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Changes

'The more things change - the more they stay the same'. For the last 43 years, William Payne has edited this magazine, but no more. Being that for some it is more than a lifetime, it is fair to say that Bill, as he is known within the Society, has put a substantial part of his into the preceding 170 issues. For this we give heartfelt and sincere thanks.

One should not underestimate the amount of work that goes into an edition and it is all done on a voluntary basis. Given that Bill has authored more than the odd article in his time, I wonder whether he can resist contributing in the future. Planning is underway for a magazine that showcases the best of the last 43 years. You are probably wondering who the replacement is - well, there isn't one, however be assured the Society will endeavour to produce the magazine of a standard at least equal to previous. If you have considered writing a paper for this magazine in the past but didn't, maybe now is the time to reconsider. Although we strictly limit advertising in this publication, the following is a one-off. Manfred Wagner - Convenor, Publishing Committee

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As an added bonus Volume 8 includes the book *Cradle of Incense - The Story of Australian Prostanthera*. Volume 9 contains the book *Australian Plant Genera*.

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Front cover: *Alyogyne heugelii*, Photograph G. Bujanda See next page.

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Alyogyne - An Update

Part 1 _____ Colleen Keena

The front and back cover images are by Gil Bujanda. Gil grows *Alyogyne*s in his garden in California, USA.

Introduction

Alyogyne species were featured in *Australian Plants* in 1966 (1). The author, Paul A. Fryxell, wrote that 'this wholly Australian genus includes two or more shrubby species with showy flowers'. He described *Alyogyne hakeifolia* and *Alyogyne cuneiformis*, both shown on the back cover of this issue.

Following the article on *Alyogyne*, there was an article 'More Hibiscus' by R.L.Hill (2) *Hibiscus huegelii* was described. The species, with either deep mauve or pure white blooms, and the deep mauve-pink flowers of the more compact *Hibiscus huegelii* var. *leptochlamys* were noted. In 1968, *Hibiscus huegelii* became *Alyogyne huegelii*.

Another plant, *Alyogyne pinoniana*, also known as *Hibiscus pinonianus*, was included in *Alyogyne* in 1968. This plant was illustrated in *Australian Plants*, Vol. 10:49. In 1987, *Alyogyne cravenii* was added to *Alyogyne*.

This brings to five the number of species at present in *Alyogyne*. References for the plants currently in *Alyogyne* can be found online at the 'Australian Plant Name Index (APNI)' or at 'What's its Name'.

Any update on *Alyogyne* needs to show not only species currently included but also any proposed changes and Dr John Conran will be foreshadowing changes to *Alyogyne* in Part 2 of this article in a future issue of *Australian Plants*.

Difference Between *Alyogyne* and *Hibiscus*

All the current species of *Alyogyne*, except for *Alyogyne cravenii*, were previously known as *Hibiscus*. *Alyogyne* is distinguished from *Hibiscus* by the flowers having a style which is undivided to the stigmas, while in *Hibiscus* the style is branched to below the stigmas. *Alyogyne* is from the Greek *alytos*, united, undivided, and *gyne*, woman, ovary, alluding to the undivided style (3).

Advantages Of *Alyogyne*

Alyogyne have a number of characteristics that make them of horticultural value. The blooms usually last more than a day and there are no prickles such as in some *Hibiscus* species. As well, the large blooms not only blend with exotics but are valued by gardeners who may not otherwise choose to grow a native plant. The flowering is profuse, often beginning in the first year.

Alyogyne huegelii has been described by John Hunt (4) as an example of an 'anywhere' plant. He describes 'anywhere' plants as plants that can be used quite freely throughout the garden, for they occupy little or no space, remaining unseen for most of the time, but they flower magnificently and are very showy at particular times of the year.

Various forms of *Alyogyne hakeifolia*



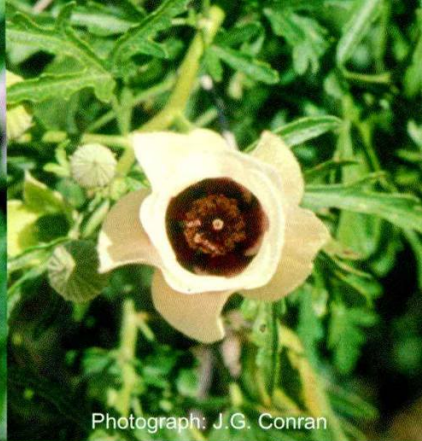
Photograph: G. Bujanda



Photograph: G. Keena



Photograph: Monterey Bay Nursery Inc.



