



EVERLASTING DAISIES *of* AUSTRALIA

Identification ♦ Propagation ♦ Cultivation

Australian Daisy Study Group

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Dedicated to

Beth Armstrong, Vic Schaumann and Julie Strudwick



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In writing this book the Australian Daisy Study Group has been helped by many people. The members have taken a very large part in the gathering of information, more than two thirds of the individual membership having actively participated in the 'Everlastings Project'.

Since our aim was to write from experience, the starting point was the collection of seed of all the species in the study. Such seed as was available at the beginning of the Project was purchased from suppliers but this produced only a small percentage of that needed. Generous donations of the species we sought and advice on their occurrence were received from Luke Sweedman (Kings Park and Botanic Garden), Stuart Donaldson (Australian National Botanic Gardens), Mark Savio and Peter Cuneo (Mount Annan Botanic Garden), David Albrecht and Hilary Coulson (Parks and Wildlife Commission of the Northern Territory), Peter Horsfall (Alice Springs Desert Park), Connie Spencer (Olive Pink Botanic Garden), Mark Saxon (Sachsenfeld Seed Company) and Val Hando (Chinchilla, Queensland). Members of the Study Group living or taking holidays in certain areas were persuaded to detour if they were anywhere near species we had not yet collected. For this reason we are indebted to the following: John and Beth Armstrong, Judy and Lee Barker, Pat Clarke, Ros Cornish, Bev Courtney, Maree and Graham Goods, Barrie Hadlow, Jan and Alan Hall, Colin Jones, Christina Leiblich, Beth McRobert, Ray and Rose Purches, Maureen and Vic Schaumann, Margery Stutchbury, Gloria Thomlinson, Ngaire Turner, and Bruce and Thelma Wallace. Special mention must be made of long journeys undertaken solely to gather seed for the project. Our thanks for these expeditions goes to Natalie Peate, Joy Greig and Peg McAllister for their outstanding collecting trip to Western Australia, and to Esma and Alf Salkin

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Once we had distributed seed to members for trialling and they had germinated it and grown it in their gardens, much seed was returned to the Group's seed bank for redistribution. For these activities we are grateful to the following industrial members in addition to those mentioned previously: John and Julie Barrie, Ros Cornish, Irene Cullen, Lyndal Howard, Jeff Irons, Fred Mazzaferri, Bob Mylius, Syd and Sylvia Oats, June Rogers, Gordon and Pat Ryan, Kym and Peter Sparshott, Julie Strudwick, Rosemary Verbeeten, and Brian Walker. The trials took many hours of members' time, involving counting of seed and seedlings, nurturing and reporting.

The Committee has received advice and assistance from many experts outside the Study Group. Foremost is Paul Wilson, Senior Botanist at the Western Australian Herbarium. Paul's enthusiasm for the project and his encouragement have been deeply appreciated. He has cheerfully answered our many questions, identified plants, provided articles, seed, plant specimens, locations and even introduced to us one of our most valuable plant collectors, Pat Fitzgerald. Paul has given us access to unpublished material and permission to include it in this book. Two other good friends,

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One of our most pleasant tasks has been the gathering of slides for inclusion in the book. We have been extremely fortunate to recruit Michael Marmach for the seed photography. Michael is a guest speaker of great note who has recently turned his skills to the photography of very small marine creatures for the Crustacea Department of the Museum of Victoria. He became interested in the beauty and diversity of the structure of Asteraceae seed and has gained our eternal gratitude. Thanks to Michael, the Study Group now holds a photographic record of the seeds of the great majority of species in this study. The slides presented here have been chosen to show the variety of seed structure existing within the everlasting daisies. Other photographs have been selected from members' collections taken on field trips or in their gardens. We thank them all for entrusting their precious slides to the Committee for the duration of the writing period.

The photographers are John Armstrong (JA), Judy Barker (JB), Lee Barker (LB), Graham Goods (GG), Joy Grieg (JG), Michael Marmach (MM), Esma Salkin (ES), Julie Strudwick (JS) and Vic Schaumann (VS).

Gloria Thomlinson, one of the talented botanical artists on the Editorial Committee, has drawn the illustrations for the chapters and the glossary. We thank her for the many hours she spends at the behest of the Group.

In compiling the information in Chapters 2 and 3, Growing Everlasting Daisies and Propagation, we received invaluable advice from Lotte von Richter and Dave Wilson (Mount Annan Botanic

Garden) and Mark Saxon. For Chapter 4, Gardening with Everlasting Daisies, we sought opinions and recommendations from numerous members living in the relevant regions. We are grateful for the excellent suggestions of the following: Ros Cornish and Barrie Hadlow, Syd and Sylvia Oats, Corinne Hampel, Margery Stutchbury, Beth McRobert and Pat Clarke, Gloria Thomlinson and Julie Strudwick, Joy Greig, Maureen Schaumann, and Natalie Peate.

The Editorial Committee has worked zealously for over five years to assemble the information gained from the cultivation of these species. We have tried to present it in a form capable of encouraging gardeners to try new species, as well as suggesting ways of making the better known species easier to grow. The task has provided much entertainment in the midst of the hard work for the co-ordinators and the other members. The proof reading has not been so much fun but we have been very fortunate to have the services of Maureen Schaumann, a consummate spotter of double spaces, misalignment and other errors invisible to the ordinary eye.

We thank our family members who have displayed great patience and forbearance over the years of our obsession.



Introduction

The Daisy family, botanically known as the Asteraceae or Compositae, is one of the world's largest families of flowering plants. In Australia it is the second largest family, comprising approximately 1000 species. The everlasting daisies described in this book are those members of the family that possess stiff, papery bracts, often in bright colours, which encircle the central disc florets. They are widespread throughout the southern two-thirds of the Australian continent. Many species grow in the semi-arid areas, transforming them from featureless sand to magnificent expanses of colour in good seasons. A contrasting habitat, the alpine herbfields, is home to an abundance of everlastings which grow in drifts of rich colour and are at their best in the summer months.

Everlastings also have the invaluable attribute of retaining their shape and character when the flowering stems are dried or the flower-heads are wired, thus providing year-round colour in floral arrangements.

This book aims to present the results of a five year study by the Australian Daisy Study Group covering all of the species in twelve genera of everlasting daisies, many of which have not previously been described in readily accessible publications. Most of these species have been collected and propagated, and plants have been grown in gardens across Australia in order to evaluate their potential for horticulture and for the cut flower and dried flower industries.

The seed or propagating material had first to be gathered. Where possible seed was purchased from commercial sources. Other species were kindly donated by universities, institutes and botanical gardens. In some cases friends living near the natural habitats of the required species made special forays to gather seed for the Group. Finally, special collecting expeditions were made

by several members of the Study Group to obtain the outstanding species. Inevitably, there were some species that could not be procured because the timing was too early or too late for seed, or because the species simply could not be found. In some districts dry seasons had led to poor seed development.

The propagating material (mainly seed) was distributed among the members of the Study Group with propagation and cultivation advice. In due course, reports on successes and failures were sent to the coordinators of the project. It is on the basis of the results of this detailed experience that the book has been written. The majority of the trials have been carried out in Victoria, most of which has a cool temperate climate, but results from many other climatic conditions have been included in the descriptions.

There are at least 15 genera of everlasting daisies (as defined above) which have not been covered in this book. Although the Study Group has grown many of the species within those genera, it was felt that the time required to do the detailed work involved in this project could not be extended, and that the study of these other genera would be better undertaken as a separate project.

The aims of this book are:

- ◆ to set out the results of the study of the twelve genera
- ◆ to encourage gardeners to grow and appreciate Australian daisies
- ◆ to extend the range of species available from nurseries
- ◆ to extend the range of seed available from seed companies
- ◆ to extend the range of everlasting daisies used in floral art
- ◆ to provide sufficient information for identification by amateur naturalists

- ◆ to develop techniques for germinating and growing everlasting daisies, including strategies for overcoming seed dormancy.

This book is intended to be a comprehensive guide for the genera studied. Recent botanical revisions have resulted in the changing of many Australian plant names. The book combines simple botanical terms with detailed information on growing the species. This book will assist gardeners, amateur naturalists and visitors to wildflower areas throughout the continent.

History of everlasting daisies

When everlasting daisies from the colonies were introduced into gardens in England and Europe some time in the late 18th and early 19th centuries they excited much interest and curiosity. Nursery proprietors were eager to be the first to get the new plants into cultivation and wealthy gardeners were vying to grow them.

The Golden Everlasting or Strawflower (then *Xeranthemum bracteatum* and now known as *Bracteantha bracteata*) was the first Australian everlasting in cultivation and the first to be hybridized. It is known to have been growing in England in 1791. A German plant-breeder imported good forms of this species, and by 1856 he had produced hybrids in a range of colours, red and white as well as yellow. Some of the hybrids were annuals, some perennials, and some were very large-flowered. It is thought that he had crossed the Australian forms with coloured forms of *Helichrysum* from South Africa, Asia, Madagascar and elsewhere. The majority of forms of *Bracteantha bracteata* growing naturally in Australia have yellow flower-heads but rare forms with white bracts are known to exist. Colourful hybrids have remained popular to this day and new cultivars are still appearing in nurseries.

From the early 1800s several everlastings were grown in Europe, including the Common Everlasting (*Chrysocephalum apiculatum*), Golden

Everlasting and *Waitzia acuminata* (then known as *Waitzia corymbosa*). Royalty and nobility were particularly anxious to be among the first to show these new blooms, and some of them were certainly grown at the Royal Gardens at Kew and also in Empress Josephine's garden at La Malmaison.

Pink and White Everlasting or Rosy Sunray, was first grown in England in 1838. There is an account of it growing in the Royal Gardens at Kew in the summer of 1854 in the August issue of *Curtis's Botanical Magazine*. The seed had been gathered by James Drummond of the Swan River Colony the year before. This beautiful, easily grown annual has suffered much renaming over the years. It was first named *Acroclinium roseum*, and is now *Rhodanthe chlorocephala* ssp. *rosea*. Georgiana Molloy collected seeds from Western Australia for Captain James Mangles in the 1830s, among them *Rhodanthe manglesii*. These seeds were distributed and grown in glasshouses. Golden Cluster Everlasting (then *Helipterum humboldtianum* and now *Rhodanthe humboldtiana*) was first grown in Europe in 1863.

Although the native everlastings were highly valued as horticultural novelties overseas there is no evidence that gardeners in Australia were offered seed until 1864. At this time the first reference to *A. roseum* was published by Law, Somner & Co. in the *General Catalogue with Calendar of Gardening Operation*. This list included about a dozen Australian species and a few exotic species. For over fifty years the everlastings were featured prominently in these garden books, and by 1891–2 thirty-five species were offered, of which about half were indigenous species or varieties. *The Australian Gardener*, a popular gardening publication available to Melbourne gardeners in the 19th century, records the virtues of 'Everlastings' for the first time in 1879.

From the 1860s until the end of the century such everlasting daisies as *Bracteantha bracteata*, *Rhodanthe chlorocephala* ssp. *rosea*, and *R. manglesii* were growing in popularity. The Law Somner Catalogue of 1891–2 offered seed of *A. roseum*

and *A. album* at sixpence a packet, guaranteed to produce 50% of double forms. Single varieties sold for threepence a packet, or the 35 varieties for eight shillings, post free to all colonies. The introduction to the Everlasting Seed List in the above issue gives a glowing description of the diversity of benefits to be gained by the purchase of seed as follows:

'The popularity of Everlasting Flowers has been wonderfully on the increase during the past few years, and not without reason, for their culture is very easy and simple, and their flowers, if carefully gathered, dried and preserved, will retain their beauty for years. Their bright and pleasing colours will be found of great service in the decoration of the church or the home, in winter, when other flowers are scarce. Many of the light varieties may be dyed of various brilliant colours; and, made up into bouquets with some of the Ornamental Grasses, are truly charming. Everlasting Flowers for preserving should be cut just as the blossoms are beginning to expand, or when they are not more than half open, and tied in bunches and hung up in a cool place to dry, with the flowers downwards. Small bunches are preferable for drying, as large bunches are apt to mould and spoil.

The Helichrysums are perhaps the most useful, and produce a great variety of brilliant and beautiful colours. *Rhodanthe maculata** and *Rhodanthe maculata alba** are two charming and elegant varieties, of fine dwarf habit; these with Helichrysums are not unfrequently introduced in the trimming of ladies' bonnets. *Rhodanthe manglesii* fl. pl. is a fine double-flowered variety of great merit.'

(* early horticultural names for forms of *Rhodanthe manglesii*.)

From the 1880s some new everlastings, such as *Rhodanthe corymbiflora* and *R. humboldtiana*, were promoted by horticulturalists but, then as now, fashions rise and fall in gardening. When interest wanes, species' names drop off the seed lists.

In 1910 a general interest in the growing of Australian plants gained momentum. Individuals were propagating and growing Australian plants in the 1920s and 1930s. Through campaigns to protect wildflowers in local reserves and to protect forests, the interest gradually developed. Wildflower shows whetted appetites. When gardeners were able to buy plants from nurseries specializing in Australian plants, the impetus increased. George Althofer's plant and seed business began in the late 1940s, and his 1956 catalogue listed everlastings such as Common Everlasting, Clustered Everlasting and Chamomile Sunray (now *Chrysocephalum apiculatum*, *C. semipapposum* and *Rhodanthe anthemoides*). Ben Schubert set up a back-yard nursery in East Oakleigh (Vic) in 1946 and later moved to a large area in Noble Park where his nursery became the 'Mecca' for Australian plant gardeners. In 1951 Morton and Mollie Boddy established the Eastern Park Nursery in Geelong. In its heyday (the late 1950s and early 1960s) the nursery was selling to all parts of Australia and overseas, listed more than 3000 native species in its catalogue, and provided a small range of rare plants for collectors.

When well known naturalists began to write articles on Australian plants these carried great influence with the general public. In 1954 Arthur Swaby began to write a series called 'Know your natives' for the widely read *Your Garden* magazine, and Jean Galbraith wrote under the pen-name 'Correa' in the *Australian Garden Lover* for many years. Miss Galbraith also wrote two valuable floras, the first, *Wildflowers of Victoria*, being published in 1950. The fact that three editions were published attests to the growing interest.

Arthur Swaby suggested the idea of a Growers' Society and in 1957 the inaugural meeting of

the 'Growers of Australian Plants' was held and 187 people were present. This name was later changed to the Society for Growing Australian Plants.

In the late 1960s and 1970s there was a proliferation of native plant nurseries, many of them founded by members of the Society.

Today the Society has many thousands of members and it is in the process of changing its name to the Australian Plants Society. The Australian Daisy Study Group is one of a number of specialist groups studying particular genera, families or aspects of growing Australian plants.

Numerous specialist nurseries and several large seed suppliers cater for the needs of these members and of gardeners in general. There are also many indigenous plant nurseries which have developed to cope with the enormous surge of interest in growing local flora. The variety of everlasting species has increased substantially until now there are 31 species offered by Australian seed suppliers, and overseas seed companies also include many species in their catalogues. Nurseries also stock an expanded range of everlastings in pots.

In recent years the botanical gardens in many States have produced spectacular displays of everlastings which have generated more interest. In particular, Kings Park and Botanic Garden in Perth, Mt. Annan Botanic Garden in New South Wales and Alice Springs Desert Park have extensive areas available for large scale plantings and excellent climates for showing these brilliant plants to great advantage.

Layout of this book

The main focus is on the performance of species in cultivation. The descriptions of species offered in Chapter 9 are of plants in cultivation. If the Study Group was not able to obtain material of a species or was unable to propagate or grow it, a description of the species in its natural habitat is given.

For quick reference the outstanding features of each species are condensed in a prominent position in each species' description. The dimensions are derived from cultivated plants except in cases where the Study Group was unable to collect material. The designated colour or colours refer to the overall impression of colour of the flower-head.

Variation was observed in many of the dimensions of the plants, flowers and fruits, resulting from the diversity of growing conditions.

The nominated flowering periods are intended as guides. They will vary depending on rainfall, temperature, soil type, aspect, and the presence or absence of nutrients.

'Similar species' lists other species of comparable appearance. Simple distinguishing characters are supplied to assist in correct identification.

For certain species 'Special notes' provides brief notes on hybridization, the background of name changes or relationships with other species.

Botanical names have been used throughout the chapters but common names, when they exist, are included in species' descriptions and are listed in the index. The use of botanical terms has been kept to a minimum; brief explanations of the terms employed are set out in the glossary. In this book the term 'fruit' has been used in botanical descriptions, while the term 'seed' has been employed when the emphasis is on propagation and cultivation.

In the naming of cultivars the current practice is to omit the species' names. In this book, however, they have been retained in the interests of understanding the origins of the cultivars.

In Chapter 8 there are keys or guides for identification of those genera which have been revised in recent times. Genera such as *Bracteantha* and *Chrysocephalum* have not yet been revised, and so their keys are not included in this book. For identification of those genera the key in the flora of the relevant State in which the species occurs should be consulted.

What is an Everlasting Daisy?

A daisy flower-head is a collection of minute individual flowers (florets) grouped together. Each head is enclosed by a number of modified leaves (bracts). The bracts of everlasting daisies are stiff and papery, many having terminal petal-like blades. These are often brightly coloured to attract the attention of insect pollinators, such as

hoverflies, small beetles and native bees. The majority of everlastings in this study have bracts which open and bend back from the stem at right angles (radiate) as the flower-head develops.

The bracts are arranged in one or more rows, and function as structures for the protection of the florets, closing tightly over them in cold or wet weather. The length, shape and often the colour of the outer bracts relative to the inner bracts vary considerably. In most cases the inner bracts are much longer and more showy. The margins are usually entire but are fringed in *Chrysocephalum* and in some species of *Waitzia*.

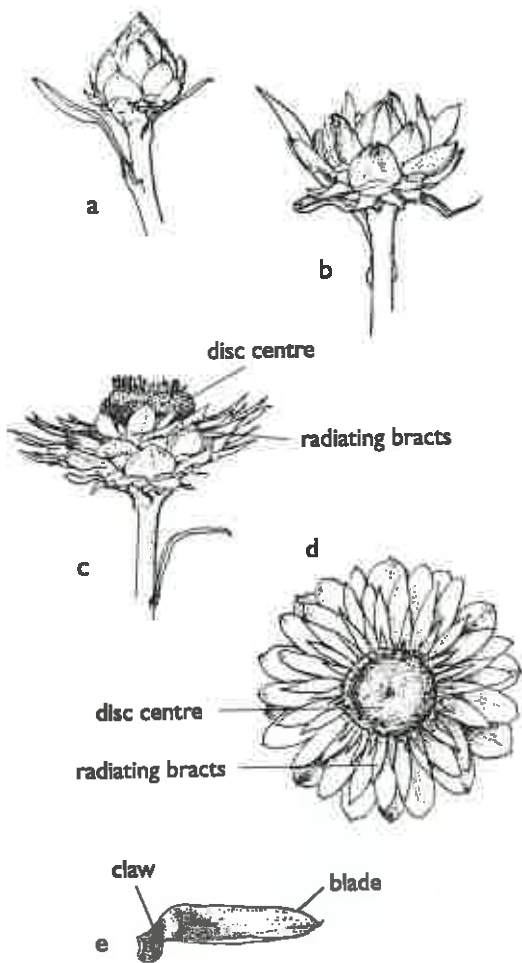


Figure 1. Flower-head
a, head in tight bud; b, bracts opening;
c and d, bracts radiating; e, outer bract

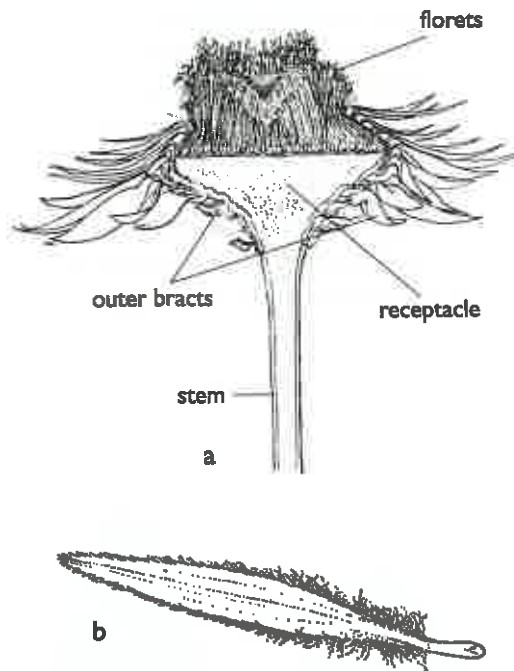


Figure 2
a, flower-head (section); b, fringed bract
of *Chrysocephalum baxteri*

These bracts retain their shape and colour when dried. If flower stems are picked at the right stage of development of the flower-head, the whole structure remains intact for long periods. This characteristic is invaluable for dried flower arrangements.

Daisies other than everlastings, such as olearias and brachyscomes, have soft, green bracts surrounding the florets. When the florets of these daisies age, the flower-head withers and dies.

The composite nature of each head with its cluster of florets is the reason that the original name of the daisy family was Compositae. This name has been changed to Asteraceae to bring uniformity to plant family names, all of which now end in 'aceae'.

The florets are stalkless (sessile), each one sitting on the enlarged tip of the flower stem, known as the receptacle.

The receptacle varies in its appearance. The surface may be smooth or pitted, and some genera, such as *Cassinia* and *Ixodia*, have receptacles bearing chaffy scales. The shape is flat, slightly domed, or conical. In the genus *Haptotrichion* the receptacle elongates into a conspicuous narrow cone up to 12 mm long.

The florets of everlasting daisies are all tubular. The outer florets may be female, as in *Bracteantha* and *Chrysocephalum*, and in a few genera the

innermost florets are functionally male, as in *Bellida*, *Lawrencella*, *Rhodanthe* and *Schoenia*. The majority of the florets, however, are bisexual. Species in the genera *Cephalipterum*, *Haptotrichion*, *Hyalosperma*, *Leucochrysum*, and *Waitzia* have bisexual florets only.

Tubular florets consist of a fleshy structure at the base (the ovary, which holds a single ovule), and a cylindrical tube (corolla) above it. The corolla of everlasting daisies usually consists of five petals which are fused at the margins and free at the tips (lobes). The exceptions in the everlastings studied are *Hyalosperma demissum*, *H. stoveae* and *H. zacchaeus*, which are 3- or 4-lobed. At the base of the corolla and attached to the ovary is a ring of hairs, bristles or scales (the pappus). Sepals are absent, the pappus apparently taking their place.

Bisexual florets of everlasting daisies contain 5 anthers, each one on an individual stalk (filament). The anther and filament together are termed the stamen. The anthers are united along the vertical edges to form a tube through which the style grows. The style is an organ arising from the top of the ovary. The tip of the style is divided into two style-arms which vary in shape and form, and usually bear hairs or minute rounded projections (papillae). The stigma is the area on the inner surface of the style-arms where the pollen grains germinate.

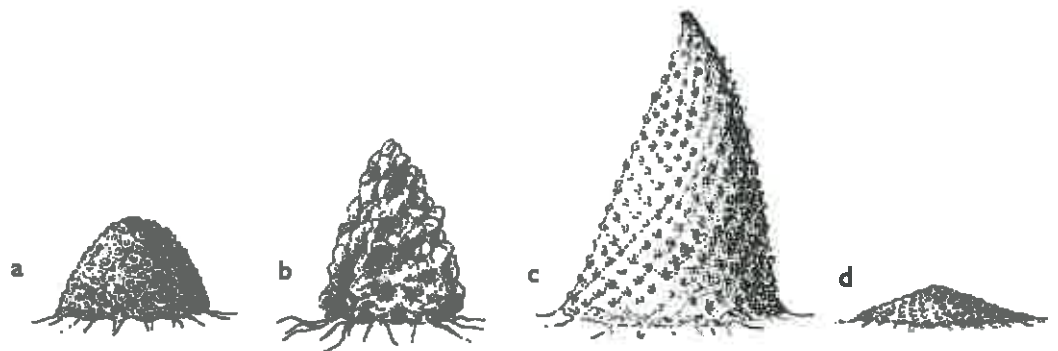


Figure 3. Receptacle

a, *Rhodanthe anthemoides* $\times 2$; b, *Hyalosperma praecox* $\times 12$; c, *Haptotrichion colwillii* $\times 4$;
d, *R. chlorocephala* ssp. *rosea* $\times 2$

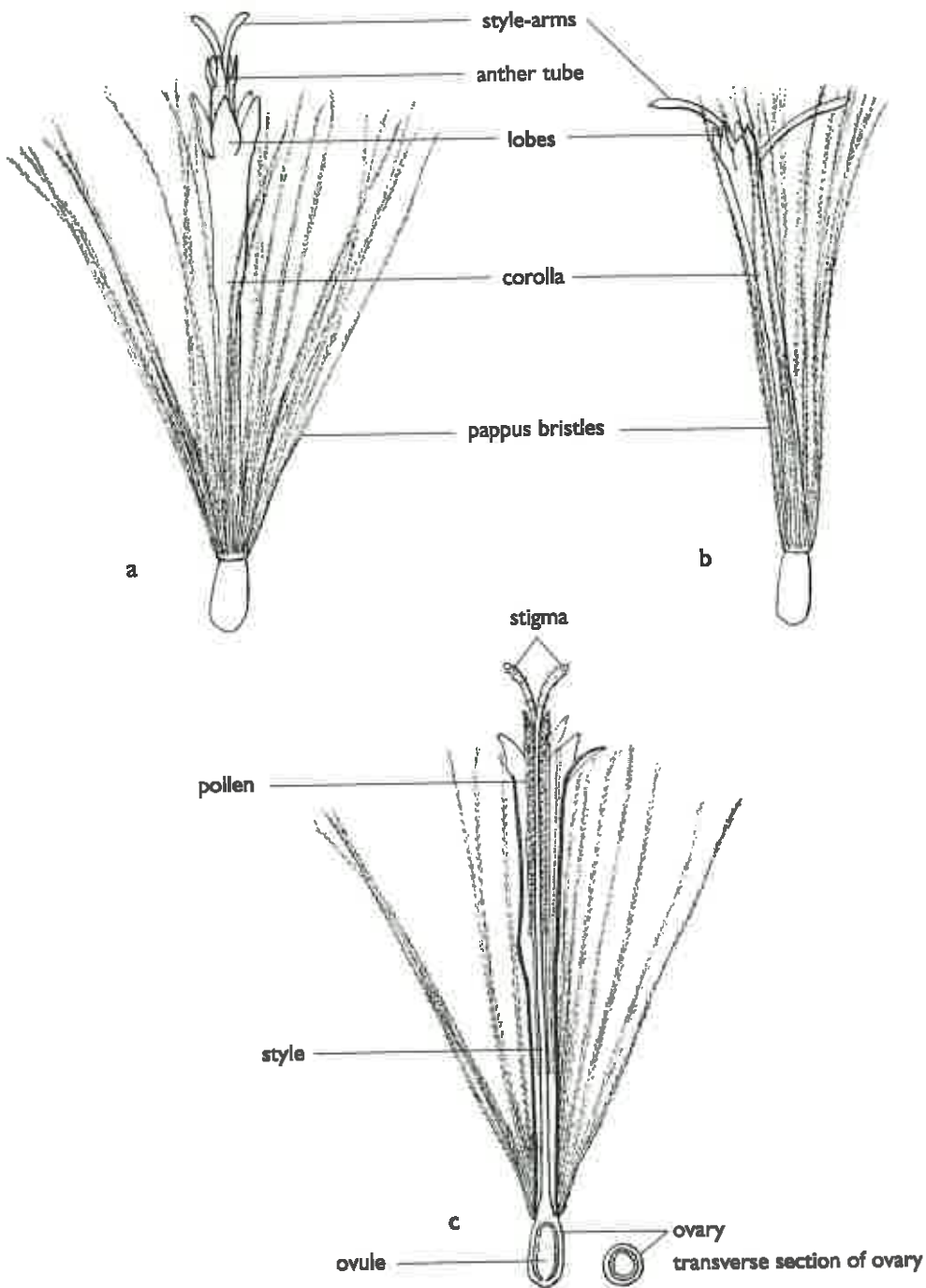


Figure 4. Florets
 a, bisexual floret; b, female floret; c, section of a mature bisexual floret

The stigma is usually covered with short glandular hairs or papillae. This arrangement of anthers and style arms allows pollination to take place in numerous ways (see Chapter 6). The anthers shed pollen to the inside of the tube and this sticky mass is then carried up out of the corolla by the elongating style where it is available to insect pollinators for distribution to other florets. During this process the stigma at the top of the style is not usually mature.

The pappus is thought to aid in wind dispersal of the fruits. There is great variation in the structure of the pappus in the genera studied, and it is useful in identification (see Figure 7). For instance, the bristles may be evenly feathery (as in *Rhodanthe*

propinqua) or feathery with club-shaped clusters of hairs at the tip (as in *Rhodanthe stricta*) or evenly barbed (as in *Bracteantha bracteata*). The bristles may be free (as in *Bracteantha bracteata*) or variably united in groups towards the base (as in *Lawrencella* species), as distinguished from the genera in which the bristles are united in a basal ring (as they are in *Hyalosperma* species). The pappus may remain attached to the fruit (persistent) as in *Lawrencella*, or it falls off the fruit early (deciduous) as in *Hyalosperma*.

The fruits of the genera studied vary in size, shape, and structure, and the appearance is an additional aid in identification. *Chrysocephalum* fruits are small (about 1 mm long) whereas *Lawrencella davenportii* fruits are up to 13 mm long. *Haptotrichion* and *Waitsia* fruits have a small stalk (beak) connecting the pappus to the body of the fruit. The species in the *Leiochrysum* section of *Rhodanthe* have densely silky-hairy fruits, whereas the species in the *Achyroclinooides* section have fruits bearing sparse short hairs. Some *Hyalosperma* species have warted fruits. *Bellida graminea* has highly distinctive, horizontally wrinkled fruits. The basal attachment (carpopodium) of the fruit to the receptacle varies in appearance. In many of the everlasting daisies it takes the form of an obvious ring. Examples are *Lawrencella rosea* and *Rhodanthe battii*.

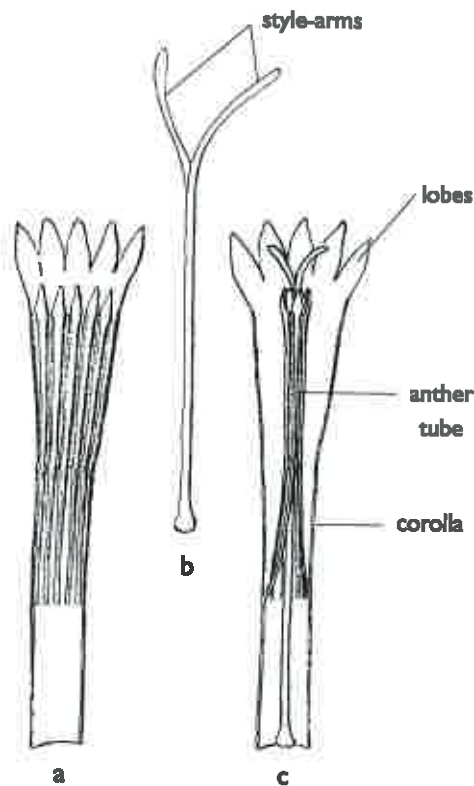


Figure 5. Anthers and style
a, anther tube opened out; b, style;
c, section of a bisexual corolla

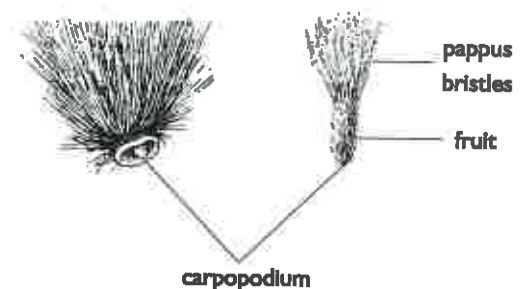


Figure 6. Carpodium
Rhodanthe battii

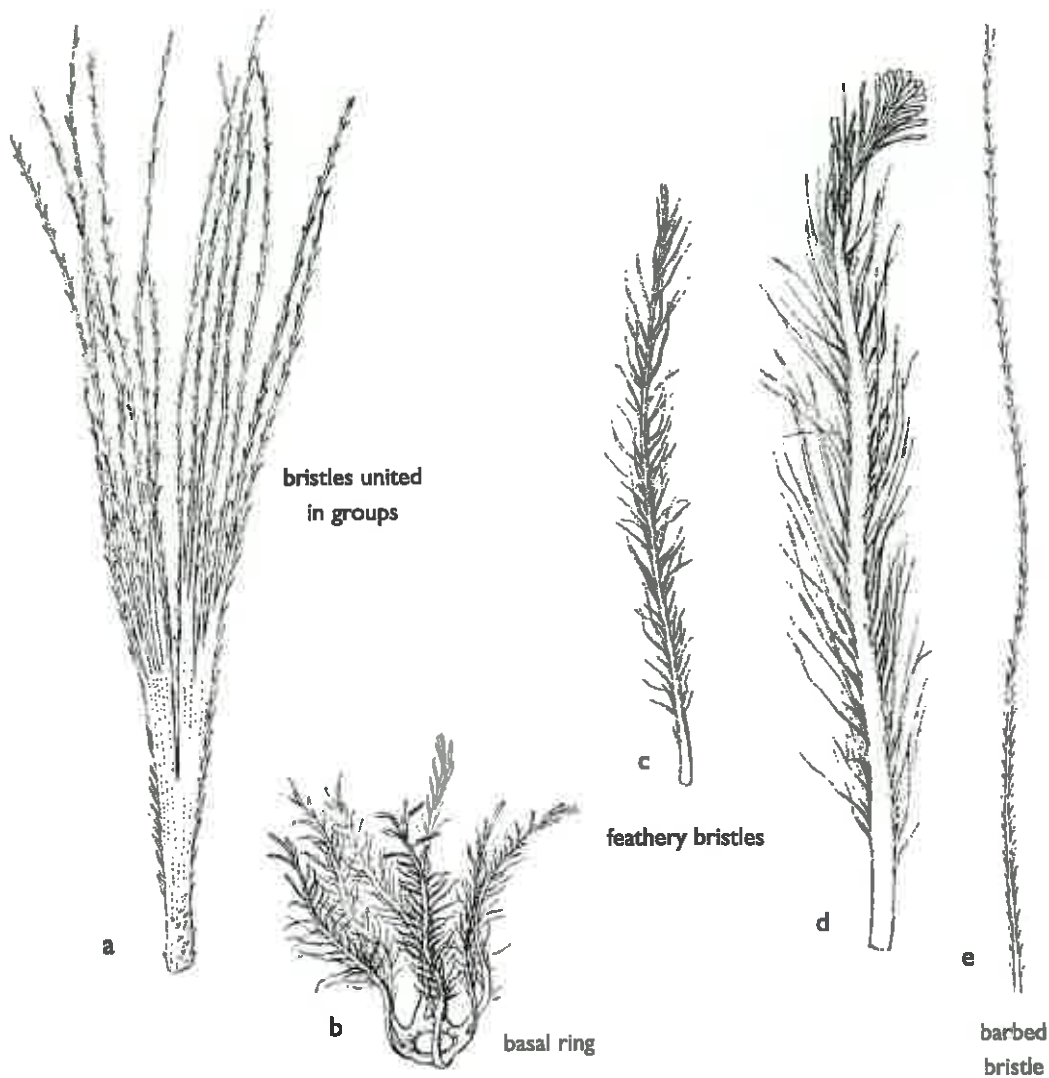


Figure 7. Pappus bristles

a, *Lawrencella rosea*; b, *Hyalosperma praecox*; c, *Rhodanthe propinqua*; d, *Rhodanthe stricta*; e, *Bracteantha bracteata*. All $\times 10$

The botanically correct term for the fruit of the Asteraceae family is cypsela because it is derived from an inferior ovary, that is, the pappus bristles, corolla and stamens are attached above the ovary (see Figure 4c). Achene is the term sometimes used for the fruit but that term can apply to fruit derived from superior ovaries, and is not technically

correct for this family. In this book the term 'fruit' has been used for simplicity. The fruits of Asteraceae consist of a single embryo enclosed by a membranous coat (testa). The outer coat (pericarp) is a fibrous structure. The fruit is indehiscent, that is it does not split open at maturity to release the seed.

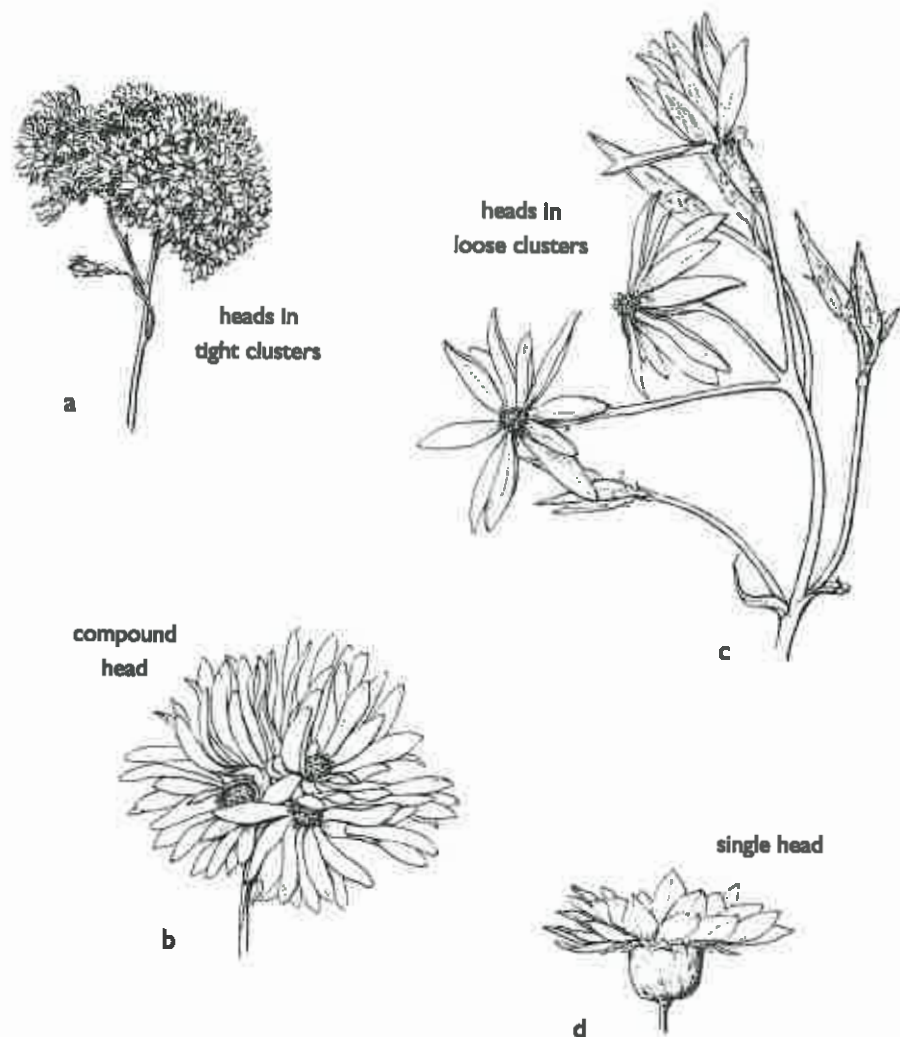


Figure 8. Flower-head arrangements
 a, *Rhodanthe haigii*; b, *Cephalopterum drummondii*; c, *Schoenia cassiniana*;
 d, *Schoenia filifolia* ssp. *subulifolia*

The flower-heads are variously arranged. They may occur singly at the tips of stems as in *Schoenia filifolia* ssp. *subulifolia*, in loose clusters as in *Schoenia cassiniana*, in tight clusters as in *Rhodanthe haigii*, or in globular compound heads like the pom-pom heads of *Cephalopterum drummondii* (see Figure 8).

The above information outlines the major characteristics of everlasting daisies. Together with the colour photographs and the simple botanical descriptions for the individual species, this information should be sufficient to enable the amateur to identify many of the everlastings in the Australian bush.

Growing Everlasting Daisies

In general everlasting daisies are easily grown. They have a preference for neutral soils with good drainage. Exceptions do occur, for instance *Bracteantha palustris* does not require good drainage but actually grows in seasonally inundated ground. An example of a daisy requiring excellent drainage is *Chrysocephalum eremaeum* which occurs naturally in deep sands, and has not flourished in garden soils when it has been tried in cultivation. Other species in the same genus, such as *C. apiculatum* and *C. semipapposum*, adapt to most soil types and do not have such inflexible requirements. More detailed information on soil requirements for individual species is provided in the cultivation notes in Chapter 9.

Healthy growth and large flower-heads are promoted by watering and fertilizing as required. Some gardeners, however, prefer to maintain a natural appearance by the use of plants suitable to their soil conditions with the addition of compost and sparing use of water. Everlastings usually grow best in open, sunny situations with good root protection. Most of them will put on brave performances in less than perfect conditions. It is obviously important to select species to suit the climatic conditions in which they are expected to grow.

Soil factors

Factors affecting growth include:

- ◆ soil type
- ◆ soil pH
- ◆ soil preparation.

Soil type

In cultivation daisies grow happily in most soils from sands to clays. They are best suited to soils enriched with natural organic matter which retain some moisture but are freely draining.

Soil pH

The acidity or alkalinity of soil is measured on a pH scale of 0–14. A pH of 0 is at the extreme of acidity, pH 7 is neutral and pH 14 is extremely alkaline. The range pH 6–7 is preferred for growing everlastings because in this range most of the minerals in the soil can be absorbed. If soil is too alkaline iron is immobilized and cannot be taken up by plants' roots. In very acid soils magnesium and phosphorus may be unavailable to plants. Healthy plants need a balance of minerals and trace elements available in the soil, and excessive amounts or deficiencies usually cause loss of vigour. Yellowing of leaves and other foliage changes may indicate nutritional deficiencies. The main cause of problems in everlastings has been a lack of iron, and this difficulty is solved by making the soil more acid or applying a soluble iron compound to the foliage or to the soil.

To reduce alkalinity add agricultural sulphur or aluminium sulphate. To reduce acidity add lime or dolomite. Lime is more effective but dolomite contains magnesium as well as calcium. Soil testing kits are available at most nurseries or garden centres.

Some species grow reasonably well in alkaline soils (see page 26). In very alkaline soils, such as prevail in certain areas around Adelaide and elsewhere, it may be preferable and certainly easier to plant those species listed as growing well in alkaline conditions.

Soil preparation

It is best to prepare soils several weeks before planting, especially if the area is large. Weeds must first be removed. Organic matter should be incorporated immediately after the first weed removal has taken place. An interval of four to six weeks should be allowed after preparation of beds to

enable secondary weeds to grow. Fresh organic matter or fertilizer tends to burn the roots of new seedlings and plants may die if the burning is severe. Soil levels are usually altered by digging and the addition of compost, and this interval allows the soil to settle before planting. After planting weeds must be removed more carefully by hand.

Clay soils yield good results if a clay-breaker (such as gypsum) and organic matter (for example animal manures, peat moss, leaf mould, compost) are dug in simultaneously. Gypsum will not alter the pH of the soil but will cause the tiny clay particles to aggregate, thus increasing the air space and facilitating better penetration of air and water. The effect of the gypsum wears off after four or five years and then the process must be repeated.

Sandy soils allow nutrients to be leached away very quickly because the drainage is so good. The incorporation of organic matter increases water-holding capacity.

Depletion of soil nutrients will occur if everlasting are regularly grown in one area. Before replanting it is critical that the soil should be re-enriched.

Planting

Annuals

It is essential to plant out annuals at such times that their root systems can develop adequately before they are exposed to hot conditions. This time will vary according to the climate (see Sowing times, page 12). For instance, in cool temperate Melbourne mid-autumn is ideal because soil is warm, usually moist, and frosts are few.

Annuals grow better in groups rather than singly. Not only do they support each other but they make attractive splashes of colour. Mass planting in large areas will provide spectacular displays, and this is generally achieved by broadcasting large volumes of seed (see Direct sowing, page 12). Natural regeneration is more likely to occur when annuals are grouped together.

Perennials

Perennials may be planted out at almost any time of year. If planted in summer the root systems need special protection and extra watering to ensure that they do not dry out. Unless the species spreads across large areas there are also advantages to grouping perennials. They support each other, help to unify the planting scheme and promote natural regeneration.

Maintenance

Good maintenance includes attention to the following aspects of cultivation:

- ◆ watering
- ◆ mulching
- ◆ fertilizing
- ◆ pruning
- ◆ protection from predators.

Watering regime

Research has shown that water deficit in the early stages of development will limit the size of plants by reducing the number of stems and leaves and also the stem length. Since many everlasting species have single flower-heads at the tips of stems, any reduction in the number of stems will automatically result in fewer flower-heads and fewer seeds produced per head.

Plants must be watered in well when planted, and the soil should not be allowed to dry out thereafter. As plants become established a good weekly watering should suffice. Annuals in sandy soil dry out very quickly. Frequent light watering may be necessary in such situations. Watering should not be necessary if soil is moist to a depth of 2–3 cm below the surface.

The type of watering depends on the size of the garden and the species planted in it. The main watering systems used are drip systems, trickle irrigation and overhead watering.

Drip and trickle irrigation are useful for the following attributes:

- ◆ The everlastings' papery bracts remain open. When wet the bracts close over the florets, and if they remain in this position, pollinators are excluded and the insects trapped inside can reduce the florets and developing seed to dust.
- ◆ The foliage remains free of water and thus does not invite fungal attack.
- ◆ The amount of water for each plant can be regulated to its needs.
- ◆ Water wastage is reduced as water is delivered only to root systems.
- ◆ Weed growth between plants is reduced.

Overhead watering of annual everlastings is most commonly used because plants are numerous and their lifetime is relatively short. Two aspects should be considered:

- ◆ The best time for watering in hot weather is in the morning since the bracts open as the temperature rises. In very hot weather an early evening watering revives flagging plants. Avoid watering in the hottest part of the day as burnt foliage may result.
- ◆ Deep soaking of the area is of greater benefit than frequent light watering which only encourages surface roots to grow at the expense of the deeper root system.

Mulching

The benefits of mulching are many: soil moisture is conserved, weed growth is discouraged, root systems are protected, and temperature fluctuations in the soil are minimized. Organic or inorganic materials may be used.

- ◆ Organic mulches such as pinebark, woodchips, seaweed and shredded prunings should be at least 7 cm thick. They will break down and over time add humus to the soil. The disadvantages are that this may burn or cause infection in plant stems which come into contact with them, and thick layers inhibit the germination of everlastings' seed. When birds forage enthusiastically for insects they toss the mulch on paths and often pull out small plants.

- ◆ Inorganic mulches, for example coarse sand, granite or bluestone chips, should be at least 2–5 cm thick. They are more expensive but have the advantage of permanence and provide excellent seed beds for everlasting species.

Fertilizing

The everlasting species described in this book respond vigorously to applications of fertilizer of all kinds. The first application should be made to the soil when preparing it for sowing or planting (see Soil preparation, page 7). If a long period of time has elapsed or if preparation was overlooked, fertilizer may be added to the base of the holes, and covered with soil before placing plants so that fragile roots are not burnt.

Thereafter fertilizer may be applied in small doses during the growing period. Slow-release fertilizers will last longer. Caution should be used if fertilizer-sensitive plants such as hakeas, banksias or heaths are growing in the same vicinity.

Annuals produce larger flower-heads, more vigorous growth, and their flowering periods are extended if nitrogen and potash are applied. Nitrogen sources include hoof and horn, blood and bone, IBDU, potassium nitrate or ammonium salts. Potassium sources are potassium sulphate and potassium nitrate.

When applying fertilizers two important points should be kept in mind:

- ◆ The recommended dosage should not be exceeded.
- ◆ Always water well before and after fertilizing.

Pruning

Pruning is useful for maintaining neat shapes and for removing dead or diseased growth.

Pruning of perennials and annuals encourages the development of more flowers. Cutting stems of fresh flowers for arrangements is a simple method of achieving this end. Light trimming is beneficial up to the time buds are beginning to form, but hard pruning should be held back until new shoots are produced.

If annuals are sown in punnets and seedlings are later transferred to positions in gardens or containers, they should be trimmed back by about half after transplanting. This encourages production of roots and new shoots.

When plants are pruned they benefit from an application of fertilizer and a good watering shortly afterwards.

Protection from predators

Pests and diseases do not pose too many problems for the everlastings in this study. Pests include the following:

- ◆ Slugs and snails travel long distances to eat seedlings, especially the small plants. Various baits are available for their control.
- ◆ Aphids can distort leaves and developing buds, and decrease vigour by congregating at the tips of stems and sucking the sap. They should be controlled as soon as they are noticed, either by squashing or spraying with pyrethrum or horticultural oil sprays. Root aphids, which are problem pests in the cultivation of *Brachyscome* and *Olearia* species, have only been observed in the soil around the roots of *Leucochrysum albicans* ssp. *alpinum* and *Rhodanthe anthemoides*, but do not seem to cause any damage.
- ◆ Caterpillars will defoliate small plants. They can be removed by hand if seen before much damage is done, but pyrethrum sprays or preparations containing bacterial spores are safe and effective controls. It may be necessary to use them frequently during a severe infestation.
- ◆ Red-legged earth mites can destroy crops very swiftly. In districts where they are active it is often better to wait until late winter, when they are absent, to begin cultivation of annuals. Appropriate systemic sprays can provide very effective control, but great precautions must be taken if they are used. Consult with your garden centre for appropriate chemicals and **READ THE LABEL.**

Powdery mildew has been noted on some annual species in still, humid weather or if seedlings are packed so closely that air movement is reduced. Thinning out will usually remedy the problem.

