom poms varying from pink to mauve (rarely red). Tolerant of saline soils.

Melaleuca quinquenervia (syn. *M. leucadendron*). W.A. Wet. Tree 40'. This form of a widely distributed species grows on North-west Australian rivers, south to the Ashburton. A fine tree with broad leaves frequently five veined. A highly ornamental shade tree. The paperbark trunk is spectacular and it will gain increasing acceptance as a street tree. Flowers fairly profuse—white—rarely pink or red.

Melaleuca radula. W.A. Int. Shrub to 10'. Well named 'Graceful *Melaleuca*'. Somewhat open habit and willowy. Bottlebrush flowers white, pink or mauve. Some rare forms are almost blue. Close affinities with *M. steedmanii* and *M. fulgens*.

Melaleuca raphiophylla. W.A. Wet. Tree 30'. Shapely tree with great untapped potential. Although reasonably drought resistant it can grow in permanent fresh water. For this reason it may be used in storm water sumps and like areas. It produces excellent paperbark for horticultural use and is very attractive to birds. Flowers profuse white.

Melaleuca scabra. W.A. Dry to Int. Shrub 2'-3'. Dense low shrub, sometimes almost prostrate. Large pink or red flowers.

Melaleuca steedmanii. W.A. Dry. 6'. Erect open shrub. Flowers very beautiful varying from pink to red. Golden anthers very prominent. A horticultural gem. Some variations in form and a tendency to hybridise in the field with *M. radula*.

Melaleuca striata. W.A. Dry and Int. Shrub 3'. A neat vigorous shrub producing masses of pink to mauve flowers. Not much used horticulturally but deserves a place in any garden.

Melaleuca thymifolia. E.A. 3'. A small attractive *Melaleuca*. Some of its forms are outstanding. There exists a prostrate form with dark pink to purple flowers. Excellent garden subject.

Melaleuca trichophylla. W.A. Dry. 3'. Very like *M. scabra*. Once considered a variety but now listed as a species. Semi-prostrate. Bottlebrushes are larger than those of *M. scabra* and frequently more colourful.

Melaleuca violacea. W.A. Dry. Shrub 3'. Small leaves. Dense. Flat topped and shapely. Flowers well distributed on stems and sometimes solitary. Violet to blue.

Melaleuca wilsoni. E.A. A useful small shrub. Like *M. thymifolia* has variable and near prostrate forms. Excellent flowering forms, varying from pink to red. Proven horticultural subject.

PROPAGATION METHODS USED AT THE CANBERRA BOTANIC GARDENS FOR RAISING AUSTRALIAN NATIVE PLANTS

by D. K. McIntyre, Canberra Botanic Gardens

Over a period of several years propagation methods for growing Australian Native plants have been developed at the Canberra Botanic Gardens. These methods are continually being changed and improved. This article outlines the current methods and the reasons for their use.

Cuttings

When cuttings are taken on field trips a long way from Canberra, they are immediately wrapped in wet newspaper and stored in a refrigerator if one is available. On arrival at the nearest airport the wrapped cuttings are placed in plastic lined boxes and air freighted back to Canberra. On arrival in Canberra they are placed in a refrigerator if they can't be dealt with immediately. Soft cuttings are potted first, and harder material is left till last. This method proved successful with very large numbers of cuttings sent back from Western Australia on a recent field trip. The experience gained from this trip showed that although soft cuttings showed some deterioration after 3-4 days, medium and hard cuttings travelled well.

Cuttings taken on short field trips, are immediately wrapped in wet newspaper and placed in a refrigerator (if one is available in the vehicle) or otherwise kept in a cool place. They are potted as soon as possible.

Cuttings taken in the Botanic Gardens or locally are immediately placed in plastic bags, moistened if necessary, and potted as soon as possible. These methods of handling cutting material prior to potting have produced very good results for most species. See pp. 117 for size of cuttings.

The cutting mixture used is 1/3 perlite, 1/3 peat moss and 1/3 washed river sand, sterilised at 140°F in a steam/air steriliser for 30 minutes. 4" x 4" plastic punnets are filled with the mixture and this is pressed down about 1/2" with a wooden block (Fig. 1) to make it firm.

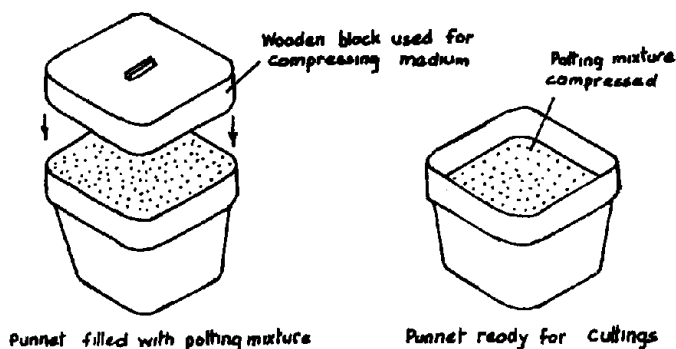


FIG. 1—METHOD OF FILLING PUNNETS

4" x 4" square punnets are used because they use all the available bench space (whereas round containers do not) and also usually only a small number of any one species is required at a time. 25 cuttings, or less if the cuttings are larger, are placed in each punnet and these are immediately watered with a watering can.

Punnets containing the cuttings are then placed in a plastic house, which has Wavelock plastic walls and a corrugated fibre glass roof. The punnets are placed about 1" into the sand/peat moss medium on the bench (Fig. 2).

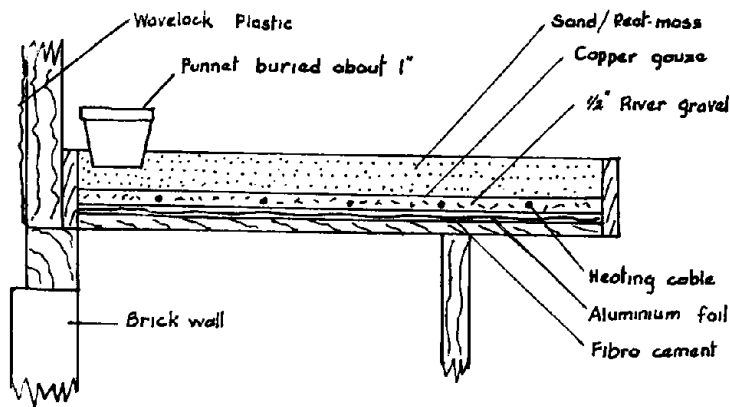


FIG. 2.—SECTION ACROSS BENCH IN PLASTIC HOUSE

Bottom heat is supplied by 5 rows of plastic covered floor heating cable (240v). The bottom heat is set to give 80°F in the rooting zone of the cuttings, and this is controlled thermostatically.

Watering, sufficient to keep the cutting mixture moist but not allowing it to dry out or get too wet, is done by hand with a fine spray from a hose. Watering is done when it is required and this may be up to four times a day in the summer.

The only heating in this plastic house is provided by the bottom heat in the benches. Four sets of glass louvres, a small exhaust fan and the door provide the ventilation. During the summer a leak hose is placed on the roof and this provides some cooling.

Excellent results have been obtained in this house despite its many obvious defects. However it is planned to rebuild the house this year, replacing the plastic walls with glass, installing thermostatically controlled heating and cooling, and installing an automatic misting system. The benches and bottom heating will be unchanged. It is hoped these modifications will further improve the propagation of natives from cuttings.

To this stage no rooting hormones are used in the general propagation of cuttings but experiments into the use of powders and dips are being carried out, and if they prove successful the use of suitable hormones will be included in routine propagation.

When cuttings are rooted they are taken out of the punnet carefully and those with well developed root systems are potted on into clean sterilised 3" dia earthenware pots. Cuttings which are still healthy and have not rooted may be returned to the punnet and placed back in the plastic house until they produce roots. If the cuttings have rotted and the species is valuable, they may be recut and returned to the punnet.

*The potting mixture used in the 3" pots is a modified UC (University of California) mix which has been sterilised at 140°F for 30 minutes with steam/air. It is:-

* This mixture has been recommended by Parks and Gardens Research Section, Yarralumla Nursery, Canberra.

70% Washed river sand, 25% Peat Moss (Bowral), 5% Jervis Bay Soil (a very fine sandy loam taken from under a coastal heath community on old sand dunes close to Jervis Bay).

Added nutrients per cubic yard:

1½ lbs. calcium carbonate, 1½ lbs. superphosphate, 1½ lbs. blood and bone, 4 oz. Magnesite ($MgCO_3$), 2 oz. Potassium sulphate, 2 oz. Potassium nitrate, 3 oz. "Essminal" (Mixture of essential elements).

About ½" of ½" dia. washed river gravel is placed in the bottom of each 3" pot to cover the drainage hole. The rooted cutting is then placed in the pot filled with sterile UC mix. The pots are then watered and placed in cold frames.

The cold frames protect the young plants from wind, heavy rain and frost. The covers may be propped open 2", 6", 12", 16", taken off completely, or closed completely depending on the prevailing climatic conditions and the tenderness of the plants.

Some frames have thermostatically controlled bottom heat, supplied by plastic covered floor heating cables embedded in concrete. During winter, frames are closed at night and frames without bottom heat are covered with an additional layer of hessian or aluminium foil to prevent frost damage.