Photograph: J.G. Conran



Photograph: J.G. Conran



Photograph: G. Keena

Various forms of
Alyogyne huegelii



Photograph: J.G. Conran

Distribution

Species of the genus are distributed in Western Australia, Southern Australia and the Northern Territory. Maps showing the distribution of specimens of each of the five currently recognised species are shown on the 'Australian Plant Name Index (APNI)' website. A map showing all the species is shown online on 'The Alyogyne Page' by Stewart Robert Hinsley.

Alyogyne Around the World

Although it originated in Australia, *Alyogyne* is currently being grown not only in Australia, but also in Europe, USA and New Zealand.

In Australia, the two species most easily obtained are *Alyogyne huegelii* and *Alyogyne hakeifolia*. Species and cultivars of both *Alyogyne huegelii* and *Alyogyne hakeifolia* are available. Cultivars of *Alyogyne huegelii* include 'West Coast Gem' which has purple blooms. A pink tulip-shaped bloom was available as *Alyogyne huegelii* 'Southern Cross Hibiscus' but now seems to be known as *Alyogyne huegelii* pink. A pink-flowering cultivar of *Alyogyne hakeifolia* is available as 'Melissa Anne' and a yellow-flowered form as 'Elle Maree'.

In Europe, the *Alyogyne* which is most readily available is the 'blue' form of *Alyogyne huegelii*, still sometimes known as 'Blue Hibiscus'. Jean-François Giraud, who lives in France, notes that *Alyogyne huegelii* is cultivated by Dutch, Spanish and Italian producers and is grown more rarely in France. He continues that it is sold in 12 to 20 cm pots, as a small flowering plant, sometimes with more than one cutting in the pot, and in Holland as a standard. Jean-François grows *Alyogyne hakeifolia* but says that it is difficult to find in Europe. Both *Alyogyne huegelii* and *Alyogyne hakeifolia* are mentioned on websites of plants in UK.

In USA, a number of cultivars of *Alyogyne huegelii* are grown. Four cultivars, with interesting background information, are shown at the 'Monterey Bay Nursery Inc' website. One is white and the others are shades of purple. There is a light purple, 'Santa Cruz', a dark purple, 'Monterey Bay' (probably equivalent to 'Mood Indigo,' and also sold as 'Purple Haze') and a medium blue purple, 'Swan River'. This is the same cultivar as the plant known as 'West Coast Gem' in Australia. The UCSC Arboretum used *Alyogyne huegelii* 'Moora' with seedlings from 'Moora' as parents and did a number of back crosses. The flowers have a conspicuous overlapping 'propeller' form. Both leaves and petals seem to have a heavier substance than most other varieties.

Alyogyne hakeifolia is available in either lavender or yellow.

The 'blue' form of *Alyogyne huegelii* is grown in New Zealand.

Species Commonly Grown

As *Alyogyne huegelii* and *Alyogyne hakeifolia* are the two species most commonly grown and most readily available, both in Australia and overseas, these will be the focus of this article.

Prior to *Hibiscus huegelii* being transferred to *Alyogyne*, there were a number of varieties recognised, e.g. *Hibiscus huegelii* var. *wrayae* and *Hibiscus huegelii* var. *leptochlamys*. Although since the move to *Alyogyne*,

these varieties have no current formal taxonomic standing, not having been recognised by Fryxell, most of the forms, including cultivars, in cultivation both in Australia and overseas, are either what was previously *Hibiscus huegelii* var *wrayae*, with open flowers, yellow anthers and blooms which are very variable in colour and size, or what was previously *Hibiscus huegelii* var. *leptochlamys*.

The other species which is most readily available is *Alyogyne hakeifolia*. It is more difficult to grow in countries like France than *Alyogyne huegelii* and is less popular in USA than *Alyogyne huegelii*. It is less hardy than *Alyogyne huegelii* in sub-tropical climates with wet summers. However, the unusual foliage and the flowers, described by Jean-François Giraud as 'exquisite, fine and delicate', make this a plant worth trying.

Description

Alyogyne Hakeifolia

Alyogyne hakeifolia (5) is normally an upright, much-branched, rapidly growing small to medium shrub reaching to 3 m (10'). The leaves are dark green, glabrous, comprised of very narrow linear segments, 5–10 cm (2–4") x 0.1–0.2 cm (to 1/8"). The individual lobes of the leaves make the foliage 'needle-like'.

The plant produces an abundance of blooms each season. There are mauve, yellow and pink forms. The plant blooms from November until March. The blooms are 5–6 cm (1"–2 1/2") long, tubular in shape, not opening widely and they usually have a dark red central spot. The capsule is 1.8–2 cm (3/4") x 1.2 cm (1/2") and is 5-celled.