Propagation

The propagation of everlasting daisies varies greatly in degree of difficulty. The method chosen is usually dictated by the material available, the species, and whether it is an annual, perennial or shrub. The usual methods are:

- ◆ from seed
- ◆ from cuttings
- ◆ by micropropagation
- ◆ by division
- ◆ by layering.

Individual plants with variable characters are produced from seed. Seedlings may differ from parent plants in size, habit, vigour and colour of flower or foliage. Plants with characters identical to those of the parent result from vegetative propagation (cuttings, micropropagation, division or layering) because the material propagated is of the same genetic constitution. Vegetative propagation must be used for selected forms or hybrids in order to reproduce plants with the same characteristics as the parent.

Propagation from seed

Interest (both overseas and within Australia) in the marketing of fresh and dried flowers has stimulated an expansion in the range of seed of everlasting daisies available commercially. Of the species presented in this book, Australian suppliers list the following 31 species and subspecies in their catalogues:

Bellida graminea, *Bracteantha bracteata* (mixed sizes and colours), *B. macrantha*, *Cephalopterum drummondii*, *Chrysocephalum apiculatum*, *C. semipapposum*, *Hyalosperma cotula*, *H. glutinosum* ssp. *venustum*, *H. praecox*, *Lawrencella davenportii*, *Leucochrysum fitzibbonii*, *L. stipitatum*, *Rhodanthe charsleyae*, *R. chlorocephala* ssp. *rosea*

(forms) and ssp. *splendida*, *R. citrina*, *R. floribunda*, *R. humboldtiana*, *R. manglesii* (forms), *R. polygalifolia*, *R. propinqua*, *R. pygmaea*, *R. sterilecens*, *R. stricta*, *Schoenia cassiniana*, *S. filifolia* ssp. *filifolia* and ssp. *subulifolia*, *S. macivorii*, *Waitzia acuminata* var. *acuminata* and var. *albicans*, and *W. suaveolens* var. *flava*.

Seed offered by suppliers has been grown and harvested as a crop or collected from the wild under licence. A new species is usually grown for several years and its germination is tested at regular intervals before being released for sale. The minimum percentage germination normally required before release is 75%, but it may be higher than 90%. For some species, such as *Bracteantha bracteata*, *Rhodanthe chlorocephala* ssp. *rosea* and *R. manglesii*, harvesting has been carried out for more than a century, and many changes in plant and flower size and in ease of growth have developed.

If suppliers depend on opportunistic collections of seed from the wild, they must also expect supply of certain species to be irregular and germination to be erratic.

In the following notes a basic knowledge of seed sowing techniques has been assumed. Where specific details relating especially to everlasting daisies are required, the information is available in the *Encyclopaedia of Australian plants suitable for cultivation* Volume 1 (Elliot and Jones 1980) and *Australian Daisies for gardens and floral art* (Australian Daisy Study Group 1987).

Germination process

In order to begin germination the dry seed absorbs water, a process known as imbibition. During this period a seed may take up two to three times its weight in water. The seed softens, swells, and many everlasting species produce a sticky substance

called mucilage. It is thought that this mucilage layer increases the moisture retention around the seed and helps it to adhere to the soil surface. There is a lag between imbibition and the appearance of seedlings.

Germination times

The germination of a batch of seed normally follows a pattern. A few seeds will germinate early, the majority will germinate almost simultaneously somewhat later, and a few more will germinate much later.

Seed may be sown directly into the garden or into containers such as tubs or baskets, or into punnets as a preliminary step.

Direct sowing

This method is most appropriate for sowing annuals if plenty of seed is available and is known to be easy to germinate. It is useful for mass planting large areas as well as for rockeries or containers. The soil must be free of weeds, and humus and fertilizer should be worked in a few weeks before sowing. Level the soil, water well and broadcast the seed evenly. For easier distribution mix seed with sand. A layer of coarse sand, granite or blue metal (5 mm) chips over the top will generally enhance germination and act as a mulch. When seedlings appear it is essential to bait for slugs and snails immediately. Both pests travel far to demolish young seedlings and can swiftly wreak havoc.

Direct sowing is quick and easy and avoids transplant shock, but has the disadvantage that there is less control over seed removed or destroyed by insects, animals, birds and harsh weather.

Sowing into punnets

If seed is in short supply or is difficult to germinate, the use of punnets allows more control over adverse conditions and requisite pretreatments.

Medium. Seed mixes must be free-draining yet capable of retaining moisture, and must be free of

weed seeds. Several good mixes are available commercially in large or small quantities; some consist of fine composted pine bark and a wetting agent, others also have vermiculite and/or peat moss added as well. A useful home-made mix consists of 1 part of peat moss to 3–5 parts of perlite. Higher proportions of perlite increase aeration but more watering is needed in hot weather. Vermiculite may be used to replace peat moss or perlite, and cocopeat to replace peat moss. Most mixes require the addition of fertilizer after the seedlings have appeared, but brands incorporating slow release fertilizers have proved very successful.

Sowing methods. Seed of the species studied germinate best in good light. For this reason they are sown on the surface of the seed mix. As advised under the direct sowing method, a thin layer of sand or granite chips over the seed acts as a protective mulch against heavy rain yet also allows enough light to penetrate. Some growers prefer to scatter vermiculite lightly over the seed to retain a moist environment for a longer period, but one drawback is the faster development of liverworts on the punnet surface than is the case with the granite mulch.

Siting of punnets. In cool temperate climates good germination is usually obtained by placing punnets outside where they receive sun for most of the day. The site selected preferably should be exposed to the rain. A flush of germination has often been observed two or three days after heavy rainfall or following a longer period of light rain. In harsh climates growers may prefer to germinate seed in glasshouses or on heat mats. Care must be taken to ensure that conditions are not so moist that fungal and other problems occur.

Sowing times. The prevailing climatic conditions influence the time at which seed should be sown, especially the seed of annuals. Autumn is the best time to sow annuals in cool temperate climates. In subtropical regions May/June sowings are more

successful. In inland districts where red-legged earth-mite is a problem the best time for sowing is late winter/spring. For frost-prone areas such as Canberra, July has been recommended as the sowing time for *Rhodanthe chlorocephala* ssp. *rosea*, in the publication by the Canberra Botanic Gardens titled *Growing Native Plants* Volume 5. Frosts have been known to occur in Canberra as late as October but this is a gamble that has to be taken. If glasshouses or heat mats are used for germination these sowing times will be more elastic. In general, annuals should be sown at such times that the plants are at full size and have flowered for some time before periods of extreme heat are expected. Apart from dehydrating the tissues of plants, summer conditions usually produce dwarf plants with small flower-heads.

Perennials may be sown at almost any time with the exception of periods of high temperature. In Melbourne perennial daisies germinate well even when sown in January or February if they are placed in cool positions in part sun for a maximum of 4 hours per day. Species with hairy foliage such as *Chrysocephalum apiculatum*, however, are more successful if sown in early spring rather than autumn because cold wet conditions often kill these small seedlings.

In optimal conditions annuals begin to germinate from 4–20 days after sowing. For perennials the germination time usually lies in the range of 5–30 days.

Poor germination

The main causes for poor germination relate to the viability and dormancy of seed. These factors are set out in detail on page 14. Other causes include one or more of the following:

- ◆ Insect or fungal damage may have occurred before the seed was collected or during storage.
- ◆ Seed may be of poor quality because weather conditions or lack of nutrients affected the flowers before the seed had matured. Also pollinating insect numbers may have been low or

their activity may have been reduced by adverse weather.

- ◆ The conditions provided were not suited to the particular species. Many environmental factors affect germination, such as light, temperature, moisture, and availability of oxygen. The germination of seed is subject to these interrelated factors acting simultaneously. Some species have a requirement for all of them to be at specific levels before germination will begin.

Light. Research has shown that most everlastings require light in order to germinate, and so should be sown on the surface.

Temperature. Research has been carried out to determine the optimal temperatures at which species germinate. Many annual species have the highest germination in the temperature range 10–20°C with little or no germination at 5°C or 30°C (Willis and Groves 1991; Plummer and Bell 1995). Although capable of germinating to some degree over a wider range of temperatures, this requirement means that in their natural habitat germination of these annuals will be confined to the cooler seasons when the rainfall may be higher and evaporation is reduced. For gardeners it suggests that these annuals should be sown from autumn to early spring in cool temperate climates.

Some species require wide fluctuations in day/night temperatures before they will germinate. Other species, such as *Rhodanthe humboldtiana*, have been found to germinate well over a constant temperature within the range of 5–30°C. This result indicates that *R. humboldtiana* germinates at any time if sufficient moisture is available.

Moisture. Water must be taken up by the seed in order to activate the biochemical systems involved in germination. Sufficient moisture must be present at the soil surface where the seed lies, and it must remain moist for a certain period of time or germination will not proceed. Under natural conditions near the Murchison River in Western Australia at

least 30 mm of winter rain is necessary for the surface to remain moist for 5 days. This is the shortest period required for about 50% germination of the two dominant everlasting daisies of that district, *Helipterum craspedioides* and *Schoenia cassiniana* (Mott 1972). It is for this reason that moisture retaining materials, such as peat moss, are used in seed mixes.

Aeration. When the seed has taken up water its respiration is greatly increased and more oxygen is needed. This means that aeration of the seed mix is important. Peat moss and perlite are two materials with good aeration properties and are often used in seed mixes.

Viability. When applied to seeds 'viable' means able to live and develop. Seeds may not be viable because they have not developed an embryo or the embryo is only partly developed. In practice, the plumpest or largest seeds are sown in germination testing. Gardeners generally are not concerned about the appearance of the seed, but sow the lot and are concerned only when no germination occurs.

Dormancy. When seeds are viable but do not germinate, their condition is described as dormant. This is a resting phase which must be broken before germination can begin. A high proportion of everlasting annuals are to be found in arid areas where seed must endure extreme environmental conditions. Such seeds possess many complicated strategies which prevent germination until the circumstances are such that the probability of survival is enhanced.

Dormancy may be a characteristic of the embryo itself or of the thickness of any of the layers of tissue surrounding the embryo. It may be due to the presence of germination inhibitors such as abscisic acid (ABA), which leaches out of mature seed quickly and is not reconstituted. This may

be one of the reasons for the flush of germination that growers observe after good rain has fallen.

Dormancy ends under natural conditions or in dry storage after a so-called after-ripening period, the length of which varies with species and habitat. Storage at room temperatures of 15–20°C frequently breaks dormancy after 6 months to 2 years or longer, but exposure to higher temperatures for various periods can reduce the after-ripening period dramatically (see page 15). The effectiveness of germination pretreatments increases in the latter part of the after-ripening period.

Dormancy may also occur when factors other than those due to seed characteristics act to prevent germination. It has been suggested that biochemical changes resulting from alterations to these factors will overcome this type of dormancy. For instance, many of the arid zone everlastings have a light requirement for germination. They will remain dormant if they are buried beneath the soil so far that light cannot penetrate. In this case dormancy depends on a pigment called phytochrome which responds to the red light frequency in sunlight. If these seeds are exposed to sunlight the phytochrome is activated and stimulates production of plant hormones, gibberellins, of which gibberellic acid (GA_3) is the most important. In turn, GA_3 stimulates production of enzymes which help the embryo to grow, and which also break down food reserves stored in the seed tissues. This weakens the tissues and allows the root radicle to break through.

Although the necessity for dormancy in wild plants is understood, it was thought that in cultivated forms it would be possible to select strains presenting less severe dormancy characteristics. Cultivating and harvesting seed over many generations, however, has not shortened the dormant period of individual species, although it has increased germination percentages.

After-ripening

The seed of many species of Asteraceae will not germinate immediately after they have been shed or collected, but they will do so after a period of storage, known as the after-ripening period. The length of the storage time required varies, as does the temperature of storage. For the everlasting species trialled by the Study Group, the period of storage at room temperature needed to break dormancy varied from 2 to 3 months for *Chryscephalum apiculatum* to 2–3 years for *Rhodanthe chlorocephala* ssp. *splendida*. Even after storage for 2½ years, ssp. *splendida* yielded only 4% germination with no pretreatment compared with 70–80% germination following pretreatment.

The results of Study Group trials suggest that the length of the after-ripening period for annuals seems to have a correlation with the annual rainfall variability trends. In general, the more variable the rainfall, the longer the after-ripening period lasts.

Seed pretreatments

Many different strategies have been used for breaking dormancy. The answers are important to seed suppliers who prefer to turn over their product quickly. When seed needs an after-ripening period of several months or years it becomes a financial burden to store it for lengthy periods. Strategies include heat treatment and/or soaking in different solutions before sowing.

Heat treatment. Seed of *Schoenia filifolia* ssp. *subulifolia* can remain dormant for more than 9 months after it has been harvested. In natural conditions it has been observed that several months of dry heat are necessary before the majority of seed of *Schoenia cassiniana* will germinate (Mott 1972). The summer temperature at the soil surface in their natural habitat in central Western Australia ranges from 15°C to an average maximum temperature of over 65°C.

In seeking answers to the breaking of dormancy, research has been carried out on the

effect of high temperatures on dormant seeds for varying periods (Cheongsaat, Plummer and Turner 1996). Their research showed that seed of *Schoenia filifolia* ssp. *subulifolia* was 96% viable one month after harvest but all the seeds were dormant. Subsequently the length of dormancy was found to depend on storage temperature of the seed. Maximum germination was achieved when dormant seeds of ssp. *subulifolia* were exposed to 80°C for 11 days and sown immediately after the heat treatment, but viability later decreased. Storage at lower temperatures (25°C, 30°C and 40°C) for 3 months resulted in 90% germination. Even at these lower temperatures it is possible that a decrease in viability over time could occur.

Gibberellic acid pretreatment. A 24 hour soak in a solution of gibberellic acid (GA₃) has been found to stimulate germination in certain species, e.g. *Leucochrysum*, *Schoenia* and some *Rhodanthe*. These results have been confirmed by Study Group trials using solutions of 50 mg/litre GA₃.

Smoke product pretreatment. In 1990 de Lange and Boucher discovered that smoke promoted germination of a rare South African member of the Brunoniaceae. Since that time many other species have been tested by exposing seed to smoke in aerosol form or to solutions of smoke in water. Germination has been stimulated in many of them, particularly in some Western Australian species that had previously proved difficult to germinate. The benefits of this discovery have had extensive applications in nurseries, conservation and revegetation.

Although at first it was thought that smoke did not promote germination in everlasting daisy species, and that it might suppress it, Study Group trials have suggested otherwise. Various smoke products* were used in the trials, e.g. Kings Park

Footnote

* For information on sources of supply of germination aids see the appendix on page 194.

Smoke Water, Regen 2000® Smokewater, Regen 2000® Germinator and Smoke-impregnated Seed Primer Plus (SISP) which was developed and produced at the National Botanical Institute at Kirstenbosch in South Africa. The last-mentioned are specially impregnated paper disks which also contain other compounds such as hormones. For the majority of species in this study that were difficult to germinate, the SISP pretreatment proved to be the best. It improved percentage germination and rate of germination to some degree in most species, but if the improvement was not marked the recommendation for its use has not been made. Recommendations for pretreatments appear in Table 1 (page 18).

Primers containing smoke alone were also trialled but results were never as good as those obtained with the additional compounds. It is thought that the action of the smoke together with that of the growth activators is synergistic, that is, they increase each other's effectiveness when applied together.

Potassium nitrate pretreatment. Seed was soaked in 0.1% solutions of potassium nitrate (KNO_3) for 24 hours before sowing.

Rhodanthe species responded moderately well to this pretreatment. It is possible that pretreatment with combinations of KNO_3 and GA_3 will be used to promote germination in the future.

Soil wetting agent. Some everlasting daisies, such as *Rhodanthe chlorocephala* ssp. *splendida* and *Rhodanthe humboldtiana*, germinate better if a very small amount of soil wetting agent (1 drop per 50 mL) is added to the solution in which the seed is soaked before it is sown. Study Group members have used a horticultural soil wetting agent rather than a household detergent in order to avoid impurities that might be toxic to seeds.

Many everlasting daisy seeds have densely silky-hairy coats which are difficult to wet. These seeds sit on the surface of the pretreatment solution and do not absorb it easily. It is thought that

the detergent acts to reduce the surface tension of the pretreatment solution. This allows the liquid to penetrate the hairy coat, making it easier for the liquid to pass through the micropyle (a tiny hole in the seed coat) and react with the cells inside the seed to begin the process of germination.

Germination trials. Scientific research on germination involves trials carried out under laboratory conditions with control over each variable. On the other hand the Study Group trials, while covering a wide range of species, have all been done with simple equipment and in most cases under natural growing conditions. Most members have sown seed in punnets on seed mixes of various kinds, and have germinated seed outdoors in all weather conditions. For some species very few seeds were available for thoroughly testing all the pretreatments, and in a few trials the results reported by some members could not be replicated by others. The Study Group recommendations (as set out in Table 1, page 18) should be viewed in the light of these differences in approach and should be regarded as guides only.

It has become apparent from these trials that the results of the pretreatments may differ depending on seed storage time, storage temperature, the origin of the seed (wild or cultivated), the quality of the seed and the seasonal conditions prevailing when sown. Table 1 contains recommendations for seed collected from the wild or from gardens after one or two years of cultivation. Commercial seed may need pretreatment if it has been collected from the wild and immediately distributed for sale while still dormant. If seed is sown after the recommended seed storage period has elapsed, pretreatment may not be necessary.

Seedling form

The shape of the cotyledons varies from one genus to another and occasionally for species within one genus. The cotyledons of *Hyalosperma* are small and rounded, while those of *Leucochrysum*

are narrow-linear, and those of *Lawrencella* are linear and longer. Within the genus *Rhodanthe*, the cotyledons vary in shape but those of species within each section are similar (see introduction to *Rhodanthe*).

Collecting seed

Licences must be obtained from the relevant government authority in each State before seed is collected. A guide to applicants is published by the Australian National Parks and Wildlife Service. There are no restrictions on collecting from private properties if permission has been granted by owners.

Seed of everlasting daisies is ready to collect when the central disc florets have loosened. They usually become darker in colour and the bracts have folded back against the stem. In some species, e.g. *Rhodanthe tietkensis*, the outer bracts remain erect, spread a little further apart, and the florets look fluffy rather than compact.

A small amount of seed should be collected from several strong, healthy-looking plants in order to obtain a reasonably large gene pool. Collections should be made in dry weather if possible because fungal problems arise if seed is allowed to remain wet.

Seed treatment

Ensure that seed is completely dry by leaving it in a warm position for several days. Before storing seed, kill insect predators by placing the seed envelope in an air-tight jar containing a few naphthalene flakes, or attach a piece of pest strip to the inside of the lid. Seed should be left in the jar for 24–48 hours and then stored. The materials suggested above are hazardous to health. A safer alternative is to wrap the seed envelope in plastic sheeting and stow it in the freezer for the same period of time.

Seed storage

Seed should be stored in cool, dry conditions to retain maximum viability. Humid conditions

often cause rapid deterioration of seed. Airtight glass jars or sealed foil packets store seed safely.

Viability of many species is maintained better when stored in the refrigerator at 4°C. If seeds have been collected from arid or semi-arid regions, immediate storage at 4°C will often induce a secondary dormancy. These seeds need to be stored for varying periods at room temperature to satisfy the after-ripening requirement. When 60–80% germination is achieved such seed may then be stored at 4°C to retain maximum viability.

Propagation from cuttings

Everlasting daisies are easy to propagate from stem cuttings. Sophisticated propagation structures are not necessary but conditions provided by polyhouses, glasshouses and heat mats improve the strike rate. Root hormone powders and solutions can enhance results. The most important factor is hygiene.

Propagation from cuttings (or other vegetative means) is essential for the reproduction of hybrids, cultivars or good forms of species because seedlings may not come true to the parent plant. Another advantage of plants propagated from cuttings is that they are usually ready to plant out much earlier than seedlings of the same species sown at the same time. Most daisies show roots through the bottom of the propagating medium within a month.

Cuttings from annuals

Although tip cuttings of annuals will form roots, the plants produced in this way lack vigour and do not develop normally.

Cuttings from perennials and sub-shrubs

Firm tip or lateral cuttings are used. Cuttings from garden plants are generally more successful than cuttings collected from the wild.

Recommendations for success:

- ◆ Buds and flowers should be removed.
- ◆ The time at which cuttings are taken influences

Table 1. Recommendations for seed pretreatments, sowing times and storage

Species	Recommended pretreatment	Best sowing time for temperate climates	Recommended seed storage #
<i>Ballia graminea</i>	none	autumn	18-24 months
Bracteantha			
most spp.	none	autumn to spring	1-3 months
<i>subundulata</i>	SISP	autumn to spring	1-3 months
<i>Cephalopterum drummondii</i>	SISP	autumn	1-3 months
Chrysocephalum			
<i>operculatum</i>	none	late winter to spring	1-6 months
<i>bacteri</i>	none	throughout the year	1-3 months
<i>eremaeum</i>	none	autumn to spring	>18 months
<i>pterochaetum</i>	SISP	autumn or spring	15-36 months
<i>putedale</i>	not tested	—	—
<i>samipapposum</i>	none	autumn to spring	1-6 months
Hopstretchian			
<i>colvilli</i>	SISP	autumn, late winter	6-18 months
<i>conicum</i>	SISP	autumn, late winter	12-18 months
Hyalosperma			
<i>cotula</i>	SISP	autumn	6-18 months
<i>dermisum</i>	none	autumn	6-18 months
<i>glutinosum</i>	SISP	autumn	6-18 months
<i>praecox</i>	water	autumn	6-18 months
<i>pusillum</i>	not tested	—	—
<i>semisterile</i>	SISP	autumn	6-18 months
<i>simplex</i>	SISP	autumn	6-18 months
<i>stoveae</i>	not tested	—	—
<i>zaccheus</i>	not tested	—	—
brodiaea			
<i>achillaeoides</i>	RG	autumn to spring	6-9 months
<i>findersica</i>	not tested	—	—
Lawrensonia			
<i>davenportii</i>	not known	not known	not known
<i>rosea</i>	SISP	autumn or winter	6-18 months
Leucochrysum			
<i>albicans</i> ssp. <i>albicans</i>	SISP	throughout the year	6-18 months
<i>fitzgeraldii</i>	SISP	autumn	12-24 months
<i>graminifolium</i>	not tested	—	—
<i>molle</i>	SISP	autumn to late winter	15-36 months
<i>stipitatum</i>	SISP	autumn or spring	15-36 months
Rhodanthis			
<i>anthemoides</i>			
unbranched form	none	autumn to spring	6-18 months
branching form	none	autumn to spring	6-18 months
<i>ascendens</i>	SISP	late winter to spring	12-24 months
<i>batii</i>	SISP	autumn to late winter	12-24 months
<i>charleyae</i>	SISP	autumn to late winter	12-24 months
<i>chlorocephala</i>			
ssp. <i>rosea</i>	none	autumn to spring	3-6 months
ssp. <i>rosea</i> (dwarf, white)	SISP + SW	autumn to spring	12-24 months
ssp. <i>splendida</i>	SISP + SV	early autumn to late winter	12-36 months
<i>citrina</i>	SISP	autumn or spring	12-24 months
<i>collina</i>	SISP + SW	autumn	9-18 months
<i>condensata</i>	none	autumn or spring	6 months
<i>corymbifera</i>	none	autumn to winter	6-18 months
<i>corymbosa</i>	none	autumn to winter	3-6 months
<i>crumena</i>	SISP + SV	autumn	12-24 months

Species	Recommended pretreatment	Best sowing time for temperate climates	Recommended seed storage #
<i>Rhodanthe</i> (continued)			
<i>diffusa</i>			
<i>ssp. diffusa</i>	RG, SISP	autumn to winter	6-18 months
<i>ssp. leucactina</i>	SISP	autumn to winter	6-12 months
<i>floribunda</i>	SISP	-	-
<i>forrestii</i>	not tested	-	-
<i>frenchiei</i>	not tested	-	-
<i>fuscescens</i>	not tested	-	-
<i>gossypina</i>	no germination	not known	not known
<i>haightii</i>	SISP + SW	autumn or late winter	18-36 months
<i>heterantha</i>	not tested	-	-
<i>humboldtiana</i>	SISP + SW	autumn to winter	12-18 months
<i>laevis</i>	SISP	late autumn to winter	8-12 months
<i>manglesii</i>	SISP	autumn to late winter	9-12 months
<i>margarethae</i>	none	summer to early autumn	not known
<i>marynii</i>	none	late summer to early autumn	12-18 months
<i>microglauca</i>	SISP	autumn to winter	6-18 months
<i>meschata</i>	none	late summer to early autumn	12-24 months
<i>nielarborensis</i>	not tested	-	-
<i>oppositifolia</i>			
<i>ssp. oppositifolia</i>	SISP + SW	autumn to late winter	18-24 months
<i>ssp. ornata</i>	SISP + SW	autumn to late winter	6-18 months
<i>pallackii</i>	not tested	-	-
<i>polyccephala</i>	not tested	-	-
<i>polygalifolia</i>	SISP	late autumn to winter	18-24 months
<i>polyphylla</i>	none	autumn to winter	3-9 months
<i>propinqua</i>	water + SW, SISP + SW	autumn to winter	12-24 months
<i>psammophila</i>	SISP	autumn or winter	6-18 months
<i>pygmaea</i>	none	winter	12-18 months
<i>pyrethrum</i>	not tested	-	-
<i>rubella</i>	SISP	winter	18-24 months
<i>rufescens</i>	not tested	-	-
<i>sphaerocephala</i>	not tested	-	-
<i>spicata</i>	none	autumn to spring	6-18 months
<i>sterilesens</i>	SISP	early autumn or early spring	12-24 months
<i>stricta</i>	SISP	late autumn to winter	9-18 months
<i>stuartiana</i>	SISP	autumn to winter	12-24 months
<i>tietkensii</i>	SISP	autumn	18-24 months
<i>troedehii</i>	SISP	late autumn or late winter	6-18 months
<i>uniflora</i>	none	autumn or winter	6-18 months
<i>Schoenia</i>			
<i>ayersii</i>	SISP	autumn	2-3 years (or longer)
<i>cassiniana</i> *	SISP, GA ₃	autumn	9-18 months
<i>filifolia</i>			
<i>ssp. arenicola</i>	GA ₃	autumn	6-18 months
<i>ssp. filifolia</i>	GA ₃	autumn	6-18 months
<i>ssp. subulifolia</i>	GA ₃	autumn	9-18 months
<i>macvorii</i>	SISP, GA ₃	autumn to winter	6-30 months
<i>retinosasima</i>	none	autumn	>12 months
<i>Waitea</i> spp.	none	autumn	1-6 months

SISP = Smoke-impregnated Seed Primer Plus. RG = Regen 2000® Germinator. GA₃ = gibberellic acid.
SW = soil wetter # Recommended storage time between harvesting and sowing

* Some commercial seed germinated poorly when first purchased. Pretreatment in SISP increased germination to above 90%.

strike rate. Those taken in the period when plants are growing vigorously are likely to be more successful. Many daisy species, however, flower for very long periods, and so cuttings are usually taken of firm new growth.

- ◆ Growth stages influence strike rate. Shoots that sprout from the base of plants are usually successful. For example, firm new shoots taken from the base of *Chrysocephalum apiculatum* and *C. semipapposum* are more successfully struck than tip cuttings. Such shoots usually emerge in late winter or early spring. Hard pruning will also produce new basal shoots if the soil is kept moist for some time after the pruning takes place.
- ◆ Commercial preparations of both talc and liquid hormones are available, but they are not usually necessary.

Cuttings rooted in water

For the novice this method of striking cuttings is a simple approach, but is very dependent upon the time at which cuttings are taken. It has been successful for herbaceous, soft-stemmed plants, such as *Bracteantha bracteata*, *B. palustris*, *Chrysocephalum apiculatum*, *C. baxteri*, *Rhodanthe anthemoides* and *R. floribunda*.

Cuttings should be stripped of leaves to the depth of the water and one or two leaves above the surface also removed. Stand the cuttings in jars of water on window sills where they receive light. No hormones need be used, but the water should be changed regularly to avoid algal growth. Roots should form in 3–12 weeks. These roots will be soft and care must be taken in potting on any cuttings struck by this method.

Transporting cuttings

If cuttings are allowed to wilt they are slower to root and more susceptible to rot. Cuttings should be dampened but not wet, and kept cool.

Micropropagation

Micropropagation is the technique by which plants are produced from very small pieces of plant tissue in aseptic laboratory conditions. It is used for the mass production of plants which are difficult to produce by other means, and where micropropagation is the cheapest method. The other major use is the development of virus and other pathogen tested stock, for distribution as certified plant material. Many Australian plants, such as *Bracteantha*, are treated in this way for distribution to overseas growers.

Propagation from division

Of the species in this study, only the rhizomatous species of *Bracteantha*, the suckering forms of *Chrysocephalum apiculatum*, and some forms of *C. semipapposum* are capable of division by having rooted pieces dug from the soil and potted up or placed in another part of the garden.

Other forms of *C. apiculatum*, such as the Mt. William form from the Grampians, and forms of *C. semipapposum* may be dug up and divided with a sharp knife, but the divisions must be large. Small divisions will not normally survive this treatment.

Layering

Layering is a slow process, rarely used for everlasting daisies. It could be tried with prostrate or ascending forms of perennials, such as *Chrysocephalum apiculatum*, *C. baxteri* and *C. eremaeum*.

4

Gardening with Everlasting Daisies

The everlasting daisies in this study are eminently suitable for most gardens. The majority are less than 30 cm high. They fit into the smallest of gardens, are colourful, and flower for long periods. Even though annuals flower only for 10–12 weeks, additional pleasure is derived from their use as fresh or dried flowers.

Shrubs and perennials may last for many years while annuals are delightful fillers of space, especially in new gardens.

Everlastings are seen to advantage as bedding plants, in rockeries, as edging plants, ground covers or grouped for colour among existing shrubs. They make decorative subjects for containers of all sizes from hanging baskets to tubs, and are perfect for patios, courtyards and balconies.

Some gardens, such as coastal, subtropical and alpine gardens, have special conditions which need to be taken into account when considering the planting. These specific purposes and situations are discussed briefly, and recommendations for species most suitable for each category are listed. (Throughout this chapter * denotes species new to cultivation for which seed or plants are not yet commercially available, and † denotes short-lived shrubs which need replacement every two or three years.) Illustrations and more detailed notes on cultivation can be found in the species' descriptions in Chapter 9.

In planning gardens consideration should be given to minimizing the use of water, which is becoming a limited resource.

Bedding plants

The function of bedding plants is primarily to supply masses of colour. Kings Park, Mount Annan and Cranbourne Botanic Gardens mount stunning displays of everlastings each year over large areas. Public gardens such as these select species

with high germination percentages that have been proved reliable over many years. Bedding plants are also used to create colour in gardens of any size. More adventurous selections can be made for small areas where irregular germination can be more easily tolerated.

Experience has shown that such annuals as *Rhodanthe chlorocephala* ssp. *rosea* and *R. manglesii* cope well with smog and pollution in suburban median strips.

Annuals

Rhodanthe chlorocephala ssp. *rosea*
Rhodanthe humboldtiana
Rhodanthe manglesii
Schoenia castiniana
Schoenia filifolia ssp. *filifolia*
Schoenia filifolia ssp. *subulifolia*

Perennials or shrubs

Bracteantha bracteata
(dwarf cultivars, hybrids) †
Chrysocephalum apiculatum
(prostrate, suckering forms)
Chrysocephalum baxteri
Leucochrysum albicans ssp. *albicans*
var. *albicans*
Rhodanthe anthemoides

Rock gardens

Many everlastings grow naturally in rocky areas and therefore perform splendidly in rock gardens where their roots are insulated from high and low temperatures. The rocks behave as a heat sink and deliver heat as soil temperatures fall, thus alleviating extremes of weather conditions which could otherwise lead to plant damage.

Plantings should be to scale, the area and shape of the rock garden dictating the size of the plantings. Good drainage is important, with the accompanying requirement of greater vigilance regarding the frequency of watering.

Although perennials would make up the majority of the plantings, small groups of annuals also have their place in rockeries. After they have died they leave gaps, but these may be filled with self-sown plants or by planting with new species.

Suggestions for small to medium rock gardens are:

Annuals

Hyalosperma cotula
Hyalosperma glutinosum ssp. *venustum*
Hyalosperma praecox
Hyalosperma simplex ssp. *simplex* *
Lawrencella rosea *
Rhodanthe chlorocephala ssp. *rosea*
 (dwarf forms)
Rhodanthe chlorocephala ssp. *splendida*
Rhodanthe citrina
Rhodanthe corymbiflora **
Rhodanthe crenea *
Rhodanthe diffusa *
Rhodanthe floribunda
Rhodanthe haigi *
Rhodanthe polygalifolia
Rhodanthe stricta
Schoenia cassiniana
Schoenia filifolia ssp. *filifolia*
Schoenia filifolia ssp. *subulifolia*
Schoenia macivarii
Waitzia acuminata
Waitzia rutida
Waitzia suaveolens

Perennials or shrubs

Bracteantha bracteata
 (dwarf, compact cultivars and forms) †
Bracteantha bracteata hybrids
 (small forms) †

Chrysocephalum apiculatum
Chrysocephalum baxteri
Chrysocephalum semipapposum
Ixodia achillaeoides (compact form) †
Leucochrysum albicans ssp. *albicans*
 var. *albicans*
Leucochrysum albicans ssp. *albicans*
 var. *tricolor*
Leucochrysum graminifolium **
Rhodanthe anthemoides

Plants for grouping and pockets of colour

All the species suggested for rock gardens fall into this category. There is less protection in the open garden than among strategically placed rocks for the smaller, more delicate species but they grow well when planted in groups. They derive support from each other, make a greater visual impact, and there is more chance of cross-pollination. Plants of larger dimensions are included in the recommendations for garden planting:

Annuals

Rhodanthe chlorocephala ssp. *rosea*
Rhodanthe humboldtiana
Rhodanthe manglesii
Rhodanthe polyphylla *

Perennials or shrubs

Bracteantha bracteata †
Bracteantha viscosa †
Chrysocephalum semipapposum
Rhodanthe anthemoides

Ground covers

The definition of ground covers includes plants whose foliage covers the soil closely. The benefits are that moisture loss is reduced, weeds are discouraged and soil temperatures remain more constant. Plants of various heights fit this description.

Prostrate, suckering plants are obvious candidates but taller plants of dense, neat habit are also suitable.

Bracteantha bracteata
(dwarf hybrids) †
Bracteantha bracteata
(coastal NSW forms) †
Bracteantha bracteata (hybrids) †
Chrysocephalum apiculatum
(prostrate, suckering forms)
Chrysocephalum semipapposum
Leucochrysum albicans ssp. *albicans*
var. *albicans*

Edging plants

These are low plants which soften the margins of paths, garden beds, walls, driveways, large tubs and troughs.

Chrysocephalum apiculatum forms
Chrysocephalum baxteri
Leucochrysum albicans ssp. *albicans*
var. *tricolor*
Rhodanthe anthemoides

Small groups of annuals may be interspersed with other plants along garden edges (refer to list under Rock gardens page 21).

Everlastings for special gardens

Subtropical gardens

Three major problems confronting gardeners in subtropical areas are humidity, heavy rains, and higher soil temperatures. These factors combine to cause an increase in fungal problems in roots and foliage. Recommendations for planting in these conditions are results of the experiences of Study Group members in the Brisbane and Bundaberg

areas. Annuals are most successful when sown May/June.

Annuals

Rhodanthe chlorocephala ssp. *rosea*
Rhodanthe chlorocephala ssp.
splendida
Rhodanthe floribunda
Rhodanthe humboldtiana
Rhodanthe manglesii
Rhodanthe stricta
Schoenia cassimani
Schoenia filifolia ssp. *subulifolia*

Perennials or shrubs

Bracteantha bracteata forms, hybrids
and cultivars †
'Argyle Star' †
'Dargan Hill Lemon' †
'Dargan Hill Monarch' †
'Elizabeth' †
'Golden Beauty' †
'Hastings Gold' †
Chrysocephalum apiculatum
(suckering Queensland form)
Rhodanthe anthemoides
(unbranched form)

Alpine gardens

The panorama of everlasting daisies seen in the Alps in late spring and summer is breathtakingly beautiful. Gardens constructed around ski-lodges and flats in resort areas should be planted with local forms not only to conserve the local varieties but also because they are likely to grow more successfully. In alpine areas plants have adapted to the harsh conditions by growing among rocks and boulders where their roots gain protection and the foliage gains warmth from heat absorption. In winter they must adapt to a snow cover metres thick, and in summer to relatively high temperatures. The following are beautiful alpine and subalpine species and subspecies:

Bracteantha subundulata
Chrysocephalum apiculatum
Chrysocephalum semipapposum
Leucochrysum albicans ssp. *alpinum*
Leucochrysum albicans ssp. *albicans*
 var. *albicans*
Leucochrysum albicans ssp. *ulbicans*
 var. *tricolor*
Rhodanthe anthemoides
 (unbranched form)

Many gardeners like to grow alpine species in metropolitan gardens. Although all of the above (with the exception of *L. albicans* ssp. *alpinum*) will grow in cool temperate climates the consistently successful species have been propagated from material collected from lower altitudes.

Montane gardens

The tablelands of South Eastern Australia have severe winters and hot, dry summers. Canberra is a typical city with such seasonal extremes. Across much of Canberra, gardeners deal with poorly-drained acid soils of relatively low nutrient value. About 40–60 frosts occur each year, with hail and snow in some years, contrasted with high summer temperatures, especially in February. Wind is a further hazard – cold westerlies and south-westerlies from winter to early spring, and hot westerlies and north-westerlies from late spring to summer. Winter rainfall is fairly regularly distributed, and short periods of high summer heat often result in thunderstorm activity and rain.

In spite of such difficult conditions numerous everlastings grow quite well. It is advisable to sow annuals from June to August in punnets indoors, so that they are ready for planting out in mid-October to November when the frosts are coming to an end. Many of the perennials self-sow in the garden, and it is recommended that local forms are grown when available.

Annuals

Rhodanthe chlorocephala ssp. *rosea*
Rhodanthe humboldtiana
Rhodanthe mangesii
Rhodanthe polyphylla *
Schoenia cassiniana

Perennials or shrubs

Bracteantha bracteata
 (including local and coastal
 NSW forms) †
Bracteantha bracteata hybrids
 (such as 'Bright Bikini') †
Bracteantha subundulata
Bracteantha viscosa †
Chrysocephalum apiculatum
Chrysocephalum baxteri
Chrysocephalum semipapposum
Ixodia achillaeoides †
Leucochrysum albicans ssp. *alpinum*
Leucochrysum albicans ssp. *albicans*
 var. *albicans*
Leucochrysum albicans ssp. *albicans*
 var. *tricolor*
Rhodanthe anthemoides

Coastal gardens

Two major problems for gardeners in coastal districts are salt spray and gale force winds. Planting of windbreaks to protect less resistant plants is of the utmost importance. Some of the recommended species for these conditions possess salt tolerant foliage (denoted by #) and their chance of survival is greater if they are of local provenance.

If some of the less well known species growing in coastal areas become commercially available in the future, they could also be selected. *Rhodanthe condensata*, *R. psammophila* and *Schoenia filifolia* ssp. *arenicola* are three such species.

Annuals

Rhodanthe chlorocephala ssp. *rosea*
Rhodanthe manglesi
Schoenia filifolia ssp. *subulifolia*

Perennials or shrubs

Bracteantha bracteata forms †
Bracteantha papillosa †
Chrysocephalum apiculatum #
Chrysocephalum baxteri
Chrysocephalum semipapposum #
Ixodia achillaeoides †
Leucochrysum albicans ssp. *albicans*
var. *albicans*
Rhodanthe anthemoides

Meadow gardens

A current trend in natural gardening is the creation of 'meadow gardens'. The concept is to sow a mixture of annuals that will germinate readily in winter/spring, flower simultaneously in early summer, then set seed. After cutting back to ground level, the dry foliage will form a mulch and the seeds in it will germinate again when the autumn rains come. Several varieties of seed mixes for this purpose are available commercially, some of which contain *Rhodanthe* and *Chrysocephalum* species as well as a number of brachyscomes, grasses and other forbs. This concept could be applicable also to inland gardens.

Inland gardens

Inland gardens include all inland areas west of the Great Divide. Such gardens are exposed to conditions akin to those of montane gardens, but snow is not a factor. Heavy winter frosts and prolonged periods of high summer temperatures allied with low rainfall are the most difficult conditions faced by gardeners. Soils vary considerably from hydrophobic (water-repelling) sands to waterlogged clays, and drainage may need to be improved and evaporation controlled by mulching.

Most annuals are burnt by frost to some extent and should not be planted until the frost period is past. Another precaution against frost damage is the selection of forms with some frost tolerance.

Annuals

Cephalopterum drummondii
Lawrencella rosea
Rhodanthe chlorocephala ssp. *rosea*
Rhodanthe chlorocephala ssp. *splendida*
Rhodanthe citrina
Rhodanthe corymbiflora *
Rhodanthe diffusa *
Rhodanthe humboldtiana
Rhodanthe manglesi
Rhodanthe polygalifolia
Rhodanthe polyphylla *
Rhodanthe stricta
Schoenia cassiniana
Schoenia filifolia ssp. *filifolia*
Schoenia filifolia ssp. *subulifolia*
Schoenia mactivorii

Perennials or shrubs

Bracteantha bracteata †
Bracteantha bracteata hybrids †
Bracteantha palustis
Bracteantha viscosa †
Chrysocephalum apiculatum
Chrysocephalum semipapposum
Leucochrysum albicans ssp. *albicans*
var. *albicans*
Leucochrysum albicans ssp. *albicans*
var. *tricolor*
Rhodanthe anthemoides

New gardens

In these situations annuals with high germination potential as well as fast-growing perennials are perfect choices for filling the gaps between permanent plantings. Both should flower in their first

year and most will provide height, colour, soil cover, and cut flowers.

Annuals

- Rhodanthe chlorocephala* ssp. *rosea*
- Rhodanthe corymbiflora* *
- Rhodanthe corymbosa* *
- Rhodanthe diffusa* *
- Rhodanthe humboldtiana*
- Rhodanthe manglesi*
- Rhodanthe polyphylla* *
- Schoenia filifolia* ssp. *filifolia*
- Schoenia filifolia* ssp. *subulifolia*

Perennials or shrubs

- Bracteantha bracteata* †
- Bracteantha viscosa* †
- Chrysocephalum apiculatum*
- Chrysocephalum baxteri*
- Chrysocephalum semipapposum*
- Ixodia achillaeoides* †
- Leucochrysum albicans* ssp. *albicans*
var. *albicans*
- Rhodanthe anthemoides*

Courtyard gardens

An increase in the number of home units has seen a corresponding rise in interest in plants for courtyard gardens. Such gardens are substantially enclosed, and the availability of direct sunlight should dictate the selection of species planted. Suitably chosen everlastings will fit into the smallest of spaces, and the species recommended for rockeries, ground covers and edging plants should be considered.

Bog gardens

The main characteristic of bog gardens is permanent dampness and this may be associated with pool edges or specially created areas. Of the everlastings in this study only *Bracteantha palustris* is suitable.

Gardens with alkaline soils

These soils usually have an excess of calcium in the form of limestone. They are common on the Adelaide Plains and in many other areas of South Australia, Northern Victoria (mallee country), and elsewhere. Rather than trying to alter the pH of the soil to reduce alkalinity, it is more practical to plant species that will grow in alkaline soils.

Annuals

- Rhodanthe chlorocephala* ssp. *rosea*
- Rhodanthe haigi* *
- Rhodanthe polygalifolia*
- Schoenia cassiniana*
- Schoenia filifolia* ssp. *subulifolia*
- Waiztia acuminata*
- Waiztia suaveolens* var. *flava*

Perennials or shrubs

- Bracteantha bracteata* forms, hybrids and cultivars †
- 'Cockatoo' †
- 'Dargan Hill Monarch' †
- 'Diamond Head' †
- 'Princess of Wales' †
- 'White Monarch' †
- Chrysocephalum apiculatum*
- Leucochrysum albicans* ssp. *albicans*
var. *albicans*
- Rhodanthe anthemoides*
(unbranched form)

Ephemeral soaks

Ephemeral soaks are depressions, usually in heavy soils, which hold water only after substantial rain. Plants in these situations may be growing in dry conditions for much of the year but must be able to withstand having their roots in water for a period of time. The sloping walls of the soak offer drier conditions than the base, and suckering or self-sowing plants may migrate to the position that best suits them. In their natural habitat many

species grow beside lakes and are often inundated for short periods. The following are suggested:

Annuals

Hyalosperma catula
Hyalosperma simplex ssp. *simplex* *
Hyalosperma simplex ssp. *graniticola* *
Rhodanthe chlorocephala ssp. *rosea*
 (dwarf white form from central WA)
Schizemia filifolia ssp. *filifolia*

Perennials or shrubs

Brodiaea bicolor †
Brodiaea palustris
Rhodanthe anthemoides
 (unbranched form)

Everlastings for containers

There are endless possibilities for everlasting daisies in containers. Tubs, pots, troughs, bowls and hanging baskets of all sizes, shapes and materials are available for small or large spaces. Terraces, balconies, patios, courtyards and verandahs are enhanced by plantings in containers. Tiers of hanging baskets can be used not only to lend height and interest to bare spaces but also to bring life and colour to fences, such as those around swimming pools.

Commercial potting mixes are readily available. They should be labelled as complying with the Australian Standard for such mixes. Alternatively an open, well-drained mix which is capable of retaining some moisture can be prepared by mixing the ingredients to suit the plants' requirements. By this means favourite plants which may have proved impossible to grow in the garden can be grown successfully.

There are two disadvantages to container growing:

- ◆ Containers may dry out quickly and must therefore be watered more often, especially on paved bases which reflect heat. Incorporation

of soil wetting crystals in the mix or subsequent application of soil wetting solutions to the surface will slow the drying out process.

- ◆ The regular watering leaches nutrients from the potting mix faster than they are leached from garden soil. Nutrients must be replenished in the growing season by applications of liquid fertiliser every 3–4 weeks or by slow-release fertilizer scattered on the surface.

Everlastings are perfect for containers by virtue of their small size, long flowering periods and have the further attribute of providing fresh or dried flowers. Containers may be brought inside for short periods without detriment.

Small containers

Annuals

Bellida graminea
Cephalopterum drummondii (small forms)
Haptatrichion cowillii *
Haptatrichion conicum *
Hyalosperma catula
Hyalosperma glutinosum ssp. *glutinosum* *
Hyalosperma glutinosum ssp. *venustum*
Hyalosperma praecox
Hyalosperma simplex ssp. *simplex* *
Lawrenella rosea *
Leucochrysum fitzibbonii
Leucochrysum molle *
Rhodanthe chlorocephala ssp. *rosea*
 (dwarf forms)
Rhodanthe chlorocephala ssp. *splendida*
Rhodanthe atrina
Rhodanthe collina *
Rhodanthe corymbosa *
Rhodanthe crenea *
Rhodanthe diffusa *
Rhodanthe floribunda
Rhodanthe hargii *
Rhodanthe oppositifolia ssp. *onista* *
Rhodanthe polygalifolia
Rhodanthe rubella *

continued / ...

Rhodanthe steriles
Rhodanthe stuartiana *
Schoenia filifolia ssp. *filifolia*
Schoenia macvora
Schoenia ramosissima *
Waitzia acuminata var. *acuminata*
Waitzia suaveolens

Perennials or shrubs
Chrysocephalum baxteri
Chrysocephalum baxteri 'Midget' †
Leucochrysum albicans ssp. *albicans*
 var. *albicans*
Leucochrysum albicans ssp. *albicans*
 var. *tricolor*
Leucochrysum graminifolium *
Rhodanthe anthemoides 'Paper Cascade'
Rhodanthe anthemoides 'Paper Star'

Medium to large containers

Containers of larger dimensions, such as tubs, allow the grouping of several species in each. Combinations of colour, height and habit can be varied for pleasing effect. Species from the above list may be included and the following taller species also could be considered:

Annuals
Cephalopterum drummondii
Leucochrysum molle *
Rhodanthe chlorocephala ssp. *rosea*
 (tall forms)
Rhodanthe corymbiflora *
Rhodanthe humboldtiana
Rhodanthe manglesi
Rhodanthe margarethae *
Rhodanthe moenchata †
Rhodanthe polyphylla *
Schoenia cassiniana
Schoenia filifolia ssp. *subulifolia*

Perennials or shrubs
Bracteantha bracteata †
Bracteantha pakistria
Bracteantha subundulata
Chrysocephalum apiculatum
Chrysocephalum semipapposum
Ixodia achillaeoides (dwarf forms) †
Rhodanthe anthemoides

Hanging baskets

Species chosen for baskets should have weeping or ascending habits so that flowers and foliage appear to advantage from below or at eye level. Baskets should look pleasing for most of the year. Soil mixes for baskets are the same as those for containers, as are the nutrient replacement and watering requirements. If the basket is hanging in an exposed position the addition of peat moss or of water-absorbing granules to the mix will enhance the water holding capacity, thus reducing the frequency of watering.

Chrysocephalum apiculatum
 (trailing forms)
Chrysocephalum baxteri
Rhodanthe anthemoides 'Paper Baby'
Rhodanthe anthemoides 'Paper Cascade'
Rhodanthe anthemoides 'Paper Star'

Many everlasting daisies look brilliant in the wild but they have not been introduced into garden culture because seed is not available or is difficult to germinate. Species such as *Cephalopterum drummondii*, *Lawrencella davenportii*, *Leucochrysum fitzibbonii*, *L. graminifolium* and *L. molle*, *Rhodanthe collina*, *R. floribunda* and *R. rubella* fall into that category. There is considerable scope for research in this field of horticulture.