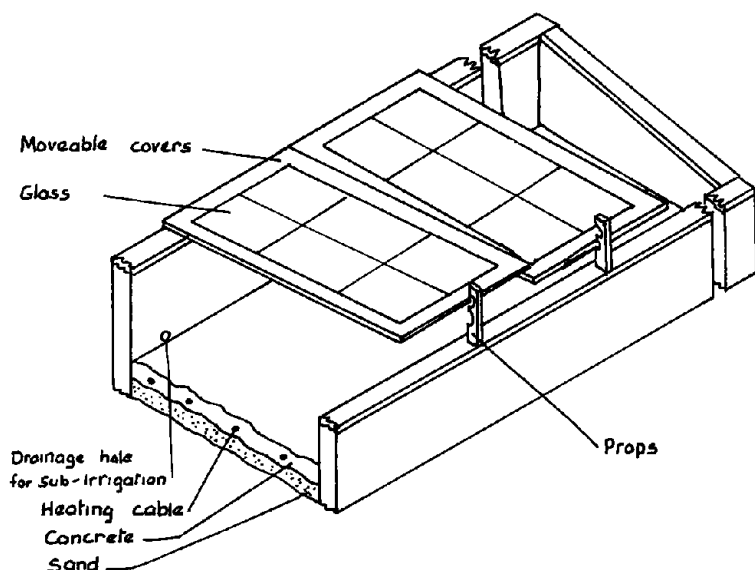


FIG. 3.—SECTION THROUGH COLD FRAME

Watering is done by hand with a fine spray from a hose at intervals, enough to keep the soil moist but not too wet. Some frames have drainage holes and watering can be done in these by sub-irrigation which has advantages over overhead watering for plants which are susceptible to damping off and other collar diseases.

The lower sides of the cold frames are facing north, and the whole area is covered with 64% Sarlon shade cloth on a pipe frame 7' above the ground.

The plants remain in 3" pots until they have produced a good root system. This is determined by tapping the contents of the pot out and observing root development. When the plants have reached the required size they are potted on into plastic bags (normally 9" x 9").

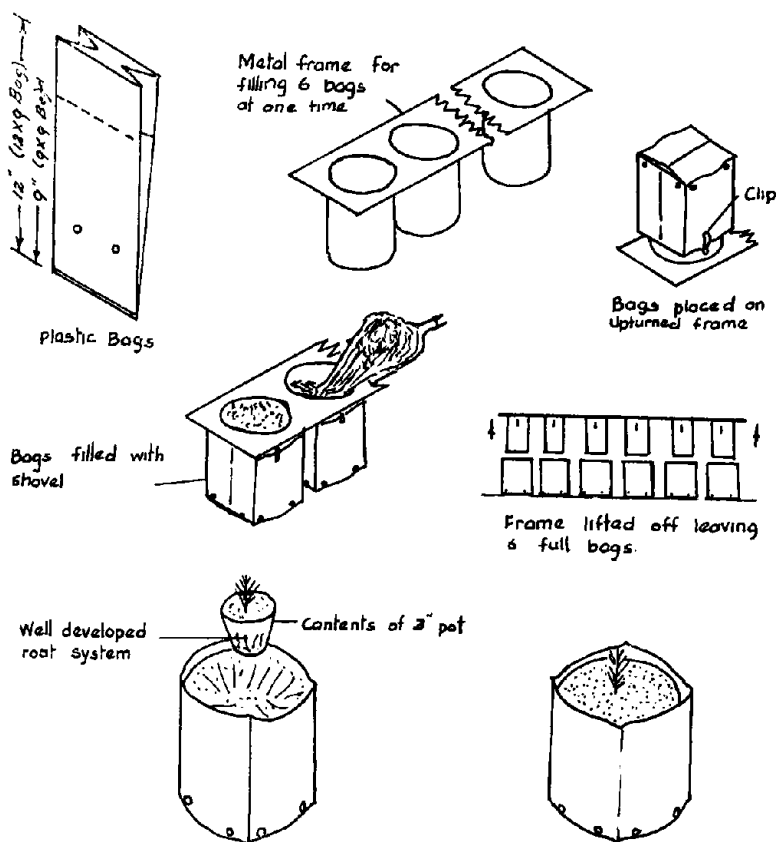


FIG. 4.—METHOD OF FILLING PLASTIC BAGS, AND TRANSPLANTING PLANTS FROM 3" POTS. THIS METHOD OF FILLING PLASTIC BAGS WAS DEVELOPED AT THE CANBERRA GARDENS BY MR. I. COLARIC.

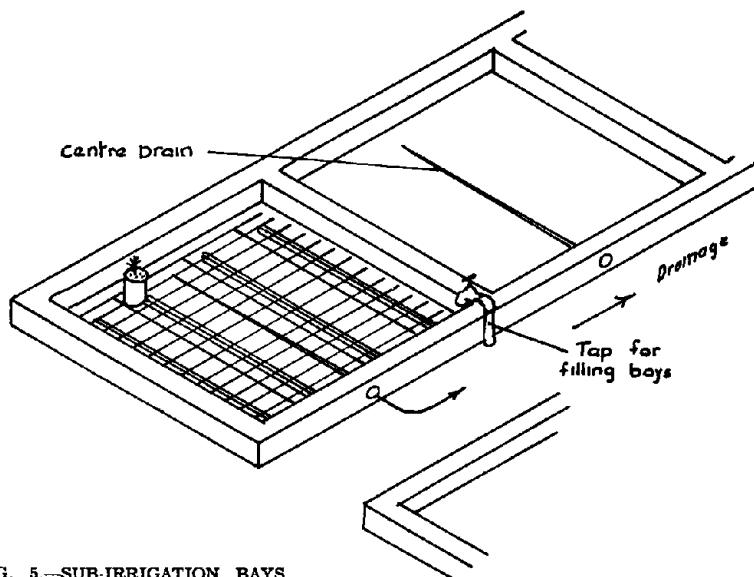
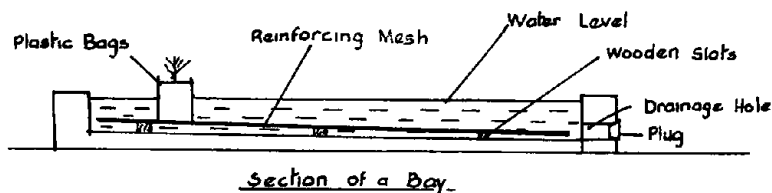
Plastic bags are filled 6 at a time by using a frame with 6 galvanised iron tubes 5" in dia, 7" long for 9" x 9" bags and 13" long for 12" x 9" bags. The bags are placed on the frame and held in place with 2 clips (Fig. 4). The bags are then filled by shovel with the modified UC mix (same as for 3" pots). The frame is lifted off leaving the filled bags behind. The soil is compacted by banging them down on the bench. The contents of the 3" pots, except the drainage gravel are placed in a hole in the soil, which is then packed down firmly around it (Fig. 4).

If the plants are going to be overhead watered, the bags are filled to within 1" of the top, but if, as is the usual case, they are to be watered by sub-irrigation, they are filled to within ¼" of the top of the bag.

The plants in plastic bags are then put into sub-irrigation bays (Fig. 5). They are placed on steel mesh which rests on 1" wooden slats (previously treated with copper naphthenate) so that the bottom of the bag is always

at least 1" above the base of the bay. The bays are flooded with water from taps at the side, and because the bags are off the ground, the water reaches all parts of the bay quickly ensuring even watering, and also quick drainage.

Water is taken up through the holes at the base of the plastic bags and rises by capillary action above the level of the water in the bay to the top of the soil in the bag. When this occurs water can be seen at the surface. When the water has reached the top of all bags in a bay, watering is complete and the plugs are removed. The water drains out of the bags quickly because they are raised. The water that drains out is only the free water. The whole watering process is usually finished in two hours. During the summer the bays may be flooded almost every day, but at other times of the year less than this, depending on the plant requirements.



Sub-irrigation has certain advantages over overhead watering; work can be done on and around plants while they are being watered; it is not affected by wind, which causes non uniform watering in overhead systems; plants which are susceptible to damping off and collar infections are far less likely to be affected when watered by sub-irrigation because the above ground part of the plant is not wet; weeds seem to be far less prevalent under these conditions; and root systems tend to grow down and are not

Editor's Note: Most readers will not have the facilities mentioned above. Previous issues have described simple methods of propagation requiring very little equipment. It seems desirable that we know how the experts do it also.

concentrated near the top of the pot, as is often the case with overhead watering.

The soft straight sided sides of the plastic bags themselves tend to prevent root curling, and when this is combined with the advantages of sub-irrigation the root systems produced are excellent and give very few problems in the later life of the plant.

All sub-irrigation bays are covered with 64% Sarlon shade cloth on a pipe frame 7' above the ground.

Soil Sterilisation and Nursery Hygiene

Following a recent infection of *Phytophthora cinnamomi* in the Botanic Gardens, and particularly in nursery stock in plastic bags, an intensive programme of nursery hygiene has been embarked upon.

This programme has included the fumigation of cold frames and sub-irrigation bays with formalin after infected plants and containers which may have been carrying the infection had been removed. This is done by spraying the cold frames and bays with 5% formalin and covering with plastic for at least 24 hours. Care is taken not to allow vapour to come into contact with plants. When the plastic is taken off the areas are not used for a couple of days.

Prior to the infection, soil was not sterilised and a soil mix of mainly Jervis Bay soil was used for general propagation in 3" pots and plastic bags.

It was considered essential to begin sterilising soil to prevent pathogenic organisms, particularly *Phytophthora* being introduced via the soil. To do this a soil sterilising unit was designed and purchased. Steam is supplied by an Allan electric 12KW Master steam generator. The fixed blower driven by an electric motor, and a mobile 20 cubic ft. trolley with double drop down sides were designed and built by D. & W. Engineering, Melbourne. The trolley is mobile and is used as a potting bench by dropping one or both sides down.