Everlasting Daisies for Floral Arrangements

Everlasting daisies are delightful as fresh flowers and excellent for dried arrangements. The structure of the heads with their stiff, colourful bracts makes them eminently suitable for drying and for wiring.

Fresh flowers

Most of the everlastings in this study will remain fresh in vases for at least seven days, many last for two to three weeks or longer. *Rhodanthe chlorocephala* ssp. *splendida* is bright and fresh for six to ten weeks. The length of time the flower-heads last varies with the species and the indoor conditions.

One of the limiting factors is the strength of the stems. When stems are thin and weak the necks droop after about four days although the heads remain perfect.

As with all cut flowers, the vase life of everlastings may be increased by taking certain precautions:

- ◆ Pick stems early in the morning or late in the evening.
- ◆ Pick when flower-heads are in bud or when the outer bracts are beginning to unfold. The heads will usually open further after the stems are picked.
- ◆ Remove all leaves that will be covered by water to minimize bacterial growth.
- ◆ Cut the stems at an angle, immerse to within 2–5 cm of the heads and leave for several hours. The angle cut allows more rapid absorption of water and decreases the chances of the stem base resting in sediment.
- ◆ If stems are woody, scrape or split the bases to a distance of 1–2 cm.

- ◆ A little sugar or lemon juice, a few drops of household bleach or a flower-keeping sachet can be added to the water before finally arranging the stems.

Long-lasting species include *Bracteantha bracteata* forms, cultivars and hybrids, *B. viscosa*, *Cephalopterum drummondii*, *Chrysocephalum apiculatum*, *C. baxteri*, *C. semipapposum*, *Hyalosperma praecox*, *H. simplex*, *Ixodia achillaeoides*, *Leucochrysum albicans* ssp. *albicans*, *Rhodanthe anthemoides* branched and unbranched forms, *R. chlorocephala* ssp. *rosea* and ssp. *splendida*, *R. citrina*, *R. floribunda*, *R. polygalifolia*, *R. polyphylla*, *Schoenia filifolia* ssp. *subulifolia* and *Waitzia suaveolens*. Information on the vase life of other species is contained in Chapter 9.

Air-dried flowers

Many of the everlastings included in this book may be air-dried successfully and their form and bright colours then will endure for many years in arrangements.

The appearance of dried everlastings is improved if the same steps are taken when picking the stems as those recommended for fresh flowers. It is important to choose perfect buds which are just on the point of opening. Fully open heads will continue to develop and the result will not be as pleasing. All specimens damaged by insect attack should be discarded.

Dried specimens are often improved if the fresh stems are initially held for varying periods of time in water, or solutions containing glycerine, or polyethylene glycol (PEG). The stems are then hung heads down in loose bunches in an airy space

out of direct sun to minimize fading of the bracts. A dry cupboard is excellent for this purpose. Most species take about three weeks to reach the desired degree of durability. A simple test is to hold the bunches upright; if the heads droop the stems require more time. In some instances species droop after being upright for 3–4 days, indicating either that the species is not suitable for drying or that the plants were not robust, well grown specimens with strong stems. If there is no success after a further period of hanging the specimens should be discarded.

When dried flowers have been in use for a considerable time they become dusty and have a tendency to droop. They may be refreshed by dipping in water and repeating the drying procedure.

Species which air-dry well include *Bracteantha viscosa*, *Cephalopterum drummondii*, *Chrysocephalum semipapposum*, *Hyalosperma glutinosum* ssp. *venustum* and *H. simplex*, *Ixodia achillaeoides*, *Leucochrysum fitzgibbonii* and *L. molle*, *Rhodanthe anthemoides*, *R. chlorocephala* ssp. *rosea*, *R. citrina*, *R. corymbosa*, *R. diffusa* ssp. *diffusa*, *R. moschata*, *R. rubella*, *Schoenia filifolia* (all subspecies), *S. macivorii*, and most of the *Waitzia* species.

Stem treatments before drying

Immersion in water. After picking immerse the stems in water for 2–3 days, and then hang upside down. This process improves the stiffness of the stems, especially if they are picked in hot weather. Species drying well using this method are *Rhodanthe rubella* and *Schoenia filifolia* ssp. *arenicola*.

Immersion in glycerine solution. Glycerine has been used traditionally to improve the form, stability and colour of dried flowers and stems. Its high solubility in water enables it to penetrate readily to all parts of plant material. A solution of two parts of boiling water to one part of glycerine is used. Stems are inserted in the warm solution to the depth required (making sure the leaves beneath the surface have been removed). Allow to stand

until the leaf colour begins to change, usually after a period of 1–5 days. Remove immediately if leaves become sticky. Stems are blotted dry and hung heads down until stiff. Some commercial flower preservation products yield a similar result, but may contain dyes to alter the natural colour of the heads.

These solutions allow the remaining foliage to be more flexible, and there is less leaf drop. Our tests indicated that this method seemed more successful for everlasting genera which were not included in this study, such as *Cassinia*, *Odisia* and *Ozothamnus*.

Immersion in polyethylene glycol (PEG) solutions.

PEG has a similar chemical constitution to that of glycerine, with the added advantage that it forms long molecular chains. These might be expected to offer greater resistance to collapse of soft tissue when water is withdrawn.

Study Group members experimented with solutions of PEG 200, 400, 600, and 1000. It was concluded that a dilution of 1 part of PEG 400 to 24 parts of water retained flower colour very well, strengthened small stems and improved the appearance of certain dried species, such as *Chrysocephalum semipapposum*. An immersion time not exceeding 5–8 hours minimizes leaf damage.

This method appears to be more appropriate for everlasting genera not included in this book, such as *Cassinia* and *Ozothamnus*.

Wired flowers

Wired flower-heads have the following advantages over air-dried flowers:

- ◆ the heads never droop,
- ◆ the heads remain perfect if picked at the right stage of development,
- ◆ wired heads are easier to handle and to store,
- ◆ wired heads last much longer.

Wired heads are more reliable when used for display and appear more natural if arranged with a filler. One disadvantage is that the foliage is lost and this sometimes detracts from the natural appearance of arrangements. The technique for wiring heads is one which improves with practice.

Steps for wiring flower-heads

1. It is desirable that flower-heads after wiring should be open to varying degrees. The heads will continue to develop after wiring, often opening fully. Picking when the buds are tight will result in fewer fully open flowers. If picked after the bracts have opened fully, insects may have damaged the disc centre, the bracts may reflex (turn back against the stem) or else seed may develop and drop. There are some exceptions including *Hyalosperma praecox* and *Rhodanthe polygalifolia* which should be picked when the bracts are open. *H. praecox* is ready when the green dot in the heart of the disc centre has almost disappeared. This avoids unattractive darkening of the centres.

Rhodanthe polygalifolia should be treated similarly. Harvesting is best in the early morning or evening. Stems may be kept in water for 12–24 hours if necessary, and in this case should be 10–15 cm long.

2. Cut the stem 0.5–1 cm behind the head.
3. Choose a wire of suitable gauge for the head. Wire of 26 gauge is fine and may be used to wire dainty heads such as those of the *Hyalosperma* species, *Lawrencella rosea*, *Schoenia filifolia* and *S. macivorii*. Slightly heavier wire of 24 gauge may be used to wire most of the *Leucochrysum*, and *Rhodanthe* species. Wire of 22 or 20 gauge should be used for *Bracteantha* forms and cultivars. If the head bends the wire a heavier gauge is required. The wire should be pushed up the centre of the stem until a slight obstruction is felt. This means the wire is at the junction of the stem and the receptacle. It should be pushed slightly further so that it enters the receptacle but does not pass through it and appear among the florets.

Stand the wired stems upright until the stem has shrunk and grips the wire tightly. Two to three weeks is usually sufficient, especially in hot weather.

Bare wires may be taped with floral tape (available at florists' suppliers) to prevent rusting. Tape is usually 12 mm wide. It makes a neater job if it is cut into three strips 4 mm wide. The bottom 10 cm of the wire should be left bare for easy

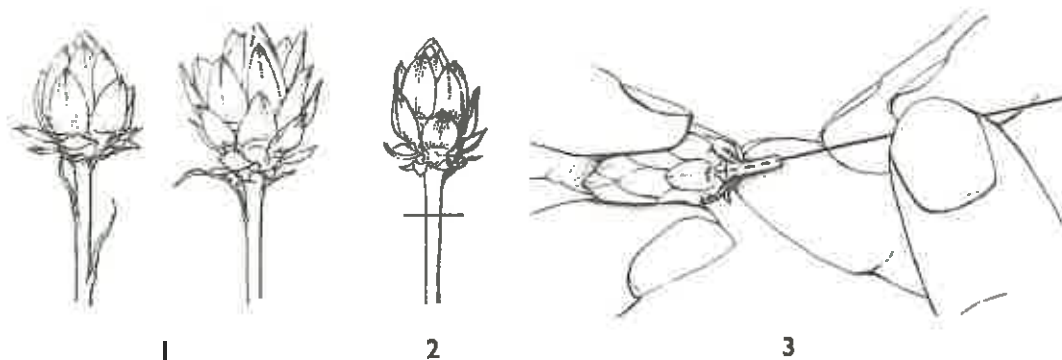


Figure 9. Steps for wiring daisy flower-heads

- 1, pick stems when outer bracts begin to open; 2, cut stem 0.5–1 cm below head; 3, insert wire through stem into receptacle

insertion into oasis or floral clay. Wires already covered with thin plastic material are also available.

Some species with hollow stems, for example *Hyalosperma cotula*, *H. praecox*, *Rhodanthe chlorocephala* subspecies and *R. polygalifolia*, are very easy to wire, the only problem being to maintain a delicate touch so that the wire barely enters the receptacle (see Figure 2, page 1).

Fillers

Species used as the background of floral arrangements are known as 'fillers'. They constitute 50–60% of the area covered by the arrangement and help to conceal the wires and the oasis or floral clay. Species with tight clusters of heads are often used as fillers, such as *Chrysocephalum semipapposum*, *Ixodia achillaeoides*, *Rhodanthe corymbosa*, *R. haigii* and *R. humboldtiana*. Other everlasting daisies not included in this study are excellent fillers – many *Cassinia* species, *Odixia achlaena* and most of the *Ozothamnus* species. Dried material other than daisies, such as *Agonis juniperina*, *Leucopogon virgatus* and *Verticordia* species, are available from florists' suppliers and make attractive fillers.

Dried arrangements

Arranging dried or wired daisies is a pleasurable exercise. The cheerful faces and bright colours almost arrange themselves. The choice of container is unlimited as long as it has a stable base and will hold some form of material into which stems and wires may be inserted.

Vases of all kinds, baskets, shells, hollow logs and pieces of driftwood are enhanced by arrangements of everlastings. The following steps for arranging a basket are a guide to the novice:

1. The base material is chosen. Oasis is simple to use as it may be cut to the required shape and size. It should be wrapped in self-clinging plastic to avoid crumbling, and attached to the base with wire.
2. Filler is placed in position first. The stem length should vary over the area of the basket, and extend beyond the rim by about 5 cm.
3. The main species is then added, the larger heads in the centre and smaller heads and buds towards the outside. Heads should be placed to face outwards in different directions. Easily grown, attractive species for this purpose are *Bracteantha bracteata* forms, *Rhodanthe chlorocephala* ssp. *rosea* and *Schoenia filifolia* ssp. *subulifolia*. Highlighting species add interest. They provide contrast and colour to the arrangements and are the final additions. Useful highlighters include *Hyalosperma praecox*, *H. simplex*, *Rhodanthe collina*, *R. diffusa* ssp. *diffusa*, *R. rubella* and *Schoenia filifolia* ssp. *filifolia*. Dainty daisies with compound heads, such as *Calocephalus citreus*, *C. sonderi* and *Pycnosorus chrysanthes*, make very attractive highlighters.

View the basket from all aspects and make any necessary adjustments.

Preserved flowers

Daisies have been preserved by semolina/borax and silica gel methods which rely on chemical desiccation rather than air-drying. Very fine, clean sand may be used in place of semolina/borax. Using these techniques the disc centres remain more golden and the bracts retain their colour for longer periods, but the procedures are tedious, take longer than those described above, and the finished products require special storage.

Pressed flowers

Everlastings press beautifully and make attractive gift or greeting cards when glued to heavy paper or plain cards. Modern colour photocopying techniques produce excellent definition of form and of colour, and allow reproduction of chosen pressings. Larger species may be pressed for plaques or wall pictures. Smaller species are preferred for cards and the following are recommended:

Bellida graminea
Chrysocephalum apiculatum
(small forms)
Chrysocephalum semipapposum
(small forms)
Hyalosperma cotula
Hyalosperma glutinosum ssp. *glutinosum*
Hyalosperma glutinosum ssp. *venustum*
Hyalosperma praecox
Hyalosperma simplex
Lawrencella rosea
Rhodanthe anthemoides
Rhodanthe ascendens
Rhodanthe laevis
Rhodanthe rubella
Schoenia filifolia ssp. *filifolia*
Schoenia filifolia ssp. *subulifolia*
Schoenia ramosissima
Waitzia acuminata
Waitzia suaveolens

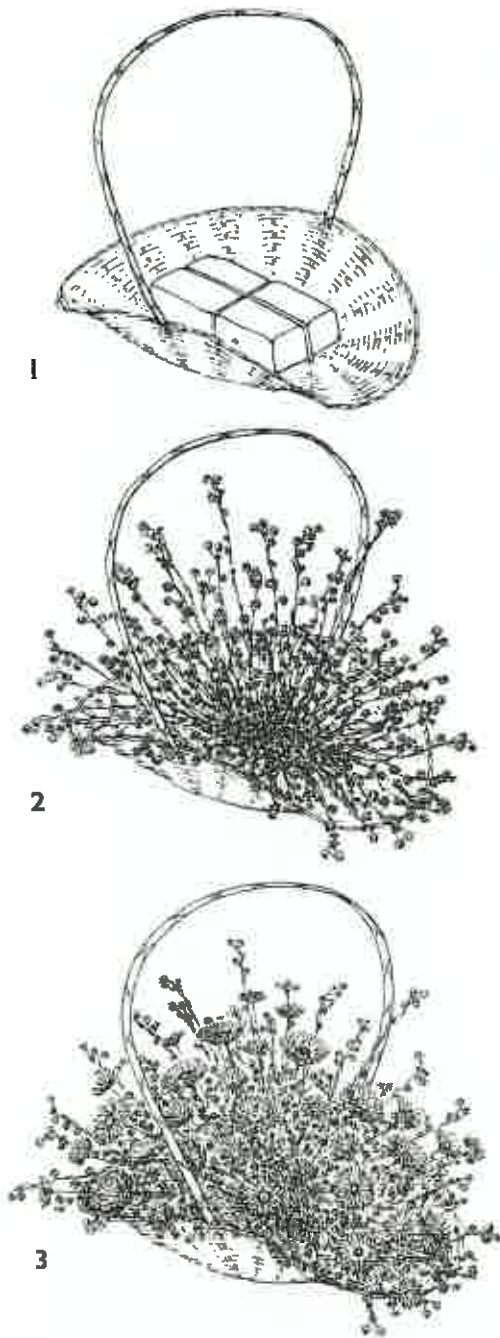


Figure 10. Arranging a basket

1, cut oasis to the appropriate size and attach to the base with wire; 2, arrange filler to cover the oasis; 3, add the main species, larger heads in the centre, and finally place highlighters

Table 2. Using daisies in floral art

Species	Colour	Dried	Wired	Filler	Postes	Features
<i>Bracteantha</i>						
<i>bicolor</i>	Yellow	✓	✓		✓	Pick buds starting to open
<i>bracteata</i>	Yellow, white	✓	✓		✓	"
<i>bracteata</i>						
<i>cultivars</i>	Various colours	✓	✓		✓	
<i>macrantha</i>	White tinged pink	✓	✓		✓	
<i>pakustris</i>	Yellow	✓	✓		✓	
<i>papillosa</i>	White	✓	✓		✓	
<i>subundulata</i>	Yellow, orange	✓	✓		✓	Vibrant colour
<i>vacosa</i>	Yellow, brown, cream, orange	✓	✓		✓	Retains colour
<i>Cephalipterum</i>						
<i>drummondii</i>	Yellow, white, pink	✓	✓		✓	Pom pom heads
<i>Chrysocephalum</i>						
<i>apiculatum</i>	Yellow	✓			✓	Pick tight heads
<i>baxteri</i>	White, buff	✓	✓		✓	Fringed bracts
<i>baxteri</i> 'Midget'	White	✓	✓		✓	Very dainty heads
<i>eremaeum</i>	Pale yellow	✓		✓		Unpleasant smell
<i>semipapposum</i>	Yellow	✓		✓	✓	Retains colour
<i>Haptotrichion</i>						
<i>colwillii</i>	Bright yellow	✓	✓		✓	Vibrant colour
<i>conicum</i>	Yellow	✓	✓		✓	Unusual leaves
<i>Hyalsperma</i>						
<i>cotula</i>	White, yellow	✓	✓		✓	Sometimes buds are pink-tinged
<i>glutinosum</i>						
<i>ssp. glutinosum</i>	Yellow	✓	✓		✓	Small heads
<i>ssp. venustum</i>	Yellow	✓	✓		✓	Larger heads, very shiny bracts
<i>praecox</i>	Yellow, white	✓	✓		✓	Pick when open
<i>semisterile</i>	Yellow	✓			✓	Small heads
<i>simplex</i>						
<i>ssp. simplex</i>	White	✓	✓		✓	Like <i>H. cotula</i> , but more reliable
<i>Ixodia achillaeoides</i>	White	✓		✓	✓	Scays white
<i>Lawrencella</i>						
<i>davenportii</i>	Pink	✓	✓		✓	Fragile bracts
<i>rosea</i>	Pink	✓	✓		✓	Fragile bracts
<i>Leucochrysum</i>						
<i>albicans</i>	White, yellow	✓	✓		✓	Retains colour
<i>fitzgeraldii</i>	White, backed purple-red	✓	✓		✓	Discolorous bracts
<i>graminifolium</i>	Yellow	✓	✓		✓	Grass-like leaves
<i>molle</i>	Yellow	✓	✓		✓	Stems may not remain stiff

Species	Colour	Dried	Wired	Filler	Posies	Features
Rhodanthe						
<i>antheroides</i>	White, often backed pink	✓	✓		✓	Slender stems are difficult to wire
<i>charsleyae</i>	Yellow	✓		✓		Bracts do not radiate
<i>chlorocephala</i>						
<i>ssp. rosea</i>	Pink, white	✓	✓		✓	Easy to grow
<i>ssp. splendida</i>	White, cream	✓	✓		✓	Spectacular heads
<i>cirina</i>	Yellow, white	✓			✓	Long-flowering
<i>collina</i>	White	✓	✓		✓	Difficult to wire
<i>condensata</i>	White/yellow	✓			✓	Short stems
<i>corymbiflora</i>	White	✓			✓	Dainty clusters
<i>corymbosa</i>	White	✓		✓		Small heads in clusters
<i>cremea</i>	White	✓	✓		✓	Discs turn brown
<i>diffusa</i> <i>ssp. diffusa</i>	Yellow	✓	✓		✓	Very dainty
<i>ssp. leucactina</i>	White	✓	✓		✓	Difficult to wire
<i>floribunda</i>	White	✓		✓	✓	Small clusters
<i>haigi</i>	Yellow	✓		✓	✓	Tight clusters
<i>humboldtiana</i>	Yellow	✓		✓	✓	Clusters
<i>manglesii</i>	Pink, white	✓			✓	Nodding heads
<i>margarethae</i>	White	✓	✓			Wire larger heads
<i>moschata</i>	Cream/yellow	✓		✓	✓	Small clusters
<i>oppositifolia</i>						
<i>ssp. ornata</i>	Yellow	✓	✓		✓	Stems break easily
<i>polygalifolia</i>	Yellow	✓	✓		✓	Pick when open
<i>polyphylla</i>	White	✓		✓		Loose clusters
<i>propinqua</i>	White	✓				Dainty heads
<i>psammophila</i>	White	✓		✓	✓	Tight clusters
<i>rubella</i>	Red	✓			✓	Fine stems
<i>sterilescens</i>	Off-white	✓			✓	Small clusters
<i>stricta</i>	White	✓	✓		✓	Selected forms
<i>stuartiana</i>	White	✓	✓		✓	Easy to wire
<i>tietkensii</i>	Yellow	✓		✓	✓	Small clusters
Schoenia						
<i>filifolia</i>						
<i>ssp. arenicola</i>	Yellow	✓			✓	Loose clusters
<i>ssp. filifolia</i>	Yellow	✓	✓		✓	Dainty small heads
<i>ssp. subulifolia</i>	Yellow	✓	✓		✓	Largest heads of the three
<i>macvora</i>	Yellow	✓	✓		✓	Lemon-scented
<i>ramosissima</i>	Yellow, white	✓			✓	Small heads
Waitzia						
<i>acuminata</i>						
<i>var. acuminata</i>	Yellow, orange	✓			✓	Rich colours
<i>var. albicans</i>	White, pink	✓			✓	Dainty
<i>nitida</i>	Yellow	✓			✓	Stems may not remain stiff
<i>suaveolens</i>						
<i>var. flava</i>	Yellow	✓			✓	Pick in tight bud
<i>var. suaveolens</i>	White, pink	✓			✓	Fragrant, pick in tight bud

All species listed are long-lasting as fresh flowers. Buds and smaller forms are preferable in posies.

Floriculture and Australian Daisies

There is a burgeoning demand for unusual and interesting flowers in both domestic and international markets. Many Australian daisies have potential to expand the existing range of species available, but successful commercial development of many of these species will be dependent on further trials to determine their cultural requirements.

Consumers in Europe, the United States, Canada and Japan have insatiable appetites for cut flowers, and a market for Australian product is assured due to the opposing seasons in the southern hemisphere. The Flower Export Council of Australia Inc. (FECA) promotes Australian fresh and dried flowers in world markets. It was formed in 1990 in response to the rapid growth of Australian flower exports.

Apart from the findings documented here by the Study Group, many species of Australian daisies are known mainly from botanical descriptions of plants growing in the wild.

A few species are well known to floriculture. Examples are *Rhodanthe chlorocephala* ssp. *rosea* and *R. manglesii* which have been marketed for many years under various names, and *Bracteantha bracteata* (known in the florist trade as Strawflowers). *Isodia achillaeoides* (Mountain Daisy) is also widely used, as is *Ozothamnus diosmifolius* (Rice Flower) which is not included in this book.

The three possibilities for marketing flowers are as fresh cut flowers, dried flowers or as flowering pot plants.

Cut flowers

Criteria for selecting species suitable for the cut flower trade include aesthetic appeal, long stem length, long vase life, uniform flowering season to facilitate harvesting, ease of cultivation and ease of propagation from seed or cuttings.

Assuming that difficulties associated with seed dormancy of some species can be overcome, those which have great potential for development as cut flower crops include *Bracteantha palustris*, *B. viscosa*, *Cephalopterum drummondii*, *Chryscephalum baxteri*, *C. semipapposum*, *Haptotrichion colwillii*, *Lawrencella davenportii*, *Leucochrysium albicans*, *L. stipitatum*, *Rhodanthe anthemoides* (unbranched form), *R. chlorocephala* ssp. *splendida*, *R. humboldtiana*, *R. polygalifolia*, *R. psammophila*, *R. rubella*, *R. stuartiana*, *Schoenia filifolia* ssp. *arenicola*, *S. filifolia* ssp. *subulifolia*, *S. macivorii* and *Waitzia nitida*.

Other everlasting daisies with potential, but not included in the present study, are *Cassinia aureonitens*, *C. laevis*, *C. leptocephala*, *C. quinquefaria*, *C. subtropica*, *Haeckeria ozothamnoides*, *Helichrysum adenophorum* var. *waddelliae*, *Ozothamnus diotophyllus*, *O. ledifolius*, *Pycnosorus globosus* and *P. thompsonianus*.

Tolerance to soil types, pests, diseases and climate are also limiting factors to successful commercialization but these may be largely overcome by choosing species which grow naturally in a particular region. For example, *Rhodanthe psammophila* could undoubtedly be grown in sandy soils in the Carnarvon region of Western Australia.

The Rural Industries Research and Development Corporation, Institute for Horticultural Development (Vic), Horticultural Research and Development Corporation and South Australian Research and Development Institute have funded several projects to evaluate Australian plant material in floriculture. Organizations in other States are doing similar work. Detailed information, including disease problems and handling techniques, can be accessed from these sources.

The development of new cut flower varieties encompasses the selection of superior forms, both

from natural populations and breeding programs, leading ultimately to the emergence of registered cultivars. This has been the case recently with flannel flowers. Although used as cut flowers since the 1800s when they were harvested from the bush, commercial growing only began in the early 1990s. After six years of intensive development since 1995, selected varieties are beginning to enjoy world wide recognition. *Bracteantha* hybrids are following a similar course. Such development has thereby seen the decline of bush picking.

Dried flowers

Dried flowers with potential for floriculture would include all of the species mentioned above. Various methods for drying are discussed in Chapter 5, but on a commercial scale air-drying would probably be the most efficient. Wiring is currently practised with *Bracteantha bracteata* and *Rhodanthe chlorocephala* ssp. *rosea* which are then sold for inclusion in dried arrangements. This technique could be applied to many of the everlastings (see Table 2, page 34).

Flowering pot plants

The notion of flowering potted plants as decorator and gift items is rapidly increasing in popularity. They are offered for sale as flowering just begins and will give a floral display for many weeks. Currently the demand is filled by exotic plants such as chrysanthemums and gerberas. One of the everlasting daisies promoted as a flowering pot plant is *Rhodanthe anthemoides* 'Paper Cascade', originally brought into cultivation by the Study Group and registered under Plant Variety Rights. (Plant Breeders' Rights have now replaced Plant Variety Rights.)

To be successful, potted species should be compact, have upright growth, numerous showy blooms, a long flowering period, tolerate low light areas and be amenable to manipulation for flowering out of season.

A study of 44 species of native daisies by Sharman (1996) concluded that, among others, eight everlasting daisy species possessed potential as flowering potted plants. These were *Hyalosperma cotula*, *H. glutinosum* ssp. *venustum*, *Lawrencella davenportii*, *L. rosea*, *Rhodanthe floribunda*, *R. manglesii* (upright form), *Schoenia cassiniana* and *S. filifolia* ssp. *filifolia*.

Growth habit and flowering out of season are achieved in the plant nursery industry by controlling the photoperiod, temperature and cultural requirements of plants. Sharman showed that the above species were amenable to manipulation in some or all of these aspects. Thus peak periods of retail demand, such as Mothers' Day, Christmas and Easter, could be targeted and all-year production of flowers could be accomplished.

The Study Group suggests that, in addition to the species listed by Sharman, the following species would also have merit: *Cephalopterum drummondii*, *Chrysocephalum apiculatum*, *C. baxteri*, *C. baxteri* 'Midget', *Hyalosperma praecox*, *H. simplex*, *Leucochrysum albicans* (all subspecies and varieties), *Rhodanthe anthemoides* (branching forms), *R. collina*, *R. diffusa* ssp. *diffusa*, *R. haigii*, *R. polygalifolia*, *R. rubella*, *R. stuartiana*, *Schoenia filifolia* ssp. *filifolia* and ssp. *subulifolia*, and *Waitzia acuminata*.

An extension of the idea of potted flowering plants is the hanging basket displaying a prostrate or pendulous plant with a profusion of flowers. Suitable species for this commercial line would be *Chrysocephalum apiculatum*, *C. baxteri*, *Rhodanthe anthemoides* (branched forms), *R. floribunda*, *R. manglesii* and *Schoenia cassiniana*.

Plant breeders in Germany, Holland and Israel have long been active in hybridizing Australian daisies, notably brachyscomes, bracteanthas and rhodanthes. A number of these hybrids have become well established in the international floriculture trade. However, the Australian daisy flora remains largely unexploited and few species have attracted the attention of the Australian nursery industry.

Reproduction and Hybridization

Sexual reproduction is the process by which new individuals are formed, inheriting characteristics from two parents. This is distinct from clonal reproduction where new individuals have characteristics identical with those of a single parent. In plants sexual reproduction comprises pollination, fertilization and the subsequent development of embryos in the ovaries to form seeds. Germination of these seeds results in the emergence of new individuals.

Pollination

During pollination the pollen grains (male cells) produced by anthers (male organs) of flower-heads are transferred to stigmas (female organs). Pollination of everlastings is usually performed by insects such as native bees, hoverflies, moths and butterflies, but the mechanism may vary with the conditions in which the plants are growing.

On arid or semi-arid inland plains it is possible that wind is a pollinating factor. In good seasons everlastings grow in masses and often form carpets of one species. Flower-heads are usually held on fine stems, even light winds causing the heads to brush together. Since the wind blows strongly and almost constantly across these plains, pollen may be transferred to receptive stigmas by this physical contact. In typical wind pollination, often employed by grasses and casuarinas, the plants release large amounts of pollen which floats in the air until it falls on a receptive stigma. The pollen grains in this case are usually light and the stigmas are large, tassel-like structures which are well-adapted to catching the grains.

Studies on the insect pollinators of Asteraceae have shown that they are attracted by colourful floral displays, large masses of colour being more attractive than small patches. Bees are attracted

to yellow and blue flowers while moths prefer white or cream flowers. The shape and scent of the flower-head and the colour and texture of the bracts all play a part in guiding the insects. Butterflies in particular are attracted to *Bracteantha* species. In general, pollinators work over small distances – metres rather than kilometres. The more pollen produced, the greater the chances of pollination. The flower-heads of daisies, with their tightly packed florets, are very well adapted to achieve high rates of pollination.

In nature successful pollination depends on pollen being viable, insects being abundant (or winds blowing frequently), and plants growing closely together and flowering simultaneously.

In gardens the same factors apply, but the availability of additional nutrients and extra watering may extend the flowering period and so increase the chances of cross-pollination. Metropolitan gardens often suffer the disadvantage of attracting fewer insects, with the associated reduction in cross-pollinations. Gardeners may increase their collections of viable seed by rubbing the disc centres of flower-heads together.

The number of pollinators is affected by conditions such as habitat destruction due to spraying with agricultural chemicals, clearing and burning. In any area there must be sufficient plants to provide insect food for as long a period as necessary. When insect populations decline the dependent plant species will die out eventually unless there is some ability to inbreed.

In many everlastings the anthers ripen before the stigma is mature. Pollen is shed as the immature stigma pushes up through the ring of anthers, carrying with it the sticky pollen mass out of the corolla. Much of it is carried away by insect pollinators for distribution to other florets. During this process the style arms are pressed together so that

any remaining pollen does not touch the stigma. As the stigma develops, the style-arms separate to expose the inner surface, which is then receptive to a deposit of pollen from other plants. If none is forthcoming the style-arms in some species reflex until the stigma is in a position to pick up any remaining pollen and thus self-pollination is achieved.

Breeding systems

Inbreeding systems involve the production of offspring by the mating of closely related individuals, while outbreeding systems do so by the mating of less closely related individuals.

An extreme form of inbreeding is self-pollination where pollen may be transferred to the stigma of the same flower, to the stigma of a different flower on the same plant, or to the stigma of a flower on another plant that is genetically identical (a clone). *Hyalosperma stoveae* and *H. zacchaeus* are probably inbreeders as they are very small plants with inconspicuous, non-radiating heads and corollas with 3–4 short lobes. These floral characters are not designed to attract insect pollinators.

In outbreeding species where pollen is accepted by the receptive stigmas of florets in heads on different plants, the process is known as cross-pollination. The transfer of pollen is usually effected by insect pollinators seeking nectar and pollen. Most of the everlasting in this study are outbreeding species. Such species usually have showy, radiating bracts as an attraction to insects. In some cases a pathway for the pollinator appears to be displayed. For example, purple blotches are often present at the base of the bracts in *Cephalopterum drummondii*, *Rhodanthe chlorocephala* ssp. *splendida* and *R. cremea*, and it is thought that they act as guides to the disc florets. *R. cremea* has an additional guide in the brown, papillate, fused lobes of the corolla which form a coloured pattern in the disc centre (Short 1996).

Some species may be pollinated by either method, often cross-pollinating at the beginning

of the flower-head development and self-pollinating later when the probability of cross-pollination has decreased.

An indication of the type of breeding system employed by a species is the ratio of the number of pollen grains produced by one floret to the number of ovules in the ovary. This ratio is known as the P/O value. In daisies there is only one ovule per floret. If a floret produces no more than 350 pollen grains to one ovule the species is likely to be inbreeding; the florets of outbreeding species produce 1500–6000 pollen grains to one ovule (Short 1981). Short established average P/O values for *Hyalosperma demissum* of 84.6 and of 252 for the form of *Rhodanthe pygmaea* which lacks small white blades. These values suggest they are inbreeders.

Fertilization

Fertilization occurs when the sperm (male gamete) from the pollen fuses with the ovum (female gamete) in the ovule at the base of the style.

After the stigma has received compatible pollen the following processes take place:

- ◆ The pollen on the stigma surface absorbs water, swells and germinates.
- ◆ A filamentous structure (known as a pollen-tube) containing sperm develops from one of the germ-pores on the pollen surface.
- ◆ The pollen-tube penetrates the surface of the stigma, grows down the style and enters the ovary and ovule.
- ◆ The sperm fuses with the ovum and fertilization takes place.

The ovule containing the new plant embryo develops into a seed. The ovary develops into a fruit (known as a cypsela in daisies).

Many kinds of pollen grain may stick to the stigmatic surface but if the pollen is not compatible there are physical and chemical barriers to prevent further development.

Relationships between genera and species

Much taxonomic work on generic revision has taken place in recent years. Much remains to be done, but patterns are emerging. Research on chromosome number determinations in Asteraceae is adding to current knowledge.

Relationships are often explored by means of cross-fertilization. A general observation is that plants will cross most readily when they belong to the same species, and less readily if they are different species but closely related. Crosses between species in different genera are very rare.

Of the twelve genera of everlastings in this study it has been observed that the two most capable of producing hybrids between species are *Bracteantha* and *Leucochrysum*:

- ◆ In gardens *Bracteantha bracteata* has hybridized with *B. papillosa* and *B. viscosa*. There is also evidence that *Bracteantha bracteata* has hybridized with *Helichrysum boormanii* and *H. elatum* in the gardens of Study Group members. This suggests that future revision may see some of the species remaining in *Helichrysum* included in *Bracteantha*. In the mid-19th Century German hybridists cross-fertilized *B. bracteata* with *Helichrysum* species from Africa and southern Asia to produce many colour forms of the popular Strawflowers. A possible hybrid between *B. subundulata* and *B. viscosa* has been recorded from south of Mt. Gingera, ACT (Burbidge and Gray 1970).
- ◆ Closely related species of *Leucochrysum* hybridize readily when growing together. Research carried out by von Richter (1996) at the Mt. Annan Botanical Garden established that species with the same chromosome number hybridized, while those with differing chromosome numbers did not. Hybridization has been achieved between the following species: *L. albicans* ssp. *albicans* var. *albicans*, *L. albicans* ssp. *albicans* var. *tricolor*, *L. molle* and *L. graminifolium*.

Within *Rhodanthe* the only hybrids noted in gardens have been those between subspecies. For example, *R. diffusa* ssp. *diffusa* has hybridized with ssp. *leucactina* when both subspecies were growing together. Similarly, the dwarf white form of *R. chlorocephala* ssp. *rosea* has hybridized with the erect pink and white forms marketed commercially. In nature the only instance of hybridization has been that noted in the Gawler Ranges by Wilson (pers. comm.) between *R. polygalifolia* and *R. oppositifolia* ssp. *oppositifolia*. This is the only location in which the two species grow together and where plants are found that are intermediate between the two species. Both species are morphologically similar and have the same chromosome number ($n = 11$).

No hybridization has been observed by Study Group members in *Schoenia* but collections suggest that *S. filifolia* ssp. *filifolia* may intergrade with ssp. *subulifolia* and with *S. macivorii* (Wilson, pers. comm.).

Hybridization between species of *Waitzia* has not been observed by the Study Group but rare cases have been reported in the natural habitat between *W. suaveolens* var. *suaveolens* and the two varieties of *W. acuminata* (Wilson 1992).

Chromosomes

Chromosomes are thread-like structures present in the nuclei of cells. They carry the complete genetic information required to specify the individuality of an organism. The number of chromosomes in different species varies and can be scientifically determined. In general, species are able to cross-fertilize more readily if the chromosome number is the same.

Chromosomes occur in pairs during division of diploid cells. The diploid number is referred to as '2n'. In haploid cells only one member of a pair of chromosomes is present in the nuclei, and in this case the haploid number is referred to as 'n'.

Table 3. Chromosome number determinations for species in this study

Genus	Section	Species	n	2n
<i>Belida</i>		<i>B. graminea</i>	9	
<i>Bracteantha</i>		<i>B. bracteata</i>	14, 12	24
<i>Chrysocephalum</i>		<i>C. apiculatum</i>	12, 24	24
		<i>C. semipapposum</i>	12	
<i>Haptatrichon</i>		<i>H. conicum</i>	12	
<i>Hyalosperma</i>		<i>H. cotula</i>	12	
		<i>H. glutinosum</i> ssp. <i>glutinosum</i>	11	
		<i>H. semisterile</i>	7 or 8	
		<i>H. simplex</i> ssp. <i>graniticola</i>	11	
		<i>H. zacchaeus</i>	8	
<i>Ixodia</i>		<i>I. achillaeoides</i> ssp. <i>achillaeoides</i>	13	
<i>Lawrencella</i>		<i>L. davenportii</i>	11	
		<i>L. rosea</i>	8	
<i>Leucochrysum</i>		<i>L. albicans</i> ssp. <i>albicans</i> var. <i>albicans</i>		16
		<i>L. albicans</i> ssp. <i>albicans</i> var. <i>tricolor</i>		16
		<i>L. albicans</i> ssp. <i>alpinum</i>		16
		<i>L. graminifolium</i>		16
		<i>L. malle</i>	9	16, 18
		<i>L. stipitatum</i>	9	18
<i>Rhadanthe</i>	<i>Achyroclinoides</i>	<i>R. haigi</i>	8	
		<i>R. psammophila</i>	5	
		<i>R. zietkensis</i>	8	
	<i>Helichrysoides</i>	<i>R. battii</i>	10	
		<i>R. pollockii</i>	10	
		<i>R. spicata</i>	10	
	<i>Leiochrysum</i>	<i>R. anthemoides</i> (branched forms)		22
		<i>R. anthemoides</i> (unbranched forms)		38, 40, 42, 44
		<i>R. chlorocephala</i> ssp. <i>rosea</i>	7, 14	
		<i>R. chlorocephala</i> ssp. <i>splendida</i>	7	
		<i>R. diffusa</i> ssp. <i>diffusa</i>		22
		<i>R. humboldtiana</i>	8	
		<i>R. oppositifolia</i>	11	
		<i>R. polygalifolia</i>	11	
		<i>R. pygmaea</i>	11	
		<i>R. rubella</i>	14	
		<i>R. stricta</i>	11	
	<i>Monencyanthes</i>	<i>R. maryonii</i>	5	
		<i>R. moschata</i>	8	
	<i>Rhadanthe</i>	<i>R. manglesi</i>	11	
	<i>Synachyrum</i>	<i>R. floribunda</i>	11	
		<i>R. stuartiana</i>	10	
<i>Schoenia</i>		<i>S. cassimiana</i>	12	24
		<i>S. filifolia</i>		24
<i>Waitea</i>		<i>W. acuminata</i> var. <i>acuminata</i>	12	24
		<i>W. acuminata</i> var. <i>albicans</i>	12	
		<i>W. nitida</i>	10	
		<i>W. suaveolens</i>	12	

Table 3 was derived from chromosome number determinations by Turner (1967, 1970), Short (1986a, 1986b, 1990, 1999), Orchard (1981), Copley (1982), Salmon (1995), and von Richter (1996).

Ployploidy

Ployploids have more than two sets of chromosomes in the nuclei, sometimes having four or six sets. Such plants are often larger and more vigorous than plants having only two sets. Examples of ployploids in the everlasting in this study are *Chrysocephalum apiculatum* and *Rhodanthe chlorocephala* ssp. *rosea* (Watanabe *et al.* 1999).

8

Keys to Genera

Keys to the twelve genera studied by the Group which have been recently revised are included in this chapter. *Bellida* and *Cephalopterum* are monotypic genera, that is there is only one species in each genus, *Bellida graminea* and *Cephalopterum drummondii*. *Bellida graminea* is closely related to *Lawrencella* species and has been included in the key to *Lawrencella*. No key has been published for *Haptotrichion* but there are only two species included in it and they are easily distinguished. Genera such as *Bracteantha* and

Chrysocephalum have not yet been revised, and so identification of species in those genera should be undertaken using the keys in the flora of the State in which the species occurred. In the case of *Rhodanthe* permission was given by Paul Wilson to present a key based on his unpublished work. More botanical terms have been used in these keys than were employed in the species' descriptions. These terms have all been included in the glossary.

Key to *Bellida* / *Lawrencella* complex

(based on a key published by P.G. Wilson 1992a)

- 1 Apex of achene extended to form a pair of cup-shaped protuberances, ray bracts absent *B. graminea*
- 1* Apex of achene truncate, ray bracts present
- 2 Leaves terete, cauline *L. rosea*
- 2* Leaves flat, sub-basal *L. davenportii*

Keys to *Hyalosperma*

(based on keys published by P.G. Wilson 1989)

- 1 Inner involucre bracts without a radiating blade or the blade less than 1 mm long; plants 2–4 cm high, very branched, corolla 3- to 4-lobed.
- 2 Involucre c. 5 mm long; inner involucre bracts with a small ovate pale brown blade 0.5–1 mm long (WA) *H. zacchaeus*
- 2* Involucre to 3 mm long; inner involucre bracts entirely hyaline or with a very short erect opaque apex.
- 3 Leaves slender terete; plant very sparsely hairy *H. demissum*
- 3* Leaves fleshy, elliptic to obovate; plant moderately hairy *H. stoveae*
- 1* Inner involucre bracts with prominent white or yellow radiating blades over 2 mm long; plants mostly 10–20 cm high; stem simple or branched; corolla 5-lobed.
- 4 Involucre top-shaped to cup-shaped, glossy, glabrous, radiating bracts with yellow blade; fruit warty

- 5 Involucre (excluding radiating bracts) top-shaped to broadly cup-shaped, reddish brown; lower leaves with rounded apex; pappus bristles broad towards base and variably united into a sheath; fruit broad-oblong, flattened, hyaline on margin (WA and Eastern States) *H. glutinosum*
- 5* Involucre (excluding radiating bracts) cup-shaped, silvery to pale brown; lower leaves obtuse to acute or acuminate; pappus bristles narrow in lower half and united only at base; fruit narrow-obovoid, not hyaline on margin (Eastern States) *H. semisterile*
- 4* Involucre spreading from base, somewhat woolly to subglabrous; radiating bracts with white or yellow blades; fruit warty or smooth.
- 6 Leaves (middle and lower) blunt; innermost involucre bracts with very short rounded or truncate blades 0.25–1.5 mm long.
- 7 Receptacle conical; innermost involucre bracts with extremely short (c. 0.25 mm) truncate white blades; pappus tips white, club-shaped (WA, Bunbury southwards) *H. pullum*
- 7* Receptacle rounded; innermost involucre bracts with short (0.5–1.5 mm) white or yellow rounded blades; pappus tips yellow, club-shaped (WA, Geraldton southwards) *H. cotula*
- 6* Leaves (middle and lower) acuminate; innermost involucre bracts with prominent (c. 5 mm) radiating blades.
- 8 Stem usually branched at and above base; receptacle rounded (WA, Perth southwards) *H. simplex*
- 8* Stem branching at base; receptacle conical (south-eastern Australia) *H. praecox*

Key to subspecies of *Hyaleperma glutinosum*

- 1 Inner involucre bracts with blades to 5 mm long; corolla lobed to c. 1/3 of length *ssp. glutinosum*
- 1* Inner involucre bracts with blades 5–15 mm long; corolla lobed 1/3 to 1/2 of length *ssp. venustum*

Keys to *Ixodia*

(based on keys published by P.B. Copley 1982)

1. Blades of inner involucre bracts glabrous; each floret enveloped by a scarious receptacular scale; achene papillose-pubescent *I. achilloides*
- 1* Blades of inner involucre bracts covered with simple flattened sub-cylindrical hairs on their adaxial surface; each floret subtended and partially enveloped by a cartilaginous, petaloid, bract-like scale; achene glabrous *I. findersica*

Key to subspecies of *Ixodia achillaeoides*

- 1 Leaves narrow-linear, linear, narrowly rhombic, or lanceolate; plants found in inland habitats **ssp. *olata***
- 1⁺ Leaves oblanceolate to obovate; plants found in coastal habitats.
- 2 Leaves oblanceolate, less than 5 mm wide; heads urn-shaped, less than 5.5 mm long and 4 mm wide; blades of 2–4 mm long, 1–2 (–3) mm wide **ssp. *achillaeoides***
- 2⁺ Leaves obovate, greater than 6.0 mm wide; heads sub-globose to globose, greater than 6.0 mm long and 6.5 mm wide; blades 4–6 mm long, 3–5 mm wide **ssp. *arenicola***

Keys to *Leucochrysum*

(based on keys published by P.G. Wilson 1992c)

- 1 Stem much branched, the lateral branches terminating in heads; outer bracts dark reddish brown, not needle-like ***L. fitzibbonii***
- 1⁺ Stem branched only near base, peduncles long and arising from near base of plant, outer bracts pale and needle-like.
- 2 Outer involucre bracts needle-like ***L. stipitatum***
- 2⁺ Outer involucre bracts with an obvious flattened blade.
- 3 Leaves filiform, tightly revolute, congested, glabrescent ***L. graminifolium***
- 3⁺ Leaves oblong or obovate or, if filiform, not tightly revolute, congested or loosely arranged along stem, woolly.
- 4 Plant annual, blade of intermediate involucre bracts broad-ovate to suborbicular, pale yellow, leaves linear to narrow-oblong or narrow-obovate ***L. molle***
- 4⁺ Plant perennial, blade of intermediate involucre bracts very narrow-obovate to obovate, if triangular then with red streaks ***L. albicans***

Key to subspecies of *Leucochrysum albicans*

- 1 Leaves obovate, densely woolly **ssp. *alpinum***
- 1⁺ Leaves filiform to narrow oblong or narrow-obovate, thin, moderately woolly **ssp. *albicans***
- 2 Inner involucre bracts white **var. *tricolor***
- 2⁺ Inner involucre bracts yellow.
- 3 Intermediate involucre bracts ovate to oblong, obtuse to acute **var. *albicans***
- 3⁺ Intermediate involucre bracts broadly ovate to triangular or orbicular, acute **var. *buffaloensis***

Key to *Rhodanthe*

(based on an unpublished manuscript by P.G. Wilson)

- 1 Radiating bracts present.
- 2 Outer bracts narrowly linear-acuminate, glandular-hairy.
- 3 Intermediate leaves with slender stalks; radiating bracts pale yellow *R. frenchii*
- 3* Intermediate leaves sessile, cordate; radiating bracts pure white *R. margerithae*
- 2* Outer bracts broad-ovate to oblong, glabrous or variously hairy.
- 4 Tufted perennial; stamens glabrous or very sparsely woolly; heads solitary; radiating white bracts (eastern and South Australia) *R. anthemoides*
- 4* Annuals; heads solitary or clustered; inner bracts various.
- 5 Leaves and branches completely glabrous, or with sessile globular glands.
- 6 Leaves decurrent *R. manglesi*
- 6* Leaves not decurrent.
- 7 Leaves filiform to narrow-oblong without spherical sessile glands; pappus of narrow-triangular serrate scales *R. pyrethrum*
- 7* Leaves narrow to broad-oblong (never filiform) with small globular sessile glands on upper surface; pappus of plumose bristles.
- 8 Head subtended by several leafy bracts; radiating bracts c. 2 mm long, pale fawn *R. fuscescens*
- 8* Head subtended by a single leafy bract or none; radiating bracts yellow, white or red.
- 9 Leaves (other than uppermost) opposite; plant with one stem, branched; radiating bracts pale to bright yellow *R. oppositifolia*
 Head 4–5 mm high; inner radiating bracts 1–3 mm long ssp. *oppositifolia*
 Head c. 6 mm high; inner radiating bracts 8–10 mm long ssp. *ornata*
- 9* Leaves (except lowermost) alternate; radiating bracts white, yellow or red.
- 10 Stem branched; head narrowly bell-shaped; radiating bracts white c. 5 mm long *R. stricta*
- 10* Stem or stems not branched; head hemispherical; radiating bracts white or yellow 5–30 mm long.
- 11 Radiating bracts red or white; terminal hairs of pappus congested and club-shaped *R. chlorocephala*
 Blade of inner bracts broad-ovate, c. 5 mm long, green ssp. *chlorocephala*
 Blade of inner bracts narrow-elliptic, to 15 mm long, white to pink ssp. *rosea*
 Blade of inner bracts narrow-elliptic, to 30 mm long, white to cream ssp. *splendida*
- 11* Radiating bracts yellow (rarely white); terminal hairs of pappus bristles neither congested nor club-shaped *R. polygallifolia*

- 5* Leaves and/or branches variously hairy or with short white hairs on leaves.
- 12 Blade of inner involucre bracts yellow.
- 13 Heads solitary or in loose clusters; individual heads hemispherical; seed beaked or not.
- 14 Plant somewhat cottony; seed with sparse fine hairs, beaked or constricted at apex *R. citrina*
- 14* Stem sparsely woolly to glabrous; leaves with sessile glands and short white hairs; seed silky, not beaked *R. diffusa*
 Radiating bracts yellow ssp. *diffusa*
 Radiating bracts white ssp. *leuactina*
- 13* Heads congested; individual heads cylindrical; seed not beaked
- 15 Seed silky *R. humboldtiana*
- 15* Seed with sparse fine hairs *R. haigi*
- 12* Blade of inner radiating bracts white or red; heads solitary or in clusters.
- 16 Blade of inner radiating bracts red to pink (rarely white); plant glandular-hairy; heads solitary *R. rubella*
- 16* Blade of inner radiating bracts white; plant cottony, woolly, at least below the head, or with white hairs on leaves.
- 17 Leaves with sessile globular glands and short thick white hairs, otherwise glabrous.
- 18 Leaves with glands and white hairs on both surfaces; leaves *R. diffusa*
 or leafy bracts extending to heads; radiating bracts white ssp. *leuactina*
- 18* Leaves with glands and white hairs on undersurface only; upper portion of branches naked; radiating bracts white *R. collina*
- 17* Leaves and/or stems cottony or woolly at least beneath the heads.
- 19 Heads solitary and terminal to slender flowering stem; radiating blade of innermost bracts 10–20 mm long, often with dark blotch at base; stems woolly beneath heads, otherwise almost glabrous *R. crenea*
- 19* Heads solitary or clustered; radiating bracts to 8 mm long without a blotch at base; stems woolly or cottony.
- 20 Heads hemispherical; bracts petal-like; seed beaked and with sparse fine hairs *R. citrina*
- 20* Heads of various shapes; bracts petal-like; seed not beaked.
- 21 Radiating bracts 5–10 mm long
- 22 Bracts all similar, petaloid, white or the outer very pale brown.
- 23 Outer bracts white or off-white; pappus bristles connecting to form a tube *R. floribunda*
- 23* Outer bracts very pale brown; pappus bristles free *R. stuartiana*
- 22* Outer bracts pale brown, not petaloid; inner bracts with white narrow-oblong blade 5–10 mm long *R. corymbiflora*

- 21* Radiating bracts to 4 mm long.
- 24 Heads congested into a compound corymb; blade of inner bracts erect; outer bracts petaloid, similar to and grading into inner bracts.
- 25 Florets 10–13 per head (one fertile) *R. condensata*
- 25† Florets 5 per head (one fertile) *R. psammophila*
- 24* Heads variously shaped; outer bract pale brown to straw-coloured, innermost with radiating white bracts.
- 26 Heads narrow-ellipsoid or narrow-cylindrical c. 6 mm long, subtended by several linear leaves; radiating bracts minute *R. pygmaea*
- 26* Heads top-shaped to bell-shaped, 5 mm long or less, not subtended by leaves.
- 27 Heads sessile in globular clusters; individual heads hemispherical c. 4 mm high; leaves soft, woolly, oblanceolate, 4–10 cm long *R. steriliscentis*
- 27* Heads very shortly stalked, top-shaped.
- 28 Leaves clustered, filiform, to 8 cm long; heads in large corymbs *R. polyphylla*
- 28* Leaves not clustered, narrow-oblong or broader; heads solitary or in small clusters.
- 29 Leaves soft, woolly all over.
- 30 Radiating bracts 1–2 mm long; claws of radiating bracts without resinous hairs *R. microglema*
- 30* Radiating bracts c. 4 mm long; claws of radiating bracts with dark resinous hairs *R. gossypina*
- 29* Leaves thin, sparsely cottony to glabrous.
- 31 Heads dark coloured towards apex; radiating bracts white, 3–4 mm long *R. troedeltii*
- 31* Heads straw-coloured or pale brown all over; radiating bracts white 1–2 mm long.
- 32 Seeds silky hairy (central WA) *R. propinqua*
- 32* Seeds with short fine hairs (south-west WA) *R. corymbosa*
- 1* Radiating bracts absent.
- 33 Heads solitary and terminal to stems; inner bracts dark red with broad green claw, plant somewhat cobwebby *R. heterantha*
- 33* Heads clustered or, if solitary, without dark red bracts.
- 34 Plant ± glaucous, glabrous or minutely and sparsely glandular-hairy.
- 35 Heads uniformly straw-coloured; leaves linear 10–20 mm long; seeds with sparse fine hairs *R. laevis*
- 35* Heads reddish above; leaves oblong c. 5–10 mm long; seeds silky *R. rufescens*
- 34* Plant somewhat cottony.

- 36 Bracts with herbaceous glandular-hairy apex.
- 37 Heads in open clusters; florets c. 20 per head *R. pollockii*
- 37* Heads in branching racemes; florets 4–11 per head *R. battii*
- 36* Bracts without herbaceous glandular-hairy apex.
- 38 Heads on slender stalks; individual heads narrowly top-shaped, 3–4 mm high, bracts glossy.
- 39 Principal leaves decurrent *R. polycephala*
- 39* Leaves sessile but not decurrent *R. forrestii*
- 38* Heads sessile or subsessile, or stalks not slender and delicate.
- 40 Outer bracts yellow and grading into leafy subtending bracts *R. charleyae*
- 40* All bracts thin and dry; heads not subtended by leafy bracts.
- 41 Heads 1–2 on major axes; individual heads hemispherical c. 10 mm across, glossy *R. sphaerocephala*
- 41* Heads numerous on branches; individual heads less than 6 mm across.
- 42 Heads deciduous early, enclosing persistent florets.
- 43 Heads shortly stalked, c. 4 mm high, florets c. 12 per head *R. maryonii*
- 43* Heads sessile, ellipsoid or narrow-cylindrical, individual heads 3–4 mm high, florets 1–3 per head.
- 44 Heads ellipsoid; bracts woolly, florets 1 *R. uniflora*
- 44* Heads narrow-cylindrical; bracts glabrous but fringed with short woolly hairs; florets 3 *R. moschata*
- 42* Heads persistent; florets or fruits deciduous.
- 45 Bracts fringed with long woolly hairs *R. tiethensii*
- 45* Bracts glabrous or very sparsely fringed with hairs.
- 46 Leaves narrow-linear to filiform 3–10 mm long *R. spicata*
- 46* Leaves linear to narrow-oblong to 2 cm long.
- 47 Heads with c. 20 florets; leaves narrow-oblong to narrow-obovate (north-west WA) *R. ascendens*
- 47* Heads with c. 12 florets; leaves linear (Nullarbor region) *R. nullarborensis*

Keys to *Schoenia*

(based on keys published by P.G. Wilson 1992a)

- 1 Leaves flat.
- 2 Radiating bracts present, pink or white *S. casaliniana*
- 2* Radiating bracts absent *S. ayersii*
- 1* Leaves terete.
- 3 Terminal barbs of pappus bristles densely clustered, club-shaped.
- 4 Involucre narrow-cylindrical or narrowly top-shaped; blade of radiating bracts 3–4 mm long, plant cottony *S. ramosissima*
- 4* Involucre hemispherical; plant covered in short hairs *S. macivorii*
- 3* Terminal barbs of pappus bristles distinct, acute *S. filifolia*

Key to *Schoenia filifolia* subspecies

- 1 Involucre top-shaped to cylindrical; radiating bracts 3–6 mm long.
- 2 Plant single-stemmed; involucre top-shaped *ssp. filifolia*
- 2* Plant multi-stemmed; involucre cylindrical *ssp. arenicola*
- 1* Involucre hemispherical; radiating bracts 7–10 mm long *ssp. subulifolia*

Key to *Waltzia*

(based on a key published by Paul G. Wilson 1992d)

- 1 Involucral bracts yellow or the outer ones orange or straw-coloured.
- 2 Pappus yellow in upper half, involucral bracts yellow *W. nitida*
- 2* Pappus white or colourless in upper half, bracts yellow or orange.
- 3 Involucral bracts rough textured, descending the peduncle *W. acuminata*
var. *acuminata*
- 3* Involucral bracts smooth, heads subtended by reduced leaves *W. suaveolens*
var. *flava*
- 1* Involucral bracts white or the outer ones pink.
- 4 Innermost bracts with small pale brown mottled blades.
- 5 Innermost bracts exceeding the pink and white intermediate bracts; outer and intermediate bracts soon reflexed *W. corymbosa*
- 5* Innermost bracts more or less equal to intermediate bracts; outer and intermediate bracts not spreading *W. podolepis*
- 4* Innermost bracts with small white or translucent blades.
- 6 Head not obviously subtended by linear herbaceous bracts, upper branches and leaves somewhat cobwebby *W. acuminata*
var. *albicans*
- 6* Head subtended by linear herbaceous bracts; upper branches and leaves glandular-hairy, with or without cobwebby hairs *W. suaveolens*
var. *suaveolens*

Species' Descriptions



Bellida

The name *Bellida* refers to the Bellidinae tribe of the Asteraceae family. It is a monotypic genus endemic in the southern half of Western Australia, and botanically closely related to *Lawrencella*.

Bellida is a herbaceous annual or short-lived perennial with blunt, linear, radical leaves and leafless stalks bearing top-shaped compound heads of tubular yellow florets. The transparent outer bracts are overlapping and not radiating. Fruits are very distinctive with horizontal sculpturing and they are obliquely inserted on the head by means

of an off-centre hollow base. The pappus consists of two cup-like scales each having a row of prominent, stiff, reddish-purple bristles, often white at the base. The pappus elongates during anthesis from about half to twice as long as the corolla.

A second species, *Bellida major* (Moore 1917), has now been included with *Lawrencella davenportii* (Wilson 1992a).

Propagation is generally from seed.



Dainty yellow florets of *Bellida graminea* are replaced by spectacular pink pappus bristles

Bellida graminea

graminea — grass-like, referring to the leaves

Rosy Bellida

ANNUAL

10–15 cm high ♦ 5–15 cm wide

Yellow/Magenta

In cultivation a tufted annual with glabrous grass-like leaves 20–70 × 10–15 mm. Each plant produces several leafless stems to 15 cm with terminal, solitary, yellow flower-heads about 10 mm across. The most attractive attribute of the species is the spectacular pappus that imparts a reddish-purple hue to the plant for several weeks.

Flowering period

Aug/Nov in cultivation. Aug/Oct in the wild.

Propagation

Seed has germinated without pretreatment in 7–14 days after storage at RT for 18 months. Seeds from cultivated plants appear to give higher yields. Seedlings should be protected from overhead watering to prevent damping-off.

Cultivation and uses

Bellida graminea prefers light well-drained soils. In the eastern States it is probably best suited to grouping in containers in a warm sunny position. Cold damp winters are detrimental. The species is not suitable for drying or wiring but makes a showy pressed specimen especially when in fruit. Cut flowers last well.

Distribution and habitat

WA. Common in the 'wildflower triangle' between Mullewa, Paynes Find and Wubin usually in mulga on red soils.

Similar species

Lawrencella rosea and *L. davenportii* are closely related but are easily distinguished as they possess radiating pink papery bracts.



Distinctive horizontal sculpturing and prominent pappus bristles are unique to *Bellida graminea* fruit

Bracteantha

Bracteantha is derived from the Latin *bractea* (bract) and the Greek *anthos* (flower) – flower-heads having many conspicuous bracts.

The genus contains seven known species, but this may change after botanical revision. Plants are perennial, sometimes short-lived, or annual herbs (rarely). Most have tap roots, but two species are rhizomatous. Leaves are basal and alternate up the stems, sessile, entire, with flat margins and glandular hairs. Flower-heads are terminal, usually single, though sometimes occurring in a group of several heads, each on a short stalk. Involucral bracts occur in several rows, and have opaque, papery blades that are generally yellow, sometimes white or pinkish. Fruits are oblong to cylindrical, smooth and brown. The pappus has a number of minutely barbed bristles, usually united at the base.

Bracteantha is endemic in Australia. Species are widely distributed, occurring in coastal, lowland, montane and alpine areas, with one species, *B. bracteata*, occurring in all States. While not providing the vast displays of colour typical of some annual everlastings, individual plants are showy in flower. *B. bracteata* was possibly the first Australian everlasting collected for garden use and breeding purposes by Europeans in the early 19th Century. Breeding programs are still being carried out today. Ranges of flower colour and size, stem length, plant shape and size have been developed, providing many desirable cultivars sought by gardeners and flower-growers worldwide.

In small home gardens plants are used as individual specimens, while in large gardens they are often mass planted for spectacular displays. Their particular requirements are noted in the species' descriptions. Flowers are used both fresh and dried and should be picked before

buds are fully opened. Dried flowers are often used in arrangements and are available commercially.

Propagation is by seed, cuttings, or division of rhizomatous species. Commercial, home garden and some wild seed germinates readily. Other wild seed may be difficult if dormancy and other factors interfere with germination (see Chapter 3). Cutting propagation is a reliable method for all *Bracteantha* species, and should be used when progeny identical to the parent is desired.

At the time of going to press advice was received (P.G. Wilson pers. comm.) that the name *Bracteantha*, published in 1991, is antedated by the name *Xerochrysum*, published in 1990 by a Russian botanist (Tzvelev 1990). *Xerochrysum bracteatum* is the only name that has been published under *Xerochrysum* to date. *Bracteantha* has been used throughout this book.



An unnamed hybrid of *Bracteantha bracteata*

Bracteantha bicolor

bicolor — having two colours, referring to the bracts

ANNUAL, PERENNIAL

30–40 cm high ♦ 40–50 cm wide

Yellow

A compact annual or perennial herb, branching at and above the base, with scabrous-pubescent stems. Leaves, 25–105 × 3–14 mm, are linear to lanceolate, alternate, and scabrous with septate and stalked glandular hairs. Solitary flower-heads, 3–4 cm across, at the ends of stems are numerous with orange-brown outer bracts and yellow inner bracts. Fruits, about 2–3 mm long, are smooth, brown and have yellow pappus bristles.

Flowering period

Dec/April in cultivation and in the wild.

Propagation

Seed germinates in 10–30 days. Cuttings strike readily.

Cultivation and uses

Plants are very floriferous in cooler gardens. They prefer moist, well-drained situations and

are not suitable for the northern parts of Australia. Heads dry and wire well and should be picked when buds are just starting to open.

Distribution and habitat

Tas. Occurs in wet places near the coast.

Synonym

Helichrysum bicolor.

Similar species

Bracteantha bracteata usually has broader leaves and cobwebby hairs on the stems. ♦ *B. macrantha* has broader leaves, white flowers and only occurs in Western Australia. ♦ *B. papillosa* has softer hairs and white flower-heads which are often larger. ♦ *B. viscosa* has sticky stems and leaves.

Special notes

A future botanical revision may include *B. bicolor* with *B. bracteata*.

Bracteantha bracteata

bracteata — referring to the prominent bracts in the flower-head

ANNUAL, PERENNIAL

10–120 cm high ♦ 25–100 cm wide

White, Yellow

Golden Everlasting, Strawflower, Yellow Paper-daisy

Erect perennial herbs (occasionally annual) or low, sometimes prostrate sub-shrubs. All forms have robust, hairy branching stems. Green to grey-green leaves, 15–120 × 5–30 mm, are lanceolate to elliptic, with cobwebby and septate hairs. Terminal flower-heads, 3–7 cm across, have shiny bracts that are shades of yellow, or rarely white. Some forms have multiple flower-heads. Fruits, about 3 mm long, are smooth, brown and have yellow pappus bristles. This species is a variable complex that requires revision.

Flowering period

Mostly summer and autumn in cultivation and in the wild. Some forms may flower all year in warmer conditions.

Propagation

Fresh seed germinates in 3–20 days without any special treatment. Cuttings strike readily.

Cultivation and uses

Plants grow well in most situations and climates. Spectacular when massed in large garden plantings. Low-growing forms are colourful container plants for small courtyards and



Smooth brown *Bracteantha bracteata* fruit has yellow pappus bristles

balconies. They prefer open sunny situations in well-drained moist soils and should not be allowed to dry out in hot weather. Mulching helps to retain soil moisture and keep roots cool; pruning after flowering helps to keep plants vigorous, free flowering and longer lived. Many cultivars and hybrids have been developed from over a century of breeding in both Europe and Australia. These offer an extensive range of plant forms and flower colours, including pinks and reds, which are sought around the world in ornamental horticulture. Flowers are highly prized in floral art and may be dried successfully if picked and wired when buds are just starting to open.

Distribution and habitat

All States. Found in open woodlands, forests and coastal heathlands in sandy and loamy soils.



***Bracteantha bracteata* prefers open sunny situations in gardens**

Synonym

Helichrysum bracteatum.

Similar species

Bracteantha bicolor usually has narrower leaves and no cobwebby hairs on the stems. ♦ *B. macrantha* has white flower-heads and occurs only in Western Australia. ♦ *B. subundulata* differs in being rhizomatous and having narrow-oblong to narrow-spathulate, discolorous leaves and bracts that are dull and pointed at the apex.

Bracteantha bracteata cultivars and hybrids

The following cultivars and hybrids have proved successful over many years and are sometimes still available:

- ◆ *B. bracteata* 'Cockatoo'. A bushy perennial, similar in size and appearance to *B. bracteata* 'Dargan Hill Monarch'. It has pale lemon to cream heads, 7 cm across, and flowers from spring to autumn. Often short-lived, but cuttings strike readily. It arose as a spontaneous garden hybrid between *B. bracteata* 'Dargan Hill Monarch' and a white-flowered perennial form.
- ◆ *B. bracteata* 'Dargan Hill Monarch'. An attractive bushy perennial, 0.5–1 × 0.5–1 m, with soft grey hairy leaves, 6–12 × 1–3 cm, and large yellow heads, 5–8 cm across, held

on long stems above the foliage. It will flower for most of the year if old heads are pruned off regularly. Originally collected from Cunningham's Gap, Qld.

- ◆ *B. bracteata* 'Diamond Head'. A compact, low-growing perennial, 20 × 60 cm, with dark green, slightly hairy leaves, 20–70 × 4–8 mm, and bright yellow heads, 3–4 cm across, held just above the foliage. It flowers from spring to autumn and is a beautiful plant for small gardens, rockeries and tubs. It is especially useful in seaside areas. Sometimes short-lived, but cuttings strike readily. Collected from Diamond Head, NSW.
- ◆ *B. bracteata* 'Hastings Gold'. A compact perennial, 50 × 80 cm, similar to, but larger than



Bracteantha bracteata 'Cockatoo' is a popular, large-flowered hybrid



Bracteantha bracteata cultivar known as 'Hastings Gold'

B. bracteata 'Diamond Head'. It has larger bright yellow heads, 4–5 cm across, and flowers for most of the year. Collected from the north coast of New South Wales.

- ◆ *B. bracteata* 'Princess of Wales'. A bushy perennial, 60 × 60 cm, with almost hairless leaves and prolific golden heads, 5–6 cm across. As flowers die, the flower stems wither and both stems and dead heads disappear into the lower foliage, while new heads appear and extend above the foliage. A spontaneous garden hybrid between *B. bracteata* 'Dargan Hill Monarch' and a coloured annual form.

Many other cultivars have become available over the years but have gradually lost their popularity, with most having a market life of about three years before they are replaced by new ones. Recently, several series of smaller growing, compact perennials have been developed. They flower profusely over long periods in attractive colours ranging from

white to lemon, yellow, gold, orange, bronze, soft to bright pink and red. They are easy to grow in both gardens and containers. These cultivars include:

- ◆ The Florabella series – of which *B. bracteata* 'Florabella Gold' won the award for best new pot plant (vegetative) in the 1999 Society of American Florists' competition.
- ◆ The Nullarbor series.
- ◆ The Sundaze series – won the 'Gran premio d'oro' at the Euroflora (flower show) in Geneva in 2001 as the best new plant series of the last three years. 'Sundaze Bronze' won the gold medal as the best *Bracteantha* at the show.
- ◆ The Queensland Federation daisies – 'Wanetta Sunshine' and 'Golden Nuggets'.

Recent trends in breeding have moved towards developing seed lines that can reliably offer specific characteristics such as plant form and flower colour, and towards crossing *B. bracteata* with other species in the *Bracteantha* genus. A recent



***Bracteantha bracteata* hybrids are colourful in gardens**

release, *Bracteantha bracteata* 'Lemon Princess', appears to be a cross between *B. bracteata* and *B. viscosa*. Crosses between these two species have potential for a new range of attractive everlastings with smaller leaves and flower-heads.

Study Group members and many other gardeners have raised beautiful plants in a range of flower colours from commercial seed and this is an inexpensive option for obtaining large displays

of colourful annuals. These usually drop seed that will self-sow, providing another crop for the next season.

When selecting flower-heads for wiring or drying, choose forms with tight, pointed buds as these seem to be less prone to insect attack and are also less likely to reflex on opening. Pick the heads while still in bud or just as the outer bracts start to unfold.

Bracteantha macrantha

macrantha — large-flowered

White Strawflower

PERENNIAL

1.5–2 m high ♦ 0.6–1.3 m wide

White

An erect perennial herb with rough hairy stems, branching at and above the base. Rough, green leaves, to 15 × 20 cm, are alternate, sessile, narrow to broad-obovate, becoming linear up the stems, and fringed with small hairs. Single white flower-heads, 4–8 cm across, are held on stout leafless stalks at the ends of stems. Fruits, 2 × 1 mm, are smooth, hairless and brown. The pappus has barbed bristles which are feathery above and united at the base.

Flowering period

Sept/June in the wild.

Propagation

Seed has germinated in 7–20 days in warm conditions. Seedlings have been found difficult to grow on in Melbourne. Cuttings have not been available to the Study Group, but the similarities between this species and *B. bracteata* make it likely that they will strike readily.

Cultivation and uses

Plants need well-drained sunny situations.

Water during hot weather, and prune after flowering to promote further flowering.

Distribution and habitat

WA. Occurs from Geraldton to Mt. Many Peaks.

Widespread in a range of habitats on a variety of soil types having excellent drainage.

Synonym

Helichrysum macranthum.

Similar species

Bracteantha bracteata has forms which are similar, but it does not occur in the Perth region where *B. macrantha* is common. ♦ *B. papillosa* is smaller and occurs only on Bass Strait Islands and in Tasmania. A specimen was collected before 1900 from the Victorian mainland but has not been recorded there since.

Special notes

Bracteantha macrantha may be included with *B. papillosa* in a future revision.

Bracteantha palustris

palustris — belonging to a marsh
Swamp Everlasting

PERENNIAL

30–100 cm high ♦ 30–50 cm wide
Yellow



Ephemeral creeks or soaks are an ideal situation for *Bracteantha palustris*

An erect perennial herb, spreading by underground rhizomes. It is usually single-stemmed with lower stems becoming hairless, while upper stems have cobwebby hairs. Green leaves are lanceolate to elliptic, 30–110 × 3–10 mm, almost hairless but with cobwebby hairs on the margins, and have pointed tips. Flower-heads, 2–4 cm across, are held singly at the tips of stems. Fruits are brown, about 3 mm long, and have a persistent pappus of yellow barbed bristles, united at the base.

Flowering period

Nov/Mar in cultivation and in the wild.

Propagation

Seed has not been germinated by the Study Group. Cuttings strike readily. The usual method is by division, which is very successful when carried out in cooler weather.

Cultivation and uses

Plants grow well in wet or boggy conditions and in containers of moist soil. In normal garden conditions it may die down over summer. It is suited to heavy clay soils. This species has potential as a cut flower.

Distribution and habitat

Vic, Tas. Occurs on black clay soils in marshy lowlands.

Synonym

Bracteantha species aff. *subundulata*.

Similar species

Bracteantha bracteata is tap-rooted and has branching stems. ♦ *B. subundulata* is generally shorter (to 45 cm), and the stems are hairy to the base. It occurs in alpine and subalpine areas usually above 900 m.

Bracteantha papillosa

papillosa — covered with small protuberances

PERENNIAL

0.15–1 m high ♦ 0.15–1.5 m wide

White



A hint of pink on the white bracts is the appeal of *Bracteantha papillosa*

An erect perennial herb, often short-lived, branching at and above the base, with stems covered in small glandular hairs. Leaves, 50–150 × 5–20 mm, are narrow-lanceolate to elliptic, alternate, sticky, and have small hairs on the upper surfaces and dense cobwebby hairs beneath. Leaf margins are sometimes undulating. White flower-heads, 2–5 cm across, are held singly at the tips of short stems which may branch. Outer bracts are greenish-yellow, inner bracts have white blades sometimes tinged pink. Fruits, 2 mm long, are oblong. The pappus has white bristles united at the base.

Flowering period

Oct/Feb in cultivation; Aug/Jan in the wild.

Propagation

Seed germinates in 7–20 days and should be sown in autumn for a late spring flowering. Cuttings strike readily.

Cultivation and uses

Plants prefer well-drained soil and will grow in full sun or part shade. Pruning will increase flowering and promote bushiness. Suitable for exposed coastal situations.

Distribution and habitat

Vic (Wilson's Promontory), Tas and on Bass Strait Islands. Occurs in coastal areas on sandy heathlands and exposed cliffs.

Synonym

Helichrysum papillosum.

Similar species

Bracteantha bracteata (white-flowered forms) are difficult to differentiate and need botanical revision. ♦ *B. macrantha* is larger and only occurs in Western Australia.

Special notes

Bracteantha papillosa and *B. bracteata* have hybridized in gardens.

Bracteantha subundulata

subundulata — almost undulate or wavy, referring to the leaves

Alpine Everlasting, Orange Everlasting

PERENNIAL

15–60 cm high ♦ 20–90 cm wide
Yellow, Orange

An erect perennial spreading by underground rhizomes and having stout, woolly stems becoming glabrous, and sometimes branching at the base. Hairy green leaves, 40–100 × 5–15 mm, are narrow-oblong to narrow-spathulate, discolourous, stem-clasping, and more crowded at the base of the stem. Solitary, terminal flower-heads, 3–5 cm across, have yellow to golden-orange bracts that are dull, papery and tapering to a narrow point. Outer involucral bracts reflex at maturity. Fruits are oblong, about 2 mm long.

Flowering period

Dec/Mar in cultivation and the wild.

Propagation

Seed germinates well in 3–20 days without any special treatment. Cuttings strike readily and rhizomes divide successfully.

Cultivation and uses

Plants have not performed well in Melbourne gardens and should be treated as annuals. They are more suited to higher altitudes where, when mass planted, they provide good floral displays. Plants prefer moist well-drained soils in sunny situations and are hardy to frost and snow. Mulch to protect roots. Plants may die back in late autumn and shoot again in late winter.

Distribution and habitat

NSW, ACT, Vic, Tas. Found at higher altitudes from the Brindabella Range in New South Wales to Tasmania. Occurs in loamy alpine and subalpine meadows and lightly forested areas.

Synonym

Helichrysum acuminatum.

Similar species

Bracteantha bracteata is not rhizomatous. It has lanceolate, concolorous leaves and shiny floral bracts. ♦ *B. palustris* is rhizomatous. It is distinguished by its simple stems which are hairy only in the upper parts.



Sharply pointed deep orange bracts are features in some forms of *Bracteantha subundulata*



Bracteantha subundulata colonizes alpine herbfields and grasslands

Bracteantha viscosa

viscosa — sticky, referring to the stems and leaves
Sticky Everlasting, Golden Everlasting, Shiny Everlasting

PERENNIAL

30–80 cm high ♦ 30–80 cm wide
Cream, Yellow, Orange, Brown



Bracteantha viscosa is common in dry, rocky areas

In cultivation an attractive perennial herb, with sticky, rough young growth. Bright green leaves, 30–100 × 2–10 mm, are linear to narrow-elliptic, sticky, and with recurved margins. Flower-heads are 2–3.5 cm across, held singly or in small groups at the tips of stems. Outer bracts are brownish-yellow, intermediate bracts usually have yellow blades, but occasionally they are cream, orange or brown. Fruits, about 2.5 mm long, are smooth and brown. The pappus is yellow.

Flowering period

Oct/May and often throughout winter in cultivation; Aug/Mar in the wild.

Propagation

Seed germinates in 7–20 days and should be planted in autumn for a spring display of flowers. Cuttings strike readily and selected forms should be propagated by this means.

Cultivation and uses

Beautiful, brightly coloured, floriferous daisy for containers and massed planting in gardens.

Plants prefer open sunny situations in very well-drained soils. When closely planted or grown in shade they may be short-lived. Plants will tolerate frost and some dryness. Prune while young and after flowering to encourage bushiness and further flowering. Flowers dry and wire well and are often used in floral art.

Distribution and habitat

Qld, NSW, Vic, Tas. Occurs in lightly wooded areas, often along inland roadsides in goldfield and subalpine regions. Grows on sand or sandy loam, and on rocky ground.

Synonym

Helichrysum viscosum.

Similar species

Bracteantha bracteata has leaves that are broader, oblanceolate to lanceolate, more hairy and not usually sticky.

Special notes

Bracteantha viscosa and *B. bracteata* hybridize in the wild and in gardens.

Cephalipterum

Cephalipterum is derived from the Greek *cephale* (head) and *pteron* (wing) – referring to the conspicuous bracts of the compound head.

Cephalipterum is a monotypic genus endemic in south-western Australia. Plants are erect annual herbs with hairy stems arising from a basal clump of linear to obovate, hairy to glabrous leaves. Stem leaves are alternate and linear to narrowly obovate. Single globular flower-heads of conspicuous white, cream, lemon, yellow or rarely pink bracts are held at the tips of the stems. Fruits have a dense covering of curled thread-like hairs and are embedded with several others in dense wads of these hairs.

It is arguably the most spectacular of Western Australia's everlasting daisies. In years of good rainfall, large areas up to several acres can be covered with plants in flower, usually of one colour. Up to 25 stems can arise from a basal clump of leaves with each stem bearing a single flower-head. The largest forms grow in the most northerly and westerly parts of southern Western Australia. They grow to 50 × 50 cm and have a profusion of heads up to 5 cm across. Usually growing in red sandy loam, they provide brilliant floral displays of white, cream or yellow, and are highly prized as dried flowers. There have been reports of plants with orange to red-tinged bracts, but these have not been seen in recent years. Medium-sized white flowered forms, 30 × 30 cm, are less spectacular but still offer wonderful displays. Their flowers are smaller, to 3 cm across, and less numerous, up to 15 heads per plant. These forms tend to grow further inland, extending across the Nullarbor into South Australia, and are often found in grey clay-loam which contains lime. Small lemon or white tinged pink flowered forms, to 10 × 10 cm, are much more limited in occurrence and only sparsely cover small areas in the south-east of Western Australia. *Cephalipterum* is quite variable within its single species as well as having similarities to species in *Rhodanthe* section *Synachyrum*. A future revision may change its taxonomic status.

Horticulturalists in Germany consider that *Cephalipterum* has potential as a flowering pot plant for balconies, patios and well-lit indoor areas. If cuttings or micropropagation prove suitable for mass production of flowering pot plants, the larger forms could have worldwide market potential.

Although Australian seed suppliers offer several forms, seed has been difficult to germinate. Seed germinates poorly in 5–20 days without special treatment but the Study Group has found that the treatment described in Table 1 (page 18) gives much better results.



White forms of *Cephalipterum drummondii* are often pink in bud

Cephalipterum drummondii

drummondii — after James Drummond (1784–1863),
first government naturalist, WA (1829–34)

Pompom Head

ANNUAL

5–50 cm high ♦ 5–50 cm wide

White, Cream, Lemon,
Yellow, Pink



The yellow form of *Cephalipterum drummondii* carpeting large areas of the mid north-west of Western Australia

A beautiful, erect, herbaceous annual with curled thread-like hairs on stems and leaves. Several slender flower stems, 5–50 cm long, arise from a basal clump of linear to obovate, hairy to glabrous, green leaves, 10–50 × 1–6 mm. Stem leaves are alternate, sessile, and 10–50 × 1–3 mm. Terminal flower-heads are globular, 1–5 cm across, with conspicuous bracts that may be white, cream, lemon, yellow or rarely pink. Fruits have a dense covering of tangled hairs and are embedded with several others in dense wads.

Flowering period

Sept/Jan in cultivation; July/Nov in the wild. Prolonged soil moisture in spring increases flower production and extends the flowering season.

Propagation

Seed germinates poorly in 5–20 days. Germination trials have shown that both fresh and stored seed germinate better with pretreatment (see page 18). Seed should be planted as a wad rather than as single seeds extracted from the mass of tangled hairs. It is possible that the wad holds water, thus keeping seed moist during germination. Cuttings strike readily but have not been grown to maturity by the Study Group.

Cultivation and uses

It prefers a warm, well-drained sunny situation and performs well in containers. The larger flowered forms are used extensively as dried flowers which retain their colour and last for long periods.



White *Cephalpterum drummondii* near Paynes Find, Western Australia



Yellow *Cephalpterum drummondii* near Mingenew, Western Australia

Distribution and habitat

WA, SA. Occurs in red sandy loam, usually under acacias, and in grey clay-loam that sometimes contains lime, usually under eucalypts.

Similar species

Rhodanthe sterilecens differs in several characteristics, but most obviously in having sessile flower-heads at the base of the plant in addition to terminal flower-heads. The fruits are not matted together in a wad of tangled hairs.

Chrysocephalum

The genus name is derived from the Greek *chrysos* (golden) and *cephalon* (head), in reference to the golden-yellow flower-heads borne by most members of the genus.

Chrysocephalum is perhaps better known to many gardeners by the former name of the genus, *Helichrysum*.

The genus currently contains six species, *C. apiculatum*, *C. baxteri*, *C. ermaeum*, *C. pterochaetum*, *C. puteale* and *C. semipapposum*. Further revision will probably result in the description of additional species. Two species until recently in *Chrysocephalum*, *C. semicalvum* and *C. serpens*, have now been included in a new Australian genus, *Leiocarpa* (Wilson 2001).

Chrysocephalum species are annuals, perennials or subshrubs, some with aromatic foliage. Leaves are alternate, sessile, hairy or glandular, and green, grey-green or silvery. Flower-heads are terminal, solitary or in clusters, golden-yellow to orange-yellow (except *C. baxteri* which is white). The involucre bracts are in several rows and have fringed margins. Fruits are oblong, sparsely to densely papillose. The pappus bristles are usually barbed, the barbs often more densely clustered in tufts at the apex. The exceptions are *C. pterochaetum* and *C. puteale*, which have feathery pappus bristles.

Gardeners are familiar with commercial forms of *C. apiculatum*, some of which are compact dense plants suitable as ground covers. Other forms sucker, and display great variation in the colour of the foliage. Another garden favourite is *C. baxteri*, which is also useful in a rockery. One long-lasting species, *C. semipapposum*, should be better known as a tough plant for massing in large gardens and for providing colour in summer. Seed of the three species above germinates readily and will regenerate naturally in gardens. Possibly due to dormancy, semi-arid species are more difficult to germinate. Vegetative propagation is usually successful, especially if new basal shoots are taken. Division is an easy option in the case of suckering forms.

Fresh flowers last in water for long periods. Heads of some species air-dry well and *C. baxteri* can be wired successfully.

Forms have been observed that are thought to be intermediate between *C. apiculatum* and *C. semipapposum*. Members of the Study Group have not observed other evidence of hybridization while studying this genus. Chromosome number determinations for species in this genus are $n = 12, 24$ (Turner 1970, Watanabe *et al.* 1999).

Chrysocephalum apiculatum

apiculatum — of the leaves, having a short, pointed tip

Common Everlasting, Yellow Buttons

PERENNIAL

10–50 cm high ♦ 0.2–2 m wide

Yellow, Orange

An extremely variable species with many forms occurring in the wild. Stems and leaves are covered with densely matted cobwebby hairs, often giving the plant a silvery appearance. Leaves are green, grey-green or silver, 10–60 × 5–15 mm, linear to spatulate, ending in a short, pointed tip. The base of the leaves is broadly sessile

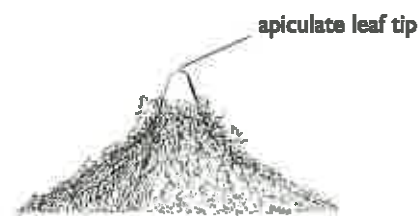
to stem-clasping. Flower-heads, 5–15 mm, are yellow to orange in loose clusters at the end of almost leafless stems. Fruits are brown, cylindrical, 1–1.5 × 0.5 mm, with sparse papillae. The pappus consists of 6–9 barbed yellow bristles with feathery clusters at the tips.

Many forms have been grown by the Study Group. Some of the best of these are:

- ◆ An upright form to 30 cm high with grey leaves from Anglesea (Vic). Flower-heads are yellow in compact clusters to 4 cm across. Deep orange buds make this a most attractive plant.
- ◆ A low-growing prostrate form with silvery leaves which is available commercially. Its habit makes it useful for cascading down sloping sites.
- ◆ A prostrate form now known as *Chrysocephalum apiculatum* 'Golden Buttons' spreads to about 1 m. It suckers lightly and has green leaves and clusters of orange-yellow flower-heads from spring to autumn. When new growth appears, cut the old stems back to ground level to promote further new growth. It was previously sold as '*Helichrysum amplexans*' but that name was illegitimate.
- ◆ A form sold as '*Helichrysum ramosissimum*' suckers vigorously. Leaves are grey-green and flower-heads are orange-yellow in small clusters which develop into racemes. It flowers most of the year and will eventually form an attractive carpet which can be lightly mown. After revision this entity may become a new *Chrysocephalum* species. It occurs in Queensland.
- ◆ A striking upright form with silvery leaves from Mt. William (Grampians, Vic) suckers lightly and grows to 40 cm high. Bright yellow flower-heads are in compact clusters to 3.5 cm across. It flowers over a long period and the heads air-dry well.
- ◆ A vigorous suckering form to 40 cm tall from Seaford (Vic) has grey-green leaves and large yellow flower-heads in clusters to 5 cm wide.

Flowering period

Sept/Mar in cultivation; Sept/Dec in the wild.



Chrysocephalum apiculatum leaf tip

Propagation

Seed germinates readily in 7–21 days when sown in autumn. Late spring sowing is also successful. Seed from semi-arid areas may be dormant for 12–18 months. Cuttings strike easily and suckering forms can be divided.

Cultivation and uses

A most useful species which is very easy to cultivate. Plants are erect or sprawling and some sucker vigorously, eventually forming large, attractive clumps. Plants prefer full sun and should not be cut back until new growth appears at the base, generally in autumn. Flower-heads air-dry well when picked in bud and cut flowers are long-lasting.

Distribution and habitat

All States. Found in many plant communities on a variety of soils.

Synonym

Helichrysum apiculatum.

Similar species

Some forms of *Chrysocephalum semipapposum* are difficult to distinguish from *C. apiculatum*. In general, flower-heads of *C. semipapposum* are smaller and a greater number of them are grouped in larger, flatter clusters. Also, the stems are more upright and woody, to 1 m high, and the leaves are often narrow, sometimes quite hairless.

Special notes

Chrysocephalum apiculatum is a variable species and revision is long overdue. Some forms may eventually become new species.



Forms of *Chrysocephalum apiculatum* such as this one from Mt. William in the Grampians, Victoria are stunning garden subjects



***Chrysocephalum apiculatum* is very colourful over the summer months**

Chrysocephalum baxteri

baxteri — after William Baxter, 19th Century
botanical collector

Fringed Everlasting, White Everlasting

PERENNIAL

20–40 cm high ♦ 20–50 cm wide
White, Buff

An attractive perennial, branching from the base and usually forming a mound of erect white stems, each terminating in a single flower-head. Leaves are shiny, dark green, 15–20 × 1–3 mm, with white woolly reverses and margins rolled under. Flower-heads, 2–4 cm across, are white with fringed bracts. Buff-coloured forms are less common. Outer bracts are brown or occasionally deep pink. Fruits are brown, oblong, 1–2 mm long, and slightly papillose. White pappus bristles (8–12) are barbed with feathery clusters at the tips.

Flowering period

July/Dec in cultivation; Oct/Dec in the wild.

Propagation

Seed germinates in 14–40 days. Cuttings of firm new growth strike readily.

Cultivation and uses

C. baxteri makes an excellent pot specimen

and prefers well-drained to dry soils in the garden. Plants may decline after 3–4 years, but can self-sow. Old growth should be cut back after new growth has appeared from the base. Flower-heads are often targets for caterpillars which cause distortion. Fresh flowers have a long vase life and may be wired.

Distribution and habitat

NSW, Vic, Tas (Bass Strait Islands only), SA. Occurs in sandy soils and heathlands. Often seen *en masse* on roadside verges.

Synonym

Helichrysum baxteri.

Similar species

Argentipallium obtusifolium also has white heads, brown buds, whitish stems and dark green leaves with white reverses, but its bracts are not fringed. The leaves have blunt tips and are more sparse.

Chrysocephalum baxteri 'Midget'

Midget — small

PERENNIAL

10–25 cm high ♦ 10–20 cm wide
White

A dainty, diminutive form of *C. baxteri* which arose in a batch of seedlings raised from seed collected in southern Gippsland in 1987. 'Midget' is a small branching shrublet which develops a woody base with age. Leaves are 1 mm wide, dark green above, white woolly below and crowded on the stems. Flower-heads are 10–15 mm across, with brown or pinkish outer bracts.

Flowering period

Oct/Feb and intermittently through autumn in cultivation.

Propagation

Mature seed has germinated but so far seedlings have failed to grow on. Cuttings strike readily.

Cultivation and uses

'Midget' is ideal for pot cultivation and grows in well-drained soils in sunny situations.

Distribution and habitat

Not known in the wild.

Special notes

'Midget' is registered with the Australian Cultivar Registration Authority (ACRA).



The papery bracts of *Chrysocephalum baxteri* are a useful landing stage for this pollinating insect



This buff coloured form of *Chrysocephalum baxteri* occurs in western Victoria

Chrysocephalum ermaeum

ermaeum — solitary, uninhabited, referring to the desert habitat

Sandhill Everlasting

PERENNIAL

20–40 cm high ♦ 20–70 cm wide
Yellow

A much-branched, tap-rooted perennial, becoming woody with age. Stems are moderately to densely woolly-cobwebby with underlying inconspicuous glandular hairs. Leaves are grey-green to silver, 5–15 × 1.3–3 mm, linear to oblanceolate, with a recurved, sometimes wavy margin, an acute apex and a broadly sessile base. They are covered with sparse to dense woolly-cobwebby hairs, especially on the underside. Single, terminal yellow flower-heads to 12 mm across are borne on stems to 7 cm long. The involucre bracts vary in length, the inner bracts being longest and having margins fringed with long hairs. Fruits are oblong, compressed, papillose, with 5–8 yellow pappus bristles tufted at the tips.

Flowering period

Sept/Jan in cultivation; most of the year in the wild, depending on rainfall.



Fruit of *Chrysocephalum ermaeum* has 5–8 pappus bristles



Chrysocephalum ermaeum occurs in the sandhills of central Australia

Propagation

Seed germinates poorly in 10–40 days. Cuttings strike with relative ease.

Cultivation and uses

This species has not been trialled extensively by the Study Group but would appear to have horticultural potential, although the foliage has an unpleasant smell. Soil must have excellent drainage.

Distribution and habitat

SA, WA, NT. Occurs in open sites and in swales or on sandplains.

Synonyms

Helichrysum eremaeum, *H. ambiguum* var. *paucisetum*.

Similar species

Chrysocephalum pterochaetum differs in the number and appearance of the pappus bristles. ♦ *Leiocarpa semicalva* is distinguished by having 12–20 barbed pappus bristles, and inner bracts with torn margins.

Chrysocephalum pterochaetum

pterochaetum — having winged hairs, a reference to the plumed pappus bristles

Perennial Sunray

PERENNIAL

14–40 cm high ♦ 15–40 cm wide

Yellow

A rigid, bushy perennial herb or subshrub with woody lower branches. Stems are thickly covered with white, woolly-cobwebby hairs. Leaves are green, linear to oblanceolate, 10–30 × 1–1.5 mm, with recurved margins, a blunt apex and a broadly sessile base. They are rough on both sides. Flowerheads on short stems are in terminal clusters of 3–8. Individual heads are bell-shaped and up to 6 mm wide. Fruits are oblong and densely papillose, with 8–19 pappus bristles united in a short collar at the base. Bristles are feathery, becoming barbed at the tips.

Flowering period

Feb/Mar in cultivation; June/Oct in the wild.

Propagation

Seed germinates poorly in 10–40 days. Pre-treatment with SISP improves germination. Cuttings have been successful.

Cultivation and uses

This species is best suited to warm inland areas. In cool temperate climates buds do not open and plants do not flourish.



Fruit of *Chrysocephalum pterochaetum* has pappus bristles united in a short collar at the base



Chrysocephalum pterochaetum occurs in dry rocky soils in central Australia

Distribution and habitat

Qld, NSW, SA, WA, NT. Occurs in sand among rocks, in or near dry creek beds, on sandy gibber and rocky hillsides.

Synonym

Helipterum pterochaetum.

Similar species

Chrysocephalum eremaeum differs in the number and appearance of the pappus bristles.

Chrysocephalum puteale

puteale — of or belonging to a waterhole

Appressed-leaf Sunray

PERENNIAL

10–30 cm high ♦ 10–30 cm wide

Yellow

A densely branched, slightly woody, erect plant with numerous twiggy branches. Stems are covered with white woolly hairs. Leaves are sticky, linear, 3–10 × 0.5–1 mm, closely pressed to the stems but with the tips spreading. The uppermost leaves have papery tips. Single flower-heads, 4–8 mm wide, are hemispherical and borne on leafy stems. Fruits are papillose, with 10–16 feathery pappus bristles.

Flowering period

Not known in cultivation; July/Nov in the wild.

Propagation

Propagating material has not been available to the Study Group.

Cultivation and uses

This species has not been trialled by the Study Group but should be suitable for arid areas.

Distribution and habitat

WA. Occurs in rocky valleys and on slopes of low hills. Grows on red sands and stony soils, often near water.

Synonyms

Helichrysum puteale, *Helipterum adpressum*.

Similar species

This species appears very similar to some specimens of *Chrysocephalum eremaeum* but it is distinguished by having 10–16 completely feathery pappus bristles. *C. eremaeum* has 5–8 partially feathery pappus bristles.

Chrysocephalum semipapposum

semipapposum — half or nearly covered with fine down

Clustered Everlasting

PERENNIAL

0.5–1 m high ♦ 0.5–1.5 m wide

Yellow

A most attractive and variable species with excellent potential for cultivation. Leaves are 5–50 × 2–7 mm, narrow and sometimes wrinkled at the edges. Leaf colour can vary from bright or dark green to grey-green or silvery. Flower-heads, 5–7 mm across, are borne in dense clusters at the tips of usually erect stems which often become woody with age. A second flush of flowering occurs at the ends of small branchlets which are produced in the leaf axils. The leaves on this secondary growth are usually finer than the leaves on the main stem. At this stage of growth the stems start to bend towards the ground and the habit appears less erect. Plants can spread by suckering or self-sowing. Fruits are 1 × 0.5 mm, pale brown, smooth or with sparse papillae, and have 6–9 barbed pappus bristles, feathery at the tips.

Many forms of *C. semipapposum* occur in the wild. Some of the best forms for the garden occur in Victoria:

- ♦ Anglesea. Fine, dark green leaves on erect stems to 60 cm high. Plants can sucker to 80 cm in width. Showy golden-yellow flower-heads occur in clusters to 5 cm in diameter. An excellent species for drying.
- ♦ Langwarrin. Plants with silvery foliage form large suckering clumps to 85 cm high. Flower-heads are bright yellow in loose clusters to 7 cm in diameter. Plants tend to flop as they age, with new flowering stems appearing in the leaf axils. A very attractive form for the garden.
- ♦ Longwood. Fine silvery leaves on sprawling stems 35–40 cm high. Heads are lemon-yellow in compact clusters. An attractive foliage form which grows well in part shade.
- ♦ Mt. Buller. Suckering form to 60 cm high, often becoming woody with age. Leaves are green, wrinkled at the edges and sticky. Yellow flower-heads in large open clusters, 6–10 cm across, occur on tall, sturdy stems. Other alpine forms also have potential for floral art.



Fruit of *Chrysocephalum semipapposum*



Large clusters of flower-heads in this alpine form of *Chrysocephalum semipapposum* make a showy garden plant

Forms from other States may prove to be more suitable for warm temperate and semi-arid districts.

Flowering period

Sept/Mar in cultivation; Nov/Mar in the wild.

Propagation

Seed germinates without pretreatment in 10–30 days when sown in autumn. Seed remains viable for long periods. Cuttings of new, firm suckering growth will strike readily. Large clumps may be divided.

Cultivation and uses

A very easy species to cultivate, it prefers full sun but will also grow successfully in part shade. Suitable for exposed coastal situations and rockeries. Cut flowers remain fresh for long periods and the flower stems dry beautifully when cut at the base and hung upside down.

Stems should be picked before individual heads open.

Distribution and habitat

Qld, NSW, Vic, Tas, SA, WA. Widespread from alpine areas to the coast, from open dry forests to inland mallee sands.

Synonym

Helichrysum semipapposum.

Similar species

Some forms of *Chrysocephalum apiculatum* are difficult to distinguish from *C. semipapposum*. In general, flower-heads of *C. apiculatum* are larger and in more open clusters, and leaves are wider.

Special notes

Future revision may result in the description of several distinct species within the *C. apiculatum* and *C. semipapposum* complexes.

Haptotrichion

Haptotrichion is derived from the Greek *hapto* (half) and *trichos* (hair), referring to the short, two-celled, tooth-like hairs on the seed.

The genus has two species, both of which are erect annual herbs, branching at and above the base. Stems and leaves are lightly covered with short glandular hairs. Leaves are alternate, sessile, slightly recurved and decrease in size up the stems. Single yellow flower-heads are held on long, almost leafless stalks at the ends of stems. The involucre is hemispherical and radiating bracts are in four rows. The receptacle is conical. The fruit is a minutely hairy, compressed narrow ellipsoid, and has a short slender beak. The pappus has slightly barbed bristles united in a small tube towards the base.