The soil mixture had to be changed to a UC mix (already described) because the Jervis Bay soil was too fine to allow the steam/air to pass through it at a reasonable rate.

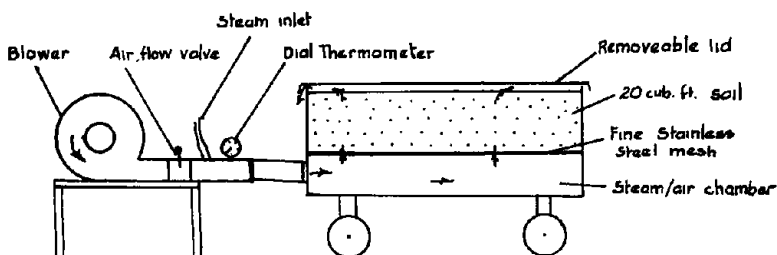


Diagram of fixed blower and mobile steam/air trolley



FIG. 6.—DIAGRAM OF STEAM/AIR UNIT

The temperature of the steam/air mixture is regulated by altering the air flow from the blower or regulating the amount of steam. This gives a range of temperatures between ambient air temperature and 212°F. A temperature of 150°F. on the dial thermometer (Fig. 6) gives a temperature of 140°F. in the soil in the trolley.

The unit has proved extremely efficient, taking about 45 minutes to heat 20 cubic ft. of UC mix to 140°F. This temperature is maintained for 30 mins. which is sufficient to kill all pathogens but does not completely sterilise the soil. The remaining microflora act antagonistically against any organisms accidentally introduced after treatment (Olson 1964).

The steam is turned off after approx. 30 minutes at 140°F. and the blower is left on, fully open. This cools the soil very quickly and it is ready for use in about 20 minutes.

Pots, tools etc. are sterilised in the trolley at 212°F. by using only steam.

Hygiene precautions taken include keeping the potting area a "clean" area by keeping it free from unsterilised pots, soil, tools etc., avoiding walking across, on or in sub-irrigation bays; and making sure boots, tools etc. are cleaned before moving into clean areas.

Sub-irrigation has one major disadvantage and this is soil borne pathogens with mobile zoospores such as *Phytophthora* can be spread from one container to another during the watering process. However it is felt that it can still be used successfully if very strict methods of hygiene are closely adhered to. The advantages of this method of watering make this worth while.

REFERENCES

- Olson, C. M., 1964.—Aerated Steam Treatment of Soil—Its Principles and Application. *The International Plant Propagators Society* 14: 305-308.

Propagation by seed will be the subject of a future article by Mr. McIntyre.

SIZE OF CUTTINGS?

Further information supplied by Keith McIntyre at request of Editor.

The average length of cuttings varies, but as a rough guide; when leaves are less than ¼" long cuttings are made 1"-2" long; when leaves are ¼"-2" long cuttings are made 2"-3" long; and when leaves are greater than 2" cuttings are made about 4" long. Other factors such as the type of the wood and time of the year must also be considered. Usually about 2/3 of the cutting is stripped of leaves and placed below the cutting medium in the punnet.

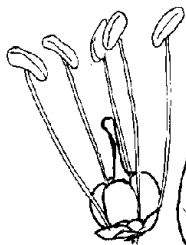
GENERA OF EPACRIDACEAE—continued from page 98.



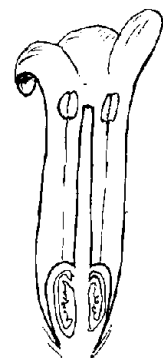
WOOLLSIA



PRIONOTES



RICHEA



DRACOPHYLLUM

STYPHELIA Sm.

by Betsy R. Jackes (Townsville)

Styphelia when used in the restrictive sense is a genus endemic to Australia occurring in all States.

Usually erect shrubs, which vary in height from 10 cm. to 2 m. high, with either sessile or shortly petiolate leaves. The axillary flowers which are usually solitary, except for one species, have several bracts and two bracteoles surrounding the lightly coloured calyx. Quite a range of floral colours are found, varying from green through white to yellow and red. The stamens are exserted; the long filaments being attached at the throat of the cylindrical corolla-tube.

In New South Wales, where half the species are found, the common name is "Five-corners", the name derived from the ribbed drupe. Main flowering season seems to be the winter although specific variations occur.

KEY TO THE SPECIES

- | | | |
|----|--|-----------------------------|
| A. | Corolla-tube with five dense tufts of hair below the middle, sometimes forming a ring | B |
| | Corolla-tube glabrous below the middle | H |
| B. | Diffuse or prostrate shrub forming a mat up to 80 cm. diameter | 1. <i>S. adscendens</i> |
| | Erect shrubs not forming a mat | C |
| C. | Branches pubescent-hirsute | D |
| | Branches glabrous or very minutely pubescent | E |
| D. | Leaves exceeding 25 mm. long, corolla greenish-yellow | 2. <i>S. longifolia</i> |
| | Leaves usually less than 25 mm. long, corolla yellow to red | 3. <i>S. laeta</i> |
| E. | Corolla red, rarely pale or white; leaves 6-15 mm. long | F |
| | Corolla green, or pink with yellow; leaves 10-25 mm. long | G |
| F. | Leaves oblong-linear or slightly cuneate with recurved margins, abruptly mucronate; shrub 1 m. high | 4. <i>S. tubiflora</i> |
| | Leaves thick, obovate-oblong, flat or slightly convex, obtuse or with a minute point; shrub about 60 cm. high .. | 5. <i>S. hainesii</i> |
| G. | Corolla green, flowers solitary, scattered | 6. <i>S. viridis</i> |
| | Corolla pink with yellow, flowers appearing to be clustered at base of shoots | 7. <i>S. triflora</i> |
| H. | Corolla-tube 1.5-2.5 cm. long | 8. <i>S. tenuiflora</i> |
| | Corolla-tube less than 1.5 cm. long | I |
| I. | Leaves much recurved, minutely pubescent on lower surface | 9. <i>S. intertexta</i> |
| | Leaves concave, flat or slightly recurved, glabrous | J |
| J. | Leaves ovate to broadly cordate, flat or concave, 6-10 mm. long | 10. <i>S. melaleuroides</i> |
| | Leaves broadly ovate, very concave, recurved at the end, 3-4 mm. long | 11. <i>S. pulchella</i> |
| | Leaves ovate to ovate-lanceolate, slightly convex, 5-7 mm. long | 12. <i>S. exarrhena</i> |

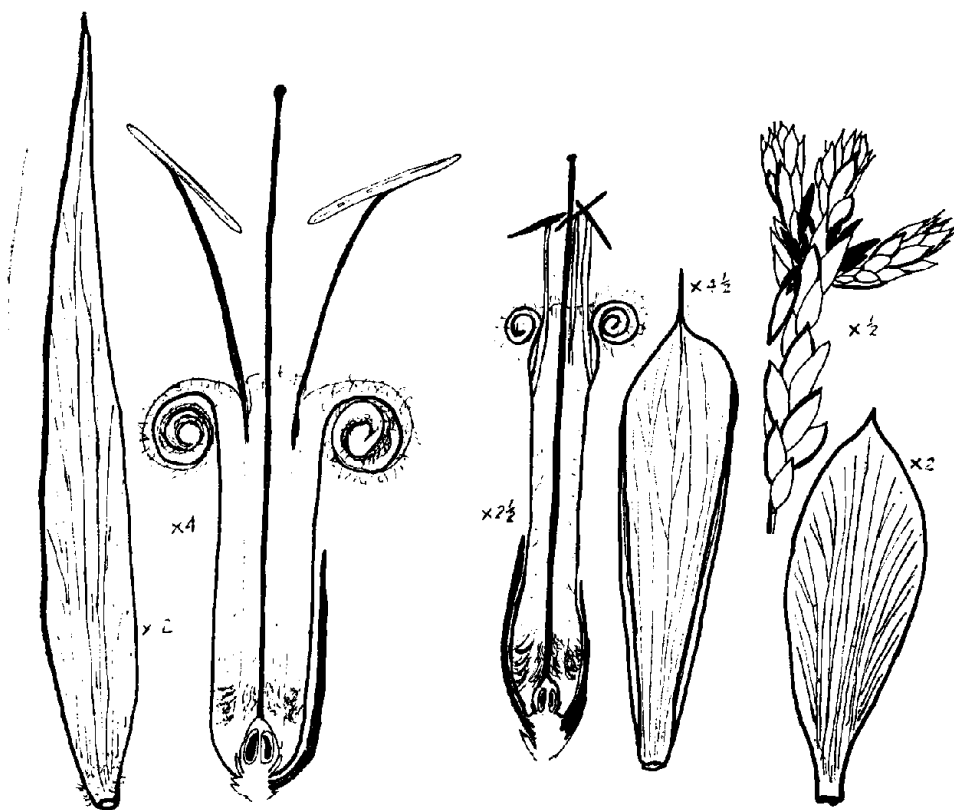
NOTES ON THE SPECIES

1. *Styphelia adscendens* R.Br.

Galden Heath

This small, much-branched shrub often forms dense mats up to 80 cm. or more in diameter. The crowded leaves are lanceolate and greyish, up to 3 cm. long. The cream or yellow flowers are grouped in axils near the end of the branches. The inner surface of the corolla-lobes, which are strongly revolute, is densely hairy, as well there are five tufts of hair at the base of the long (ca. 20 cm.) corolla-tube. The stamens are much exserted with long linear anthers. The green fruit which may be up to 10 mm. long is edible.