Haptotrichion is endemic in Western Australia. *H. conicum*, discovered in 1882, occurs west of Gascoyne Junction and was originally named *Waizzia podolepis*. In 1966 it was described as *Waizzia conica* since it had an unusual, markedly conical receptacle and like *Waizzia*, it had fruit with a beak. There are significant anatomical differences between *Haptotrichion* and *Waizzia*, as described in the revision by Wilson (1992d). *H. colwillii*, discovered in 1984, occurs in a small area south of Carnarvon.

Hybridization has not been observed in the wild because of the geographical separation of the two species, and probably has not been attempted in cultivation.

Flowers have not been available to the Study Group, but have been successfully air-dried in Western Australia. Plants raised from seed in Melbourne were small, and only survived when kept in heated polyhouses. Further trials should be carried out in warmer, drier climates.

Propagation from seed has been moderately successful, germination taking 7–30 days. Cuttings have not been tried by the Study Group.



Golden *Haptotrichion colwillii* growing among other daisies near Hamlyn Pool, Western Australia

Haptotrichon colwillii

colwillii — for John Colwill, a Western Australian horticulturist who first collected this species in 1984

ANNUAL
25–35 cm high ♦ 10–15 cm wide
Bright Yellow

A beautiful, erect annual herb with glandular-hairy stems becoming more hairy beneath the flower-heads, and branching at and above the base. Green leaves, 5–30 × 0.5–1 mm, decrease in size up the stems and are linear, sessile, glandular-hairy, slightly recurved, with a blunt tip. Bright yellow heads, 3–5 cm across, are held singly at the ends of stems. Outer bracts are broad-elliptic, transparent and hairy; inner bracts have bright yellow blades. The receptacle, about 12 × 7 mm, is conical. Fruit, 3 × 0.8 mm, is brown, smooth, curved, narrow-ellipsoid, minutely hairy and has a smooth slender brown beak, 3 mm long. The pappus, about 1 cm long, is usually persistent, and has lightly barbed bristles united near the base to form a tube about 2 mm long.

Flowering period

Oct/Dec in cultivation; Aug/Oct in the wild.

Propagation

Seed germinates in 7–30 days and may need pretreatment (see page 18).

Cultivation and uses

In Melbourne plants were smaller than in the wild and needed the protection of a heated polyhouse. Trialling in warmer, drier climates would be worthwhile.

Distribution and habitat

WA. Limited to a small area near Hamlyn Pool, it grows on red sandy loam under scattered trees.



Curved fruit of *Haptotrichon colwillii* has a slender beak

Similar species

Haptotrichon conicum occurs in a small area near Gascoyne Junction. It has leaves ending in a club-shaped tip, and smaller floral parts and fruits. The receptacle, about 10 × 3 mm, is more sharply conical and the sheath of pappus bristles is split along one side.

Haptotrichion conicum

conicum — cone-shaped, referring to the receptacle

ANNUAL

20–35 cm high ♦ 10–15 cm wide

Yellow



Haptotrichion conicum growing near Gascoyne Junction, Western Australia

A pretty, erect annual herb with glandular-hairy stems becoming more hairy below the flower-heads, and branching at and above the base. Leaves, 5–40 × 0.5–2 mm, decrease in size up the stems and are linear, sessile, glandular-hairy, slightly recurved, ending in a club-shaped tip. Flower-heads, 2–3 cm across, are yellow and held singly at the ends of stems. Outer bracts are elliptic, transparent, hairy, and inner bracts have yellow blades. The receptacle, about 10 × 3 mm, is sharply conical. Smooth brown fruit, 1.5 × 0.7 mm, is ellipsoid, minutely hairy and has a smooth slender, pale coloured beak, 2 mm long. The pappus, about 6 mm long is usually persistent, and has lightly barbed bristles united near the base to form a tube, 1 mm long. The sheath of pappus bristles is split along one side.

Flowering period

Oct/Dec in cultivation; Aug/Nov in the wild.

Propagation

Seed germinates in 7–30 days and may need pretreatment (see page 18).

Cultivation and uses

In Melbourne plants were smaller than in the wild and needed the protection of a heated polyhouse. They are probably more suited to warmer, drier climates.

Distribution and habitat

WA. Occurs near Gascoyne Junction on red sandy silt in exposed rocky situations.

Synonym

Waitzia conica.

Similar species

Haptotrichion colwillii occurs in a small area near Hamlyn Pool. It has larger floral parts and fruits. The receptacle, about 12 × 7 mm, is not so sharply conical.

Hyalosperma

The name *Hyalosperma* is derived from the Greek *hyalos* (glass) and *sperma* (seed).

The genus, revised by Paul Wilson in 1989, contains nine species and four subspecies, all of which are cottony-hairy to subglabrous annual herbs. Stems are single, or branching at and above the base. Leaves are alternate (lower ones sometimes opposite), simple, slender and semiterete. Heads are single, terminal, and cup-shaped to top-shaped. Involucral bracts occur in rows and are papery, glossy, glabrous or sparsely woolly; inner bracts have white, yellow, pale brown or transparent blades that are sometimes minute. Fruit is oblong to obovoid, or flattened and obovate, glabrous, smooth or warty, has a deciduous pappus of fine feathery bristles and a small annular carpodium.

Hyalosperma is endemic in temperate Australia, occurring in all States except the Northern

Territory. Species grow in a variety of habitats including open grasslands, heathlands, woodlands, marshy areas and exposed situations.

Hybridization between species has not been observed by the Study Group.

While some species, such as *H. demissum*, *H. stoveae* and *H. zacchaeus*, are very small and appear to have little horticultural potential, others, such as *H. cotula*, *H. glutinosum* and *H. praecox*, have been successfully introduced to garden and container culture. When planted in well-drained sunny situations they offer attractive displays of white or yellow flowers in spring. Some species are excellent for wiring, and may also be used as cut or dried flowers.

Propagation is from seed which germinates in 6–28 days. Best sowing time is autumn. Seed of some species is available commercially.



Hyalosperma cotula is usually found in patches in woodland or heathland

Hyalosperma cotula

cotula — similar to the genus *Cotula*

Mayweed Sunray, Sunray

ANNUAL

10–20 cm high ♦ 10–20 cm wide

White, Yellow

In cultivation an erect, floriferous annual, sometimes single-stemmed but usually branching at or above the base. Grey-green leaves, becoming alternate up the stems, are slender terete, blunt at the apex, 5–20 × 1 mm, with scattered cottony hairs. White or yellow heads, 1–2 cm across, appear singly at the tips of stems. The innermost bracts are similar to the intermediate bracts but have very short white or yellow blades with rounded apices. Fruit, about 1 mm long, is obovate, warty, pale brown and glossy. Pappus bristles are white with tufts of yellow club-shaped cilia at the tips.

Flowering period

Sept/Dec in cultivation and in the wild. Sometimes flowers sporadically.

Propagation

Seed germinates moderately well in 7–21 days and should be planted during autumn for a spring display of flowers. Seed is available commercially.

Cultivation and uses

Plants prefer moist, well-drained sandy to clay loam in sunny situations. They need watering during dry periods and may be damaged by frosts in cold areas. Tip pruning will often increase branching and flowering, as well as extend the life of the plant. Effective when mass planted in containers and rockeries. Vase life is 10–25 days. Flower-heads air-dry and wire successfully.

Distribution and habitat

WA. Usually found in dampish situations in woodland or heathland and sometimes on granite outcrops where moist soil is present.

Synonym

Helipterum cotula.

Similar species

Hyalosperma praecox has leaves pointed at the apex. It occurs in NSW and Vic but not in WA. ♦ *H. pusillum* has pappus bristles that are white at the tips. ♦ *H. simplex* has lower and middle leaves that are pointed at the apex, and innermost involucre bracts similar to, and only slightly smaller than, the intermediate bracts.



The deciduous pappus on the fruit of *Hyalosperma cotula* has club-shaped cilia at the tips of the bristles

Hyalosperma demissum

demissum — low lying, referring to the whole plant
Moss Sunray, Tiny Sunray

ANNUAL

5–20 mm high ♦ 5–50 mm wide
Pale Green, Whitish

Not known in cultivation. In the wild a minute, branched, sparsely hairy to glabrous annual with slender stems, sometimes resembling moss. Leaves are opposite to alternate, slender terete, pointed and 2–5 mm long. Minute pale green or straw-coloured to whitish flower-heads are numerous, sessile and clustered among the often red floral leaves at the ends of the stems. Fruit, about 0.7 mm long, is obovoid, warty, colourless to pale brown and glossy. Pappus bristles are colourless and feathery throughout.

Flowering period

Aug/Nov in the wild.

Propagation

Seed has not been germinated by the Study Group but plants in containers have regenerated naturally.

Cultivation and uses

Unknown. Its garden potential is not promising owing to its small size.

Distribution and habitat

NSW, Vic, Tas, SA, WA. Found growing in a variety of habitats, often in damp or exposed situations.

Synonym

Helipterum demissum.

Similar species

Hyalosperma stoveae has more hairy branches, broader leaves and a smooth fruit.

♦ *H. zacchaeus* has pale brown heads and larger red-brown fruit to 2 mm long.



Tiny flower-head of *Hyalosperma demissum* which is less than 2 cm high

Hyalosperma glutinosum ssp. *glutinosum*

glutinosum — sticky. Type specimens were sticky but this may have been caused by insect attack as subsequent specimens were not

Golden Sunray

ANNUAL

5–20 cm high ♦ 5–15 cm wide
Yellow



Hyalosperma glutinosum ssp. *glutinosum* grows along roads near Mingenew, WA

An attractive erect annual, single-stemmed or branching at and above the base. Slender stems and leaves may be glabrous or have a few woolly hairs. Leaves are alternate, filiform, up to 2 cm long, and reduce in size up the stems, becoming tiny and bract-like. Yellow flower-heads, 1–2 cm across, occur singly at the tips of stems. Inner involucre bracts have blades about 5 mm long. Fruit, about 2 mm long, is broad-oblong, rounded at the base, slightly concave at the apex, has translucent margins, and is warty, straw-coloured and glossy. Pappus bristles are broader in the lower half and feathery in the upper half.

Flowering period

Sept/Nov in cultivation; Aug/Nov in the wild.

Propagation

Seed germinates in 10–20 days and should be planted in autumn.

Cultivation and uses

Although not well known in cultivation, it should thrive in well-drained soils in sunny situations and be suitable for pot culture. Flowers dry and wire well.

Distribution and habitat

NSW, Vic, SA, WA. Grows in a variety of soils in open situations where rainfall is unreliable.

Synonym

Helipterum hyalospermum.

Similar species

Hyalosperma glutinosum ssp. *venustum* has inner involucre bracts with blades 5–15 mm long. In WA it grows amongst, and may intergrade with, *H. glutinosum* ssp. *glutinosum*. ♦ *H. semisterile* has fruit without translucent margins.

Hyalosperma glutinosum ssp. *venustum*

venustum — charming, beautiful

Charming Sunray

ANNUAL

10–20 cm high ♦ 5–20 cm wide

Yellow

A pretty little annual, occasionally single-stemmed, but usually bushy, branching at and above the base. Stems and leaves may be glabrous or have a few woolly hairs. Leaves are alternate, filiform, up to 4 cm long, reducing in size up the stem, the smallest leaves being tiny and bract-like. Glossy yellow flower-heads, 1–3 cm across, grow singly at the tips of stems. Inner involucrel bracts have blades 5–15 mm long. Fruit and pappus bristles are similar to those of ssp. *glutinosum*.

Flowering period

Sept/Nov in cultivation; Aug/Nov in the wild.

Propagation

Seed germinates in 5–10 days and should be planted in autumn.

Cultivation and uses

This attractive little plant should grow well in gardens and containers if provided with good drainage and a sunny situation. Flowers dry and wire well.

Distribution and habitat

WA. Grows in sand, gravel or loam in open woodland and mulga scrub.

Synonym

Helipterum venustum.

Similar species

Hyalosperma glutinosum ssp. *glutinosum* has inner involucrel bracts with blades to 5 mm long.



Straw-coloured fruits of *Hyalosperma glutinosum* ssp. *venustum* have translucent margins



Hyalosperma glutinosum ssp. *venustum* has glossy yellow flower-heads larger than those of ssp. *glutinosum*

Hyalosperma praecox

praecox — early, referring to flowering

Fine-leaf Sunray

ANNUAL

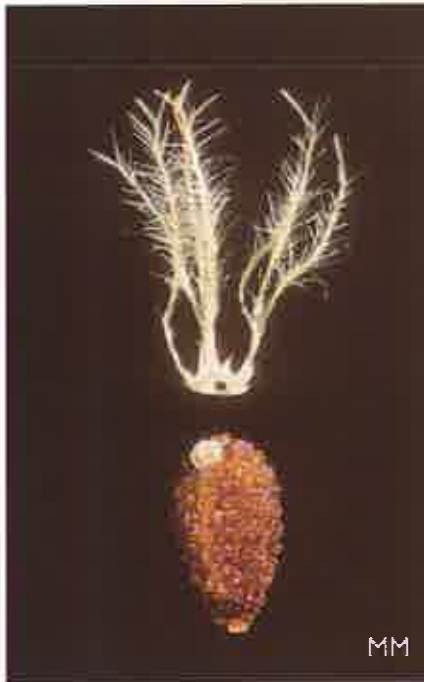
10–15 cm high ♦ 10–15 cm wide

Yellow, White

In cultivation an erect annual, branching at the base with several slender, sparsely cottony stems. Fine green leaves are alternate, semiterete, acuminate, 10–20 × 1.5 mm, decreasing in size up the stem, and glabrous or with a few cottony hairs. Each leaf is tipped with a papery, straw-coloured appendage. Yellow or white heads, 1–2 cm across, appear singly at the tips of the stems. The receptacle is conical. Fruit, about 1 mm long, is obovoid, glabrous to warty, brown and glossy. Feathery pappus bristles are colourless or very pale yellow.

Flowering period

Sept/Dec in cultivation; July/Dec in the wild.



Fruit of *Hyalosperma praecox* is brown and warty and the pappus is deciduous



Hyalosperma praecox is an excellent small plant for gardens and containers

Distribution and habitat

NSW, Vic. Usually found on sandy or loamy red soils in grassland or open woodland.

Synonym

Helipterum praecox.

Similar species

Hyalosperma cotula has leaves that are blunt at the apex. It occurs only in WA south of Geraldton. ♦ *H. simplex* has leaves that are acuminate at the apex, and the receptacle is rounded. It occurs only in WA south of Perth.

Hyalosperma pusillum

pusillum — slender, referring to the plant

ANNUAL

5–20 cm high ♦ 5–10 cm wide

White

Not known in cultivation. In the wild an erect annual, either single-stemmed or branching at and above the base, the stems bearing a few cottony hairs. Leaves are about 1 cm long, the lowest opposite (but becoming alternate up the stems), slender, semiterete and blunt, glabrous or with a few cottony hairs. Flower-heads are single, terminal, and about 2 cm across. Fruit, about 1 mm long, is narrow-obovoid, minutely tessellated but not warty, reddish-brown and glossy. Pappus bristles are white at the tips and feathery.

Flowering period

Sept/Nov in the wild. May also flower after temporary flooding.

Propagation

Seed and cutting material have not been available to the Group.

Cultivation and uses

Unknown.

Distribution and habitat

WA. Found between Bunbury and Albany, usually in temporarily waterlogged sand over clay or in heavy loam.

Synonym

Helipterum pusillum.

Similar species

Hyalosperma cotula has pappus bristles that are yellow at the tips.



***Hyalosperma pusillum* is usually found in waterlogged soils**

Hyalosperma semisterile

semisterile — some sterile, referring to the flowers

Orange Sunray

ANNUAL

5–15 cm high ♦ 5–20 cm wide

Yellow



Hyalosperma semisterile growing in the Maccullochs Range, New South Wales

An erect, branching, sometimes bushy annual, with slightly woolly-hairy or glabrous, slender stems. Slender leaves are alternate, slightly hairy or glabrous, 5–15 × 2 mm, semiterete, and obtuse to acute. The terminal leaves become small and bract-like. Single flower-heads at the tips of the branches are 5–10 mm across. Outer involucre bracts are ovate to obovate and silvery to pale brown. Inner involucre bracts have ovate, bright yellow blades, about 3 mm long. Fruit, about 1.5 mm long, is obovoid, without translucent margins, warty, pale brown and glossy. Feathery pappus bristles are colourless or pale yellow at the tips.

Flowering period

Sept/Nov in cultivation; Aug/Nov in the wild.

Propagation

Seed germinates in 10–20 days. Autumn is the best sowing time for a spring display of

flowers. Seedlings should be protected from wintry conditions.

Cultivation and uses

Although not common in cultivation, this species grows well in warm, sunny, well-drained situations. It is also attractive when massed in pots and tubs.

Distribution and habitat

Qld, NSW, Vic, SA. Found on a wide variety of soils, on rocky outcrops, in woodland, and exposed situations in areas of unreliable rainfall.

Synonyms

Helipterum semisterile, *H. jessenii*.

Similar species

Hyalosperma glutinosum ssp. *glutinosum* has a reddish-brown involucre and fruit that is broad-oblong and slightly concave, with translucent margins.



Fruits of sterile floret (left) and bisexual florets of *Hyalosperma semisterile* showing the deciduous pappus

Hyalosperma simplex* ssp. *graniticola

graniticola — living on granite soil

ANNUAL

15–20 cm high ♦ 10–15 cm wide

White

This subspecies is similar to ssp. *simplex* in appearance, but has smooth fruit 1–2 mm long.

Flowering period

Sept/Dec in the wild.

Propagation

Seed of this subspecies has not been available to the Study Group.

Cultivation and uses

Plants should grow and perform well in garden conditions similar to those suiting ssp. *simplex*.

Distribution and habitat

WA. Found in mossy areas amongst rocks in the south-west from Busselton to the Albany area.

Synonym

Helipterum simplex.

Similar species

Hyalosperma cotula has leaves that are blunt at the apex and the innermost involucre bracts



Hyalosperma simplex ssp. *graniticola* has a smooth fruit (right). A floret with pappus is still attached to an immature fruit (left)

are not similar to the intermediate bracts.
♦ *H. simplex* ssp. *simplex* has warty fruit, 1 mm long.



Hyalosperma simplex ssp. *graniticola* favours mossy granite boulders

Hyalosperma simplex ssp. *simplex*

simplex — simple, referring to the stems

ANNUAL

10–20 cm high ♦ 10–15 cm wide
White, Yellow

A recently described attractive annual which has been confused with *H. cotula*. Stems are either single or branch near the base. Leaves are slender, semiterete, 10–20 × 0.5–1 mm, glabrous or with a few cottony hairs, acute to acuminate at the apex. The lowest leaves are opposite becoming alternate higher up the stem. Flower-heads are 1.5–2 cm across, and occur at the tips of the stems. The innermost bracts are similar to the intermediate bracts and only slightly shorter. Fruit, about 1 mm long, is obovoid, dark brown and warty. Feathery pappus bristles are white becoming yellow.

Flowering period

Sept/Dec in cultivation and in the wild.

Propagation

Seed germinates moderately well in 7–21 days and should be planted during autumn for a spring display of flowers.

Cultivation and uses

Plants prefer moist, well-drained sandy to clay loam in sunny situations and are very pleasing in tubs. Tip pruning will often increase branching and flowering and may prolong the life of the plant. Excellent for colourful massed plantings. Vase life is 10–30 days or longer. Care should be taken when wiring because the receptacle is shallow.



Hyalosperma simplex ssp. *simplex* is as fresh as a daisy

Distribution and habitat

WA. Found in moist or marshy situations in sand or loam, in woodland and low shrubland from the Darling Range to Augusta.

Synonym

Helipterum simplex.

Similar species

Hyalosperma cotula has leaves that are blunt at the apex and innermost involucre bracts that are short and rounded. ♦ *H. simplex* ssp. *graniticola* has smooth fruit, 1–2 mm long.

Hyalosperma stoveae

stoveae — after K. Stove, Australian botanist who collected the holotype in 1978

ANNUAL
2–5 cm high ♦ 2–5 cm wide
Whitish

Not known in cultivation. In the wild a semi-prostrate, slightly hairy annual with slender branches. Leaves are almost opposite, fleshy, 2.5–5 mm long, reducing in size up the stem. Lower leaves are narrow-oblong, upper leaves elliptic, and uppermost leaves ovate. Flower-heads are terminal, single and are subtended by about

four leaves. Involucre bracts in two rows are glabrous and do not radiate. They have rounded tips that are transparent or sometimes slightly opaque. Fruit, about 0.5 mm long, is obovoid, smooth, colourless to pale brown and glossy. Pappus bristles are feathery and colourless.

Flowering period

July/Oct in the wild.

Propagation

Seed has not been available to the Study Group.

Cultivation and uses

This species does not appear to have any garden potential.

Distribution and habitat

Vic, SA, WA. Grows in acacia and mallee woodland.

Synonym

Helipterum stoveae.

Similar species

Hyalosperma demissum has branches that are less hairy, narrower leaves and warty fruit. ♦ *H. zacchaeus* has pale brown heads and larger red-brown fruit to 2 mm long.

Hyalosperma zacchaeus

ANNUAL

zacchaeus — after Zacchaeus, the biblical character from Jericho, who was of lowly stature (like the plant). Jericho was a slang expression for a distant place and the plant was found near distant Coolgardie in 1895

3–5 cm high ♦ 3–8 cm wide
Pale Brown to Whitish

Dwarf Sunray

In the wild a prostrate to ascending rounded annual, slightly hairy to slightly woolly, branching at and above the base. Leaves are slender, semiterete, 3–6 mm long and acute. Terminal leaves are clustered around flower-heads and have short dry appendages. Pale brown to whitish flower-heads appear singly at the tips of the stems. Fruit, about 2 mm long, is oblong to obovate, warty, reddish-brown and glossy. Feathery pappus bristles are either colourless or very pale yellow.

Flowering period

Aug/Oct in the wild.

Propagation

Seed has not been germinated by the Study Group.

Cultivation and uses

Unknown.

Distribution and habitat

WA. Found inland from Cowcowing to Coolgardie on sandy loam or on gravel in open forest and exposed situations.

Synonyms

Helipterum zacchaeus, *H. guilfoylei*.

Similar species

Hyalosperma demissum has smaller, pale brown, warty fruit. ♦ *H. stoveae* has broader leaves and smaller, colourless to pale brown, smooth fruit.

Ixodia

Ixodia is derived from the Greek *ixodes* (sticky), referring to the foliage.

The genus contains two species, *Ixodia achillaeoides* and *I. flindersica*. *I. achillaeoides* has been subdivided further into three subspecies, ssp. *achillaeoides*, ssp. *alata* and ssp. *arenicola* (Copley 1982). Both species are restricted to southern mainland Australia. Two species endemic in Tasmania, *Odixia achlaena* and *O. angusta* were previously included in *Ixodia*. They have now been recognized as belonging to the new genus, *Odixia* (Orchard 1981).

Plants are shrubs or subshrubs and display great variability in their character and habit. Leaves are alternate, sessile or decurrent, sticky, with margins entire and flat or revolute. Flowerheads are in compact terminal clusters or spray arrangements along the stem. Heads have papery white radiating inner bracts, each head being 4–14 mm across. Florets in the central disc vary from cream to yellow and purple-red. Fruits are brown, 1.5–2.5 mm long, with three or four vertical ridges, glabrous or covered with small papillae. The pappus is either absent or there is a short ring of erect papillae at the rim, known as the 'pseudo-pappus'.

For many years forms of *I. achillaeoides* have been popular when used as fillers in dried floral arrangements. Recently much research has been undertaken for the cut flower industry, particularly on forms of ssp. *alata*. The white of the flowerheads, the delicacy of the clusters and the length of stems (up to 50 cm) produced by good forms are three attributes appreciated by domestic and export markets. Flowers from wild populations initially supplied demand, but government regulations now restrict bush picking; in addition, variation in stem quality was too great to match market specifications.

Much research on selection of good forms has been undertaken by the South Australian Department of Primary Industries sponsored by the wild-flower program of the Rural Industries Research and Development Corporation. Forms of ssp. *alata* occurring in the Nelson and Mt. Lofty Ranges have been identified as the best sources of material for cut flower varieties. Selections have been made of individual forms with characteristics required for export to various countries, cultivation needs have been studied, and it is expected that cropping of the species will supply all demand in the future. Another unique attribute of this species is that various forms are in flower at different times and so, with an appropriate selection of forms, plants will be in flower for at least four months of each year. As a result of this research ten cut flower varieties and three pot plant and garden varieties are ready for release to the horticultural industry (Barth, in press).

Germination of *I. achillaeoides* increases dramatically following fire or soil disturbance. Germination of fresh seed is normally low, but increases with maturation and is markedly enhanced by treatment with smoke or smoke products.

Cuttings taken from new growth that has hardened strike readily when propagated under mist. Vegetative propagation of superior forms is recommended practice for cut flower crops.

Ixodia flindersica is rarely seen in cultivation but many forms and subspecies of *I. achillaeoides* are attractive in gardens. Forms with compact, dense habits and fine foliage are preferable to the larger, open forms which have a tendency to grow untidily.

Plants resembling *I. achillaeoides* ssp. *alata* and ssp. *arenicola* have been observed behind the coastal dunes in the Nelson area and around Portland. It is thought possible that further taxonomic study may indicate that ssp. *arenicola* is a variation of ssp. *alata*.

Ixodia achillaeoides ssp. *achillaeoides*

achillaeoides — resembling the genus *Achillea*

SHRUB

10–80 cm high ♦ 50–80 cm wide

White

Shrub, often dwarfed in habit, with glabrous ascending or erect stems, branching in the upper parts. Leaves are oblanceolate to narrow-obovate, 4–40 × 0.5–5 mm, leathery to fleshy, usually sticky, and often with decurrent bases. Flower-heads are urn-shaped, 4–7 mm across, in clusters about 2–3 cm wide. The radiating white blades on the inner bracts are glabrous. Fruits are brown, 2 × 1 mm, oblong, 4-angled, with a sparse covering of papillae. There is no pappus.

Flowering period

Nov/April in cultivation and in the wild.

Propagation

Softwood cuttings root successfully. Root initiation is improved with hormone preparations, bottom heat and intermittent mist.

Cultivation and uses

Subspecies *achillaeoides* is ideal for coastal planting. It withstands gale force winds, grows

in open situations on sands and cliffs, but needs root protection. Stems may be used fresh or dried but are shorter than those of ssp. *alata* and not as attractive.

Distribution and habitat

SA. This subspecies grows only along the coast. It occurs on the coastline of the Yorke and Eyre Peninsulas, on Kangaroo Island and nearby islands, on exposed cliffs and sand dunes.

Similar species

Ixodia flindersica has hairs on the white blades of the inner involucre bracts, and the fruits are glabrous, with a 'pseudo-pappus'. Plants occur only in the Flinders Ranges. ♦ Subspecies *alata* has leaves which are linear, lanceolate or rhombic. ♦ Subspecies *arenicola* has obovate leaves more than 6 mm wide. The heads are larger, almost spherical, and have longer radiating blades on the inner bracts.

Ixodia achillaeoides ssp. *alata*

alata — winged, referring to the stems

Ixodia Daisy, Mountain Daisy, Hills Daisy

SHRUB

0.5–4 m high ♦ 0.5–1 m wide

White

An extremely variable shrub with an erect habit, open or dense. The stems are branched and usually winged. The leaves are sticky, vary in shape from narrow-linear to linear, rhombic or narrow-lanceolate, and in size, 50–100 × 1–10 mm. Flower-heads are 6–12 mm across with radiating white blades on the inner bracts. Fruits are the same for all subspecies. Plants appear in profusion after fire.

The variation is so great that five forms from four different areas are described separately:

- ♦ Anglesea (Vic). Open, upright shrub, 1–2 m tall. Leaves are shining, 5–100 × 1–6 mm, green, linear or narrow-lanceolate, slightly sticky, with decurrent bases. Heads are in terminal clusters about 3 cm across. Individual heads are 6–10 mm, with yellow disc florets tinged purple-red which turn brown with age. Plants flower late Jan/March.
- ♦ Nelson (Vic). There are two forms of ssp. *alata* in this area. 'Donovans' form grows in open habitats and has thin flexible stems, hardly



***Ixodia achillaeoides* ssp. *alata* occurs in many forms on Kangaroo Island, South Australia**

winged. Leaves are sparse, 2–20 × 1–2 mm, light green. Flower-heads are white (occasionally pale shell-pink) produced in small clusters on relatively long stems along the full length of the branches. The terminal cluster is relatively large. The disc florets are usually lemon but may be yellow, mauve or white. Plants start flowering in January, are resistant to frost, and flowering stems air-dry beautifully. The forest form can grow up to 4 m tall if left unpruned for eight or more years, and the heads (in dense pyramidal clusters) are larger than ‘Donovans’ form. These heads may be severely deformed when grown in the open. Plants usually flower six weeks earlier than the ‘Donovans’ form.

- ◆ Kangaroo Island (SA). Although many forms are found on the island one form is of particular interest. The stems are fine, not obviously winged, and the leaves are linear, 4–10 × 1–2 mm. Heads are 6–8 mm across, either singly on

short lateral stems or in small clusters. Plants flower Jan/Mar.

- ◆ Mt. Lofty Ranges (SA). In open stringybark forests plants grow to 2 m with thick, strongly winged stems and broad-linear to lanceolate leaves. Heads are 8–10 mm across in small dense clusters. Plants flower in late January. At lower altitudes plants growing in the open along roadsides seldom exceed 50 cm. The stems are not as thick nor as obviously winged, and the heads are often larger. Plants flower as early as December.

Flowering period

Usually Nov/Feb in cultivation and in the wild but the flowering period varies with the form grown.

Propagation

Seed is rarely available from seed suppliers and has been difficult to germinate. Germination is greatly increased if seed stored at 4°C for

6–9 months is sown with a light sprinkle of smoke-impregnated vermiculite. Seed germinates in 20–30 days. Hardened softwood cuttings root readily, especially with mist treatment.

Cultivation and uses

Subspecies *alata* grows best in well-drained sandy or sandy-loam soils. Alkaline soils often cause yellowing of leaves, and plants are short-lived in heavy soils. Positions in sun or dappled sun are suitable and extra water is necessary in extended periods of hot weather. This subspecies is considered the best for fresh and dried flowers and for pot culture and gardens.

Distribution and habitat

Vic, SA. Occurs on the south-west coast of Victoria at Nelson and the Anglesea district, and inland in the Grampians. In South Australia it occurs on Eyre and Yorke Peninsulas, the Mt. Lofty Ranges, on Kangaroo Island and the south-eastern region. It grows on a variety of soils in forests, woodland and coastal heathlands.

***Ixodia achillaeoides* ssp. *alata* is considered the best subspecies for floral art purposes**

Similar species

Ixodia flindersica occurs only in the Flinders Ranges. The fruit is glabrous, with a 'pseudo-pappus'. ♦ Subspecies *achillaeoides* has linear, narrow-rhombic or lanceolate leaves. ♦ Subspecies *arenicola* has obovate leaves more than 6 mm wide.



Ixodia achillaeoides ssp. *arenicola*

arenicola — growing in a sandy place

SHRUB

35–50 cm high ♦ 35–50 cm wide

White

A small shrub with ascending to horizontal branches turning up at the tips. Stems are thick, coarse and winged, with leathery obovate leaves, 10–30 × 6–10 mm. Flower-heads are large,

10–15 mm across, almost globular, in loose terminal clusters. The white blades of the inner bracts are radiating and glabrous. In cultivation under overhead cover it grows taller and more open.

Flowering period

Jan/Mar in cultivation; Dec/Mar in the wild.

Propagation

As for esp. *alata*.

Cultivation and uses

Subspecies *arenicola* is an excellent species for exposed coastal gardens. It is best suited to open sunny conditions in well-drained soils with good root protection. Although it may be used as a cut flower and will air-dry well it is considered somewhat coarse.

Distribution and habitat

Vic, SA. Occurs in an exposed coastal area near Portland (Vic) and Douglas Point and Port MacDonnell (SA). Grows on sand dunes and cliffs.

Similar species

Ixodia flindersica only occurs inland in the Flinders Ranges. The fruit is glabrous and has a 'pseudo-pappus'. ♦ Subspecies *achillaeoides* differs in having oblanceolate leaves less than 5 mm wide. ♦ Subspecies *alata* does not have obovate leaves and the habit is taller and more erect.

Ixodia flindersica

flindersica — a reference to the distribution

SHRUB

20–40 cm high ♦ 20–50 cm wide
White

A recently described shrub to 40 cm high with erect and ascending glabrous branches. Leaves are sessile, hard-textured and sticky, 5–50 × 0.5–7 mm, linear, elliptic or narrowly rhombic. The surfaces are shining dark green above, paler below. Leaves are crowded together on young branches, the lower parts of the old branches becoming bare. Flower-heads are cylindrical, about 8 mm across, in small terminal clusters, 1–2 cm across. Outer bracts are stiff, light green to yellow-brown in rows; inner bracts have short white radiating blades with flattened hairs on the inner surface. Fruits are oblong, 1–2 × 0.5 mm, and glabrous. The 'pseudo-pappus' is a short ring of stiff papillae.

Flowering period

Nov/April in the wild.

Propagation

The Study Group has not collected propagating material of this species.

Cultivation and uses

Judging from the habitat of *I. flindersica*, it is most likely to thrive in sunny positions on well-drained sandy soils in warm temperate climates. Pruning would be necessary to retain foliage on the branches. If it can be brought into cultivation it would probably be a pleasing cut flower and would dry well.

Distribution and habitat

SA. Occurs in the northern Flinders Ranges and the Gammon Ranges where it grows on sandstone slopes, in rock crevices and on rocky creek beds.

Similar species

Ixodia achillaeoides has glabrous white blades on the inner involucre bracts. The fruit is papillose and has no pappus. Plants are of coastal origin.

Lawrencella

Lawrencella was named after Robert W. Lawrence (1807–33), a settler and botanical collector in Tasmania; and from the Latin *ella* to indicate smallness.

Lawrencella consists of two species, both endemic in south-western Australia. They are erect herbaceous annuals with glandular-hairy young growth often becoming glabrous with age. Single erect stems sometimes branch above the base. Leaves are sub-basal and cauline, opposite or alternate and flattened or terete. Flower-heads are terminal, pink sometimes fading with age, or white rarely. The involucre is hemispherical. Outer and intermediate bracts are green and narrow-triangular to narrow-oblong. Innermost bracts are radiating and have blades that are elliptic to oblong and pink to white. Disc florets are yellow. Fruits

are spindle-shaped with a hollowed base and flattened tip. They have a persistent pappus of pink to white barbed bristles.

In the wild both species provide spectacular displays of pink flowers, sometimes covering several acres. Attractive as cut or dried flowers, they retain their colour reasonably well after picking, but should be handled carefully as the bracts are fragile. Garden and tub plantings provide masses of colour for many weeks from early to late spring in warm, sunny areas, and from mid to late spring in cooler areas. All plantings should have sun for most of the day.

Attempts to cross *L. davenportii* with *L. rosea* have not been successful, probably because their chromosome numbers differ. For *L. davenportii* $n = 11$, and for *L. rosea* $n = 8$ (Turner 1970).

Observable differences between *Lawrencella* species

1a	Flower stems to 40 cm, usually unbranched and arising from basal clump	<i>L. davenportii</i>
1b	Flower stems up to 20 cm, branching from main stem above base	<i>L. rosea</i>
2a	Leaves flattened, mostly in a clump at base of plant	<i>L. davenportii</i>
2b	Leaves terete	<i>L. rosea</i>
3a	Flower-heads up to 4.5 cm across	<i>L. davenportii</i>
3b	Flower-heads less than 4 cm across	<i>L. rosea</i>
4a	Seed to 13 mm long, with pappus of barbed white bristles, usually pink at base and to 8 mm long	<i>L. davenportii</i>
4b	Seed to 8 mm long, with pappus of barbed white bristles to 10 mm long	<i>L. rosea</i>
5a	Seed generally difficult to germinate	<i>L. davenportii</i>
5b	Seed easy to germinate	<i>L. rosea</i>



***Lawrencella davenportii* occurs with other daisies near Mingenew, Western Australia**

Lawrencella davenportii

ANNUAL

davenportii — after Sir Samuel Davenport (1818–1906), pioneer pastoralist and parliamentarian in South Australia

10–40 cm high ♦ 15–40 cm wide
Pink

Davenports Daisy

In cultivation an attractive aromatic annual with sticky young growth. Several flower stems, to 40 cm long, arise from a basal clump of flat, glandular-hairy, aromatic green leaves 3–140 × 4–10 mm. A few opposite to alternate stem leaves are sometimes present. Flower-heads, up to 4.5 cm across, have radiating bracts with elliptic to oblong blades from deep to very pale pink, sometimes fading with age. Disc florets are yellow. Fruits, to 13 mm long, are spindle-shaped with a hollowed base and flattened apex. The pappus is persistent and consists of fine, barbed white bristles, to 8 mm

long, usually pink in the lower half and united in groups at the base.

Flowering period

Aug/Dec in cultivation; July/Oct in the wild.

Propagation

Seed has been germinated in 7–21 days, but trials carried out by the Study Group have not been successful, with the exception of one trial where the bog method was used. About half of the seed planted germinated but most did not grow on to maturity. Further germination



Flower-head of *Lawrencella davenportii* developing fruits



***Lawrencella davenportii* is a beautiful species worthy of cultivation**

studies would be valuable to bring this beautiful species into cultivation.

Cultivation and uses

Limited experience suggests that plants prefer well-drained, sunny situations and would perform well in tubs. Tip pruning may induce branching and increased flowering.

Distribution and habitat

SA, WA, NT. Widespread in mulga woodland and mallee shrubland, usually growing in sandy loam, on sand dunes and rocky outcrops.

Synonym

Helichrysum davenportii.

Similar species

Lawrencella rosea differs in having stems branching above the base, leaves that are cauline and linear to terete, smaller fruit, to 8 mm long, and a pappus of white bristles to 10 mm long.

Lawrencella rosea

ANNUAL

rosea — referring to the pink colour of the radiating bracts 20–30 cm high ♦ 20–30 cm wide
Lindleys Everlasting Pink, White (rarely)

An erect, sometimes spreading annual with hairy to glabrous stems to 30 cm long, branching above the base. Leaves, 30–100 × 2–4 mm, are green, terete, opposite or alternate and glandular-hairy to glabrous. Flower-heads, to 4 cm across, have radiating bracts from deep to pale pink (rarely white), sometimes fading with age. Disc florets are yellow. Fruits, to 8 mm long, have a hollowed base and flattened apex. The persistent pappus consists of fine, toothed white bristles, to 10 mm long, united in groups at the base.

Flowering period

July/Dec in cultivation; July/Oct in the wild.

Propagation

Seed germinates fairly well in 5–21 days.

Cultivation and uses

Plants prefer well-drained sunny situations and are improved when watered occasionally during very hot, dry periods. Excellent for tubs and massed plantings in the ground. Fresh flowers last for at least 7 days in water. Flower stems dry and wire well.

Distribution and habitat

WA. Occurs in open woodland, mulga scrub and mallee areas particularly near water.

Synonym

Helichrysum lindleyi.

Similar species

Lawrencella davenportii differs in having single stems arising from a basal rosette of flat leaves, larger fruit, to 13 mm long, and a pappus of white bristles to 8 mm long, usually tinged pink in the lower half.



***Lawrencella rosea* is a delightful garden or container plant**



Fruit of *Lawrencella rosea* has a pappus of fine white bristles



Uptake of water causes immediate physiological changes in the hairs of the fruit of *Lawrencella rosea*

Leucochrysum

Leucochrysum is derived from the Greek *leucos* (white) and *chrysos* (gold), referring to the white bracts and yellow florets of some species.

The genus, revised by Wilson in 1992, contains five species, one with two recognized subspecies and three recognized varieties. *Leucochrysum* is thought to be more closely related to *Waitzia* than to *Rhodanthe*. Plants are erect annual or perennial herbs branching at or above the base, with sparse to dense, sometimes cottony, glandular hairs on branches and leaves. Alternate leaves are sessile, simple and entire. Single flower-heads occur on leafless stalks at the ends of branches. The flower-head is hemispherical with papery bracts in rows. Outer bracts, sometimes sessile, are pale brown to purple; intermediate bracts have terete claws and petal-like blades that are white or yellow; inner bracts have terete claws and small blades that are usually yellow. Fruit is glabrous to warty and has a persistent pappus of feathery bristles.

Leucochrysum is endemic in Australia and is widely distributed across the country in areas ranging from alpine to semi-arid. The annual species found in semi-arid areas are particularly dependent on winter rains, and in good seasons some offer large spectacular displays of white or yellow flowers. The perennials also have white or yellow flowers and usually occur in the less arid, more forested to alpine regions where they do not cover such large areas.

Propagation is by seed or cuttings. Seed germinates in 5–30 days and may need pretreatment (see page 18). Annual species should be grown from seed for best results. Selected forms may only be reproduced clonally, usually from cuttings which strike easily.

Hybridization in the garden occurs readily between closely related species when they are planted near one another and flower at the same time. In work carried out by von Richter (1996) at the Mount Annan Botanic Garden, those with the same chromosome number were found to cross readily, while those of differing numbers did not cross. Hybridization occurred between *L. albicans* ssp. *albicans* var. *albicans*, *L. albicans* ssp. *albicans* var. *tricolor*, *L. graminifolium* and *L. molle* (Jerilderie), all of which have the same chromosome number $2n = 16$. None of these crossed with *L. stipitatum*, which has the chromosome number $2n = 18$, nor did they cross with *L. fitzgibbonii*. While *L. molle* from Jerilderie has the chromosome number $2n = 16$, plants of *L. molle* from Maccullochs Range were found to have the chromosome number $2n = 18$, even though the plants were physically similar.



Bracts of *Leucochrysum albicans* ssp. *albicans* var. *albicans* vary in length

Leucochrysum albicans* ssp. *albicans* var. *albicans

PERENNIAL

albicans — whitish, referring to the foliage

15–50 cm high ♦ 15–100 cm wide

Hoary Sunray

Yellow



***Leucochrysum albicans* ssp. *albicans* var. *albicans* occurs in a wide range of habitats from wooded grasslands to alpine herbfields**

In cultivation an erect spreading perennial with hairy young stems branching at and above the base. Silver-green hairy leaves, 20–100 × 1–5 mm, are linear to filiform or oblanceolate. Yellow flower-heads, 2–3 cm across, are held singly on almost leafless stalks at the tips of stems. Outer bracts are pale brown; intermediate bracts are yellow, ovate to oblong, and obtuse to acute; inner bracts are yellow. Fruit, 2–4 mm long, is obovoid, curved, white to pale brown and smooth to warty.

Flowering period

Aug/Mar in cultivation; Sept/Mar in the wild.

Propagation

Seed germinates in 7–15 days. Pretreatment improves germination (see page 18). Sow seed in late autumn and protect seedlings from wet winter conditions until planting out in spring.

Cuttings strike readily and good forms can be renewed by this means.

Cultivation and uses

Suitable for both single and mass planting in most well-drained soils in open situations. A beautiful tub specimen. Plants can last for several seasons if not over-watered and if pruned towards the end of the flowering season. A fairly frost tolerant plant for temperate climates. The alpine forms are frost tolerant but can be short-lived in temperate gardens. A form from Longwood (Vic) has proved most adaptable. An excellent fresh flower, it also wires well.

Distribution and habitat

Qld, NSW, Vic. Occurs in a wide range of habitats from wooded grasslands to alpine herbfields, usually on rocky ground.

Synonym

Helipterum albicans ssp. *albicans* var. *albicans*.

Similar species

Leucochrysum albicans ssp. *albicans* var. *buffaloensis* differs in having intermediate

bracts that are broadly ovate to triangular or rounded. ♦ *L. albicans* ssp. *albicans* var. *tricolor* differs in having white flower-heads. ♦ *L. molle* differs in having much broader leaves.

Leucochrysum albicans ssp. *albicans* var. *buffaloensis*

PERENNIAL

buffaloensis — endemic in Victoria, restricted to Mt. Buffalo

30–50 cm high ♦ 20–50 cm wide
Yellow

An attractive perennial herb with many erect stems. Silver-green leaves, 20–100 × 1–3 mm, are linear, hairy and profuse on the stems. Single flower-heads, 2–3 cm across, are held on almost leafless stalks at the tips of the stems. Outer bracts are darkish red, intermediate and inner bracts are yellow. Intermediate bracts are broadly ovate to triangular or rounded.

Flowering period

Jan/Mar in the wild.

Propagation

Seed germinates in 7–20 days. Pre-treatment improves germination (see page 18). Cuttings strike readily.

Cultivation and uses

This plant does not survive in gardens when weather becomes hot. It can be grown in tubs kept in cool spots. Flower-heads wire well, but if air-dried the stems should be lacquered to maintain stiffness.

Distribution and habitat

Vic. Occurs only on Mt. Buffalo where it grows amongst rocks.

Synonym

Helipterum albicans ssp. *albicans* var. *buffaloensis*.



Leucochrysum albicans ssp. *albicans* var. *buffaloensis* is endemic on Mt. Buffalo, Victoria

Similar species

Leucochrysum albicans ssp. *albicans* var. *albicans* differs in having intermediate bracts ovate to oblong, obtuse to acute.

Leucochrysum albicans* ssp. *albicans* var. *tricolor

PERENNIAL

tricolor — having three colours, referring to the flower-head

10–50 cm high ♦ 10–50 cm wide

Hoary Sunray

White



***Leucochrysum albicans* ssp. *albicans* var. *tricolor* has white or yellow inner bracts**

A beautiful, small perennial herb with woolly stems, branching at and above the base. Silver-green leaves, 20–120 × 1–4 mm, are linear to filiform or oblanceolate, and covered with woolly hairs. Solitary flower-heads, 2–3.5 cm across, are held on almost leafless stalks at the ends of the stems. Outer bracts are straw-coloured to deep reddish-purple. Inner bracts vary; they may open white or open yellow and fade to white. Together with the reddish-purple outer bracts this colour variation has led to the varietal name, *tricolor*. Fruit, 2–3 mm long, is obovoid, curved, white to pale brown and warty.

***Leucochrysum albicans* ssp. *albicans*
var. *tricolor* has a pappus united
in a collar at the base**



Flowering period

Sept/Mar in cultivation and in the wild.

Propagation

Seed germinates in 7–20 days. Pretreatment improves germination (see page 18). Sow seed in late autumn and protect seedlings from winter rain until planting out in spring. Cuttings strike readily and good forms can be renewed by this means.

Cultivation and uses

An attractive garden and tub plant which often behaves as an annual in moist garden situations. When planted in well-drained soil

and kept fairly dry, plants usually survive for more than one season. Mulch with pebbles or stones to keep roots cool in hot weather. Flowers dry and wire well.

Distribution and habitat

NSW, ACT, Vic, Tas. Occurs in drier, often stony grasslands and lightly wooded areas.

Synonym

Helipterum albicans ssp. *albicans* var. *incanum*.

Similar species

Leucochrysum albicans ssp. *albicans* var. *albicans* differs in having yellow flower-heads.

Leucochrysum albicans* ssp. *alpinum

alpinum — from alpine areas

Alpine Sunray

PERENNIAL

10–15 cm high ♦ 10–50 cm wide

White

In cultivation a spreading perennial herb with woolly new stems which become woody with age. Soft, felted leaves, 20–100 × 10–15 mm, are

obovate or oblanceolate, thick, silvery white and clustered near the base of the flower stems above withered leaves from previous seasons. Solitary



***Leucochrysum albicans* ssp. *alpinum* forms colonies in alpine areas**

flower-heads, 2.5–4 cm across, at the tips of stems have bronze to deep pink outer bracts and glistening white inner bracts. Its appearance is quite different from other members of the *L. albicans* complex. Fruit, about 3 mm long, is obovoid, curved, warty and pale brown.

Flowering period

Dec/Jan in cultivation; Dec/Mar in the wild.

Propagation

Seed germinates in 7–20 days. Cuttings strike readily.

Cultivation and uses

A difficult species for home gardens but has been grown in Melbourne when kept moist

in well-drained, composted, sandy soil with afternoon shade. It performs reasonably well in tubs of moist composted soil. Easier to grow in alpine or montane districts. Flowers dry and wire beautifully.

Distribution and habitat

NSW, ACT, Vic. Occurs on peaty soils among rocks in alpine areas.

Synonym

Helipterum albicans ssp. *alpinum*.

Similar species

Leucochrysum albicans ssp. *albicans* var. *tricolor* differs in having much narrower leaves which are less hairy.

Leucochrysum fitzgibbonii

fitzgibbonii — after E.G. Fitzgibbon, 19th Century town clerk of Melbourne

Glandular Sunray, Fitzgibbons Daisy

ANNUAL

5–45 cm high ♦ 15–50 cm wide
White

An attractive annual herb, branching above the base with a few erect or ascending green stems, which are glandular-scabrous and woody near the base. Dark green leaves, 10–45 × 1–5 mm, are linear, slightly stem-clasping and also glandular-scabrous. Solitary terminal flower-heads, 1.5–2.5 cm across, have reddish-brown outer bracts and white, occasionally pinkish, intermediate bracts. Fruit, 1.5–2 mm long, is cylindrical, greyish-brown and furrowed.

Flowering period

Oct/Jan in cultivation; July/Nov in the wild.

Propagation

Seed germinates in 5–15 days with pretreatment (see page 18).

Cultivation and uses

The Study Group has not grown this species successfully in the ground, but a few have been trialled in containers. Although some plants in pots grew and flowered quite well in sunny positions, others succumbed to Melbourne's climate. Further trials in warmer drier climates might prove worthwhile as it is a beautiful and unusual small daisy. Flowers dry and wire very well when picked in bud.