This is the only species found in Tasmania and Victoria, it prefers sandy heathland soils. It is also found in southern New South Wales and south-east South Australia. Flowers mainly in summer.



Styphelia longifolia
Leaf and flower—as shown, full size x

Styphelia tubiflora *Styphelia triflora*
See page 127 for habit sketches

2. *Styphelia longifolia* R.Br.

Long-leaved Five-corners

An erect shrub, varying in height from 1 to 2 m. high, with long lanceolate leaves (25-50 mm.) which gradually taper to a sharp point. The corolla with its revolute lobes is greenish-yellow. The long filaments are thick rather than flattened. Prefers sandstone soils, particularly common in the Sydney area, where it flowers winter and early spring.

3. *Styphelia laeta* R.Br.

Corolla varies in colour from red or yellowish to cream. A rigid shrub up to 2 m. high occurring mainly on the coast and mountains around Sydney. *S. laeta* R.Br. var. *laeta* is characterised by ovate, ovate-lanceolate or broadly oblong leaves which taper quickly to a fine point. The leaves are usually less than 8 mm. wide as are those of var. *angustifolia* (DC.) Benth. but here the narrow, lanceolate leaves taper gradually to a fine point; in var. *latifolia* (R.Br.) Benth. the broadly ovate leaves are from 8-15 mm. wide, and taper quickly to a fine point. Flowers mainly in the winter and early spring. See page 124 for forms and varieties.

4. *Styphelia tubiflora* Sm.

Red Five-corners

This New South Wales species forms a spreading shrub up to 1 m. high. The leaves are oblong-linear or somewhat cuneate with recurved margins, they terminate in a long mucronate point. The slender corolla is usually red, rarely pale or white except at the base of the corolla-tube. The hairs on the revolute lobes and inside the corolla-tube are usually dark red. The linear anthers are borne on long flattened filaments. Flowering season is normally winter or early spring.

5. *Styphelia hainesii* F. Muell.

This is the only species from Western Australia which has the five dense tufts of hairs in the corolla-tube. This bushy shrub, growing up to about 60 cm. has thick obovate-oblong leaves, and red flowers with a long corolla-tube. Winter flowering.

6. *Styphelia viridis* Andr.

Green Five-corners

The green flowers of this erect shrub (1-2 m.) contain a large quantity of nectar. They are axillary and scattered over the branches; the corolla-lobes are sparsely hairy. The leaves of var. *brevifolia* Benth. which is found in Queensland and northern New South Wales are narrower and the corolla-tube and sepals are smaller. Main flowering period is winter.

7. *Styphelia triflora* Andr.

Pink Five-corners

The pale pink or yellow flowers of this species, although usually solitary, appear to be clustered at the ends of the branches.

An erect shrub up to 2 m. with narrow to broad lanceolate or oblong-lanceolate leaves, it is found along the coast and nearby ranges of New South Wales and Queensland. Flowers in winter and spring.

8. *Styphelia tenuiflora* Lindl.

Slender-flowered Heath

A spindly shrub, often reaching 1 m. high, it is common in the south-west of Western Australia. The leaves are ovate to lanceolate about 15 mm. long, with a long pungent tip. The lobes of the white or yellowish-white flowers bear long scattered hairs. Flowering period extends from May to November.

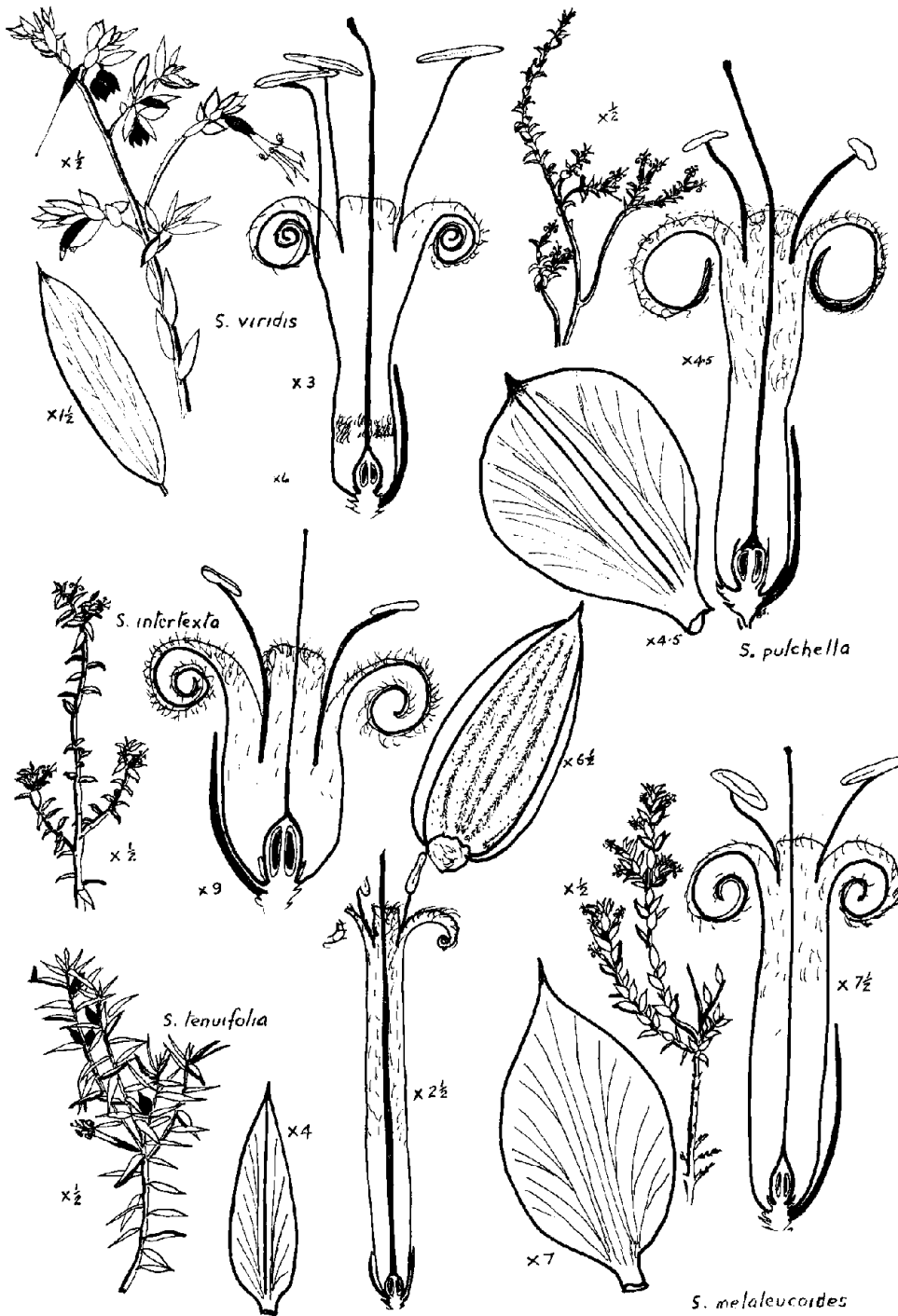
9. *Styphelia intertexta* A. S. George

A much-branched shrub up to 60 cm. high. The lanceolate or broadly lanceolate leaves have recurved margins and a rigid mucronate tip. The branches as well as the undersurface of the leaves are pubescent. The short, axillary flowers (ca. 6 mm.) are white and usually found in pairs towards the ends of the branches.

Occurs in small scattered areas in south-west of Western Australia where the flowering season is early winter.

10. *Styphelia melaleucoides* F. Muell.

An erect shrub normally ranging in height from 60-90 cm. found in Western Australia. Leaves are typically ovate to broadly cordate 6-10 mm. long with a short mucronate point. Var. *ovata* F. Muell. has ovate leaves



Flower, leaf and flowering branch of five species—Actual size x

with a longer rigid tip. The corolla has a cream tube and white lobes. The dark pink anthers are exerted on long thin filaments.

11. *Styphelia pulchella* (Stschegl.) Druce

An erect shrub rarely exceeding 30 cm. high with broadly ovate, very concave (ca. 3 mm. long) leaves which are recurved at the end. The flowers are 8-10 mm. long, pale pink in bud. The corolla-lobes are covered by long white hairs. This Western Australian plant flowers predominately in late winter and early spring.

12. *Styphelia exarrhena* (F. Muell.) F. Muell.

A small shrub with ovate to ovate-lanceolate leaves found only in South Australia. The white flowers have a very short corolla-tube, about 3 mm. long, with densely bearded revolute lobes. Var. *hirtella* (F. Muell. ex Benth.) Black describes short hairs on the leaves.

WESTERN STYPHELIA

SOME W.A. SPECIES OF STYPHELIA, by Ken Newby

This genus belongs to the family Epacridaceae and is very close to *Leucopogon*.

Apart from *Styphelia tenuifolia*, species of this genus are rarely seen in W.A. *S. melaleucoides* possibly has not been seen since its original collection in the mid 1800's. *S. melaleucoides* v. *ovata* and *S. pulchella* which were originally collected during the same period, have only been relocated during the last 2 or 3 years.

As almost all W.A. species are rare they have not been brought under cultivation. All have good ornamental potential. All grow on well drained soils, usually stony, are mainly low growing and should be ideal for rockeries. The plants themselves are not conspicuous but usually have masses of bright white, cream or red flowers. Some species have a more or less open habit and pruning should be beneficial. Very little or nothing is known about germinating the seed or striking cuttings.

S. hainesii and *S. melaleucoides* have not been seen by the author and are not described in this article.

***Styphelia intertexta*.** A few stemmed, grey barked, well branched, spreading to rounded, fairly dense, leafy shrub or undershrub 1 to 2 ft. high and similar across. A temperate inland species found growing on the plains, mainly amongst or under medium sized trees on loam or clay loam in 15" rainfall. Leaves are $\frac{1}{4}$ "- $\frac{1}{2}$ " long, under $\frac{1}{8}$ " wide, margins partly rolled under, rigid, tapering to a fine drawn out point, pungent and bright darkish green in colour. Flowers are basically tubular, over $\frac{1}{4}$ " long, slightly under $\frac{1}{8}$ " diameter, opening into 5 narrow and recurved petals, bright white in colour, axillary in sessile pairs, on the last $\frac{1}{2}$ " or so of the branches and almost covering the plant when in full flower during later winter and early spring. A good ornamental with good foliage and very attractive in flower. Should be suited to both deep and shallow soils ranging from sandy loam to clay loam and requires good drainage. Will stand exposure and under these conditions becomes lower and more dense. Grows in situations where the cold air drains off quickly after frosts so will be hardy to moderate frosts. Occurs in full sun or partial shade and will stand some shade. Has a life span of about 30 years.

A coarse form differs mainly in darker and coarser leaves and a lower and denser habit.

***Styphelia melaleucoides* v. *ovata*.** A single stemmed, grey barked, upright-spreading, fairly dense, leafy shrub 12"-15" high and 10"-12" across. A rare inland species found growing on the ridges amongst other low shrubs, on sandy gravel or stony loam in 20"-25" rainfall. Leaves are $\frac{1}{4}$ "- $\frac{3}{8}$ " long, $\frac{1}{8}$ " wide, tapering to a fine point, slightly rigid and bright green in colour. Flowers are basically tubular, $\frac{1}{4}$ " long, under $\frac{1}{8}$ " diameter, anthers protruding $\frac{1}{8}$ ", creamish white in colour, single, sessile, axillary on the last 1" of the branches and often in masses during late autumn and winter.

A good small ornamental with good habit, foliage and attractive in flower. Should be suited to both deep or shallow soils ranging from sand to loam and requires good drainage. Will stand some exposure and requires a rocky soil for root anchorage. Grows in situations where the cold air drains off quickly after frosts and will be hardy to moderate frosts. Occurs in full sunlight or partial shade and has a life of about 25 years.

***Styphelia pulchella*.** A few stemmed, grey barked, much branched, spreading to dome shaped, fairly dense, leafy shrub 12"-30" high and 18"-36" wide. A rare inland species found growing on rocky clay ridges in 15" rainfall. Leaves are $\frac{1}{8}$ " or slightly more in length, $\frac{1}{8}$ " wide, slightly recurved, ending in a small fine point, slightly rigid and light green to almost bluish green in colour. Flowers are $\frac{5}{16}$ " long, over $\frac{1}{16}$ " diameter, opening to $\frac{3}{16}$ ", white in colour, sessile, axillary, in terminal clusters of up to 6, very numerous and almost covering the plant during late winter.

A good ornamental with average foliage but very attractive in flower. Should be suited to shallow soils ranging from loam to clay and requires good drainage. Will stand some exposure and requires a rocky soil for root anchorage. Grows in situations where the cold air drains off quickly after frosts and will be hardy to moderate frosts. Occurs mainly in partial shade and should have a life span of about 20 years.

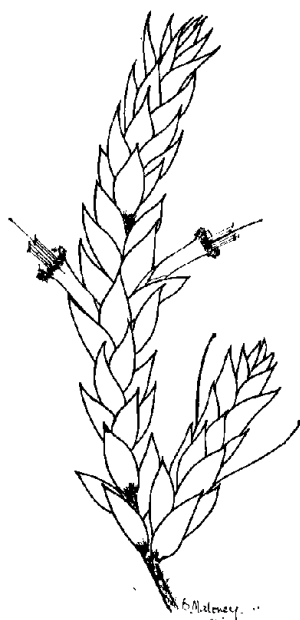
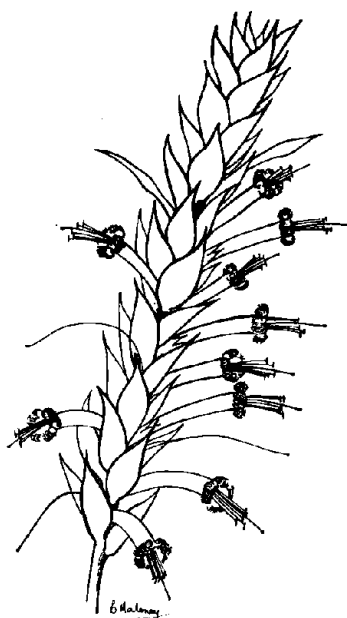
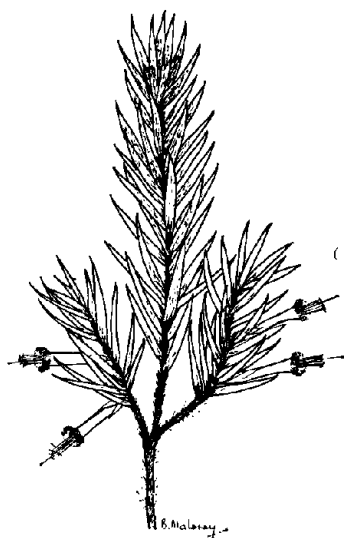
***Styphelia tenuiflora*.** A single or few stemmed, not much branched, slightly open to open, upright to spreading shrub to 4 ft. high and 3 ft. across. A widespread inland species found growing on the plain or ridges on sand or sandy gravel in 15"-30" rainfall. Leaves are $\frac{1}{4}$ "- $\frac{1}{2}$ ", about $\frac{1}{4}$ " wide at the base, tapering to a fine drawn out rigid point, rigid, prickly and dull green in colour. Flowers are tubular, $1\frac{1}{4}$ " long, $\frac{1}{8}$ " diameter; opening into 5 small narrow and recurved petals, bright cream in colour, axillary on the last 1" or so of the branches and in masses during winter and early spring.

A good ornamental with average foliage and very attractive in flower. Should be suited for both shallow and deep soils ranging from sand to loam. Will stand some exposure and requires a rocky soil for root anchorage. Under exposure it becomes lower and denser. Grows in situations where the cold air drains off quickly after a frost but will stand moderate ones. Occurs in full sunlight but will stand some limited partial shade.

READERS AND PHOTOGRAPHERS

Dr. Jackes will continue to describe the plants in the family *Epacridaceae* a genus at a time in future issues. However she needs flowering specimens of plants from all over Australia and the editor needs 35 mm. colour slides to illustrate the articles. Will readers please go out into the field over the next flowering season and collect specimens of plants you think could belong to the tribe *Styphelieae* and send them to Dr. B. Jackes, 5 Ashton Street, Vincent, Townsville, Qld. 4814. Just wrap small flowering specimens in a plastic bag and brown paper and send by parcel post. She particularly wants specimens of *Coleanthera*, *Pentachondra*, *Trochocarpa*, *Chloristemon*, *Needhamiella* and *Oligarrhena* but all genera listed are needed.

Photographers, will you please make a special effort to get good 35 mm. colour slides of these flowers and send them to the editor for inspection.

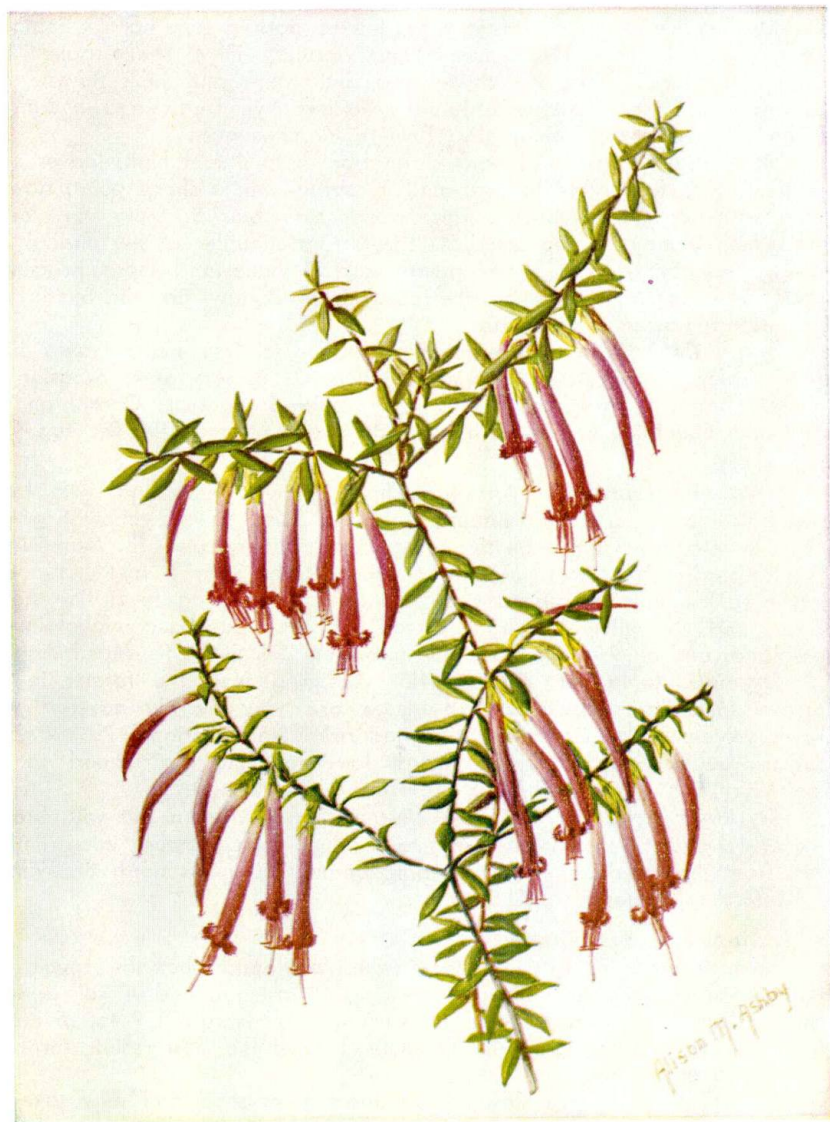
Styphelia laeta var. *laeta*—two forms*Styphelia laeta* var. *latifolia**Styphelia laeta* var. *angustifolia*

These plants are described on page 126.