Distribution and habitat

SA, WA, NT. Found in sand, sometimes near sandstone outcrops, or in clay-loam soils in scattered mallee scrubland.

Synonym

Helipterum fitzgibbonii.



Leucochrysum fitzgibbonii on a stony outcrop in mallee

Leucochrysum graminifolium

graminifolium — having grass-like leaves

PERENNIAL

10–20 cm high ♦ 10–30 cm wide

Yellow

In cultivation an erect perennial herb developing a woody base and branches. Light green leaves, 10–120 × 1–2 mm, are filiform, revolute, almost glabrous and crowded on the branches, giving the plant a grass-like appearance. Solitary flower-heads, 2–3 cm across, are held on slender stalks at the ends of branches, and have pale brown outer bracts and bright yellow inner bracts. Fruit, about 3 mm long, is obovoid, curved, greyish and smooth.

Flowering period

Sept/Jan in cultivation and in the wild, but some flowering may also occur in other months.

Propagation

Seed has not been available to the Study Group for germination trials but has germinated in

7–15 days in the course of research work (von Richter 1996). Cuttings strike readily and grow on well.

Cultivation and uses

Plants prefer well-drained open situations and perform well in tubs. Flowers dry and wire well.

Distribution and habitat

NSW. Occurs only in a small area where it grows on sandstone outcrops.

Synonyms

Helipterum graminifolium, *H. albicans* var. *graminifolium*.

Similar species

Narrow-leaved variants of *Leucochrysum albicans* differ in having woolly leaves with flat margins.

Leucochrysum molle

molle — probably after an unidentified person named Molle, as the lectotype was found at Molle's Plains, NSW

Golden Paper-daisy, Hoary Sunray, Soft Sunray

ANNUAL

20–50 cm high ♦ 20–50 cm wide

Yellow

In cultivation a very pretty annual herb with erect to ascending, woolly stems branching at and above the base. Grey-green leaves, 15–100 × 1.5–10 mm, are linear or oblanceolate and decrease in size up the stem. Solitary, bright yellow flower-heads, 1.5–2 cm across, are borne in profusion on long leafless stalks at the end of stems. Fruit, about 3 mm long, is obovoid, curved, brown and usually prominently warty.

Flowering period

Sept/Feb in cultivation; Aug/Dec in the wild.

Propagation

Seed germinates in 6–21 days but may need special treatment to break dormancy (see page 18). Best sowing time is early autumn, but seedlings should be kept in a warm, sunny spot away from winter rain for planting out in spring. Although cuttings strike readily, plants grown from seed perform better.



Fruits of *Leucochrysum molle* are usually markedly warty



Leucochrysum molle grows on red soils in inland areas

Cultivation and uses

Plants are suitable for temperate climates and will withstand some frost. They grow in most well-drained soils, preferring warm sunny situations. Plants are suitable for tubs and for mass planting in the ground. Prune off old flowers to encourage extended flowering. Fresh flowers dry and wire well.

Distribution and habitat

Qld, NSW, Vic, SA. Occurs in inland areas,

usually on heavier loam and clay soils in lightly wooded locations.

Synonym

Helipterum molle.

Similar species

Leucochrysum albicans ssp. *albicans* var. *albicans* is often difficult to distinguish. It is a perennial, has much narrower leaves, and the fruits are normally less warty.

Leucochrysum stipitatum

ANNUAL

stipitatum — having a stalk, referring to the inner bracts

30–60 cm high ♦ 30–60 cm wide

Desert Paper-daisy, Sand Sunray, Spinifex Everlasting, Woolly Sunray

Yellow

In cultivation this species behaves as a short-lived perennial. In the wild it is an erect to ascending annual herb. Woolly grey-green stems, sometimes branched, are woody at the base. Grey-green leaves, 20–100 × 2–6 mm, are narrow-linear, and woolly. Solitary flower-heads, 1.5–3 cm across, are borne on long, sparsely hairy stalks at the ends of the stems. Outer bracts are pale and needle-like, inner bracts are ovate, bright yellow, on stalks to 8 mm long. Fruit, to 3 mm long, is oblong, curved, golden-brown and smooth to warty.

not successful as the bracts reflex against the stems.

Distribution and habitat

Qld, SA, WA, NT. Usually growing on sand in semi-arid areas.

Synonym

Helipterum stipitatum.

Flowering period

Dec/Feb in cultivation; July/Sept in the wild.

Propagation

Seed germinates in 5–20 days. Pretreatment improves germination (see page 18). Cuttings strike readily but plants grown from seed make better garden plants.

Cultivation and uses

Plants need well-drained sunny situations in warm climates for best results. Fresh flowers are attractive but dried and wired flowers are

***Leucochrysum stipitatum* grows on sand in semi-arid areas**



Rhodanthe

Rhodanthe is derived from the Greek *rhodo* (rose-coloured) and *anthes* (flower).

The genus contains 46 species, the majority of which are annual herbs and the remainder perennials, sometimes short-lived. Plants are usually hairy, rarely glabrous. Leaves are entire, mostly alternate. Heads are single or in clusters; the involucre bracts are papery, have flattened claws, and occur in rows. Inner bracts often have white or coloured radiating blades. The body of the fruit is hairy, the density of the hairs being variable. Pappus bristles are barbed or plumose.

Rhodanthe is endemic in Australia. Species are widely distributed, occurring in alpine and coastal regions but the majority are of semi-arid origin. In years of good autumn or winter rainfall the annuals germinate quickly to cover vast tracts of inland Australia with floral carpets of white, pink and yellow. *Rhodanthe chlorocephala*, *R. charsleyae* and *R. stricta* are among the major contributors.

Some *Rhodanthe* species have been in cultivation in England and Europe since the 1850s, notably *R. manglesii* (as it was known at that time) and *R. chlorocephala* ssp. *rosea* (then called *Acroclinium roseum*). As seed merchants in Australia offered a range of forms, so these species became fashionable for garden display, for drying or as cut flowers. Other species offered in the past were *R. corymbiflora* and *R. humboldtiana*. Over the years demand for a greater range of everlasting daisies has waxed and waned. Commercial seed companies now offer nine species of *Rhodanthe*. At least eight additional species are worthy of development for cultivation.

Rhodanthe species make colourful massed displays and are especially useful in new garden beds. They may be tucked into small spaces to add colour, and some species make attractive container subjects. Their long-lasting qualities provide additional value as cut or dried flowers. Cultivation is not difficult as long as plants receive sun for several hours each day, the soil is well drained



***Rhodanthe anthemoides* 'Paper Cascade' has ruby red pointed buds**

and well fertilized, and adequate watering is ensured. Regular picking of flowers increases the number of flowers produced and lengthens flowering periods.

Propagation is usually from seed although cuttings strike easily. Seed collected from the wild is often difficult to germinate due to dormancy and other factors (see Chapter 3). Seed companies stock some seed which has been collected from the wild. Seed of selected forms is usually provided by cultivated crops. Such seed has a high percentage germination and germinates in 5–20 days.

Rhodanthe species do not appear to hybridize readily. In cultivation the only hybridization reported has been between the two subspecies of *R. diffusa*, and between the dwarf white and the tall pink forms of *R. chlorocephala* ssp. *rosea*. Paul Wilson reported (pers. comm.) that he had only noted one case of possible natural hybridization and that was between *R. oppositifolia* ssp. *oppositifolia* and *R. polygalifolia* in the Gawler Ranges, South Australia, which is the only place where the two species grow in the same general area. There is variation in the chromosome numbers within *Rhodanthe*, as determined by Turner (1970), for example, $n = 5$ for *R. maryonii*, $n = 8$ for

R. humboldtiana, $n = 10$ for *R. spicata*, $n = 11$ for *R. polygalifolia*, and $n = 14$ for *R. rubella*. This variation may have a bearing on the inability of species to hybridize.

Wilson (1989), Anderberg (1991) and others had pointed out that species in the genus *Helipterum* Lindley, in the strict sense, do not occur in Australia. Wilson (1992b) proposed a reclassification of species in *Helipterum* and related genera. The largest genus in the revised classification is *Rhodanthe*, which now contains most of the Australian species previously included in *Helipterum*.

Rhodanthe contains species which often vary in the shape or form of their structural characters. Eleven sections have been described (Wilson 1992b) in which species with similar characters (such as the appearance of the seed, or distinctive style apex and anthers) are grouped. Some of these sections may later be reclassified as new genera.

Botanists and naturalists are still collecting new species. One such species collected by P.S. Short in 1983 may be a new species of *Rhodanthe*. It is an open herb to 50 cm high, branching sparsely in the top half. The leaves are sessile, linear, and slightly sticky, with the decurrent base



***Rhodanthe anthemoides* 'Paper Cascade' is an excellent pot or hanging basket subject**

forming a narrow wing down the stem. The flower-heads are yellow with papery outer bracts. It is known provisionally as *Rhodanthe* sp. Overlander

because it was collected in the vicinity of the Overlander Roadhouse (WA). Further work will determine the identity of this species.

Rhodanthe anthemoides unbranched form

PERENNIAL

anthemoides — resembling wild chamomile, *Anthemis*
Chamomile Sunray

25–50 cm high ♦ 20–60 cm wide
White



Rhodanthe anthemoides growing near Mt. Selwyn, New South Wales

An attractive tufted perennial displaying great variation. Unbranched stems are glabrous to slightly hairy. Leaves are sessile, blue-green to green or grey-green, 10–25 × 1–6 mm, linear, narrow-oblong or lanceolate, with smooth or toothed margins. Upper leaf surfaces are pitted, each pit containing a sessile globular gland. Septate hairs may also be present. Leaves vary in thickness and smell of chamomile when crushed. Buds are pale brown (rarely pink or red). Flower-heads, 1–3 cm across, occur singly at the tips of stems. Outer bracts have a dark vertical line in the centre. Fruits are brown or black and silky-hairy, but variation between forms can be seen in size and degree of hairiness.

The unbranched forms of *R. anthemoides* differ so markedly that separate descriptions of good forms for gardens have been included:

- ♦ Queensland. Plants to 50 cm or more, with erect stems (later spreading) and grey-green leaves. Buds are pale brown and flower-heads 1.5–3 cm across are borne almost all the year.
- ♦ Liverpool Range (NSW). Plants are 30–40 cm high with erect and ascending stems, and green lanceolate leaves. Buds are pale brown or soft pink, heads are white, 1–2.5 cm across. Plants flower almost all the year. Basal cuttings strike readily if taken in spring.
- ♦ North-west slopes of NSW. Plants are 25–35 × 60 cm with ascending stems and narrow

grey-green leaves. Buds are wine-red and heads are 1–2 cm across. The outstanding feature is that the heads appear candy-striped red and white from above because the outer radiating bracts are deep red on both sides. Heads wire beautifully.

- ◆ **Organ Pipes (Vic).** Delicate plants to 30 cm, narrow grey-green leaves, and dainty white heads 1–1.5 cm across. This form germinates very well from seed and its neat shape can be restored by pruning after each flush of flowering.
- ◆ **Whitlands (North-east Vic).** Plants to 45 cm high form more erect, narrow tufts. Dainty leaves are blue-green. Buds are pale brown or straw-coloured, heads are 2–3 cm across with blunt-tipped bracts. Plants flower through most of the year.
- ◆ **Alpine or subalpine.** These forms also differ slightly depending on their origin. In general the plants grow 20–30 cm high, have erect, ascending or decumbent stems and narrow thick leaves which may not have the typical chamomile smell. The heads, 1.5–2.5 cm across, are top-shaped rather than hemispherical. Plants flower in summer. Adequate watering and root protection are essential in hot weather.

If these forms are grown together in gardens they will hybridize with each other. The seed collected yields seedlings which usually display variation.

Flowering period

Flowering times vary with the form. In cultivation, alpine or subalpine forms flower over summer, montane and lowland forms flower intermittently throughout the year. In the wild the flowering period is spring to summer.

Propagation

Seed germinates in 6–20 days and percentage germination varies from 20–80% from seed stored at RT. Best germination is from seed 1–2 years old stored at 4°C, but 40% germination has been obtained from seed 1 month old. Pretreatment is not necessary. Seed may

be sown at any time of year but is slower to germinate in winter. Unbranched forms self-sow vigorously if enough plants of seedling origin are grown close together. Cuttings do not strike readily in some forms. Success has been reported from cutting material containing a portion of the basal cambium layer if the parent plant is grown in soil, but not if it is from a soil-less potting mix.

Cultivation and uses

Plants grow well in most soils, are best suited to part sun, and need root protection. Soils should not be allowed to dry out. Constant picking of stems at the base maintains plants in good condition for at least 12 months. If this is not possible plants often become untidy. It is easier to remove them and depend on natural regeneration for replacement rather than to prune them. If pruning is undertaken wait until new growth appears and follow pruning with an application of fertilizer. Most forms withstand moderate frosts. This pleasing long-flowering species looks well in drifts or groups, and in containers. Vase life is 2–3 weeks. Air-dried flower stems are not successful but wired heads last for years.

Distribution and habitat

Qld, NSW, Vic, Tas, SA. (The last South Australian record was made in 1897 from Mt. Lofty and the southern Flinders Ranges.) Widespread in eastern Australia. Grows in alpine and subalpine areas, often on moist rocky escarpments. In Tasmania it occurs in montane grasslands, and on river plains in Queensland.

Synonym

Helipterum anthemoides.

Similar species

Rhodanthe diffusa ssp. *leucactina* is distinguished by its annual habit. The leaves are thinner and, although globular glands are present, these glands are not embedded in pits. ◆ *R. stuartiana* has narrower dark green leaves without globular glands.

Rhodanthe anthemoides branched form

anthemoides — resembling wild chamomile, *Anthemis*
Chamomile Sunray

PERENNIAL

10–30 cm high ♦ 20–80 cm wide
White



This branched form of *Rhodanthe anthemoides* known as 'Paper Baby' is colourful in late winter and spring

Charming small shrublet with a dense habit. Stems branch to form lateral branchlets 5–10 cm long. Leaves are grey-green or blue-green, 20–25 × 3–4 mm, thin, linear-lanceolate to oblanceolate. They smell of chamomile when crushed. Flower-heads are hemispherical, 1.5–3 cm across, borne in profusion at the tips of branchlets. Inner bracts have white radiating blades, the outermost often wine-red beneath. Outer bracts are transparent or straw-coloured with a dark central line. Black fruits are covered with silky white hairs.

Branching forms in cultivation also vary and are separately described:

♦ *R. anthemoides* 'Paper Baby'. This cultivar has been popular for many years. Plants have a dense, bushy habit, grow 20–30 × 50–80 cm. Leaves are grey-green. Wine-red or pink rounded buds form in May/June. Flower-heads are cup-shaped, 1.5–2 cm across, the broad

white inner bracts having blunt tips and pleated surfaces.

♦ *R. anthemoides* 'Paper Cascade' PBR (Plant Breeders' Rights). This beautiful cultivar was released in 1991. It is a low-growing, spreading perennial, 20–30 × 50–80 cm, with a cascading habit. Leaves are blue-green. Ruby-red pointed buds are long, narrow and pendent. Flower-heads are star-shaped, 2–3 cm across, the narrow white inner bracts having pointed tips.

♦ *R. anthemoides* 'Paper Star' PBR. This cultivar was bred in Australia and first released in 1993. It is a round cushion, 15–25 × 20–40 cm, with erect branching stems. Leaves are grey-green and very aromatic. White buds form in May/June. Flower-heads are 2–2.5 cm across, star-shaped, the white inner bracts being narrow and pointed.

- ◆ *R. anthemoides* 'Sunray Snow' PBR provisional protection. This cultivar was released in 2001. It is a neat cushion with aromatic grey-green leaves. Pointed pink buds form in winter, opening to white, star-shaped flower-heads. It is said to last well as an indoor plant.

If these branched forms are grown close together they hybridize with each other. If seed is collected and sown the resultant seedlings exhibit variation. No hybridization, however, has been observed between the branched and the unbranched forms in cultivation.

Flowering period

In cultivation 'Paper Baby' and 'Paper Star' flower July/Sept, and 'Paper Cascade' flowers about six weeks later. In the wild the original branching form usually flowers Oct/Dec.

Propagation

If enough plants of seedling origin have been grown close together, seed is usually ready for collection in Oct/Nov in temperate climates. Collect seed when it appears at the perimeter of the disc centres. This generally occurs before the head puffs. Good germination

(70–90%) in 8–20 days has resulted from seed 2–15 months old when stored at RT. Seed retains viability longer if it is stored at 4°C. No pretreatment is necessary. Cuttings of new growth strike readily.

Cultivation and uses

These small plants are best suited to dappled shade or part sun. They prefer rich soils, and need moisture for good growth. Prune off old growth when new shoots are beginning to grow strongly, and then fertilize and water well. Prune and fertilize lightly again in mid-autumn. They are excellent plants for containers and rockeries, and for individual planting or massing in gardens. The cascading habit is ideal in hanging baskets or trailing over walls. All three forms have a vase life of 3–4 weeks. 'Paper Baby' can be dried, and wired if the stems are stout enough. 'Paper Cascade' dries and wires well but the stems of 'Paper Star' are too narrow for wiring.

Distribution and habitat

NSW. Branching forms occur in the New England area, growing on moist cliff faces.

Rhodanthe ascendens

ascendens — rising upwards, referring to the stems

ANNUAL

10–15 cm high ◆ 15–30 cm wide
Yellow

A recently described small annual, branching at the base. In cultivation woolly-hairy stems are ascending and erect. Leaves are grey-green, sessile, linear to narrow-obovate, 10–35 × 3–5 mm, moderately woolly on both sides. Small, bright yellow flower-heads on short stalks are borne in terminal clusters, 1–1.5 cm across. Individual heads are 3 mm across and 4–5 mm long. The outer bracts are glossy yellow, cream or pinkish-purple, not radiating. Fruits are brown, 1 × 0.5 mm, moderately covered with short hairs. The pappus has white barbed bristles.

Flowering period

Aug/Oct in cultivation; July/Sept in the wild.

Propagation

Germination is usually poor (less than 5%). Pretreatment (see page 18) increases germination slightly. Best results have been achieved by sowing seed *in situ* after pretreatment. Sow in late winter or early spring.

Cultivation and uses

Rhodanthe ascendens grows well in containers. Although a bright, dainty herb in its natural habitat it is unlikely to excite gardeners. It

could be used as pressed specimens for gift cards. Vase life is 7–10 days.

Distribution and habitat

WA. This species has a restricted occurrence in the area near Gascoyne Junction. Grows on clay soils in open situations.

Similar species

Rhodanthe nullarborensis occurs only in the Nullarbor region, and is distinguished by its smaller heads and narrower leaves. The pappus bristles have short feathers rather than being barbed.

Rhodanthe battii

battii — after J.D. Batt, teamster from Balladonia, and plant collector for the Melbourne Herbarium

ANNUAL

20–25 cm high ♦ 5–10 cm wide
Yellow-Green

In cultivation an erect or sprawling, malodorous annual. Reddish stems bear glandular hairs and sparse woolly hairs, and branch above the base. Glandular leaves, 10–50 × 2–10 mm, are stalked below, decreasing in size up the stem and becoming sessile. Cylindrical flower-heads on very short stalks are clustered in spikes at the tops of the stems. Outer bracts are acute, green; inner bracts are papery and do not radiate. Fruits are white, silky-hairy, and the pappus is evenly feathery. It is close to *R. pollackii* and may be a southern variant (P.C. Wilson pers. comm.).

Flowering period

Sept/Feb in cultivation; Aug/Sept in the wild.

Propagation

Seed germinates poorly in 5–40 days. Pre-treatment with SISP improves germination. Best sown from autumn to late winter.

Cultivation and uses

The unpleasant smell emanating from *R. battii* would exclude it from gardens or containers. It is neither sufficiently colourful nor unusual for use as a dried flower.

Distribution and habitat

WA. Found inland from Kalgoorlie to west of Meekatharra in sand or on rocky soil.

Synonym

Helipterum battii.



Silky-hairy fruit of *Rhodanthe battii* showing a ring-like carpodium

Similar species

Rhodanthe charsleyae also has heads in spikes and may grow with *R. battii* but plants are almost hairless, the heads are top-shaped, and the outer bracts are blunt and yellow. ♦ *R. spicata* has dense white woolly hairs on the upper stems, and narrow sessile leaves. Flower-heads are smaller and the outer bracts are yellow or red-brown.

Rhodanthe charsleyae

charsleyae — after Fanny Charsley, 19th Century
botanical artist

Floodway Ephemeral

ANNUAL

20–35 cm high ♦ 15–20 cm wide
Yellow

A pleasing upright or ascending annual with robust, almost glabrous, branching stems. Leaves are green, almost glabrous, 10–70 × 1–10 mm, narrow-oblong or elliptical, the lowest often stalked. Bright yellow, faintly scented flower-heads, each 5–7 mm across, are clustered at the tips of branchlets to form a spike of flowers. The bracts do not radiate. Fruits are white, silky-hairy.

Flowering period

Sept/Nov in cultivation; Aug/Sept in the wild.

Propagation

Wild seed germinates poorly in 4–60 days. Storage at RT for 12–24 months and pretreatment improve germination (see page 18). Seed is commercially available. Sow in autumn or late winter in temperate climates.

Cultivation and uses

Plants grow best in warm climates. Suitable for massing in gardens or tubs. It prefers warm, open situations in well-drained soils. To encourage stability cut back stems when planting out. Prune towards the end of the flowering season to stimulate a second flowering. Moderately free from insect attack. Flowers last 1–2 weeks in water and may be air-dried.

Distribution and habitat

Qld, SA, WA, NT. Occurs in inland Australia in open herbfields, often on floodplains. Usually grows on loam or sandy loam.

Synonym

Helipterum charsleyae.



***Rhodanthe charsleyae* is an ephemeral of the floodways of the semi-arid interior**

Similar species

Rhodanthe battii is glandular-hairy, the heads are cylindrical and the outer bracts are green. ♦ *R. spicata* has narrow sessile leaves and white woolly stems, more woolly in the upper parts. Heads are smaller and fewer in number.

Rhodanthe chlorocephala ssp. *chlorocephala*

chlorocephala — with a green head

The species is described as a herb to 15 cm high, with leaves to 5 mm long. The blades of the inner bracts are 5 mm long, broad-ovate, and are metallic green (at least when dried). Fruits are densely silky-hairy and the pappus bristles (10–15) are feathery with clustered cilia at the tips.

James Drummond, plant collector and botanist, collected specimens of the original plant population from an unknown locality while he was on one of his collecting trips in 1846. It is thought that they may have been collected from the Moore

River area. Drummond sent the specimens back to Sir William Hooker, Director of Kew Botanical Gardens, in 1847 as part of his fourth collection of specimens. In his revision of *Rhodanthe* Wilson (1992*b*) applied the epithet ssp. *chlorocephala* to the form represented by the type collection. The type specimen is the original specimen from which a description of a new species is made and published. The Study Group has not trialled ssp. *chlorocephala* because it has not been found since Drummond's original collection.

Rhodanthe chlorocephala ssp. *rosea*

ANNUAL

rosea — rosy, referring to the bract colour of some forms

15–70 cm high ♦ 10–30 cm wide

Rosy Sunray, Pink Sunray, Pink and White Everlasting, Pink Paper-daisy

Red, Pink, White

This beautiful annual has erect or ascending, usually unbranched, glabrous stems. Leaves are grey-green, linear to narrow-oblong, 10–20 × 2–4 mm. Under magnification small globular sessile glands embedded in pits can be seen on the upper surfaces. Flower-heads are white or shades of red and pink, 1.5–6 cm across, with black or yellow disc centres. Fruits are 3–4 × 2 mm, densely covered with long white silky hairs. The pappus bristles are yellow, barbed below and feathery above, with clusters of yellow or blackish cilia at the apex.

A dainty variant from Balladonia (WA) differs markedly from the tall forms grown from commercial seed. It has a profusion of ascending stems to 20 cm, narrow blue-grey leaves, and pale pink buds opening to white flower-heads, 1.5–2 cm across. Similar small forms with white heads from other areas of Western Australia have been collected and grown by Study Group members. These forms have hybridized with the more common tall forms when grown together. Delightful variations



Fruit of *Rhodanthe chlorocephala* ssp. *rosea* is covered with long white hairs. Pappus bristles are feathery and tufted at the tips

of size, habit and colour have resulted. Another variant with much-branched stems has been grown from commercial seed. The habit is less neat but more flower-heads are produced.

Flowering period

In cultivation *ssp. rosea* flowers for 8–10 weeks from mid-winter to early summer. The time of flowering may be varied by sowing at different times. In the wild this species flowers between July and October.

Propagation

Commercial seed and seed of selected forms is readily available. It germinates very well (70–90%) in 4–10 days without pretreatment. Seed of the tall form needs a 3 month after-ripening period to overcome dormancy. Seed of the small white forms requires a period of 12–24 months for after-ripening. It will then germinate well (60–70%) in 7–14 days after pretreatment (see page 18). Seed of hybrids between the two forms yield 60% germination after 6 months storage at RT but pretreatment is necessary to achieve this percentage.

Cultivation and uses

This rewarding and easily grown annual is best suited to sunny situations in well-fertilized soils. Although it is relatively drought tolerant it responds to extra watering in hot weather. Heavy frosts will damage young seedlings. It is an excellent species for massed display, for grouping, or for containers, and it self-sows readily. Vase life is 2–3 weeks. It dries well but is better wired for flower arrangements. Pick in bud or when flower-heads first open.

Distribution and habitat

SA, WA. Grows on sand hills, clay pans and swampy areas.

Synonyms

Helipterum roseum, *Helipterum roseum* var. *nigropapposum*, *Helipterum troedelii* var. *patens*.

Similar species

Rhodanthe rubella has smaller heads (1–1.6 cm across), and stalked glandular hairs on leaves and stems. ♦ *Lawrencella davenportii* has aromatic, glandular-hairy, green leaves, often in a basal clump. The fruits are much longer and are not silky-hairy.



Bracts of *Rhodanthe chlorocephala ssp. rosea* are often rosy pink



Rhodanthe chlorocephala ssp. rosea is an excellent species for massed display

Rhodanthe chlorocephala ssp. *splendida*

splendida — splendid

Splendid Everlasting, Silky White Everlasting, Showy Sunray

ANNUAL

15–60 cm high ♦ 10–30 cm wide

White, Cream



Rhodanthe chlorocephala ssp. *splendida* is widespread in Western Australia

In cultivation this lovely annual is daintier than ssp. *rosea*. Unbranched stems are erect and ascending. Grey-green leaves are linear, 5–25 × 1–3 mm. Under magnification small sessile globular glands can be seen embedded in pits on the upper leaf surfaces. Nodding pear-shaped buds open to white or cream flower-heads, 3.5–7 cm across. The blades of the inner bracts often have purplish markings at the base. Fruits are 3–4 × 2 mm, densely covered with silky white hairs. The pappus has 10–12 feathery white bristles with clusters of cilia at the tips.

Flowering period

June/Feb in cultivation; July/Oct in the wild.

Plants flower for 6–20 weeks in cultivation.

Propagation

Commercial seed is available but germination is variable unless seed is pretreated (see page 18). Seed collected from gardens and stored at RT for 18–30 months germinates moderately

well (40–70%) in 7–14 days with pretreatment. Best sowing times are autumn/winter. Seedlings tend to collapse in unaccustomed hot weather.

Cultivation and uses

Subspecies *splendida* should be grown in sun or part shade in enriched soils with good drainage. Plants are not frost tolerant and are prone to aphid attack. When grouped in gardens, rockeries or containers these plants are most ornamental. Vase life is 6–10 weeks. It is easy to wire or dry but the bracts are fragile.

Distribution and habitat

WA. A widespread species growing on loams, sands and clays.

Synonym

Helipterum splendidum.

Similar species

Rhodanthe cremea has woolly hairs on the stems just below the heads; the disc centres are brown with cream corollas and style arms.

Rhodanthe citrina

citrina — lemon-coloured

Pale Immortelle, Pale Everlasting

ANNUAL

20–30 cm high ♦ 15–20 cm wide

Yellow, White

In cultivation *R. citrina* is a bushy annual, sparsely woolly or glabrous. Leaves are green, linear to narrow-oblong, 10–60 × 1–4 mm, with bases slightly stem-clasping. Bright yellow or white radiating flower-heads are in clusters 2–5 cm across. Each head is 1–1.5 cm across when fully open. Fruits are narrowed at the neck (or beaked), pale brown, 1 × 0.5 mm, with short hairs on the body.

Flowering period

Depending on the time of sowing, plants flower for a period of 3–6 months between April and January in cultivation; Aug/Nov in the wild.

Propagation

Moderate germination (40–50%) in 3–15 days has been achieved from seed stored at RT for 12–24 months. Pretreatment with SISP increases germination. Seed harvested from cultivated plants germinates more readily. Best sowing times are early autumn or spring. Seed is occasionally available from specialist seed companies.

Cultivation and uses

Best suited to warm temperate climates. Well-drained soils in sunny situations are essential. It makes a handsome massed display and is colourful in rockeries and containers. *R. citrina* dries well and vase life is about 4 weeks.

Distribution and habitat

NSW, SA, WA, NT. Grows on sands, gravels and granitic soils.

Synonym

Waitzia citrina.

Similar species

Waitzia nitida has larger heads (2–3.5 cm), and fewer heads per cluster.



Rhodanthe citrina fruits showing variation in the beak



Rhodanthe citrina has clusters of yellow flower-heads

Rhodanthe collina

collina — living on low hills
Yalgoo Daisy

ANNUAL

10–30 cm high ♦ 10–20 cm wide
White



Rhodanthe collina is a newly described species

This is a newly described annual, branching at and above the base. Stems are upright and hairy to the naked eye. Leaves are blue-green, 5–15 × 1–2 mm, linear to oblanceolate, glabrous above. When magnified, sessile globular glands can be seen on the undersurface, and septate hairs on the mid-rib. Iridescent gold buds open to white radiating flower-heads, 1–2.5 cm across, produced singly at the tips of branches. Fruits are 2–3 × 1 mm, black, slightly curved, and covered with stiff white hairs. The pappus has 16–18 bristles.

Flowering period

Aug/Oct in cultivation and in the wild.

Propagation

Seed germinates well (>80%) if stored at RT for 9–18 months but pretreatment is also

necessary to achieve this high percentage (see page 18). Best sowing time is autumn. Protect seedlings in winter.

Cultivation and uses

Rhodanthe collina prefers well-drained soils and sunny conditions. It looks fresh and pretty when massed in rockeries or containers. Vase life is 3–4 weeks, and flower stems air-dry well. Stems are difficult to wire.

Distribution and habitat

WA. Occurs in the Yalgoo district on low hills of quartzite.

Similar species

Rhodanthe diffusa ssp. *leucactina* has weaker stems. The septate hairs on the leaves are longer and more numerous. It does not occur in WA.

Rhodanthe condensata

condensata — crowded closely together, referring to the dense clusters of flower-heads

ANNUAL

10–25 cm high ♦ 15–25 cm wide
White/Yellow



***Rhodanthe condensata* is found on coastal sands in the Shark Bay area of Western Australia**

Attractive low-growing annual in cultivation. Woolly stems branch at and above the base. Sessile, dark green leaves, 10–40 × 2–6 mm, are linear or narrow-oblong and woolly on both sides. Margins are often wavy. Pure white flower-heads with frilly inner bracts are crowded together in clusters, 1.5–3 cm across, at the tips of branchlets. Each head contains 10–13 yellow florets, all fertile. Fruits are brown, 1.5–2 mm long, sparsely covered with short white hairs.

Flowering period

Sept/Nov in cultivation; Aug/Oct in the wild.

Propagation

Seed germinates poorly in 20–25 days. Store at RT for 6 months before sowing. Best sowing time is autumn or spring, and seedlings need protection in cold wet conditions.

Cultivation and uses

This annual has not been tried in cultivation

often. An open sunny situation in well-drained soil is essential. The bright yellow disc centres have almost as much significance as the white bracts. The compact habit, and the contrast between leaves and flowers make it a pleasing subject for small containers. Flower stems are very short but they air-dry well.

Distribution and habitat

WA. Occurs between Murchison River and Shark Bay on coastal sands.

Synonym

Helipterum condensatum.

Similar species

Rhodanthe psammophila is a newly described species, often mistaken for *R. condensata*. It is distinguished by its tall erect habit (to 50 cm), and by each head having five florets (only one being fertile). *R. psammophila* occurs north of the natural habitat of *R. condensata*.

Rhodanthe corymbiflora

corymbiflora — flower-heads arranged in corymbs
Small White Sunray, Grey Sunray, Small White Paper-daisy

ANNUAL

10–40 cm high ♦ 10–20 cm wide
White



Rhodanthe corymbiflora carpets large areas in the Wimmera in Victoria and is very attractive in gardens

In cultivation a silver-foliaged annual, attractive when massed. Leaves to 4 cm, soft, sessile, linear to lanceolate, white-woolly on both sides. Flower-heads, 1–2 cm across, are arranged in loose clusters at the tips of stems. The inner bracts are white and radiating, and the outer bracts are shining, yellow-green. Fruits are silky-hairy, and pappus bristles are evenly feathery.

Flowering period

Aug/Nov in cultivation; June/Oct in the wild.

Propagation

Wild seed germinates moderately well (>50%) in 7–20 days, but seed harvested from cultivated plants achieves >70% germination. Pretreatment improves germination but is not necessary. After-ripening dormancy lasts about 6–18 months. Best sowing time is autumn to early winter.

Cultivation and uses

Plants prefer open situations in sun or part sun, and flower longer if soil is not allowed to dry out. Fertilizer improves growth. Plant in groups and protect from aphid attack. Good cut flower and air-dries quite well. Pick while still in bud.

Distribution and habitat

Qld, NSW, Vic, SA. Usually grows in heavy soils in various communities, such as open mallee with saltbush, black box and myall communities.

Synonym

Helipterum corymbiflorum.

Similar species

Rhodanthe gossypina has shorter heads (to 4 mm), shorter white blades on the inner bracts (3–4 mm), and black resinous hairs on the claws of the inner bracts. ♦ *R. floribunda* has white outer bracts. ♦ *R. microglossa* has shorter white blades on the inner bracts (1–2 mm).

Rhodanthe corymbosa

ANNUAL

corymbosa — abounding in corymbose clusters of flowers

25–40 cm high ♦ 10–25 cm wide

Corymbose Sunray

White

Erect or ascending annual, new to cultivation. Purplish branching stems have white woolly hairs. Leaves are linear, 15–60 × 1–3 mm, shiny green above, paler beneath. Flower-heads on short stalks are produced in terminal clusters, each cylindrical head being 3–4 mm across and 4.5–5 mm long. The outer bracts are shiny, straw-coloured or pinkish brown, and the inner bracts have white radiating blades to 1.5 mm. Fruits are brown with sparse short hairs. In the wild plants are smaller.

Flowering period

Oct/Nov in cultivation and in the wild.

Propagation

About 50% germination has resulted from seed stored at RT for 6 months. Pretreatment increases germination but is not necessary.

Cultivation and uses

This dainty annual has not been grown previously in cultivation but is proving attractive when massed in gardens and containers. It is best suited to morning sun or semi-shade, and its roots must be protected. Plants regenerate naturally in gardens. Cut flowers last 10–14 days in water and stems air-dry well.

Distribution and habitat

WA. Occurs in the south-west from Busselton to Northampton. Grows on limestone slopes, laterite escarpments and in granite areas, often under small trees.

Synonyms

Helipterum corymbosum, *Helipterum album*.

Similar species

Rhodanthe polycephala is distinguished by the absence of white radiating blades on the inner bracts.



Rhodanthe corymbosa is a dainty annual which is attractive in containers

Rhodanthe cremea

cremea — cream-coloured, referring to the colour of the inner involucre bracts

ANNUAL

15–35 cm high ♦ 10–25 cm wide
Cream, White

A beautiful, upright annual. Numerous stems arise from a basal group of glabrous, linear or narrowly obovate leaves. Stem leaves are 20–35 × 2–3 mm, and occur near the base. Cream or white heads, 3.5–5 cm across, are single at the tips of stems. Young buds are shining olive-green and purple, and bracts may have dark purple bands at the base. A few woolly hairs are present on stems for some distance below the heads. Disc centres are brown with cream corollas and style arms. Fruits are dark with long silky hairs on one face, short hairs on the other. Cream pappus scales narrow to feathery bristles with club-shaped clusters of hairs at the tips. As the fruits mature the fragile bristles tend to break off the scales. Plants are usually taller (to 50 cm) in the natural habitat, and heads may be up to 6 cm across.

Flowering period

July/Oct in cultivation; July/Sept in the wild.

Propagation

Seed germinates poorly when collected in the wild. It should be stored at RT for 12–24 months before sowing. Pretreatment increases germination (see page 18). Sow in autumn.

Cultivation and uses

This species is new to cultivation. It prefers warm, open situations in well-drained soils, and is suitable for grouping in containers or gardens. Guard against aphids. Flowers last 10–14 days when freshly picked. Heads may be wired or air-dried but the brown centre makes them less attractive than those of the similar *R. chlorocephala* ssp. *splendida*.



Immature fruit (left) and mature fruit of *Rhodanthe cremea*. The pappus bristles (attached to scales) break off easily

Distribution and habitat

WA. Occurs in an area from the south end of Hamelin Pool towards the North West Coastal Highway. Usually found in red sand.

Similar species

Rhodanthe chlorocephala ssp. *splendida* has spherical glands embedded in pits on the leaves. The heads have yellow disc centres (rarely black), and the fruits are densely covered with silky white hairs.



Flower-heads of *Rhodanthe cremea* (above) are very similar to those of *Rhodanthe chlorocephala* ssp. *splendida*



***Rhodanthe diffusa* ssp. *diffusa* carpets the ground near Lake Cargelligo, New South Wales**

Rhodanthe diffusa ssp. *diffusa*

diffusa — widely spreading

Ascending Sunray

ANNUAL

15–20 cm high ♦ 25–30 cm wide

Yellow

In cultivation an attractive, floriferous, neat annual with ascending stems. Leaves are blue-green, 10–25 × 1–5 mm, sessile, with transparent tips. Glands and short septate hairs appear on both surfaces. Yellow (or rarely buff-coloured) heads, 1–2.7 cm across, appear singly at the tips of the many unbranched stems. Disc centres are deeper yellow. Fruits are 2.5–3 mm long, silky-hairy. The pappus consists of 14–16 white, evenly feathery bristles.

Flowering period

Aug/Oct in cultivation; Aug/Sept in the wild.

Propagation

Seed harvested from cultivated plants germinates in 5–20 days. Pretreatment of seed increases germination (see page 19). April sowing produces good results.

Cultivation and uses

Plants prefer open, sunny situations but tolerate some shade. Though small, they are colourful in rockeries or grouped in the garden, and are excellent for containers. This species regenerates naturally. Suitable for cool temperate and inland regions. Flowers last about 2 weeks in water. They wire well if picked when heads are fully open and disc centres are yellow rather than greenish.

Distribution and habitat

NSW. Occurs between Hillston and Narrandera. Grows along roadsides in red sandy loam, less frequently in grey clays.

Synonym

Helipterum diffusum.

Similar species

Rhodanthe polygalifolia also has blue-green foliage and yellow heads. It is hairless, usually taller (to 40 cm), and the habit is erect.

Rhodanthe diffusa ssp. *leucactina*

leucactina — with white rays

ANNUAL

15–25 cm high ♦ 20–30 cm wide

White

In cultivation plants are multi-stemmed, often branching in the top third. Habit is semi-erect and ascending. Stems are glabrous. Leaves are green, 2–20 × 1–2 mm, sessile, with clear tips. Small spherical glands and septate hairs are present on both surfaces. Buds are pinkish, and flower-heads white, 15–20 mm across, held singly at the tips of branchlets. Fruits are similar to those of ssp. *diffusa*.

Flowering period

June/Dec in cultivation; Aug/Sept in the wild.

Propagation

Seed germinates in 7–30 days. Pretreatment increases germination (see page 19).

Cultivation and uses

This subspecies is new to cultivation. It is a pretty, long-flowering plant for containers. It grows better in sunny, slightly protected garden positions since the stems are less robust than

those of ssp. *diffusa*. Flowers last about 2 weeks in water. Wiring is not easy.

Distribution and habitat

Qld, NSW. Occurs from Nyngan to south-eastern Qld on red-brown loams to clays, in herbfields and open woodland.

Synonym

Helipterum polygalifolium var. *leucactinum*.

Similar species

Rhodanthe anthemoides differs in that it is a perennial, and has thicker leaves with spherical glands embedded in pits. Septate hairs are absent. Red-brown lines are obvious on the outer bracts.

Special notes

When grown together ssp. *diffusa* and ssp. *leucactina* may hybridize. The resultant seedlings are dainty, vary in colour from ivory to yellow, and usually possess branching stems.

Rhodanthe floribunda

floribunda — having many flowers

Common White Sunray, Large White Sunray,
Flowery Sunray, White Paper-daisy, Many-flowered Sun Wing

ANNUAL/PERENNIAL

10–40 cm high ♦ 10–45 cm wide

White

Usually an annual, in cultivation *R. floribunda* may be a short-lived perennial. Stems are branching and the habit is variable, upright or ascending, sometimes forming dense cushions. Narrow leaves up to 3 cm long bear cobwebby and glandular hairs. Masses of white flower-heads, 1–2 cm across, are held singly or in loose clusters at the ends of short flowering stems. The white, radiating bracts are in many rows. Fruits are silky-hairy, top-shaped, 2 × 1 mm. The pappus consists of 6–12 white bristles united at the base, and falling off in one piece. The bristles are broader at the base, and edged with short hairs which become longer at the tips.

Flowering period

Oct/March in cultivation in cool temperate areas; June/Oct in the wild.

Propagation

About 10% germination results from sowing wild seed. Pretreatment with SISP increases germination to 26%. Seed should be stored at RT for 6 months to 2 years and sown in late summer/early autumn. Seed is available commercially. Cuttings strike quite readily.

Cultivation and uses

Plants are best suited to open, sunny positions and respond to fertilizers. *R. floribunda* tolerates moderately heavy frosts, and has been grown successfully in subtropical climates. Attractive as a bedding plant, in rockeries or containers. Cut flowers last 3–4 weeks in water if picked as buds begin to open. Stems air-dry well.

Distribution and habitat

Qld, NSW, SA, WA, NT. Grows on most soil types in semi-arid regions.

Synonyms

Helipterum floribundum, *Helipterum cirratum*.

Similar species

Rhodanthe corymbiflora has shining yellow-green outer bracts, glands are not present on the leaves, and the seeds are larger. ♦ *R. stuartiana* is almost hairless, and has pale brown, transparent outer bracts.

Special notes

Rhodanthe floribunda is included in the section *Synachyrum*. Other species in this section are *R. sphaerocephala*, *R. sterilecens*, *R. stuartiana* and *R. troedelii*.



***Rhodanthe diffusa* ssp. *leucactina* (above) hybridizes with ssp. *diffusa* when plants are grown together**



***Rhodanthe floribunda* occurs in abundance in most soil types in semi-arid regions**



***Rhodanthe floribunda* is variable in form but always floriferous**



Masses of white flower-heads on *Rhodanthe floribunda*

Rhodanthe forrestii

forrestii — after Sir John Forrest (1849–1901),
explorer and premier of Western Australia

Delicate Sunray

ANNUAL

10–20 cm high ♦ 4–8 cm wide
Red-Brown

Erect, slender, sparsely woolly annual, usually single-stemmed, branching in the top half. Leaves are alternate, linear to narrow-oblong, 15–25 × 2–3 mm, greyish below and darker above. The leaf bases are narrowed but not decurrent. Top-shaped flower-heads, 4 mm long, are held on thin stalks about 7 mm long in open clusters. The outer bracts are shiny, copper-coloured, and not radiating. Fruits are top-shaped, 1–1.5 mm long, with a few short hairs.

Flowering period

Sept/Oct in the wild.

Propagation

The Study Group has been unable to acquire either seed or cutting material of this species.

Cultivation and uses

R. forrestii has not been grown in cultivation.

Distribution and habitat

WA. Occurs in central and north-west regions.
Grows in sand and among rocks.

Synonym

Helipterum forrestii.

Similar species

Rhodanthe polycephala is distinguished by its cylindrical heads, and by the decurrent leaf bases. It is possible that *R. forrestii* is only a northern variant of *R. polycephala* (Wilson 1992b).

Rhodanthe frenchii

frenchii — after Charles French (1842–1933), assistant
to Ferdinand Mueller in the Phytological Museum
(later the National Herbarium of Victoria)

Long-petioled Sunray

ANNUAL

30–40 cm high ♦ 10–15 cm wide
Yellow

An upright annual, single-stemmed or branching near the top. Stems are robust, reddish, glabrous, becoming glandular near the heads. Lower leaves are ovate to lanceolate, 15–40 × 5–10 mm, on slender stalks to 25 mm long. The leaves become linear and sessile up the stem. Single pale yellow or straw-coloured flower-heads, 12–17 mm across, are held at the tips of thin stems. The bracts are glandular. The inner bracts are in about five rows and have broad radiating blades. Fruits are brown, cylindrical, slightly papillose. The pappus consists of 10 feathery bristles broadening at the base.

Flowering period

Sept/Oct in the wild.

Propagation

Neither seed nor cutting material has been available for trialling.

Cultivation and uses

There is no record of *R. frenchii* being used in horticulture. It is described as being very similar to *R. margarethae* which is a most attractive annual.

Distribution and habitat

WA. Occurs in the western Pilbara district growing on rocky hills and in gullies.

Synonym

Helipterum frenchii.

Similar species

Rhodanthe margarethae differs in having white flower-heads, and sessile, cordate leaves.

Special notes

Further collecting is necessary to ascertain whether *R. frenchii* grades into *R. margarethae* (P.G. Wilson pers. comm.).

Rhodanthe fuscescens

fuscescens — darkish, referring to the bracts

Smooth *Podotheca*

ANNUAL

10–15 cm high ♦ 3–6 cm wide

Brown

Slender glabrous annual with erect, unbranched stems. Leaves are thick, obovate to lanceolate, 5–10 mm long, with scattered spherical glands on the upper surfaces. Lower leaves are opposite, becoming alternate up the stem. Flower-heads are 6 mm long, held in a cluster of leaves larger than the stem leaves. Bracts are pale brown, the innermost with short (1–2 mm), pale brown, radiating blades. Fruits are silky-hairy, 2.5 × 1–1.5 mm. The pappus has about 14 very feathery bristles.

Flowering period

Sept/Oct in the wild.

Propagation

The Study Group has not had access to propagating material of *R. fuscescens*.

Cultivation and uses

Descriptions of this delicate herb do not sound ornamental enough to suggest a horticultural use.

Distribution and habitat

WA. Occurs near Cranbrook in the south-west.

Synonyms

Helipterum fuscescens, *Podotheca fuscescens*.

Similar species

Rhodanthe oppositifolia also has opposite leaves but the radiating bracts are yellow and the heads are not subtended by a cluster of leaves.

Rhodanthe gossypina

gossypina — referring to the cottony hairs clothing the plant

ANNUAL

10–30 cm high ♦ 5–20 cm wide

White

Rhodanthe gossypina is a recently described species. It is a neat rounded annual with grey-green foliage. Leaves are 10–40 × 1–4 mm, sessile, linear to narrow-oblong, with cottony hairs on both surfaces. Flower-heads are white, 10–15 mm across, arranged in small clusters at the tips of stems. Inner bracts have radiating blades 3–4 mm long. A distinguishing feature of this species is the presence of black glandular hairs on the claws

of the inner bracts. Fruits are 2–3 × 1 mm, pale brown, silky-hairy, with evenly feathery pappus bristles joined at the base.

Flowering period

May/Oct in the wild.

Propagation

Although seed has been trialed it has not germinated.

Cultivation and uses

Plants should do well in moist open positions in heavy soil. *R. gossypina* would be a decorative addition to gardens, and the neat floriferous habit could be attractive in containers.

Distribution and habitat

Qld, NSW, SA, NT. Grows in open situations in heavy soils which are often flooded.

Similar species

Rhodanthe corymbiflora is taller, more erect, with longer heads (6–7 mm long), and the inner bracts have longer white blades (5–10 mm). Black glandular hairs are absent from the claws of the inner bracts. ♦ *R. floribunda* has white outer bracts. ♦ *R. microglossa* has very short white blades on the inner bracts (1–2 mm), no black glandular hairs on the claws of the inner bracts, and corolla lobes with hairy throats.

Rhodanthe haigii

haigii — after William Haig (1823–93), medical officer

ANNUAL

10–20 cm high ♦ 2–15 cm wide
Yellow



***Rhodanthe haigii* is a most attractive plant, new to cultivation**

New to cultivation, this neat colourful annual should become popular. Narrow grey-green leaves to 3 cm long contrast well with small yellow heads in tight rounded clusters at the tips of stems. Individual heads are cylindrical and 4 mm long. The

bracts are slightly hairy with yellow radiating blades on the inner bracts to 2.5 mm. Fruits are 1–1.5 × 0.6 mm, dark brown, with short stiff hairs. The pappus is composed of about 12 white bristles with short feathers.

Flowering period

Nov/March in cultivation; Aug/Nov in the wild.

Propagation

Wild seed yields 30–40% germination following pretreatment if stored at RT for 1–3 years after collection (see page 19). Best sowing time is autumn or late winter.

Cultivation and uses

Grows well in sunny, open situations in well-drained soil, and regenerates naturally. Should perform well in alkaline soils. Recommended as an attractive plant for containers. Cut flowers last at least two weeks in water and are attractive when air-dried.

Distribution and habitat

SA, WA. Grows in sandy soils or light loams on plains, in open mallee or grasslands, often in limestone areas.

Synonym

Helipterum haigii.

Similar species

Rhodanthe humboldtiana has larger fruits (2–2.5 mm) covered with silky white hairs. Heads are longer (to 5 mm) and the radiating innermost bracts are also longer (to 4 mm).



Fruit of *Rhodanthe haigii* is brown with short stiff hairs

It occurs only in WA. ♦ *R. tietkensii* is usually a larger plant (30–45 cm), and is readily distinguished by the innermost bracts which do not radiate.

Rhodanthe heterantha

heterantha — unequal flowers, a possible reference to the unequal lobes of the corolla

ANNUAL

15–30 cm high ♦ 2–5 cm wide
Dark Red, Yellow-Brown

Upright annual with red woolly stems, branching at the base. Basal leaves, 20–30 × 5 mm, are obovate to lanceolate, covered with long white hairs. Stem leaves are sessile and diminish in size up the stem. Flower-heads are single, terminal, 14–20 mm across. Dark red or yellow-brown bracts have erect non-radiating blades to 2 mm long, and occur in four rows. Fruits are red, 2 × 1 mm, very silky-hairy. The pappus consists of about 14 evenly feathery bristles joined at the base.

Flowering period

Sept/Dec in the wild.

Propagation

The Study Group has not been able to collect seed of this species.

Cultivation and uses

Dried herbarium specimens and descriptions of *R. heterantha* indicate that plants are attractive, and should do well in cultivation.

Distribution and habitat

WA. Occurs in south-western areas near Coolgardie, Kondinin, and Lake Moore. Grows in open eucalypt woodland, on low granite outcrops and saline flats.

Synonym

Helipterum heteranthum.

Special notes

Helipterum heteranthum included two varieties, var. *majus*, which was described as 30–45 cm high with heads to 2.5 cm, and var. *minor*, which was described as 10–15 cm high with small heads. *R. heterantha* is the only species in the section *Helipteridium* (Wilson 1992b).

Rhodanthe humboldtiana

humboldtiana — after Baron Friedrich von Humboldt, 1769–1859, naturalist and geographer

Golden Cluster Everlasting

ANNUAL

30–40 cm high ♦ 25–30 cm wide
Yellow



Flower-heads of *Rhodanthe humboldtiana* dry very successfully

Showy, upright, grey-green to silvery annual, branching at the base. Stems and leaves are woolly. Leaves are sessile, 5–40 × 1–5 mm, linear to narrow-oblong, extending up the stems to the heads. The margins are often wavy. Individual

flower-heads are 7–8 mm in diameter in clusters 2–4 cm across. Outer bracts are transparent or pale brown, and inner bracts have radiating yellow blades which may dry dark green. Fruits are top-shaped, silky-hairy, 2–2.5 × 1–1.5 mm.

Flowering period

Sept/Dec in cultivation; Aug/Oct in the wild.

Propagation

Commercial and garden seed germinates well in 3–20 days from autumn sowing. Wild seed germinates poorly and needs after-ripening and pretreatment (see page 19). Although this species takes longer to germinate in winter, good results are achieved by sowing in late July.

Cultivation and uses

Rhodanthe humboldtiana is easily grown, preferring open sunny conditions. It has been grown successfully in subtropical climates and in cool temperate areas. Cold wet weather often induces wilting and curling of the foliage. It

is an attractive annual for grouping or massing, and an excellent subject for tubs if plants are cut back to induce branching. Vase life is 10–14 days. Flower clusters dry well if picked as the heads begin to open.

Distribution and habitat

WA. Occurs in western and central regions. Grows on red loam and sand in open areas.

Synonym

Helipterum humboldtianum.

Similar species

Rhodanthe haigii has shorter fruits (to 1.5 mm), which are brown and not silky-hairy. Individual heads are shorter (4 mm long), and the clusters are smaller. Plants are also shorter (to 20 cm).

Rhodanthe laevis

laevis — smooth, almost completely hairless

Smooth Sunray

ANNUAL

4–10 cm high ♦ 1–5 cm wide

Cream, Bronze, Red

A slender, erect, almost glabrous annual with few stems. Leaves are 10–20 × 1–2 mm, narrow-linear. Leaves and stems are often reddish purple. Flower-heads in loose clusters are cylindrical, 3–4 mm long, with glossy, non-radiating bracts which vary from cream to bronze or red. Fruits are black, narrow-obovate, 1 × 0.5 mm, sparsely covered with short stiff hairs. The pappus is feathery.

Flowering period

Sept/Nov in cultivation; Aug/Oct in the wild.

Propagation

Seed stored at RT yields 25% germination when sown in the autumn following collection. Germination increases to more than 50% if seeds are pretreated with SISF.

Cultivation and uses

Rhodanthe laevis prefers dappled shade and root protection. While attractive, it is too delicate for gardens, and the flowering period of individual plants is too short for a good display. It can be grown in small pots, and the more colourful forms could be pressed for cards.

Distribution and habitat

NSW, Vic, SA, WA, NT. Grows on sandy or stony soils in woodland, mulga or mallee.

Synonym

Helipterum laeve.

Similar species

Rhodanthe forrestii differs in being sparsely woolly. It occurs only in WA. ♦ *R. polycephala* has cottony hairs on the stems and the leaf undersurfaces.

Rhodanthe manglesii

manglesii — after Captain James Mangles, 1786–1867

Pink Sunray, Mangles Everlasting, Ngyamingyaming

ANNUAL

10–50 cm high ♦ 15–20 cm wide

Pink, White



Rhodanthe manglesii is an easily grown, colourful annual

An easily grown annual, popular in cultivation for many years. Cordate greyish-green leaves, 15–45 × 5–35 mm, clasp the wiry stems. Dainty pendent silver buds open to pretty pink or white flower-heads, 2–3 cm across. The pink heads often have deeper pink rings circling the yellow disc centres. Fruits are 3 × 1.5 mm, covered with silky hairs. The pappus has 15–20 feathery white bristles.

Flowering period

Aug/Jan in cultivation; Aug/Oct in the wild.

Propagation

Commercial seed yields 50–65% germination in 3–20 days. Seed collected in the wild has an after-ripening dormant period of 9–12 months. After this period wild seed yields 20%

germination. Pretreatment of seed can improve germination to about 60% (see page 19).

Cultivation and uses

Selection over many years has produced colour variation and larger, stronger plants, sometimes more upright. This species prefers warm, open situations. It grows in part shade although flowering is reduced. Suitable for the ranges, coastal and subtropical areas but must be protected from frost. Close planting overcomes a tendency to become top-heavy. Attractive for borders or massed planting, but often untidy in containers. Smaller, more delicate forms may be better for pot culture. It is an excellent cut flower and dries very well.

Distribution and habitat

WA. Grows in open woodland in southwestern regions.

Synonym

Helipterum manglesii.

Similar species

Rhodanthe chlorocephala ssp. *rosea* differs in that the heads are hemispherical rather than top-shaped, the leaves are linear, not stem-clasping, and the stems are usually unbranched.

Rhodanthe margarethae

margarethae — after Lady Margaret Forrest (1844–1929), wife of Sir John Forrest, later Baron Forrest

ANNUAL

30–100 cm high ♦ 20–50 cm wide

White

An attractive herb, possibly a short-lived perennial, with a branching open habit. Stems are sparsely glandular-hairy. Leaves are cordate, sessile, 4–7 × 1–2 cm, with ear-shaped lobes at the base. Flower-heads 1.5–2 cm across are single and terminal. Outer bracts are linear with long pointed tips. Inner bracts are in five or more rows and have broad white radiating blades. Fruits are cylindrical, 1–1.5 × 0.5 mm, orange-brown, moderately covered by hairs of different lengths. The pappus consists of 8–12 white, feathery bristles tufted at the tips.

Flowering period

Nov/Dec in cultivation; Aug/Oct in the wild.

Propagation

Seed germinates moderately well in 8–9 days without pretreatment. Good results have been achieved by sowing in mid-summer and autumn.

Cultivation and uses

Plants grow well in open conditions in well-drained soils. It is an attractive species for pots or tubs but seems best suited to warm temperate climates. It is prone to attack by white fly. Vase life is 10–14 days. Flower stems air-dry well and the larger heads may be wired.

Distribution and habitat

WA. Occurs in the Hamersley Range, growing on south-facing cliffs in iron-rich soils.

Synonym

Helipterum margarethae.

Similar species

Rhodanthe frenchii may be distinguished by the yellow flower-heads. The lower leaves are shorter (1.5–4 cm), and have slender stalks.



Fruits of *Rhodanthe margarethae*

Rhodanthe maryonii

maryonii — after J.E.C. Maryon, plant collector for the British Museum

ANNUAL

15–25 cm high ♦ 30–50 cm wide
Cream, Buff

Upright or sprawling woolly annuals with branching stems. Green or grey-green leaves are soft, 10–40 × 2–10 mm, oblong to lanceolate, sessile, slightly stem-clasping. Cream to buff cylindrical heads, 5 mm long, with vertical green markings are present in small-stalked clusters at the tips of branchlets. Bracts do not radiate. Fruits are brown ellipsoids, 3 × 0.5 mm, wrapped in woolly hairs. The pappus consists of 8 delicate white bristles.

Flowering period

Sept/Nov in cultivation; Aug/Sept in the wild.

Propagation

Seed germinates poorly. Pretreatment has not increased germination. Storage at RT for 12–18 months overcomes some degree of dormancy. Autumn is the best time to sow.

Cultivation and uses

Although pleasing in bud, *R. maryonii* is not

attractive enough in gardens. Seedlings are attacked by aphids, the soft, hairy foliage succumbs to cold wet conditions and burns in hot windy weather. Unsuitable as a cut flower or for drying.

Distribution and habitat

WA. Occurs in south-central districts on most soils, often in acacia woodland. Usually grows under the protection of shrubs or small trees.

Synonym

Helipterum maryonii.

Similar species

Rhodanthe ascendens has narrower leaves (3–5 mm across), and the fruits are not wrapped in wool. ♦ *R. battii* has heads in spikes. The fruits are covered with silky hairs. ♦ *R. charsleyae* has heads in spikes, bright yellow outer bracts, glabrous leaves and fruits are covered with silky hairs.

Rhodanthe microglossa

microglossa — small tongue, probably a reference to the small blade on the inner bracts

ANNUAL

15–20 cm high ♦ 25–35 cm wide
White

Clustered Sunray

Not often seen in cultivation, this small annual has a rounded habit, sessile woolly leaves to 3 cm, and flower-heads, 4–5 mm across, in dense clusters. The inner bracts have white radiating blades 1–2 mm long. The attractive buds are creamy yellow, narrow and pointed. Fruits are white and silky. Plants in cultivation grow much larger than those in the wild.

Flowering period

Sept/Nov in cultivation; July/Oct in the wild.

Propagation

Seed germinates in 9–25 days. It may be dormant for 6–18 months (see page 19).

Cultivation and uses

Rhodanthe microglossa responds well to fertilizer and watering but is not as attractive as similar species of *Rhodanthe*. Some forms with red-brown buds are more showy, but the flower-heads are not obvious because the radiating bracts are very short. An open position in sun or part shade is most suitable.



A small-headed species, *Rhodanthe microglossa* is best grown in pots

Distribution and habitat

Qld, NSW, SA, WA, NT. Occurs on open red sandplains, gibber, or rocky outcrops, often on saline soils. Grows with saltbush or bluebush.

Synonym

Helipterum microglossum.

Similar species

Rhodanthe gossypina has longer white blades on the inner bracts (3–4 mm) and the claws bear black glandular hairs under magnification. ♦ *R. troedelii* has heads in loose clusters and the blades on the inner bracts are 3–4 mm long.

Rhodanthe moschata

moschata — having a musky scent, referring to the foliage
Musk Sunray, Musk Daisy

ANNUAL
25–45 cm high ♦ 30–50 cm wide
Cream/Yellow

In cultivation an erect or sprawling annual. Thick branching stems snap off easily. Leaves are grey-green, hairy, 5–40 × 3–10 mm, oblanceolate to lanceolate, aromatic when crushed. Flower-heads are in terminal clusters, 10–15 mm across, white or cream at first, later becoming yellow. Fruits are mid-brown, spindle-shaped, and encased in the wool of the bracts.

Flowering period

Oct/Jan in cultivation; usually Aug/Nov in the wild.

Propagation

Wild seed germinates poorly in 10–15 days. Percentage germination is not improved by pre-treatment, but is increased if seed harvested from cultivated plants is sown.

Cultivation and uses

Grows well in sunny, well-drained situations, and regenerates naturally. Needs to be massed for best effect. *R. moschata* has not impressed growers so far but trials are continuing. Flower stems air-dry reasonably well and can be used as filler.

Distribution and habitat

Qld, NSW, Vic, SA, NT. Grows mainly on sandy soils or loams in saltbush, mallee or mulga.

Synonym

Helipterum moschatum.

Similar species

Rhodanthe tietskensii has similar grey-green hairy leaves and yellow heads in terminal clusters. It differs in having more florets per head (usually 10), and the fruits are not encased in wool.



Fruit of *Rhodanthe moschata* is embedded in woolly hairs

Rhodanthe nullarborensis

ANNUAL

nullarborensis — a reference to the habitat of this species

20–35 cm high ♦ 10–20 cm wide
Yellow

Heavily scented annual with an ascending habit. Loosely woolly stems branch at the base. Greyish leaves are 10–15 × 1–1.5 mm, linear and sessile. Flower-heads form compact clusters, 10–15 mm across, at the tips of stems. Individual heads on short stalks are cylindrical, 3–4 mm long, with three or four rows of glossy, yellow papery bracts which do not radiate. There are no bracts on the receptacle. Fruits are dark brown, 1 mm long, covered with short stiff hairs.

Flowering period

Aug/Sept in the wild.

Propagation

The Study Group has not succeeded in collecting this species. According to our theories seed would have a dormant period of 12–24 months.

Cultivation and uses

There has been no opportunity to test this newly described species in cultivation. The colourful, strongly scented flower-heads and the compact habit observed in dried specimens appear attractive. It should do well in warm temperate climates and in alkaline soils.

Distribution and habitat

WA. Occurs only on the Nullarbor Plain, growing in open depressions in limestone.

Similar species

Rhodanthe tietskensii has larger leaves (10–80 × 2–12 mm). The heads are hairier and the clusters are larger (2–2.5 cm). Bracts are present on the receptacle.

Special notes

Rhodanthe nullarborensis is included in the section *Achyroclinoides*, together with *R. ascendens*, *R. condensata*, *R. corymbosa*, *R. forrestii*, *R. haigii*, *R. polycephala*, *R. psammophila* and *R. tietskensii*.

Rhodanthe oppositifolia ssp. *oppositifolia*

ANNUAL

oppositifolia — having opposite leaves
Twin-leaf Sunray, Twin-leaved Sunray

10–25 cm high ♦ 5–15 cm wide
Yellow, White (rarely)

In cultivation a fragile annual, erect and branching. Blue-green linear leaves are opposite, sessile, with pointed tips, 5–35 × 1–4 mm, dotted with tiny spherical glands on the upper surfaces. Yellow (or rarely white) heads, 5–10 mm across, appear singly at the tips of stems. Fruits are white with dense silky hairs, and pappus bristles have feathery hairs evenly distributed along them.

Flowering period

Aug/Oct in cultivation; July/Sept in the wild.

Propagation

Seed germinates poorly. Pretreatment of seed slightly increases germination (see page 19), and a period of dry, dark storage may induce further germination. Late autumn/winter is the best time to sow in temperate climates. Insufficient seed was available to the Study Group for thorough trialling.

Cultivation and uses

Open, sunny conditions are best. Tip prune to promote a dense habit as strong winds break the stems and knock plants over. Flower-heads are so small, however, that this subspecies appears to have no potential for horticulture.

Distribution and habitat

SA, WA. Occurs in the Gawler Ranges of SA and between Fraser Range and Shark Bay in WA. Grows on stony outcrops or near saline depressions.

Synonym

Helipterum oppositifolium.

Similar species

Rhodanthe polygalifolia has leaves which are only opposite near the base of stems. The heads are larger (2–3 cm across) and always yellow. The seed coat is dark and bears white silky hairs. ♦ *R. stricta* has alternate leaves, and seeds have feathery pappus bristles with clusters of club-shaped cilia at the tips.

Rhodanthe oppositifolia ssp. *ornata*

ornata — handsome

ANNUAL

20–45 cm high ♦ 6–10 cm wide

Yellow



Rhodanthe oppositifolia ssp. *ornata* has excellent horticultural potential

In cultivation a handsome annual, erect and branching in the top half. Blue-green linear or narrow-lanceolate leaves are mainly opposite, 10–40 × 1–2 mm, sessile, with very pointed tips, and small spherical glands on the upper surfaces. Yellow flower-heads, 2–3.5 cm across, are solitary at the tips of stems (5–8 cm long) bearing alternate leaves. Fruits are like those of ssp. *oppositifolia*.

Flowering period

Sept/Nov in cultivation; Aug/Oct in the wild.

Propagation

As for ssp. *oppositifolia*.

Cultivation and uses

Due to poor germination this beautiful annual has been trialled only in containers. Open, sunny conditions are most suitable. Fertilizers

should be used sparingly. Heads wire easily as stems are hollow. This subspecies air-dries well and vase life is 14–20 days.

Distribution and habitat

WA. Occurs only on the southern margins of Freycinet Estuary. Grows at the edges of saline flats.

Similar species

Rhodanthe oppositifolia ssp. *oppositifolia* has smaller heads (5–10 mm across), and the blades on the inner involucre bracts are shorter (1–3 mm). ♦ *R. polygalifolia* has leaves which are only opposite near the base. It does not occur in WA. ♦ *R. stricta* has smaller heads (7–15 mm across), the radiating inner bracts are always white, and the fruits have clusters of club-shaped hairs at the tips of the feathery pappus bristles.

Rhodanthe pollackii

pollackii — after Josef Polak (c. 1844–1899), plant collector with John Forrest on his 1882 expedition to the Gascoyne River

ANNUAL

20–45 cm high ♦ 5–10 cm wide
Green, Purplish

An upright annual herb with glandular-hairy leaves and stems. Lower leaves are 30–50 × 5–10 mm, lanceolate, and with relatively long stalks (to 2 cm). Upper leaves decrease in size and are sessile. Flower-heads are in spike-like clusters. Individual heads are cylindrical, 6–7 mm high, and contain about 20 florets. The outer bracts are green; the inner bracts do not radiate and may be tinged purple. Fruits are silky-hairy with feathery pappus bristles.

Flowering period

Aug/Sept in the wild.

Propagation

The Study Group has been unable to collect seed of this species.

Cultivation and uses

There is no record of *R. pollackii* in cultivation. It is similar to *R. battii* and is unlikely to possess horticultural potential.

Distribution and habitat

WA. Occurs in the Gascoyne River district, usually in rocky areas.

Synonyms

Podosperma pollackii, *Podotheca pollackii*.

Similar species

Rhodanthe battii has bell-shaped heads, 7–9 mm high, each containing 4–11 florets. The heads in the flower spikes are more densely arranged than those in *R. pollackii*. It is possible that *R. battii* may be a southern variant of *R. pollackii* (P.G. Wilson pers. comm.).

Rhodanthe polycephala

polycephala — many heads, referring to the clusters of heads

ANNUAL

10–20 cm high ♦ 10–15 cm wide
Brown, Yellow

An ascending or erect, single-stemmed or branching annual. Stems and leaves are silvery at first, later becoming glabrous except for the lower leaf surfaces. Leaves are thin, 10–25 × 1–3 mm, linear to narrow-oblong, with pointed tips and decurrent bases. Cylindrical flower-heads, 4 mm long, are on short stalks. Heads are held in loose clusters. The bracts are papery, glossy, yellow to brown, and do not radiate. Fruits are cylindrical, brown, 1–2 × 0.8 mm, with a few short hairs. The pappus is feathery.

Flowering period

Sept/Oct in the wild.

Propagation

Seed has not been available to the Study Group. It is presumed that propagation would be similar to that of *Rhodanthe corymbosa* which has some characters in common with *R. polycephala*.

Cultivation and uses

Rhodanthe polycephala has been suggested for massed planting in gardens or containers in semi-arid and temperate regions (Elliot and Jones 1990, as *Helipterum polycephalum*). No record of cultivation, however, has been found for it.

Distribution and habitat

WA. Occurs in the area from the Stirling Range north to Shark Bay and Wiluna. Grows in sands or clays under mallees or melaleucas and in eucalypt woodlands.

Synonym

Helipterum polycephalum.

Similar species

Rhodanthe forrestii has top-shaped heads, and the leaves are not decurrent. ♦ *R. corymbosa* has white, radiating blades on the inner bracts.

Special notes

It is possible that *R. forrestii* is a variant of *R. polycephala* (Wilson 1992b).

Rhodanthe polygalifolia

polygalifolia — having leaves like those of the genus *Polygala*

Brilliant Sunray, Golden Everlasting, Milkwort Sunray

ANNUAL

25–40 cm high ♦ 25–35 cm wide
Yellow

In cultivation a handsome, upright, glabrous annual with robust stems, mostly branching near the base. Leaves are variable, 10–70 × 5–10 mm, green to blue-green, linear to oblanceolate, sessile, opposite at first, becoming alternate up the stem. Flower-heads are golden, 2–3 cm across, flat or cupped in shape, borne singly at the tips of thick stems which are naked below the heads for 6–20 cm. Fruits are 2–3 × 1 mm, dark brown to black, covered with long silky hairs.

Flowering period

July/Oct in cultivation and in the wild.

Propagation

Best germination results from seed stored at RT for 1–2 years. Pretreatment is recommended (see page 19).

Best sowing time is late autumn to winter.

Cultivation and uses

Grows well in gardens in open, sunny positions. It is eye-catching in pots but prone to collapse in cold conditions. Strengthen plants by disbudding several times before allowing to flower. Flowers last 14–20 days in water, and



***Rhodanthe polygalifolia* is a handsome, upright annual**

flower stems air-dry reasonably well. Hollow stems make heads easy to wire but care should be taken not to pierce the receptacle.

Distribution and habitat

NSW, Vic, SA. Grows on a variety of soils in association with bluebush, saltbush, mulga and casuarinas.

Synonym

Helipterum polygalifolium.

Similar species

Rhodanthe oppositifolia differs in that opposite leaves extend further up the stems, and the fruits are smaller and paler.

Special notes

Subspecies *oppositifolia* and *R. polygalifolia* grow together in only one place, the Gawler Ranges, SA, and this is the only place where plants are found that are intermediate between the two species (P.G. Wilson pers. comm.).

Rhodanthe polyphylla

polyphylla — having many leaves

PERENNIAL

45–70 cm high ♦ 25–35 cm wide

White



New to cultivation, *Rhodanthe polyphylla* performs well as a cut flower

In cultivation an interesting, long-flowering perennial with dense foliage and an erect shrubby habit. Leaves are grey-green, 15–80 × 1–4 mm, narrow, sessile, usually bunched together on woolly stems. Small, almost frilly white flower-heads are

clustered on short stalks at the tips of branchlets. Fruits are 2–3 cm long, black, moderately covered with stiff, short hairs. The pappus has about 24 white, evenly feathery bristles joined at the base, and it falls off the fruit early.

Flowering period

July/Dec in cultivation; spring to summer in the wild.

Propagation

Seed germinates well without pretreatment. The best sowing time is late winter. Cuttings strike readily.

Cultivation and uses

Rhodanthe polyphylla is new to cultivation. It prefers an open position in full to part sun, and tolerates light frosts. It may need supplementary water in hot weather. Plant singly or in groups. In cool temperate climates the apical leaves and stems often curl and twist in winter. This condition responds to pyrethrum sprays and is probably due to insect attack. As a cut flower it lasts in water for at least 4 weeks, and flower stems air-dry very well.

Distribution and habitat

Qld, NSW. Grows in loams and heavy clays from the Narrabri district to eastern Queensland.

Synonym

Helipterum polyphyllum.



Fruits of *Rhodanthe polyphylla* are black with short, stiff hairs, and the pappus bristles are joined at the base

Rhodanthe propinqua

propinqua — related, referring to an affinity to another species

ANNUAL

30–35 cm high ♦ 15–25 cm wide

White

In cultivation a dense bushy annual, with many branching stems. Leaves, 15–35 × 5–15 mm, are lanceolate, green, sparsely cottony beneath, and have stem-clasping bases. Shiny gold or brown buds open to white flower-heads, 4–6 mm across, in short-stalked clusters at the stem tips. Fruits are top-shaped, silky-hairy, 2–2.5 mm long. The pappus bristles (16–18) are evenly feathery.

Flowering period

July/Nov in cultivation; Aug/Sept in the wild.

Propagation

Wild seed germinates poorly in 5–25 days. Pretreatment with SISP or detergent slightly increases germination. Seed is available commercially. Best sowing times are autumn and late winter.

Cultivation and uses

Rhodanthe propinqua flowers profusely but the flowers are small and the flowering period is relatively short. It does not tolerate cold wet weather but grows well in inland climates.

Mass or group in gardens. It is not a good cut flower because the disc centres develop too rapidly, but air-dried stems are dainty.

Distribution and habitat

WA. Occurs in the Austin district from around Laverton to west of Meekatharra. Grows in sands or sandy loams in mulga.

Synonym

Helipterum propinquum.

Similar species

Rhodanthe stricta has larger flower-heads (1–1.5 cm across). Heads are usually held singly on slender flower stems but a few may occur in loose clusters. Leaves have small globular glands on the upper surfaces.

Rhodanthe psammophila

psammophila — sand loving, referring to the habitat

ANNUAL

35–50 cm high ♦ 20–30 cm wide

White/Yellow



White inner bracts open to reveal yellow florets in *Rhodanthe psammophila*

An annual with a tall, erect habit, new to cultivation. Stems are hairy and winged. Leaves are soft, mid-green, sessile, 50–100 × 0.5–5 mm, linear to narrow-oblong with acute tips. Leaf bases continue

down the stems to give a winged appearance – more conspicuous in cultivation than in the wild. Flower-heads are in terminal clusters, 1–3 cm across, on stems 1–5 cm long. Inner bracts have white frilly



***Rhodanthe psammophila* grows on coastal dunes**

erect blades. Each head opens to reveal five yellow florets (only one being fertile). Fruits are brown, 2.5 mm long, sparsely covered with short hairs. The pappus has 14–16 bristles.

Flowering period

Oct/Nov in cultivation; Aug/Oct in the wild.

Propagation

Seed germinates moderately well (50–70%) in 7–10 days if treated before sowing (see page 19). Seed dormancy lasts 6–18 months when stored at RT. Best sown in autumn but seedlings need protection in cold, wet conditions.

Cultivation and uses

Rhodanthe psammophila has not been trialled over enough time for a proper assessment of its

value. Although rarely grown, it is a tall annual, best suited to well-drained soils in open sunny positions. Vase life is 7–10 days, and flower stems air-dry well.

Distribution and habitat

WA. Occurs on the coast from just south of Carnarvon to Onslow and inland to the Kennedy Range. Grows on coastal dunes and red sands.

Similar species

Rhodanthe condensata is distinguished by its lower, more dense habit. The clusters are on shorter flower stems, and each head has 10–13 florets (all fertile). It occurs south of the natural habitat of *R. psammophila*.

Rhodanthe pygmaea

pygmaea — dwarf or low, referring to the habit
Pygmy Sunray

ANNUAL

5–8 cm high ♦ 20–25 cm wide
White

In cultivation an annual, 5–8 cm high, with much-branched decumbent stems. Leaves are mid-green, 10–20 × 1 mm, linear, very slightly hairy. Flower-heads are narrow, up to 10 mm long with minute white radiating blades at the tips of the bracts. In some populations the blades are absent. Buds are cream. Fruits are relatively large (2–3 mm long), covered with silky hairs and having 20–30 evenly feathery white pappus bristles. In the wild plants are usually slightly taller, less spreading, and have an ascending habit.

Flowering period

Aug/Oct in cultivation; June/Nov in the wild depending on seasonal conditions.

Propagation

Seed germinates poorly. It is commercially available and is best sown in late winter. Seed

from cultivated plants self-sows. Pretreatment does not increase germination.

Cultivation and uses

Plants grow best in containers in open, semi-shaded positions, but flower-heads are so inconspicuous that *R. pygmaea* would appear to have no potential in gardens. The relatively large fluffy seeds are notable features but plants are withering when they are produced. It is unsuitable as a cut flower or for drying.

Distribution and habitat

Qld, NSW, Vic, SA, WA. Occurs in a variety of habitats including mallee and open, seasonally inundated areas. Grows in red sands, clay-loams and clays.

Synonym

Helipterum pygmaeum.

Rhodanthe pyrethrum

pyrethrum — referring to the similarity of the flower-heads to those of the genus *Pyrethrum*

ANNUAL

10–20 cm high ♦ 5–8 cm wide
White

In cultivation an erect, glabrous or slightly glandular annual, with stems simple or branching at the apex. Stems are smooth, markedly broad at the base. Narrow leaves, 3–12 × 0.5–2 mm, are usually linear but may vary in shape and size if they are submerged. Flower-heads are single and terminal, 10–25 mm across, with white, radiating inner bracts, sometimes tinged pink. Fruits are silky-hairy, 0.7–1 mm long, with about 10 feathery pappus bristles broader at the base and united in a ring.

Flowering period

Oct/Dec in cultivation; Oct/Nov in the wild.

Propagation

This species is now regarded as quite rare in its natural habitat. Study Group members have been unable to acquire propagating material.

Cultivation and uses

The only specimens of *R. pyrethrum* seen by the Study Group have been dried herbarium specimens. It appears to be an attractive and interesting species, and would be very ornamental for bog or water gardens.

Distribution and habitat

WA. Occurs in south-west Western Australia in shallow winter swamps. Grows in clay and mud.

Synonym

Helipterum pyrethrum.

Special notes

Rhodanthe pyrethrum is the only species in the section *Anisolepis*.

Rhodanthe rubella

rubella — reddish, referring to the bract colour
Glandular Sunray, Reddish Sunray

ANNUAL

10–20 cm high ♦ 5–15 cm wide
Red, White (rarely)

In cultivation a dainty erect annual with unbranched glandular-hairy stems. Narrow green leaves to 2.5 cm clothe the stems to the heads. The leaves have obvious glandular hairs. Solitary pinkish-red flower-heads are 1–1.6 cm across. White flower-heads are seldom seen. Fruits are silky-hairy. Pappus bristles are feathery with club-shaped clusters at the tips.



Flowering period

Sept/Feb in cultivation; Aug/Oct in the wild.

Propagation

Germination is poor. Seed may need 18–24 months storage at RT to break dormancy. Pre-treatment with SISP increases germination. Further germination often follows periods of dark, dry storage. Best sowing time is autumn/early winter but seedlings must be protected from cold wet conditions. It is hoped that seed will become commercially available.

Cultivation and uses

Plants grow with relative ease once germinated, and are tolerant of light frosts. This species is most attractive in rockeries or containers. Vase life is at least 4 weeks and flower stems air-dry well.

Distribution and habitat

WA. Not widespread but occurs in southern central areas on sandy loams in open eucalypt woodland, shrubland and hummock grassland.

Dainty *Rhodanthe rubella* has deep pinkish-red bracts

Synonym

Helipterum rubellum.

Similar species

Rhodanthe chlorocephala ssp. *rosea* has larger flower-heads and hairless leaves and stems, and the small spherical glands are embedded in the leaf surfaces.

Rhodanthe rufescens

rufescens — reddish, referring to the colour of the top of the inner bracts

ANNUAL

5–10 cm high ♦ 20–30 cm wide
Straw-coloured/Red

A recently described prostrate herb with many wiry, branching stems arising from the base. Leaves are sessile, 5–10 × 1–2 mm, with blunt tips. Stems and leaves are sparsely glandular-hairy. Flower-heads are small, cylindrical, not radiating, 4–5 mm high, occurring at the ends of stems. The bracts are in three rows; outer bracts straw-coloured, inner bracts also straw-coloured at the base and reddish towards the top. Fruits are silky-hairy and the pappus bristles are evenly feathery.

Flowering period

Aug/Sept in the wild.

Propagation

Although Study Group members have travelled

to the habitat they have not been able to locate this species.

Cultivation and uses

The written description suggests that *R. rufescens* is not sufficiently ornamental to interest gardeners.

Distribution and habitat

Qld. Occurs only in south-west Queensland in the Noccundra district, where it was described as growing in 'herbage'.

Special notes

Rhodanthe rufescens is a member of the section *Leiochrysum*. It was first collected in 1987 but has not been obvious since that time.

Rhodanthe sphaerocephala

sphaerocephala — globose head

ANNUAL

15–25 cm high ♦ 10–15 cm wide
Yellow

This is a recently described upright annual with woolly stems branching at and near the base. Leaves are 5–10 × 1 mm, sessile, held close to the stem. The surfaces are sparsely woolly with crinkly hairs. Flower-heads are almost spherical, about 1 cm across, held at the tips of stems. The outer bracts are straw-coloured, glossy and slightly wrinkled. Intermediate bracts have broad, slightly wrinkled, straw-coloured blades which do not radiate. Fruits are about 2 mm long, densely covered with long silky hairs. The pappus bristles have short feathers in the lower half, longer feathers in the upper half and tufts at the apex.

Flowering period

Oct/Nov in the wild.

Propagation

The Study Group has not been able to collect seed of this species.

Cultivation and uses

There are no records of *R. sphaerocephala* in cultivation. Dried specimens are attractive and unusual, and suggest that this species may have horticultural potential.

Distribution and habitat

WA. *R. sphaerocephala* is known only from a location west-north-west of Meekatharra where it grows in red sands.

Similar species

Podolepis kendallii is also a slender, upright annual (to 30 cm) with spherical heads, and it grows in the same district. It is distinguished by longer leaves (to 5 cm), and warty fruits.

Rhodanthe spicata

spicata — having flower-heads in spikes
Spike-headed Sunray

ANNUAL

15–30 cm high ♦ 10–30 cm wide
Yellow, Brown



Rhodanthe spicata has flower-heads in compact terminal spikes

In cultivation an erect or sprawling annual to 30 cm high. Stems are often thick, branch at the base, and develop a reddish tinge. White woolly hairs are dense on the upper stems, becoming sparse lower down. Narrow thread-like green leaves, 1–10 cm long, decrease in size up the stem. Small flower-heads are present in compact yellow or red-brown terminal spikes, and smaller spikes may develop at intervals, sometimes on short stems. Fruits are 2–2.5 × 1 mm, covered with white silky hairs. The pappus has 14–16 straw-coloured feathery bristles.

Flowering period

Sept/Oct in cultivation. It may begin to flower as early as July in the wild.

Propagation

Wild seed germinates in 11–20 days without pretreatment, but seed harvested from cultivated plants germinates better and faster, and plants are more robust. The after-ripening period is quite short (3 months).

Cultivation and uses

Rhodanthe spicata prefers open, sunny positions and applications of fertilizer. Tip prune to encourage a bushy habit. It is an easily grown, quite attractive annual for gardens when massed or grouped with other annuals. Although not as ornamental as many other everlasting species, the unusual shape of the heads has novelty. The habit is less tidy in pots. Cut flowers last 2–3 weeks in water. Flower stems air-dry moderately well.

Distribution and habitat

WA. Widespread in southern Western Australia. Occurs on rocky outcrops or in open woodland on sands or loams.

Synonym

Helipterum spicatum.

Similar species

Rhodanthe charsleyae has narrow, oblong or obovate leaves. Stems are almost glabrous.

Rhodanthe sterileszens

sterileszens — the majority of the fruits in each head are infertile

Infertile Sunray, White Pom Poms

ANNUAL

15–30 cm high ♦ 15–20 cm wide

Off-White

Erect, grey-green, branching, woolly annual, faintly scented. Stem leaves are oblanceolate, sessile, 10–50 × 2–10 mm, with long woolly hairs and septate hairs. Basal leaves are longer (to 8 cm) and have a short stalk. Terminal globular clusters of 3–6 pearly (sometimes pinkish) buds open to off-white heads 4–8 mm across. Small clusters of heads may also occur in the basal leaf axils. Cream disc florets become yellow. Fertile fruits (only 2–4 per head) are 2 × 1 mm, silky-hairy and top-shaped. Infertile fruits are narrow and glabrous. The pappus has 8–10 cream, feathery bristles, tufted and curled at the tips.

Flowering period

July/Jan in cultivation; July/Oct in the wild.

Propagation

Germination is poor from seed stored at RT for 6 months. Storage for 9–18 months yields better results. Pre-treatment with SISP slightly increases germination. Best sowing time is early autumn, or spring. Protect seedlings in cold wet conditions.



***Rhodanthe sterileszens* grows on red sands and quartzite**

Cultivation and uses

Rhodanthe sterilecens is best suited to warm temperate climates and open, well-drained soils. It may prefer alkaline conditions. Little is known of it in cultivation but it is most attractive as a massed species in the wild, and is worth trying in rockeries and containers. Vase life is 7–10 days, and stems air-dry well.

Distribution and habitat

WA. Occurs in the Gascoyne and Murchison districts, often covering huge areas. Grows on red sands and quartzite in shrubland, woodland or on plains.

Synonym

Helipterum sterilecens.

Similar species

Cephalipterum drummondii (white form) has dense clusters of heads terminally but never in the basal leaf axils. Leaves are finer and less hairy. Fruits have coiled, very woolly hairs.



Pappus bristles on *Rhodanthe sterilecens* curl at the top

Rhodanthe stricta

stricta — upright, referring to the habit

Slender Sunray, Glabrous Sunray, Erect Sunray, Urn Paper-daisy

ANNUAL

25–45 cm high ♦ 20–35 cm wide

White

Sturdy little bushes in cultivation. Branching stems are glabrous. Green or grey-green leaves are alternate, sessile, 10–50 × 1–12 mm, dotted above with small spherical glands. White heads, 7–15 mm across, either singly or in loose clusters are held at the tips of slender flower stems to 15 cm long. Fruits are white, silky-hairy. Feathery pappus bristles are tipped with club-shaped cilia.

ately well in 5–30 days and pretreatment increases germination (see page 19). Seed is commercially available. Best sowing time is late autumn/winter.

Cultivation and uses

A prolific annual for gardens when massed, and attractive in containers. Tip prune young plants to promote bushiness. Tolerant of light frosts. Flower stems with multiple heads air-dry well and individual heads may be wired. Vase life is 7–14 days.

Flowering period

July/Dec in cultivation; July/Oct in the wild.

Propagation

Seed should be stored at RT for 18–24 months to overcome dormancy. It germinates moder-

Distribution and habitat

Qld, NSW, Vic, SA, WA, NT. Grows on a variety of soils.



Prolific *Rhodanthe stricta* is attractive in containers



An attractive annual, *Rhodanthe stuartiana* deserves wider recognition

Synonym

Helipterum strictum.

Similar species

Rhodanthe oppositifolia ssp. *oppositifolia* has opposite leaves. Pappus bristles are evenly

feathery. ♦ *R. propinqua* has smaller heads (4–6 mm) in short-stalked clusters, and leaves with sparse cottony hairs on the lower surfaces. Pappus bristles are evenly feathery.

Rhodanthe stuartiana

stuartiana — after John McDouall Stuart (1815–66), explorer

Clay Sunray, Flowery Sunray

ANNUAL

20–35 cm high ♦ 20–40 cm wide

White

In cultivation an attractive annual with stems either unbranched or having one or two side shoots. Narrow linear leaves to 3 cm are dark green, almost hairless. White flower-heads 1.5–3 cm across are held singly at the tips of stems. Fruit is silky-hairy, 2 × 1 mm, with an evenly feathery pappus.

Cultivation and uses

Open, sunny positions are preferred, and plants respond to fertilizers. Tip prune to promote branching. Attractive in rockeries and containers, this relatively unknown species should be reliable in gardens and deserves to be more popular. Cut flowers last 2–3 weeks in water, and flower stems are easily wired.

Distribution and habitat

Qld, NSW, Vic, SA. Grows mostly on heavy soils in herbfields or mallee.

Synonyms

Helipterum stuartianum, *Helipterum floribundum* var. *stuartianum*.

Similar species

Rhodanthe anthemoides has thick leaves bearing spherical glands embedded in pits. ♦ *R. diffusa* ssp. *leucactina* has spherical glands and short septate hairs on leaves. ♦ *R. floribunda* has blunt leaves with cobwebby and glandular hairs. ♦ *Hyalosperma praecox* (white form) has orange-brown warted fruits.

Flowering period

Aug/Nov in cultivation; July/Oct in the wild.

Propagation

Commercial seed is not yet available. Wild seed yields about 25% germination after 6 months storage, and germination increases further after 12–18 months storage. Seed from cultivated plants results in increased germination. See page 19 for the best pretreatment. Seedlings appear in 6–20 days if sown in autumn/winter and may need protection in cold wet conditions.

Rhodanthe tietkensis

tietkensis — after William Henry Tietkens (1844–1933),
explorer and surveyor

Sand Sunray, Tietkens' Daisy

ANNUAL

30–45 cm high ♦ 40–60 cm wide

Yellow

In cultivation an upright or ascending woolly annual with clusters of sessile yellow non-radiating flower-heads, 2–2.5 cm across, at the tips of branching stems. The flowers emit a faint perfume. Leaves are green or grey-green, aromatic, 10–80 × 2–12 mm, slightly stem-clasping. Fruits are dark brown, not encased in wool.

Flowering period

Sept/Jan in cultivation; July/Nov in the wild.

Propagation

Seed germinates moderately well in 7–20 days. Germination is improved with pretreatment (see page 19). Best sowing time is autumn. Seed is not readily available commercially.

Cultivation and uses

This species grows in sunny, well-drained positions, responding to fertilizer and adequate watering. Tip prune to maintain a neat shape, and mass plant for best effect. Cut flowers last in water for 14 days and firm stems may be air-dried.

Distribution and habitat

Qld, NSW, Vic, SA, WA, NT. Occurs on sandy soils in semi-arid regions in mallee, mulga and saltbush communities.

Synonym

Helipterum tietkensis.

Similar species

Rhodanthe moschata has similar clusters of heads which are smaller, and which remain



Rhodanthe tietkensis growing on red sands

white for longer periods before turning yellow. It is distinguished by having fewer florets in each individual head (usually three), and by the fruits which are encased in wool.



Clusters of sessile yellow flower-heads on *Rhodanthe tietkensis*

Rhodanthe troedelii

troedelii — after Charles Troedel, whose company made many lithographic prints for Baron von Mueller in the 19th Century

Western Sunray

ANNUAL

5–20 cm high ♦ 10–25 cm wide

White

A small annual with sparsely cottony stems branching towards the top. Narrow linear leaves to about 25 mm are almost hairless. Small white heads, 6–8 mm across, appear at the tips of stems in loose clusters. Inner bracts have radiating blades 3–4 mm long. Silky-hairy fruits, 1.5–2 mm long, have white evenly feathery pappus bristles united in a tube in the lower half.

Flowering period

Oct/March in cultivation; Aug/Oct in the wild.

Propagation

Wild seed germinates poorly in 8–20 days but good germination has resulted from seed harvested from cultivated plants. Pretreatment increases germination (see page 19).

Cultivation and uses

Open, sunny conditions are most suitable. In cultivation plants have increased in width and tended to sprawl. The long flowering period is its main attribute. Flowers last 6–8 weeks in water, but are not worth drying.

Distribution and habitat

NSW, SA, WA. Grows in open semi-arid regions, on gibber plains, in sands, clays or saline soils.

Synonym

Helipterum troedelii.

Similar species

Rhodanthe microglossa has heads in dense clusters. The blades on the inner bracts are 1–2 mm long. ♦ *Schoenia ramosissima* (white form) has brown fruits with hooked hairs, and 14–26 barbed yellow pappus bristles.

Rhodanthe uniflora

uniflora — one flower, a reference to the number of florets in each head

Woolly Sunray

ANNUAL

5–15 cm high ♦ 10–30 cm wide
White

In cultivation a bushy annual to 15 cm high with branching stems. Soft, grey-green, linear leaves, 10–15 × 1 mm, bear woolly hairs. Flower-heads are 1.5 mm across and 3–4 mm long, with white woolly non-radiating bracts. Heads are in small terminal and axillary clumps held in leafy clusters. Fruits are brown, spindle-shaped, to 2 mm long, wrapped in wool. In the wild *R. uniflora* may grow taller and less spreading.

Flowering period

Sept/Dec in cultivation; between late May and October in the wild.

Propagation

Although *R. uniflora* has regenerated naturally in pots, germination of wild seed or seed harvested from cultivated plants is often poor (about 10%). Germination is increased by storage at RT for 12–18 months and pretreatment with SISF.

Cultivation and uses

Plants prefer open positions in soil which is not allowed to dry out. The colour and form are attractive in containers but this species is short-lived in gardens. Slugs attack the foliage. Unsuitable as a cut flower.

Distribution and habitat

Qld, NSW, SA, WA, NT. Occurs on gibber plains, flood plains and along watercourses. Grows in clays, sands and sandy loams.

Synonym

Helipterum uniflorum.

Similar species

Rhodanthe maryonii grows taller, has green leaves, and larger flower-heads with about 12 florets. ♦ *R. moschata* grows taller, has broader leaves (3–10 mm), and heads containing 2–3 florets.

Schoenia

The genus *Schoenia* is named in honour of Johannes Schoen, a botanical illustrator who was also an ophthalmologist living in Hamburg in the early 19th Century.

Schoenia, revised by Wilson (1992a) contains five species and three subspecies, all endemic in Australia. Plants are erect annuals, variously hairy, with leaves opposite or alternate, flattened or terete. Flower-heads are solitary or in clusters, narrow-cylindrical to cup-shaped or top-shaped. Involucral bracts are in rows and are woolly or glabrous, papery, ovate, and glossy. The colour of the heads is pink, white or yellow.

Schoenia occurs in all States except Victoria and Tasmania, with two species, *S. macivorii* and *S. filifolia*, being confined to Western Australia. Plants grow in open situations, generally on loamy soils, often under mulga, where they contribute to the colourful carpet of wildflowers seen in inland areas during the spring.

Most species, even the tiny *S. ramosissima*, have excellent horticultural potential. Propagation is from seed, most species being commercially available. Seed of some species has a dormant period of at least nine months, which necessitates storage for the length of the dormant period or treatment to reduce dormancy. Optimum sowing time is autumn although spring may be best in cooler regions.

Some *Schoenia* species are popular for their ease of cultivation. They grow well in gardens, either massed or planted in drifts, and are showy in rockeries and containers. Species are best suited to warm temperate climates but will grow in cooler areas provided they have enough sun. Plants need good drainage and flower profusely for up to twelve weeks in cultivation. Fresh flowers have a vase life of 1–3 weeks, some species air-dry well and may be wired.



A brilliant pink carpet of *Schoenia cassiniana* in Western Australia

Schoenia ayersii

ayersii — after Sir Henry Ayers (1821–97), premier of South Australia and Governor of Adelaide Botanic Gardens from 1862–97

ANNUAL

10–30 cm high ♦ 5–10 cm wide
Yellow

An erect aromatic annual with branching flower stems arising from a tuft of basal leaves. Stem leaves are sessile, linear to narrow-oblong, 20–70 × 2–10 mm. Stems and leaves are covered in glandular and septate hairs. Flower-heads, 1–2 cm wide, are solitary or irregularly clustered on slender stems. Heads are hemispherical and the bracts do not radiate. Fruits are 3–4 mm long, top-shaped, brown, slightly wrinkled, with blunt hairs. The apex is truncate and saucer-shaped. Pappus bristles are numerous, united at the base and falling off the body early.



Schoenia ayersii grows on loamy soils or rocky outcrops



Top-shaped fruit of *Schoenia ayersii*

Flowering period

Not known in cultivation; July/Sept in the wild.

Propagation

Seed germinates poorly. Pretreatment does not appear to improve germination.

Cultivation and uses

This species has not been grown successfully by the Study Group but it would appear to have horticultural potential.

Distribution and habitat

SA, WA, NT. Occurs on loamy soils and rocky outcrops.

Synonyms

Helichrysum ayersii, *Podolepis georgii*.

Similar species

Superficially resembling *Podolepis*, *Schoenia ayersii* is distinguished by the top-shaped fruits bearing coarse hairs. The fruits of *Podolepis* species are terete and papillose.

Schoenia cassiniana

cassiniana — after Count Henri de Cassini (1781–1832)
Pink Cluster Everlasting, Pink Everlasting,
Cassini's Everlasting

ANNUAL

10–40 cm high ♦ 5–15 cm wide
Pink, White



Deep pink flower-heads of *Schoenia cassiniana* are very attractive when massed in gardens

An erect annual with firm stems, often branching near the base. Stems are covered in short hairs which become more woolly towards the top. Leaves are opposite or alternate, sessile, 2–9 × 1–3 cm, oblong to ovate. Terminal, open flower clusters are held on slender stems. Flower-heads are 1–2 cm in diameter, in various shades of pink which fades to white on aging. White-flowered forms occur, but are more rare. Fruits are oblong, flattened, 5 × 1–2 mm, usually black but sometimes brown. Brown seed has germinated, so is not necessarily immature. The pappus bristles are up to 5 mm long.

Flowering period

Sept/Nov in cultivation; Aug/Nov in the wild.

Propagation

Seed from cultivated plants germinates in 6–20 days. Percentage germination of commercial seed is increased after pretreatment with SISP or gibberellic acid. Cuttings of firm growth strike readily.

Cultivation and uses

Schoenia cassiniana makes an attractive display when mass-planted in gardens or tubs. Flowers last well in water. The largest individual heads may be wired but air-dried clusters usually droop when inverted and the bract colour fades with time. A form known as 'Tanner's Pride' is shorter and more compact. Flower-heads are smaller, to 1.3 cm across, and there

are more heads per cluster. Buds are pale pink, opening to white.

Distribution and habitat

SA, WA, NT. Grows as a brilliant carpet under wattle scrub and on the heavy soils

of mulga scrub. Often found in association with *Cephalopterum drummondii*.