STYPHELIA OF SYDNEY AREA

An article in the series "Hawkesbury Sandstone Flora" by Alec M. Blombery

A feature of the Hawkesbury Sandstone Area is the heathland of the coast and the blue mountains. *Styphelia* are some of the dainty shrubs found there as well as in the adjacent light forests.



Blocks by courtesy of the South Australian Museum from a painting by Alison M. Ashby. Copies of this picture may be obtained from the S.A. Museum, Adelaide, S.A.

STYPHELIA TUBIFLORA

The genus *Styphelia*, family Epacridaceae, is represented by 5 species, one of the species has 3 recognised varieties, which are more or less restricted to particular areas. The species may be arranged into 2 groups:-

- (1) Those in which the branches are glabrous (smooth) or with minute hairs.
- (2) Those in which the branches are pubescent, i.e. covered with fine, soft, velvety hairs.

Group (1)

***Styphelia tubiflora*:** This is the smallest of the species and is an erect to straggling shrub, 2 to 3 feet high; leaves dark green, narrow, oblong, linear, with recurved edges, terminating abruptly in a sharp point. The slender, tubular flowers are chiefly red, but white and pink flowers are not uncommon. This species is found in sclerophyll forest and heathland of the coast and Blue Mountains; flowers March-August.

***Styphelia viridis*:** An erect shrub from 3 to 6 feet high; leaves light green, oblong, lanceolate to oval, ending abruptly in a sharp point; flowers green with conspicuous bracts. This species resembles *S. laeta* var. *laeta*, from which it may be separated by the abrupt shoulder at the end of the leaves, terminating in a sharp point, lack of hairs and more prominent bracts. This species occurs on the coast from Botany Bay in Sydney to Queensland; flowers April-August.

***Styphelia triflora*:** An erect shrub, 3 to 6 feet high; leaves light green, oblong, lanceolate, tapering to a point; flowers pink, occasionally yellow, often with a number of flowers clustered together. Occurs on the coast and mountains, chiefly on heathlands of N.S.W. and Qld; fls. Aug.-Oct.

Group (2)

***Styphelia longifolia*:** An erect shrub, 5 to 8 feet high, with long, lanceolate leaves, tapering gradually to a long point; flowers yellowish green, occurs in sclerophyll forest on the coast of the Sydney area; fls. March-Aug.

***Styphelia laeta* var. *laeta*:** An erect shrub, 3 to 6 feet high, with light green leaves, oblong to ovate, lanceolate, tapering to a fine point; flowers red to yellowish green. Occurs on the coast and mountains in heathlands and on Wainamatta shade (see map Vol. 5-40); fls. March-August.

***Styphelia laeta* var. *angustifolia*:** Differing from the former in the narrow, lanceolate leaves and branches are very heavily covered with brown velvety hairs. Occurs in a limited area from National Park on the southern outskirts of Sydney westwards to Picton and Springwood on the Blue Mountains on the edge of the Hawkesbury Sandstone.

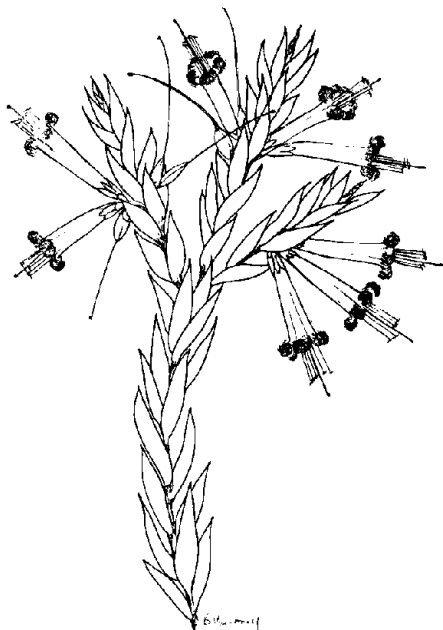
***Styphelia laeta* var. *latifolia*:** Resembling var. *laeta* but with broad, lanceolate leaves, shortly tapering to a fine point. Occurs in a limited area from the Hawkesbury River, approximately 30 miles north of Sydney, to Gosford, 40 miles from Sydney.

Cultivation and Propagation

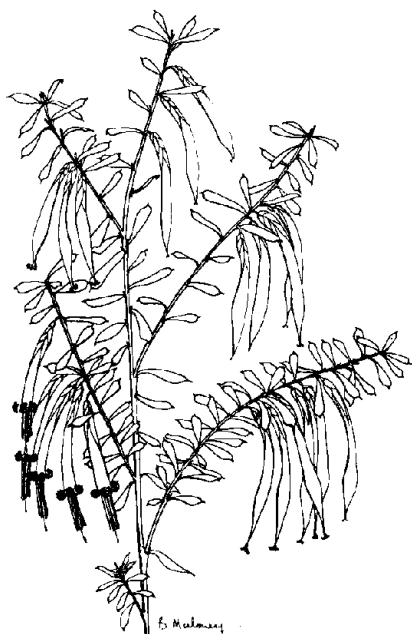
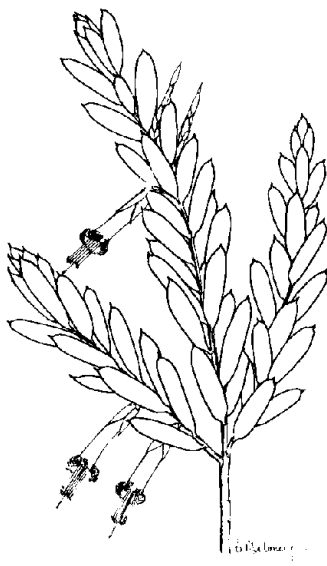
As with other species of the Hawkesbury Sandstone, the species of *Styphelia* are readily cultivated and best results are obtained in well drained soil, particularly in garden beds in which the soil is raised 9 to 15 inches above the surrounding ground; this method gives the best results for most plants including native species.

Styphelia species are slow to germinate from seed and may take up to 12 months or more; propagation from cuttings is the best method with cuttings taken in spring and autumn in a medium of coarse river sand and peat under glass or plastic covering in a half shaded position. Cuttings take 3 to 6 months to root.

Styphelia triflora



Styphelia viridis



Styphelia tubiflora



Styphelia longifolia

CONSIDER THE BIRDS

by David Leithhead

It is accepted that the more birds there are in your garden the better will insect pests be controlled. Bearing this in mind, it is easy to fill a garden with plants beloved by the birds; but a little more thought is required to select those which will provide some blossom, and thereby retain some birds, throughout the year. These notes are submitted as a record of such plants found suitable at Austinmer, N.S.W., and it is hoped they could be of assistance to others with similar climate. Each district, by experiment and records, should be able to establish its own list. The rewards are worth the effort.

Austinmer is 9 miles north of Wollongong, N.S.W., entirely within sound of the surf, with generous rainfall and deep, rich black soil. All natives tried have not survived these conditions, but sufficient have enjoyed them to make the choice of further plants more an embarrassment of riches than a search. Grevilleas are by far the best group on which to specialise; not only do they provide within themselves a wide diversity of colour, form, habit and size, but they can give you flowers right round the calendar. One at least—Sid Cadwell's vigorous hybrid 'Boongala Spinebill'—has not been without blossom since its first flower well over a year ago. So give first preference to grevilleas; the birds will endorse your choice. Callistemons and melaleucas are good, too, but most of their blossom comes in spring—in time for the feeding of young broods. Except for one which blooms at a useful time, eucalypts have not been mentioned; this is a small garden.

In the table below, only plants which contribute materially to the around-the-year supply of nectar are included. There are many more well worth their place in the garden for other reasons; *Kennedyia nigricans* was a picture here from July to November, but no bird was observed on it. And the birds?

	J	F	M	A	M	J	Jy	A	S	O	N	D
<i>Callistemon phoeniceus</i>												
<i>Euc. leucoxydon macrocarpa</i>												
<i>Grev. barkleyana</i>												
<i>Grev. bipinnatifida</i>												
<i>Grev. "Boongala Spinebill"</i>												
<i>Grev. "Crosbie Morrison"</i>												
<i>Grev. lutea</i>												
<i>Grev. stenomera</i>												
<i>Grev. trinervis</i>												
<i>Grev. wilsonii</i>												
<i>Melaleuca huegelii</i>												
<i>Melaleuca hypericifolia</i>												
<i>Melaleuca nesophila</i>												

MY BIRDS

These are my birds. Why don't you cultivate a similar nature's aviary?