Synonym

Helichrysum cassinianum.

Schoenia filifolia* ssp. *arenicola

arenicola — growing in a sandy place

ANNUAL

25–30 cm high ♦ 10–15 cm wide

Yellow

An erect annual with slender to robust single stems branching above to form an open cluster of heads. Leaves are green, 20–40 × 0.5–1 mm, linear. Flower-heads are yellow, 10–15 mm across, in corymbose clusters. The involucre is cylindrical. Fruits are brown, compressed, cylindrical, 3 × 1 mm, sparsely covered with short hairs. Pappus bristles, 20–30, are barbed, pale yellow along their length and bright yellow at the tips.

Flowering period

Aug/Oct in cultivation; Sept/Nov in the wild.

Propagation

Untreated wild seed germinated very well in 8 days when sown 12 months after collection.

Cultivation and uses

This is a spectacular annual which prefers open sunny locations in well-drained soils. It should be more widely grown as seed becomes available. Plants are suitable for containers, rock gardens and mass planting. Vase life is 10–14 days and flower stems air-dry well.

Distribution and habitat

WA. Confined to sand hills in the Carnarvon area. An early collection from Champion Bay suggests that this subspecies may have occurred as far south as Geraldton.

Similar species

Subspecies *filifolia* is multi-stemmed, and has top-shaped involucre. ♦ Subspecies *subulifolia* branches near the base, has solitary heads that are larger (to 4 cm across), and hemispherical involucre.

Schoenia filifolia* ssp. *filifolia

filifolia — with thread-like leaves

Thread-leaved Everlasting

ANNUAL

10–25 cm high ♦ 4–25 cm wide

Yellow

An erect annual with slender, single or branched, slightly hairy stems. Leaves are green, 15–80 × 0.5–1 mm, linear, with acute tips and a few sparse hairs. Plants branch near the base and are more hairy when young. Stems terminate in single yellow flower-heads, 2–2.5 cm across. Radiating blades

on the inner bracts are 3–7 mm long. The involucre is top-shaped. Fruits are 2 × 1 mm, brown to dark brown, narrowly obovate, with a sparse to moderate cover of appressed transparent hairs. The pappus is readily shed.



***Schoenia filifolia* ssp. *arenicola* is a spectacular annual with clusters of bright flower-heads**



***Schoenia filifolia* ssp. *filifolia* is a reliable, floriferous annual**

Flowering period

July/Nov in cultivation; Aug/Nov in the wild.

Propagation

Seed from cultivated plants germinates readily in 6–14 days when sown in autumn.

Cultivation and uses

Subspecies *filifolia* has enormous potential as a neat, colourful, floriferous annual and makes a bright display either in pots or the garden. Plants should be nipped back when young to promote branching. Cut flowers last for 2–3 weeks and heads wire successfully.

Distribution and habitat

WA. Occurs in the south-west from Mullewa to Kalgoorlie and Lake Barker, often growing in saline areas.

Synonym

Helichrysum filifolium.

Similar species

Subspecies *arenicola* is single-stemmed, and has cylindrical involucre. ♦ Subspecies *subulifolia* has hemispherical involucre and the blades are 7–11 mm long. Plants are taller and more open.

Special notes

One collection of a variant of this subspecies



Fruits of *Schoenia filifolia* ssp. *filifolia*

represented by the type of *Helichrysum turbinatum* W.Fitzg. has short white blades about 3 mm long.

Schoenia filifolia ssp. *subulifolia*

subulifolia — having awl-shaped leaves

Showy Everlasting

ANNUAL

20–50 cm high ♦ 5–25 cm wide

Yellow, White (rarely)

An erect annual with single or branching stems that have small glandular hairs and a few cobwebby hairs. Leaves are green, 30–50 × 1–1.5 mm, linear, well-spaced. Stems terminate in large yellow flower-heads, 1–4 cm in diameter. In rare collections the radiating blades are white. The involucre is hemispherical. Fruits are 3 × 1 mm, dark brown, with a dense covering of stiff transparent hairs. Pappus bristles, 30–40, are barbed, pale yellow with bright yellow tips.

Flowering period

July/Nov in cultivation; Aug/Oct in the wild.

Propagation

In autumn seed germinates very well in 4–10 days. Commercial seed is available.

Cultivation and uses

Subspecies *subulifolia* makes a spectacular display in the garden or in containers and it self-sows readily. It tolerates cold conditions reasonably well but has been badly burned

by frost to -5°C . Nipping back when young will promote branching and extra flowers. It lasts well as a cut flower and may be wired easily.

Distribution and habitat

WA. Occurs in the Geraldton district, sometimes growing in swampy areas.

Synonym

Helichrysum subulifolium.

Similar species

Subspecies *filifolia* is shorter and more branched. Heads, leaves and seeds are smaller. The involucre is top-shaped.

Special notes

Some collections suggest that ssp. *filifolia* and ssp. *subulifolia* grade into each other.



***Schoenia filifolia* ssp. *subulifolia* is a showy, easily grown annual**

Schoenia macivorii

ANNUAL

macivorii — after Ralph MacIvor (died about 1917), agricultural scientist

15–25 cm high ♦ 10–25 cm wide
Yellow

New to cultivation, this handsome, lemon-scented annual has erect to ascending stems, glandular-hairy under magnification. Leaves are green, 15–75 × 1–3 mm, narrow-lanceolate, channelled above, and glandular-hairy. Flower-heads are yellow, 2–3.5 cm across, with broad blunt bracts, held singly at the tips of stems. Fruits are brown, cylindrical, 3–4 × 1.5 mm, densely covered with

long hairs extending above the apex. Pale yellow pappus bristles, 10–14, are stiffly barbed, the barbs bright yellow and more dense at the apex. In the wild heads may be up to 5 cm across.

Flowering period

Aug/Dec in cultivation; at least July/Sept in the wild.



Broad bracts are characteristic of *Schoenia macivorii*

Propagation

Seed germinates moderately well (50–60%) with SISF pretreatment. Seed is commercially available.

Cultivation and uses

Schoenia macivorii prefers open, sunny conditions in well-drained soils. It is attractive in containers and rockeries, and should prove popular when it is more widely known. Vase life is about 2 weeks, and heads air-dry well and are easily wired.

Distribution and habitat

WA. Occurs in the Gascoyne River region growing on sands and stony loams.

Synonym

Helichrysum macivorii.

Similar species

Schoenia filifolia ssp. *subulifolia* is usually taller (to 50 cm), more erect, and not lemon-scented. It occurs in the Geraldton area.



***Schoenia macivorii* has brown fruits with fragile yellow pappus bristles**

Schoenia ramosissima

ramosissima — branching, referring to the stem

Dainty Everlasting

ANNUAL

3–12 cm high ♦ 10–20 cm wide

White, Yellow

A dainty erect, multi-stemmed annual. As plants develop, the stems grow dense and top-heavy. Leaves are green, 20–40 × 1–2 mm, linear and sometimes woolly. Flower-heads are white or yellow, 5–8 mm across, in loose terminal clusters. White forms may have pink outer bracts. Fruits are brown, compressed, 2–2.5 mm long, covered with short hairs coiled at the tips. Pappus bristles, 14–26, are barbed, with thickened, often yellow clusters at the tip.

Flowering period

Aug/Dec in cultivation; June/Oct in the wild.

Propagation

Seed collected from cultivated plants germinates moderately well in 7 days. Seed from semi-arid areas is dormant for at least 9 months. Germination has been improved in some trials with GA₃ pretreatment.

Cultivation and uses

This species is probably too small to make much of an effect in gardens, but it is a very dainty subject for pot cultivation, either on its own or mixed with other small species.

Distribution and habitat

Qld, NSW, SA, NT. Occurs in a wide range of habitats; tablelands, gibber plains, arid rocky hills, waterholes and areas subject to short inundation. Usually grows in sandy clay or clay-loams.

Synonym

Helichrysum semifertile.

Similar species

Rhodanthe troedelii might be mistaken for the white form of *S. ramosissima*. It is distinguished by its silky-hairy fruits, and feathery pappus bristles.



Schoenia ramosissima is a dainty, multi-stemmed annual

Waitzia

The genus *Waitzia* was named for Karl Friedrich Waitz (1774–1848), a privy councillor in the duchy of Saxe-Altenburg in Germany.

The genus comprises five species and two recognised varieties (Wilson 1992*d*). They are erect annual herbs, often branching at the base, with cobwebby hairs. Leaves are alternate, linear to narrow-oblong, sessile, sometimes with recurved margins; the uppermost grading into bracts subtending the flower-head. The involucre is hemispherical to top-shaped, and the bracts are arranged in several layers. The fruit is a compressed ellipsoid with a slender neck (or 'beak') below a pappus of numerous barbed bristles united at the base.

Waitzia is endemic in Australia and is a dominant understorey forb of open woodland, mallee and mulga communities in the drier regions of

Western Australia. One species (*W. acuminata*) extends to all other States except Tasmania.

Hybridization between species in the wild appears to be rare and limited to crosses between *W. suaveolens* var. *suaveolens* and the two varieties of *W. acuminata*.

Waitzia species make colourful massed displays and are long-lasting as cut flowers. They are attractive container subjects. Cultivation is easy provided plants receive plenty of sunlight, the soil is well drained, and overhead watering is avoided. *Waitzia nitida* and *W. suaveolens* are often sold as dried flowers. All species are worthy of horticultural development.

Propagation is generally from seed that is available from specialist stockists. It germinates readily in 3–20 days when planted in autumn.

Waitzia acuminata var. *acuminata*

acuminata — tapering to a point; referring to the outer bracts

Orange Immortelle

ANNUAL

10–50 cm high ♦ 5–40 cm wide

Yellow, Orange

In cultivation an erect or ascending annual often branching at the base, and with short, soft hairs. Leaves are alternate, 20–70 × 2–5 mm, broad-linear, usually with revolute margins. Flower-heads are borne in loose clusters at the ends of reddish-brown stems and may be vivid yellow or orange to red. The heads are ovoid to bell-shaped, 1.5–2 cm long, and seldom fully open except on hot sunny days. Lanceolate outer bracts with irregular microscopic teeth are arranged in several layers descending down the stem. The barbed pappus is white or colourless.

Flowering period

Aug/Dec in cultivation; June/Dec in the wild.

Propagation

Seed germinates moderately well in 3–12 days when sown in autumn. Seedlings should be protected from overhead watering to prevent damping-off.

Cultivation and uses

Waitzia acuminata prefers open sunny positions. Tip pruning when young encourages a bushy habit and increases flower production. Stunning when grown en-masse, it has potential as a bedding plant, and also performs well if sown direct in containers. Stiff flower stems air-dry well if picked in bud, but wiring of individual heads is unrewarding. Long-lasting as a cut flower.



***Waitzia acuminata* var. *acuminata* is a showy species of mulga scrub**



***Waitzia acuminata* var. *albicans* (left) and var. *acuminata* grow together near Kalbarri, Western Australia**

Distribution and habitat

Qld, NSW, Vic, SA, WA and NT. Occurs south of the tropics in mallee, mulga and woodlands, usually on sandy red soils.

Synonym

Waitzia discolor. *Waitzia corymbosa* is a misapplied name.

Similar species

Waitzia acuminata var. *albicans* differs only in the colour of the involucre bracts which are white or violet-red. ♦ *W. nitida* has larger more top-shaped flower-heads and pappus bristles which are always yellow in the upper half. ♦ *W. suaveolens* var. *flava* has smoother less prominently layered bracts, and heads subtended by reduced leaves.

Waitzia acuminata* var. *albicans

albicans — tending to white; referring to the outer bracts

ANNUAL

10–50 cm high ♦ 5–40 cm wide
White, Pink

In cultivation an upright annual branching at the base. It is identical to *W. acuminata* var. *acuminata* except that the outer bracts are a deep cyclamen-pink becoming paler as the head opens, and eventually fading to white.

Flowering period

Aug/Dec in cultivation; June/Dec in the wild.

Propagation

See *W. acuminata* var. *acuminata*.

Cultivation and uses

See *W. acuminata* var. *acuminata*.

Distribution and habitat

WA. This variety is found in similar habitats to *W. acuminata* var. *acuminata*, generally near the coast between York and Hamelin Pool.

Similar species

Waitzia acuminata var. *acuminata*. ♦ *W. suaveolens* var. *suaveolens* has broader, smoother involucre bracts, and flower-heads subtended by linear herbaceous bracts.

Waitzia corymbosa

corymbosa — with flower-heads more or less at the same level; referring to the flower clusters

ANNUAL

10–40 cm high ♦ 5–25 cm wide
Pink, White, Cream

An erect, moderately hairy annual branching at and above the base. Leaves are sessile, alternate, linear, revolute, 15–100 × 1–5 mm, decreasing in size up the stem. Loose, often drooping clusters of flower-heads, 1.5–2 cm across, occur at the top of each stem. The outer involucre bracts are lance-shaped with microscopic teeth and are usually subtended by leafy bracts. A characteristic of this species is that the outer bracts quickly reflex to reveal long stiff inner bracts with small

straw-coloured blades. The pappus is barbed, and white or colourless.

Flowering period

Sept/Nov in cultivation; July/Oct in the wild.

Propagation

Seed germinates in 3–20 days. Best sowing time is autumn but seedlings require protection from cold wet conditions.

Cultivation and uses

This species has not often been tried in cultivation. An open sunny situation in well-drained soil is considered essential. Pot culture has been successful. Whilst mass plantings are showy, the habit of the outer bracts reflexing is not aesthetically pleasing and detracts from the species as a subject for drying or as a cut flower.

Distribution and habitat

WA. Occurs between Kalbarri and Shark Bay growing on coastal sands.

Synonym

None. The name *Waitzia corymbosa* has been misapplied to both *Waitzia acuminata* and *W. suaveolens*, and the name *W. podolepis* has been misapplied to *W. corymbosa*.

Similar species

Waitzia acuminata var. *albicans* is not obviously subtended by leafy bracts. ♦ *W. suaveolens* var. *suaveolens* has white or translucent innermost bracts. ♦ *W. podolepis* has inner bracts more or less equal in length to the outer ones.

Waitzia nitida

nitida — shining, lustrous; referring to the outer bracts
Golden Waitzia

ANNUAL

20–60 cm high ♦ 10–30 cm wide
Yellow

An upright sparsely woolly annual with stems single or branching near the base. The sessile leaves are woolly-hairy, 20–80 × 2–13 mm, narrowly ovate to linear, and revolute with a short stiff point at the tip. Top-shaped flower-heads, 2–3.5 cm in diameter, are vibrant yellow and borne in terminal clusters. Outer involucre bracts are lance-shaped and generally entire. Fruit is ovoid with a long slender beak and a pappus of yellow bristles, often becoming white at the base.

Flowering period

Sept/Nov in cultivation; Aug/Dec in the wild.

Propagation

Seed germinates moderately well in 3–20 days without pretreatment. Autumn sowing is preferable provided that seedlings are protected from cold wet conditions during winter.

Flower-heads of *Waitzia nitida* are beginning to shed fruits



Cultivation and uses

Responds to cultivation in well-drained soils and has excellent potential as a bedding plant for sunny situations. Stems air-dry if picked in bud, and cut flowers last well.

Distribution and habitat

WA. Frequent and widespread in the south-west, generally on sands or gravelly soils amongst scrub or in open woodland.

Synonyms

Waitzia aurea, *Leptorhynchos aureus*.

Similar species

Waitzia acuminata var. *acuminata* has smaller flower-heads and a pappus which is white or colourless in the upper half. ♦ *W. suaveolens* var. *flava* is readily distinguished by its colourless pappus.

Waitzia podolepis

podolepis — referring to the stalked inner bracts

ANNUAL

10–30 cm high ♦ 5–25 cm wide

White

A handsome, upright annual, often branching at the base and clothed in cobwebby hairs on leaves and stems. Leaves are alternate, 25–50 × 2–3 mm, linear to narrow-oblong, sessile and revolute; the uppermost grading into bracts just below the flower-head. The involucre is white, hemispherical to top-shaped, 15–22 mm across, and borne in loose clusters at the tips of sometimes reddish stems. Outer bracts are lance-shaped and generally entire. The inner bracts, often tinged purple, usually do not exceed the outer ones in length, and have mottled pale-brown blades. The fruit is pale brown and the barbed pappus is white above a straw-coloured beak.

Flowering period

Sept/Oct in cultivation; July/Sept in the wild.

Propagation

Seed germinates readily in 3–20 days. Sow in autumn/late winter and protect from cold and over-watering.

Cultivation and uses

This species is new to cultivation. It prefers warm, open situations in well-drained soils, and is suitable for grouping or massing in gardens and containers. Flowers last well when freshly picked, and stems may be air-dried.

Distribution and habitat

WA. Occurs between the Irwin River and Shark Bay, usually in sand.

Synonym

Leptorhynchos podolepis. The name *Waitzia podolepis* has been wrongly applied to *W. corymbosa*.

Similar species

Waitzia corymbosa has inner bracts distinctly longer than the outer bracts. ♦ *W. suaveolens* var. *suaveolens* differs in that the blades of the innermost bracts are white or translucent.



Beaked fruits of Waitzia species
 From the left *W. acuminata* var. *acuminata*, *W. corymbosa*, *W. nitida*,
W. podolepis and *W. suaveolens* var. *suaveolens*

Waitzia suaveolens var. *flava*

flava — yellow, referring to the outer bracts

ANNUAL

20–60 cm high ♦ 10–30 cm wide
 Cream, Yellow

This variety differs from some forms of *W. suaveolens* var. *suaveolens* only in the colour of the outer bracts which are cream to lemon yellow. The upper branches and leaves are glandular-hairy, heads are smaller, and the clusters more open, as in the eastern form of var. *suaveolens*. The heads are subtended by reduced leaves.

Flowering period

Aug/Nov in cultivation; Sept/Dec in the wild.

Propagation

See *W. suaveolens* var. *suaveolens*.

Cultivation and uses

Not grown as often as var. *suaveolens* but equally successful.

Distribution and habitat

WA. Grows in open woodland from the Stirling Range north to Norseman and east to Balladonia, sometimes together with var. *suaveolens*.

Synonym

None. The name *Waitzia aurea* has been misapplied to this variety.

Similar species

Waitzia acuminata var. *acuminata* has flower heads not subtended by reduced leaves. ♦ *W. nitida* has a yellow pappus. ♦ *W. suaveolens* var. *suaveolens* has white or pink outer bracts.

Waitzia suaveolens var. *suaveolens*

suaveolens — sweet smelling
Fragrant Waitzia

ANNUAL
20–60 cm high ♦ 10–30 cm wide
White, Pink



Beautiful pink and white flower-heads of *Waitzia suaveolens* var. *suaveolens*

An attractive, floriferous annual with a sweet fragrance. Upper branches and leaves have cobwebby or glandular hairs or are almost glabrous. Leaves are 10–80 × 1–6 mm, narrowly linear or obovate, sessile, with an acute apex. Flower-heads are solitary or in clusters, hemispherical and 1–3 cm in diameter. Heads are subtended by reduced leaves. Outer involucral bracts are often deep pink, giving the buds an intense colour. Intermediate bracts are white to pale pink, and innermost bracts have white or translucent blades. Fruit is ovoid, brown and glabrous, and the pappus is colourless.

Flowering period

Aug/Nov in cultivation; Sept/Dec in the wild.

Propagation

In autumn seed germinates in 5–20 days without pretreatment.

Cultivation and uses

Plants prefer open, sunny situations but tolerate some shade. They are colourful in rockeries or grouped in the garden, and are excellent for containers. Cut flowers last 2 weeks and stems may be picked for air-drying when in tight bud.

Distribution and habitat

WA. Occurs in the south west from Geraldton to Esperance mostly in open woodland. Wilson (1992d) reports a gradation from east to west in the degree and type of hairiness.

Synonyms

Waitzia nivea, *Leptorhynchos suaveolens*. The name *Waitzia corymbosa* has been misapplied.

Similar species

Waitzia acuminata var. *albicans* has flower-heads which are not subtended by reduced leaves. ♦ *W. suaveolens* var. *flava* has cream or yellow outer bracts.



Glossary

- Achene** a dry one-seeded fruit that does not open to disperse its contents.
- Acuminate** (of leaf or bract apices) gradually tapering to a point. (Figure 11a)
- Acute** (of leaf or bract apices) sharply pointed. (Figure 11b)
- Alternate** (of leaves or flowers) occurring at different levels along stems. (Figure 12c)
- Alpine** of or from the alps, usually above the snowline (approximately 1000 m).
- Annual** a plant that completes its life cycle within one year.
- Annular** ring-shaped.
- Anther** the pollen-bearing part of a stamen.
- Anthesis** the time of flowering, or the time during which pollen is released.
- Apex** (pl. apices) the tip of a leaf, bract or style. (Figure 11)
- Apical** of, or attached to the apex.
- Apiculate** terminating in a short, sharp flexible point. (Figure 11d)
- Apomixis** (adj. apomictic) the process whereby a plant produces viable seed by maturation of the ovules without fertilization having taken place.
- Appressed** pressed closely together (e.g. leaves against a stem).
- Arid** having a low, unreliable annual rainfall.
- Aromatic** having a pervasive fragrance or odour.
- Ascending** spreading horizontally, then becoming erect. (Figure 15d)
- Axil** (adj. axillary) the upper angle between one part of a plant and another (e.g. leaf and stem).
- Barb** (adj. barbed) a hooked projection on an awn or bristle. (Figure 7e, page 5)
- Barbellate** minutely barbed.
- Basal** (of leaves in a rosette) attached or grouped at the base.
- Beak** (adj. beaked) a slender neck between the body of a fruit and the pappus.
- Biennial** a plant that completes its life cycle in more than one but less than two years.
- Bisexual** (of flowers) having both male and female reproductive organs.
- Blade** the expanded part of a leaf or bract. (Figure 1e, page 1)
- Bluebush** common name for a group of plants which often occur in saline conditions.
- Bract** a modified leaf usually in association with a flower-head or inflorescence.
- Bristle** a straight, stiff hair (either smooth or with minute teeth).
- c.** about or approximately
- Calcareous** having a high proportion of free limestone (calcium carbonate).
- Calcrete** (of soil) composed of gravel, sand and debris cemented by porous calcium carbonate.
- Calyx** the outer whorl (sepals) of a flower (cf. corolla).
- Capitulum** (flower-head) a dense cluster of more or less sessile flowers or florets.
- Carpodium** an annular structure on an achene at the point of attachment to the receptacle.
- Cauline** (of leaves) borne on the aerial part of a stem (cf. radical).
- Cilia** (adj. ciliate) hairs more or less confined to the margin of a structure.
- Claw** (of a petal, sepal or bract) narrow stalk-like basal portion. (Figure 1e, page 1)
- Clay pan** natural depressions of clay soil retaining water after rain.
- Clone** a genetically identical individual produced vegetatively from a single parent.

Cobwebby	covered with fine tangled whitish hairs resembling a cobweb. (Figure 16a)
Complex	closely related plants that have not been fully determined taxonomically.
Concolorous	with the same colour throughout or on both surfaces. (cf. discolourous)
Conical	cone-shaped with the broad end at the base (e.g. receptacle).
Cordate	(of leaves) heart-shaped. (Figure 13j)
Corolla	the inner whorl (petals) of non-fertile parts of a flower. (cf. calyx)
Corymb	(adj. corymbose) arrangement of flowers with branchlets at different points but reaching approximately the same height.
Cottony	with a downy appearance resembling seeds of the cotton plant. (Figure 16c)
Cotyledon	(pl. cotyledons) primary leaf or leaves of a plant embryo, (seed leaf or leaves).
Cypsela	dry one-seeded fruit formed from an inferior ovary, which does not open to disperse its contents. (cf. achene)
Cultivar	a horticultural variety developed by selection.
Cytological	pertaining to a cell.
Deciduous	(of a pappus) falling from the fruit. (cf. persistent)
Decumbent	having branches that grow horizontally but turn up at the tips. (Figure 15e)
Decurrent	(of leaves) when the base is prolonged down the stem as a narrow wing or raised edge. (Figure 12e)
Diploid	(of cells) having a full complement of paired chromosomes. (cf. haploid)
Disc centre	(in daisies) the central part of the flower-head.
Disc floret	(in daisies) a floret in the disc centre as distinct from a ray floret with an extended strap-shaped corolla lobe on the periphery of some flower-heads.
Discolorous	with upper and lower surfaces of a different colour.
Dormant	(of seeds) (n. dormancy) inactive.
Ellipsoid	three-dimensional shape that is elliptic in all sections through the long axis.
Elliptical	(of leaves, bracts etc.) oval-shaped. (Figure 13e)
Endemic	having a natural distribution restricted to a particular geographical region.
Entire	(of leaves, bracts etc.) having a smooth margin, not toothed or dissected. (Figure 14e)
Ephemeral	a short-lived plant that flourishes when seasonal conditions are favourable.
Epithet	name applied to a botanical entity.
Erect	(of hairs) perpendicular to a surface: (of plants) upright.
Family	group of one or more genera sharing common features or ancestry.
Feathery	(of pappus bristles) resembling a feather. (Figures 7c, 7d, page 5)
Felted	matted with short interlocked hairs, resembling felt. (cf. tomentose)
Filament	a thread-like structure: (of stamens) the stalk.
Filiform	thread-like. (Figure 13a)
Flora	all the plants growing in a certain region or a book dealing systematically with the plants of a region.
Floral leaves	leaves immediately below a flower or flower-head.
Floret	small flower that is part of a group forming a larger flower-head.
Flower-head	(capitulum) collection of small individual flowers grouped together on a common receptacle, often surrounded by bracts or leaves.
Forb	a non-woody plant other than a grass, sedge or rush.
Form	(<i>L. forma</i>) taxonomic category ranking below species, differentiating minor variation within a species.

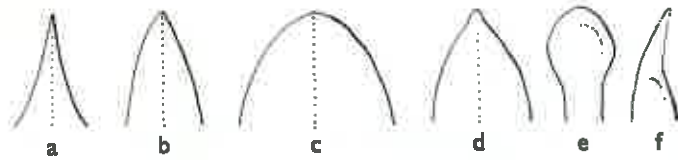


Figure 11. Leaf apices

a, acuminate; b, acute; c, obtuse; d, apiculate; e, capitate; f, having a papery appendage

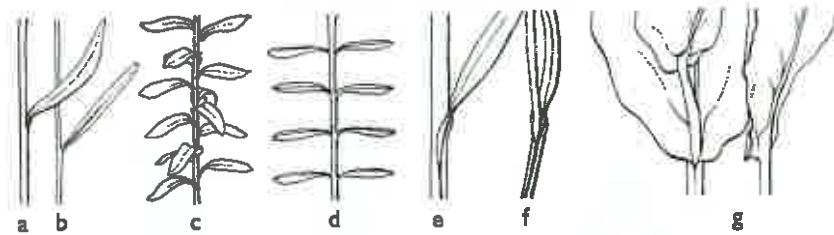


Figure 12. Leaf arrangements and leaf bases

a, sessile; b, petiolate; c, alternate; d, opposite; e, decurrent; f, sheathing (stem-clasping); g, sheathing

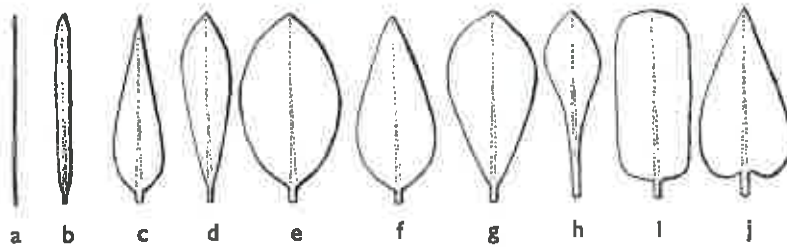


Figure 13. Leaf shapes

a, filiform; b, linear; c, lanceolate; d, oblanceolate; e, elliptic; f, ovate; g, obovate;
h, spatulate; i, oblong; j, cordate

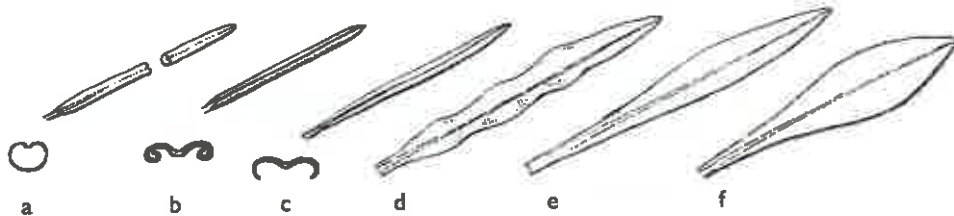


Figure 14. Leaf margins

a, terete; b, revolute (rolled-under); c, recurved (curved-under); d, undulate (wavy);
e, entire; f, ciliate (fringed with hairs)

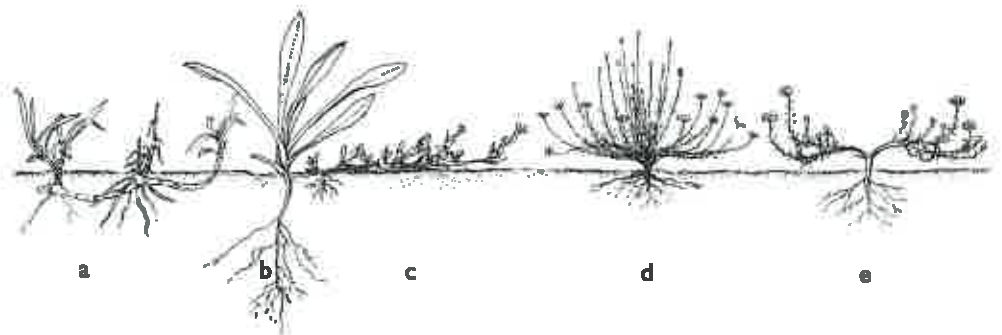


Figure 15. Plant growth forms
 a, rhizomatous; b, tap-rooted; c, prostrate; d, ascending; e, decumbent

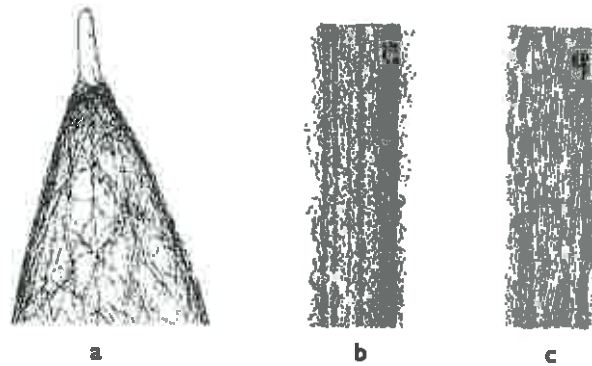


Figure 16. Surface coverings (stems, leaves) a, cobwebby; b, woolly; c, cottony

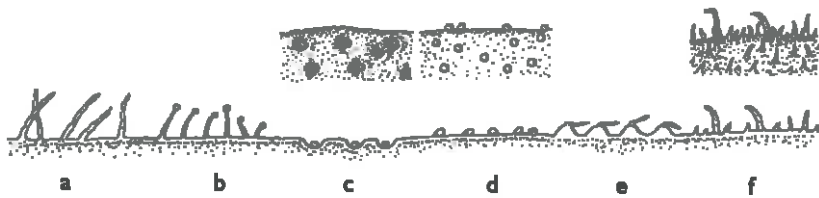


Figure 17. Hair types
 a, septate; b, glandular (stalked); c, glandular (sessile) embedded in pits;
 d, glandular (sessile); e, papillose; f, scabrous

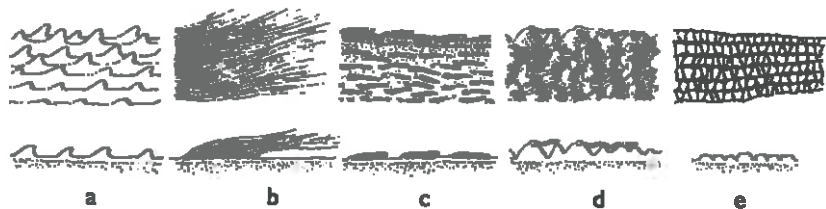


Figure 18. Fruit surfaces
 a, warty (papillose); b, silky-hairy; c, short hairs; d, papillose with simple hairs; e, tessellated

Fruit	seed-bearing structure formed from the ovary after fertilization.
Gamete	cell or nucleus that fuses with another during sexual reproduction.
Gene	(adj. genetic) portion of a chromosome that specifies a single character in an individual.
Genus	(pl. genera) taxonomic category above species, grouping those that share common features or ancestry.
Germ-pore	the point on a pollen grain through which the pollen tube germinates.
Gibber	arid area characterized by hard stony ground.
Glabrescent	almost or becoming glabrous.
Glabrous	without hairs, scales or bristles.
Gland	(adj. glandular) smooth bead-like outgrowth, usually secretory.
Globular	(globose) nearly spherical, ball-shaped. (Figure 19b)
Granitic	(of soil) derived from granite, containing quartz and mica.
Habit	(of plants) the general appearance including size, shape, texture and growth form.
Habitat	environment and conditions where a plant grows naturally.
Hair	elongated cell or row of cells borne on the surface of a structure, either branched or unbranched. (Figure 17)
Haploid	(of cells) having a single set of unpaired chromosomes. (cf. diploid)
Head	(capitulum) a dense cluster of more or less sessile flowers or florets.
Heathland	vegetation dominated by small shrubs usually having small, sharp leaves.
Herb	plant that does not develop a woody stem; usually green and soft in texture.
Herbaceous	(e.g. bracts) green and soft in texture, resembling a herb.
Holotype	(type) herbarium specimen chosen by the author of a plant name as a reference specimen.
Hyaline	translucent, usually colourless or almost so.
Hybrid	offspring of two genetically different parents, usually of different species.
IBDU	isobutylene diurea, a slow-release nitrogen rich fertilizer.
Imbibition	(of seeds) taking up water prior to germination.
Indigenous	occurring naturally in a particular area, not introduced.
Inflorescence	group or arrangement of flowers (e.g. a capitulum in Asteraceae).
Involucre	(adj. involucre) group of bracts surrounding a flower-head.
Lanceolate	lance-shaped, broadest in the lower half and tapering to a tip. (Figure 13c)
Lateral	attached to the side of a structure (e.g. leaves on a stem).
Laterite	(adj. lateritic) (of soils) consisting of a high proportion of iron oxides.
Layering	(of plants) the process of rooting where a stem touches the soil.
Lectotype	herbarium specimen chosen by an author subsequent to the first author of a plant name. (cf. holotype)

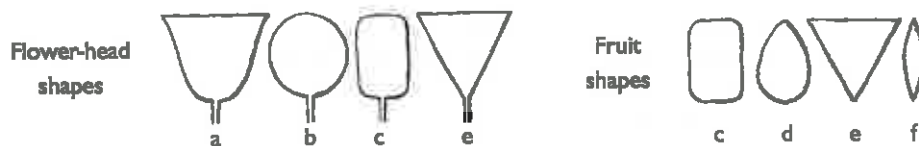


Figure 19. Flower-head and fruit shapes
a, campanulate (bell-shaped); b, globular; c, cylindrical; d, ovoid;
e, turbinate (top-shaped); f, spindle-shaped

Limestone	(of soil) consisting of a high proportion of calcium carbonate.
Linear	long and narrow with more or less parallel sides. (Figure 13b)
Loam	(of soil) rich, friable blend of clay, sand and vegetable matter.
Lobe	(of leaves or petals) often rounded portion formed by divisions to about half-way to the centre.
Mallee	plant community characterized by trees each having several trunks arising from a single lignotuber.
Microscopic	not visible to the naked eye. (cf. macroscopic)
Monotypic	(of a genus) consisting of only one species.
Montane	of or from the mountains, usually below the snow-line (approx 1000 m).
Mucilage	viscous substance produced by some seeds after water imbibition.
Mulga	plant community characterized by shrubby acacias, typically <i>A. aneura</i> .
Myall	plant community characterized by several acacias, especially <i>A. pendula</i> .
Node	(of plants) a point along a stem from which the leaves and/or branches arise.
Nomenclature	system of naming, especially in scientific usage in taxonomy.
Oblanceolate	lance-shaped, with broadest part beyond the centre. (Figure 13d) (cf. lanceolate)
Oblong	(of leaves or bracts) two-dimensional rectangular shape with the length a few times greater than the width and the ends usually rounded. (Figure 13i)
Obovate	(of leaves or bracts) two-dimensional egg shape with the widest part beyond the centre. (Figure 13g) (cf. ovate)
Obovoid	egg-shaped with the widest part beyond the centre.
Obtuse	(of leaves or bracts) blunt or rounded at the apex. (Figure 11c) (cf. acute)
Opposite	(of leaves or flowers) borne at the same level but on opposite sides of the stem. (Figure 12d)
Orbicular	(of leaves or bracts) two-dimensional shape more or less circular.
Ovary	basal portion of a carpel enclosing the ovule, developing into the fruit after fertilization.
Ovate	(of leaves or bracts) two-dimensional egg shape with the widest part nearest the base. (Figure 13f) (cf. obovate)
Ovoid	egg-shaped with the widest part at the base. (Figure 19d) (cf.) obovoid
Ovule	structure within the ovum that contains the female gamete and develops into the seed after fertilization.
Panicle	a raceme in which the flowers are borne on a main stem and branches of the stem.
Papilla	(pl. papillae, adj. papillose, papillate) small projection on a surface. (Figures 17e, 18a, 18d)
Pappus	(of daisy florets) tuft or ring of hairs or scales borne above the ovary and outside the corolla (possibly a modified calyx).
Peduncle	(adj. pedunculate) stalk of an inflorescence (flower stem).
Pendent	drooping, hanging downwards, pendulous.
Perennial	plant that has a life span of more than two years. (cf. annual, biennial)
Pericarp	the wall of a fruit, developed from the ovary wall after fertilization.
Persistent	remaining attached to the plant beyond the usual time of falling. (cf. deciduous)
Petaloid	like a petal (soft textured and/or coloured).
Petiole	(adj. petiolate) stalk of a leaf.
Pleated	(of bracts) folded on itself resembling pleats.
Plumose	feather-like with fine hairs branching from the main axis. (Figures 7c, 7d, page 5)

Pollen	powdery mass containing the male gametes shed from the anthers of a flower.
Pollen tube	filamentous structure developing from the pollen surface and growing down the style to the ovule to facilitate the entry of the male gamete.
Polyploid	with more than two sets of chromosomes in the cell nucleus.
Prostrate	lying flat on the ground. (Figure 15c)
Provenance	(of seed or species) geographic origin or source.
Quartzite	rock composed of granular quartz.
Raceme	(adj. racemose) a series of flowers on lateral stalks from a main stem, with the youngest at the top.
Radiating	(of bracts e.g. ray bracts,) diverging from the centre like spokes of a wheel.
Radical	(of leaves) basal, clustered at the base of a stem. (cf. cauline)
Radicule	part of an embryonic plant giving rise to the root system.
Receptacle	(in daisies) the expanded tip of the flower stem to which the florets are attached, usually surrounded by a ring of bracts.
Recurved	(of margins of bracts or leaves) bent or curved backwards or downwards. (Figure 14c)
Red sand	(of soils) containing significant levels of iron oxide.
Reflexed	(of leaves or bracts) bent sharply backwards or downwards.
Revolute	(of leaves) having edges rolled under. (Figure 14b)
Rhizome	(adj. rhizomatous) underground stem usually growing horizontally. (Figure 15a)
Rhombic	(of leaves) having four equal sides.
RT	room temperature, commonly 15–20°C.
Saline	(of soils) impregnated with salts (e.g. sodium chloride).
Saltbush	common name of plants able to tolerate saline soils (e.g. <i>Maireana</i> species).
Samphire	common name of succulent plants tolerant of heavy soils which are inundated at times (e.g. <i>Pachycornia</i> species).
Scabrous	(scabrid) rough to the touch. (Figure 17f)
Scale	reduced or modified leaf, or small papery structure on a surface.
Seed	(in daisies) ripened ovule containing embryonic plant and food reserve (endosperm) enclosed in a fruit known as a cypsela.
Semi-arid	having a low but reasonably constant annual rainfall.
Semiterete	semicircular in cross-section.
Sepal	(of a flower) one of the segments of the outer whorl of non-reproductive parts.
Septate	(of hairs) divided by internal transverse partitions. (Figure 17a)
Serrate	(of leaves or bracts) with asymmetrical teeth pointing forward like the edge of a saw.
Sessile	(of leaves, flowers etc.) without a stalk. (Figure 12a)
Sheath	(adj. sheathing) a tubular part of a leaf clasping or surrounding a stem. (Figure 12f, 12g)
Shrub	a branched woody perennial plant without a single main trunk.
Shrublet	a shrub less than 1 metre high.
Silky	densely covered with fine, soft, shiny hairs aligned in the same direction. (Figure 18b)
Simple	(of leaves, hairs etc.) undivided.
SISP	Smoke Impregnated Seed Primer.
Spathulate	(of leaves, bracts etc.) spoon-shaped, broad at the tip and narrow at the base. (Figure 13h)

Species	individuals, or groups of individuals, that show common features and are capable of interbreeding to produce fertile offspring.
Spike	a series of stalkless flowers on a main stem.
Spindle	a shape, circular in cross-section and tapering towards each end. (Figure 19f)
Stalk	(of leaves, flowers) stem or main axis of a plant or floral structure.
Stamen	male organ of flowering plants consisting of a stalk (filament) and pollen-bearing anther.
Stereome	(of bracts) herbaceous or hardened opaque portion, resembling a midrib.
Sterile	not fertile, incapable of reproduction.
Stigma	that part of a flower which carries the pollen-receptive tissue, usually held above the ovary by a style.
Stipitate	borne on a stalk.
Stoloniferous	having slender prostrate stems producing roots and/or shoots at the nodes.
Style	the part of a flower between the ovary and the stigma, often elongated.
Subalpine	of altitudes immediately below alpine, usually below the snow-line (approx 1000 m).
Subglabrous	sparsely clothed in hairs, scales or bristles.
Subsessile	almost sessile.
Subshrub	small shrub which may have partially herbaceous stems.
Subspecies	taxonomic category below the rank of species.
Subtend	(v. subtended) occurring just below or close under (e.g. bracts subtending an involucre).
Suckering	the process of forming shoots developed from a root or lignotuber.
Swale	depression between two areas of higher ground (e.g. sand dunes).
Synonym	superseded name for the same plant.
Tap-root	(adj. tap-rooted) the main persistent root from which lateral roots are developed. (Figure 15b)
Taxon	(pl. taxa) a group of plants sharing common characteristics that is assigned one of the categories of a classification.
Taxonomy	(adj. taxonomic) the study of principles involved in a system of classification.
Terete	circular in cross-section and more or less cylindrical. (Figure 14a)
Terminal	occurring at the ends of stems or branches.
Tessellated	marked in a pattern resembling tiles. (Figure 18e)
Toothed	(of leaves, bracts etc.) having margins with more or less regular sharp notches.
Translucent	transmitting light but not transparent.
Truncate	cut off abruptly with a blunt end.
Tubercle	(adj. tuberculate) a small swelling or wart-like outgrowth.
Tubular floret	(in daisies) tube-shaped floret without an extended corolla lobe.
Turbinate	shaped like a spinning top. (Figure 19e)
Type	an item (usually a herbarium specimen) to which the name of a taxon is referred.
Variety	(abbr. var.) a taxonomic category ranking below that of species or subspecies.
Viable	(of seeds) capable of continuing life.
Warty	(adj. warted) having small relatively hard lumps on the outer surface. (Figure 18a)
Whorl	(of leaves, bracts etc.) radiating from a common level on the stem.
Wing	(adj. winged) a thin flange of tissue on a stem or petiole; (in daisies) a thin, flat membranous expansion of a fruit or seed.
Woolly	densely covered with long, soft, matted (often curly) hairs. (Figure 16b)



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Australian Daisy Study Group

The Australian Daisy Study Group is one of a number of Study Groups formed from members of the Association of Societies for Growing Australian Plants Inc. (ASGAP). In June 1981 Maureen Schaumann founded the *Brachyscome/Helipterum* Study Group. At that time she was advised to concentrate on two genera since the Asteraceae family was considered too large for comprehensive study. The genus *Brachyscome* was chosen because the majority of the species are perennial. The second genus, *Helipterum*, (now split into a number of new genera including *Hyalosperma*, *Leucochrysum*, *Rhodanthe* and others) was chosen for its importance to floral art, cut flower exports, and for the additional reason that the majority of species are annual. The following aims were formulated:

- ◆ to collect all species in the two genera
- ◆ to identify the species correctly
- ◆ to determine the best means of propagation
- ◆ to determine optimal conditions for cultivation
- ◆ to evaluate the horticultural potential of each species
- ◆ to extend the range of everlasting species available for cut flowers and for floral art
- ◆ to promote the growth of rare and endangered species in the Asteraceae
- ◆ to study seed viability and life span
- ◆ to study seed dormancy and the means of overcoming it.

After some years of work the enthusiasm of the members increased so much that they wished to include all members of the Asteraceae family. Maureen agreed with some reluctance since this opened the way to a daunting number of species for study. The name of the Group became the Australian Daisy Study Group to embrace the wider field of study. The Daisy Study Group has collected

information on the identification, distribution, propagation, and cultivation of as many species of the family Asteraceae as has been possible in twenty years. Since the Group was founded there have been four leaders. There are about seventy individual members in the Group, most of whom have contributed in some way to this book.

The Study Group Editorial Committee

John Armstrong

B.Arch., Dip.Arch. Botanical artist of international repute. Past president of APS Maroondah Inc. Keen traveller and gardener. Interested in garden design. His garden has participated in the Open Garden Scheme.

Judy Barker

B.Sc. Editor of *Australian Brachyscomes, Australian Daisies for gardens and floral art* and *Everlasting Daisies of Australia*. Editor of AD SG Newsletter (1988–2000). Leader of the Study Group (1995–2000). Past president of APS Waverley Inc. Enjoys propagating from seed, bush regeneration and weeding.

Bev Courtney

Treasurer of the Study Group for many years. Past secretary of APS Peninsula Inc. Interested in ecology, bush regeneration and all aspects of the natural world. Actively involved in local conservation. Runs a hobby nursery for local indigenous plants.

Joy Greig

Dip.App.Chem. Leader of the Study Group (2000–date). Former secretary and treasurer of APS Waverley Inc. Keenly interested in plant propagation, gardening, conservation and photography.

Natalie Peate

M.Sc. Co-author of the *Grow What Where* series. Past president of the Nursery Industry Association of Victoria and of the International Plant Propagators' Society. Member of the Rhamnaceae Study Group. Particularly interested in the horticultural development of Australian plants and enthusiastic bridge player.

Esma Salkin

B.A.(Hons.) Joint author with Alf Salkin of the booklet on the Waverley Valley Reserve. Leader of the Study Group (1988–95), and Honorary Life Member of APS Victoria Inc. Enthusiastic conservationist, gardener, lecturer, photographer and propagator. Her special interest is the history of the cultivation of Australian plants.

Maureen Schaumann

Founder and first leader of the Study Group, past secretary of APS Waverley Inc. Editor of AD SG Newsletter (1981–87). Keenly interested in propagation, gardening, garden design and the drying and preserving of Australian plant material.

Gloria Thomlinson

Past president of SGAP Shepparton Inc. Botanical artist for *Australian Brachyscomes*, *Australian Daisies for gardens and floral art*. Contributed botanical drawings to *Flora of Victoria* Volumes 3 and 4, *Growing trees for farms, parks and roadsides*, the APS Victoria and AD SG Newsletters. Loves gardening and propagating plants, and her artistic interests include drawing, painting and landscaping.

Appendix

The Study Group used various products in seed germination trials. These products are currently available from the sources detailed below.

Smoke products

- ◆ Kings Park and Botanic Garden, West Perth, Western Australia 6005. Tel: (08) 9480 3600. Smoked water is available.
- ◆ Grayson Australia – Tecnica Pty. Ltd., PO Box 134, Bayswater, Victoria 3153. Tel: (03) 9720 7705. This company offers a liquid based Smokewater (Regen 2000® Smokemaster) as well as a dry granulated germinator (Regen 2000® Germinator).
- ◆ National Botanic Institute, Kirstenbosch, Private Bag X7, Claremont, Cape Town, South Africa 7735. Researchers have developed a seed primer of absorbent paper impregnated with smoke and a range of natural germination stimulants. This product is 'Kirstenbosch Instant Smoke-Plus Seed Primer' (SISP). The sole distributor for countries other than South Africa is D. Orriell, 45 Frape Avenue, Mt. Yokine, Western Australia 6060. Tel: (08) 9344 2290.

Gibberellic acid

Gibberellic acid (GA₃) may be purchased from Sigma Pharmaceuticals Pty. Ltd., 96 Merrindale Drive, Croydon, Victoria 3136. Tel: (03) 9839 2800 or Freecall 1800 628 870.

Soil-wetting agents

Most nurseries stock several brands of liquid wetting agents.

Potassium nitrate

Solutions of potassium nitrate are available from some local pharmacies.



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Everlasting Daisies of Australia aims to encourage the appreciation of these Australian daisies and to develop techniques for germinating and growing them.

It is the result of five years of work by the Australian Daisy Study Group covering all of the species in twelve genera of everlasting daisies, many of which have not previously been described in readily accessible publications.

The book has chapters on growing everlasting daisies, propagation, floral arrangements, floriculture, reproduction and hybridization. Detailed species' descriptions are written in easy-to-understand language and illustrated with beautiful colour photographs. For each individual species there are sections on flowering period, propagation, cultivation and uses, distribution and habitat, and similar species. Where appropriate there are brief notes on hybridization, name changes and relationships with other species.

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