Blue Wrens scurry amongst the lower growth, and Silver-eyes search the branches above. Bless them both! but it is the Honey-eaters which really regard the garden as their own, and as all of them readily snap up any



Photography by N. Chaffer

Blocks by courtesy of the Bird Bander's Assn. of Australia

THE REGENT BOWER-BIRD

(See over page for further information)

insect spotted between sips of nectar, they are ever welcome. As with humans in certain categories, the Honey-eaters recognise an established "pecking order". Spine bills are the constant attendants here and know every twig in the garden; but when Yellow-faced Honey-eaters arrive their first act is to chase the Spineys from wherever they're feeding, and take over. They, in turn, dive for cover whenever Yellow-wings show up; but if a Lewin Honey-eater then slips across from the dark gully on the hillside first remark is to order all the lesser fry back into the queue. Callistemon time brings Brush Wattle-birds who rule the roost unless a Friar Bird turns up; but this foolish fowl spends so much time telling and showing the avian world what a big fellow he is that all his meals are interrupted and he probably develops ulcers. The Spinebills do best. They are the most industrious, know their environment perfectly and have no interest whatever in the real or imaginary value of a position in the social scale; they just get on with the job of living—and they still find time to sing.

So work out your own list of favourites to share with the birds throughout the year. It doesn't take long. No plant in the table is five years old.

THE REGENT BOWER-BIRD

The Regent Bower-bird *Sericulus chrysocephalus* inhabits suitable parts of the coastal area from about Sydney, New South Wales to Mackay in Queensland. It is not uncommon in parts of the Gosford district where the brilliant black and gold plumage of the adult male attracts immediate attention. The bird depicted in the excellent photo by Mr. Norman Chaffer is a female with food for its nestlings. Young males are similar in appearance to the female.

Like most members of the bower-bird family the Regent Bower-bird is a bower builder. The brightly plumaged male displays at the bower to attract females for mating. The female carries out the domestic chores such as nest-building, incubating the eggs and feeding the nestlings. The nest is built in thick-foliaged trees or in vines at heights up to 40 feet from the ground, in rain forest or wet sclerophyll habitat. Two eggs normally form the clutch; they are yellow-stone colour with numerous dark brown or purplish-grey hair-like markings.

"THE AUSTRALIAN BIRD BANDER"

The colour plate over the page is reprinted from "The Australian Bird Bander" that gives much more information on the bower-bird. This journal is published quarterly by the Bird Banders' Association of Australia. It normally comprises some twenty four pages of articles and notes from members, with photographs, diagrams or maps, and interesting data on Australia recoveries of birds banded both within Australia and elsewhere. A regular feature, "Bird in the Hand", provides a valuable guide to identification, age and sex.

The Bird Banders' Association of Australia membership subscription is \$3.00 per annum. For juniors (under 18 years) it is \$1.50. Enquiries to R. G. Lonnon, P.O. Box 17, Avalon Beach, N.S.W. 2107.

Control of Pests on Natives

The above articles give a guide as to how wildflowers will attract birds. Previous issues give further details of plants that attract birds and how you may feed the birds. There is a small book available from the editor for \$2.10—"Australian Native Gardens & Birds" by S. Salter. If you have native birds you do not have a pest problem, the birds attend to that. Difficult pests that form scale can be removed by an old toothbrush. Please do not use insecticides, they are rarely necessary.

A survey of plants that attract birds is being conducted by M. P. Hines, 42 Panzeza Street, Stafford, Qld. 4053 and he would be pleased to have any reports on the subject.

LEAVES YELLOWING ?

Symptoms

Iron chlorosis in plants is characterized by blanching or yellowing of the leaves. This change in the appearance of the leaves is due to failure of chlorophyll (green colouring matter) to develop normally.

Mildly affected plants become unsightly and grow poorly. Severely affected plants fail to grow, flower, or fruit. Very severely affected plants die from lack of iron.

Causes

Iron chlorosis occurs in susceptible plants wherever and whenever iron is not available to them. The condition is often due to high pH, which makes it possible for other elements to interfere with the absorption of iron, rather than to lack of iron in the soil. It occurs most often on soils that are high in lime.

But iron chlorosis is not limited to naturally occurring high-lime soils. It may be caused by actual deficiency of iron, or by application of excessive amounts of lime or phosphate to certain soils. It may be caused by over-irrigation, poor drainage, bicarbonate in the soil or in irrigation water, and high levels of certain heavy metals in the soil (for example, manganese, copper, and zinc).

Control

If over irrigation or poor drainage is a possible cause of iron chlorosis, it should be corrected. Otherwise, the disease is controlled by furnishing soluble iron to plants, either through the soil or through the foliage of the plants.

Two principal types of iron-containing compounds used to furnish iron to plants are:

1. Iron chelates.
2. Inorganic compounds containing iron in soluble form. Ferrous sulphate (also called copperas) is such a compound.

Iron Chelates.—Iron chelates are organic compounds containing iron. The iron remains available to plants when the chelates are placed in the soil.

The iron in chelates costs much more per pound than the iron in ferrous sulphate, but the amount of chelates required for control of chlorosis is much smaller than the required amount of ferrous sulphate, and the cost of treatment with chelates need not be greater.

Ferrous Sulphate—Ferrous sulphate and similar compounds that contain inorganic iron furnish soluble iron to plants. However, when they are applied to the soil, much of the applied iron becomes unavailable to plants. Consequently, applications must be much in excess of amounts actually required by the plants. The iron is made unavailable by the same factors that cause iron chlorosis initially (high pH, interfering elements, etc.).

The sections that follow refer to treatment with ferrous sulphate.

Treating Soil

For trees and shrubs, the solution is prepared by dissolving ferrous sulphate in water at the rate of 1 pound of the chemical per gallon of water. Best period for soil treatment is winter or early spring.

Dendrobium stuartii F. M. Bail.

An article in a series on the genus *Dendrobium* by I. D. WALTERS

This section of *Dendrobium* is perhaps the most widespread of the genus. Representatives are found all over Asia, to China, the Philippine Islands, New Guinea and with one representative, in Australia. The section is distinguished by having pseudobulbs, usually evenly fleshy or sometimes thickened at nodes, erect or pendulous, leafy throughout, the leaves usually deciduous at flowering. Inflorescence short, few flowered, the flowers medium to large. The labellum usually more or less downy on the inside, broad and rounded, without lateral lobes and usually without callus or keels. Mentum short with the column foot having a hollow nectary. Sepals and petals usually similar and fairly broad.

The Australian *Dendrobium stuartii* F. M. Bail. is a little known species from Cape York Vegetatively, the plant resembles a small plant of the well known Indian species, *Dendrobium pierardii* Roxb., having pendulous stems up to eighteen inches in length and about one quarter inch in diameter, even all the length but tapering to a point at the end. Leaves are produced the entire length of the stem and are deciduous at flowering. Leaves are soft, two or three inches long and about one half inch wide, lanceolate.

The flowers are produced in pairs, sometimes threes, from nodes of the new growth which has lost its leaves or is in the process of doing so. Inflorescence short, flowers about one half inch across, three quarters inch long. Sepals and petals narrow, lanceolate, acute, opening wide. The labellum is somewhat tubular, flaring out somewhat towards the apex, about as long as the petals. The margins of the labellum are finely fimbriate and inside it is dawny. Margins are somewhat undulate and the apex is pointed.

The sepals and petals are a dull green or greenish yellow in colour, while the labellum is more brownish green. The flowers are short lived and open widely for but a short time. The flowers are also apparently self pollinating.

Because of the pendulous nature of the plants, small baskets, containing peat, and slabs of treefern fibre offer the best accommodation. The plants require a warm position, shaded to prevent burning of the soft foliage, and copious watering when in growth. On the appearance of the buds, a short dry rest period should be afforded until the flowers are spent and the new growth appears. Feeding when in growth should produce continually larger stems, and old back stems could be propagated by cutting them into lengths of several nodes and placing them on wet peat—as is done with the Indian species *D. pierardii* Roxb.—to produce aerial plantlets.

ORCHID PHOTOGRAPHERS

It is our policy to produce a full colour plate of an Australian orchid in each issue. The problem is the obtaining of suitable 35 mm. colour slides. A good slide of *Dendrobium stuartii* is not available. How much better this article would be if we had a colour plate of the plant and flower. We need colour slides of all species that have not appeared in previous issues or are not pictured in "Australian Indigenous Orchids". Please send the best slides you have for inspection and make an effort, over the coming flowering season to photograph the rarer species.

Miniature Indoor Greenhouse

A Hermetically Sealed Indoor Greenhouse by Dr. P. S. Vadilo, Leningrad, U.S.S.R.

Buy or make yourself a narrow but high aquarium. Place in it to a depth of 4 to 6 inches, a good garden soil containing humus and just moisten it throughout. Plant your plants, put on the glass lid and seal it with adhesive plaster. The hermetically closed indoor greenhouse is in operation.

Put it on a window-sill or verandah. The micro-organisms of this soil decompose the humus producing CO₂. Leaves of the plants take in the CO₂ expiring oxygen and water. The water condenses on the inner walls of the hermetically sealed greenhouse and flows into the soil.

If the soil had little moisture in it and only a few plants were growing you would have the climate of a desert. If the soil was initially very wet you will have the climate of a swamp. However a wide range of plants will grow and bloom if you have normal moisture.

In such a greenhouse you can grow your plants years without watering. It is also a way of keeping indoor plants if you should go away for a week.

Dr. P. S. Vadilo, Pilutova 17-53, Leningrad L-259, U.S.S.R. can supply seed of the wildflowers of the Leningrad (North Russia) region, either by packet, ounce or pound weight. Send for free list.



DENDROBIUM BIFALCE

Dendrobium bifalce was described in our No. 39 issue together with *D. bairdianum* (which was illustrated in colour). A suitable colour slide has now come to hand. A typical tropical orchid it requires a warm sunny position with maximum moisture when growing.

THE FROST PROBLEM

by W. A. Marshall

Frost is a serious problem to growers of native plants in many parts of inland Australia. In Canberra frosts are severe in nature and occur over all the winter months, mainly between May and September, with occasional frosts in April and October. Canberra has an average of 90 frosts per annum, with air temperatures as low as 16.3°F. Ground temperatures of 14°F. are common and have on occasion fallen to 9°F. Late frosts may not be as severe as the July ones, but they may cause more damage by their effect on tender early spring growth.

An understanding of the conditions favouring the formation of frost may help us to provide measures to lessen the disastrous effects of frost on tender plants. Frosts occur on still, clear nights when a layer of cold air settles on the ground, and under sub-freezing temperature conditions (below 32°F. ground temperature) water condensed from the atmosphere is deposited in crystalline form on cold objects such as vegetation. Unrestricted radiation of heat from the ground surface combined with the evaporative cooling effect of the air in contact with moist objects further lowers the air temperature below that of the air at higher levels.

The colder air tends to flow to the low-lying areas, thus frosts in hollows and low areas are more severe than those on the slopes or low hills, and minimum temperatures can vary considerably over comparatively small areas—as much as 12°F. temperature difference has been measured over a distance of no more than 100 feet.

Frost effect—Visible effects of frost on the more tender plants is seen as splitting of stems or "burning" or discoloration of foliage. Splitting of plant stems is probably caused by freezing of the sap in the trunk and limbs and its expansion into solid ice, which can occur with irresistible force. "Burning" of foliage is due to freezing and disintegration of leaf cells and interruption of the normal metabolic function of the plant by prevention of the sap flow to the leaves.

Frost damage may cause:-

- (i) Total collapse and death of a plant.
- (ii) Lowering of the plant's resistance to disease.
- (iii) Temporary damage such as "burning" of foliage tips or discoloration of leaves, from which the plant will probably recover completely.

Some plants may be frost-tender for the first year or two after planting, then be able to resist further frost without protection. Yet other plants may be so tender that they will survive only when located in a frost-free position.

It is not easy to determine when plants will prove frost tender under Canberra conditions, and even then some plants which cannot survive in the lower areas of Canberra may thrive in the higher or more protected parts. Some plants may be classified as frost hardy and will be capable of resisting 10° of frost, but may be badly affected by 15° or 20° frosts, or when subjected to a number of frosts over a long season, such as may be experienced in Canberra.

There is a need for a more precise classification by nurserymen and other native plant specialists in frost hardiness ratings, such as that given by the N.S.W. Forestry Commission Handbook. This publication nominates four ratings, viz.: T—Frost tender when young; M—Moderately resistant; R—Resistant; V—Very resistant.

In their book "Know Your Trees & Shrubs", Messrs. R. E. and Chas. Harrison have indicated even more precise degrees of frost hardiness. Plants classified "A" will survive unharmed frosts of up to 4°F .; "B": $4\text{--}8^{\circ}\text{F}$.; "C": $8\text{--}12^{\circ}\text{F}$.; "D": $12\text{--}16^{\circ}\text{F}$.; "E": $16\text{--}20^{\circ}\text{F}$. and "F" = plants which would survive even in the colder European countries.

The environment in which the plant naturally thrives will often give a good indication of its hardiness. Inland species should be more frost resistant than coastal ones, and many plants from the arid areas have proved frost tolerant in Canberra. In the case of West Australian plants, species from the Albany area, i.e. the Stirling and Warren botanical sub-division, have a better chance of survival than those from the Irwin area north of Perth, and many inland species will thrive if given some protection when young. Exceptions to this are some of the plants from forest areas—these will survive only when given the protection of taller trees and shrubs.

Much also depends on the conditions under which the plants have been exposed in the nursery and the areas from which seeds and cuttings have been collected—for instance propagating material taken from a species growing on the N.S.W. Tablelands will produce hardier plants than if taken from the same species growing in coastal areas.

Frost protection—By taking suitable precautions it is possible to grow a wide range of native plants in Canberra. Having determined to the best of our ability the relative hardiness of the plants of our choice, we must give them the conditions under which they have the best chance of survival.

Areas adjacent to the house which are exposed to the sun are normally frost-free, as heat from the sun during the day is reflected from the walls of the building to the ground and heat radiation from the building at night reduces the drop in temperature in those areas within 5 to 10 feet of the building. Walls having a northerly aspect are most effective in this regard, and eastern and western walls are also effective to a lesser degree. Here should be located the most select of the frost tender plants, and these areas should always be reserved for that purpose alone.

Where it is necessary for plants to be located in the open, overhead shelter of larger shrubs or trees will be found effective, as these intercept some of the heat radiation from the ground at night, consequently air beneath the trees remains substantially warmer on still nights than that in the areas without this overhead protection. It is a good plan to choose for these positions plants which besides being somewhat frost tender will need some shade from the summer sun, e.g. plants from a forest environment.

For plants in the open, a good layer of mulch will help, particularly if loose clean straw is piled around the plant stems. This will not prevent foliage damage, but will tend to keep the soil temperature higher.

Perhaps the most effective form of frost protection for frost tender plants in the open is in the use of hessian covers. All such plants should be covered overnight by hessian sheets, large enough to overlap stakes or chicken wire guards, and placed so that they do not touch plant tips. Care must always be taken to remove the hessian each morning, as the plants will suffer if left covered during the day.

Artificial watering should be restricted somewhat in autumn to allow the plants to become hardened. Care should be taken however to ensure that the ground does not become too dry, and heavy soakings given in the dry summer periods will ensure that the sub-soil retains an adequate supply of moisture.

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BOOK REVIEWS

"FLORA OF NEW ZEALAND"—Volume II

Volume I was published in 1961 and dealt with all the indigenous plants of New Zealand except the Monocotyledons. This volume II presents the remainder except for the grasses, *Gramineae*. The plants are fully described botanically. 350 pages.

"KOOKABURRAS" by V. A. Parry

This is a large 100 page book, illustrated in colour, just on Kookaburras. The author has made a very careful study of these fascinating birds on a meticulous scientific level but this book is a complete report for the layman. It is engrossing to read through chapters entitled "History", "Plumage", "The Kookaburra's Social System", "Vocal Behaviour", "Visual Behaviour", "Breeding", etc. and find how these birds live. The author takes you 30 ft. up rope ladders while she counts eggs, weighs the chicks and reports on their family life. Yes Kookaburras have a family life, each family with its own home territory. If you like Kookaburras you will enjoy this book.

"THE WILDFLOWERS OF WILSON'S PROMONOTORY NATIONAL PARK" by J. Ros. Garnet

This 190 page book is the record of observation and study by a meticulous and competent naturalist of an area of Australian bush that obviously has much fascination for him. It will for you too as he describes the area and its past, rambles along The Sealer's Cove Track or The Tongue Point Track. Then follows a checklist of every plant species known to have been discovered there. For those who would like to wander in this picturesque retreat and name the wildflowers but have little knowledge of botany, over 150 of the more common plants are illustrated by very simple but beautifully accurate sketches.

LEAVES YELLOWING?—Continued from page 131

Trees

To determine the quantity required, measure the diameter of the periphery of the tree at the drip line. This is the edge of the ground area below the foliage or where the outer leaves would drop. You will need ½ gallon of ferrous sulphate solution for each foot of the diameter of the periphery.

Dig holes around the periphery at intervals of about 3 feet.

Dig each hole deep enough to hold ½ a gallon of liquid.

Pour ½ gallon of ferrous sulphate solution in each hole; let it soak away.

Fill each hole with water once or twice; let it soak away.

Refill the holes with soil.

Small Trees and Shrubs

Treatment holes around tall, slender trees should be 2 instead of 3 feet apart. Apply ½ gallon of solution per hole as for other trees.

To treat small trees, apply the solution in 6-inch-deep trenches around the peripheries of the trees, but dig the trenches no closer than 1 foot from the base of the tree. The minimum dosage is ½ gallon per tree.

The summer after treating the soil, watch for symptoms of chlorosis. If chlorosis persists, take these additional steps:

Spray the foliage once or twice to gain temporary improvement.

Repeat the soil treatment when the trees are again dormant.

Treating Foliage

Quick but short-lived results are obtained by spraying ferrous sulphate solution on the foliage of plants affected with iron chlorosis. The amount required is much smaller than that required for application to the soil. However, if chlorosis is severe, frequent applications to foliage are required to keep plants green and healthy.

To prepare 3 gallons of spray, dissolve 2 ounces of ferrous sulphate in 3 gallons of water and add 2 tablespoons of detergent. (Detergent acts as a wetting agent).

Applying Spray

Spray treatments can begin any time during the growing season but are most effective when started early in the season. Thoroughly wet the foliage of the plants with spray.

If spray solution gets on flowers, it may stain and ruin them. To prevent this, direct the spray away from flowers, or spray when plants are not in bloom.



Photography by M. Baldwin

EPACRIS PULCHELLA

PROPAGATION OF EPACRIS

Propagation is by means of tip cuttings which at times only gives moderate success. Small pieces $1\frac{1}{2}$ to 2 inches long are selected from the tip of the shoots. If the tip is still very soft it should be removed and material selected from below this. The foliage is carefully removed from the lower half of the cuttings by using a sharp knife or razor blade so that there is no damage to the bark on the stem. Damage here will lead to failure of the cuttings. It is not necessary to worry about selecting the correct point along the stem to make the cut as the new roots develop from many and not a single point as is usual with many other species.

The cuttings need to be placed in a potting mixture of coarse washed sand and some peat moss. The pots of cuttings are placed in a cold frame or box which have been described in previous issues.