It is a desert shrub which occurs in South Australia and in the southern part of West Australia (P1).

Alyogyne Huegelii

Alyogyne huegelii (5) is an open, rapidly growing medium-sized shrub reaching about 2.5 m (8') in height and almost equal breadth. The leaves are 2–7 cm (3/4"–3") long, bright green and deeply lobed into 3-5 segments. The segments are blunt, the margins are irregularly toothed and lobed.

This plant can produce hundreds of blooms each season. It blooms from October until March and can also bloom sporadically. The flowers are 7–10 cm (3–4") and last 1–2 days and can be yellow, white, lilac, pink, mauve or deep purple. The ovoid capsule is about 2 cm (3/4") across. The yellow form was described in *Australian Plants* in March 1965 (Vol. 3:58).

It occurs in sandy to sandy-gravel areas of both South and West Australia.

Cultivation

Alyogyne Hakeifolia

As *Alyogyne hakeifolia* (5) is a desert plant, it is well suited to a warm, dry climate. It is intolerant of bad drainage but is adaptable and sufficiently hardy in cool moist climates such as south-eastern Australia. A well-drained sunny spot is ideal although plants will grow in semi-shade. Plants perform best when they receive sunlight for most of the day and have some wind protection as large plants are subject to wind damage.

Alyogyne huegelii Cultivars



'Swan River' or 'West Coast Gem' G. Keena



'Santa Cruz' G. Bujan



'Monterey Bay' Monterey Bay Nursery Inc.

The plant may develop into a well-shaped shrub without any need for pruning but it can be pruned to improve the shape if desired.

Alyogyne hakeifolia tolerates mild frosts but some protection may be required from heavier frosts.

Alyogyne Huegelii

As *Alyogyne huegelii* (5) comes from sandy to sandy-gravel areas, it is also intolerant of bad drainage however it is adaptable to a wide range of soil types. A well-drained sunny spot is ideal although plants will grow in semi-shade. Plants perform best when they receive sunlight for most of the day and have some wind protection as large plants are subject to wind damage.

The plant becomes straggly unless pruned regularly. After the main flowering flush in late spring the shrub can be pruned back quite hard to ensure stronger growth and increase its longevity and flowering life. *A. huegelii* tends to become a little sparse of foliage on lower limbs if left completely unpruned. This species has the desirable ability to throw out vigorous, fast-growing shoots from old wood, thus enabling it to be kept down to a small compact shrub if desired. Heavy pruning can maintain its size in relation to other plants.

Alyogyne huegelii is moderately frost tolerant but some protection is required from the heaviest frosts. Experience at Monterey Bay Nursery in California indicates that it will probably be cut to the ground by -4°C (25°F) for more than a single night.

Cultivation Of *Alyogyne Hakeifolia* and *A. Huegelii*

Alyogyne species usually grow well without fertiliser, particularly if well mulched with a mulch that breaks down and provides nutrients. However, if a fertiliser is needed, for example when raising seedlings, use of a seaweed extract has been found to be beneficial. Many Australian plants are sensitive to phosphorus as they have developed in nutrient-deficient soils. *Alyogyne hakeifolia* and *A. cuneiformis* are least sensitive to phosphorus whereas *Alyogyne huegelii* is highly sensitive. Further information is available in an online article describing 'phosphorus sensitivity' by Kevin Handreck.

Plants grown in well-mulched beds require minimal, if any, supplementary watering once established. Plants will however take regular watering provided that they are in a well-drained position.

Alyogyne plants perform well in pots. Both *Alyogyne huegelii* and *Alyogyne hakeifolia* not only flourish but even set seed when grown in 15 cm (6") pots. Maintaining them in such small pots would require ongoing care and potting on to larger containers would be advisable.

Alyogyne is usually not troubled by pests. If pests are present, e.g. scale or mealybug, pruning may be sufficient to control them.

Propagation

Alyogyne huegelii and *A. hakeifolia* are easily propagated from both seed and cuttings. The species are easy to grow from seed but cultivars would need to be propagated from cuttings to maintain the characteristics of the parent plant.

Seed of both species may keep its viability for a number of years. Treatment that will break through the hard protective coating and allow moisture to penetrate is recommended. Germination will be much faster after treatment. Seeds can be abraded with an emery board, or a slight nick can be made while the seed is being held with tweezers. As well, seeds can be soaked in warm but not boiling water, with water being changed every day until the seeds start to swell. Time of planting seed would depend on where the plant is being grown. In areas with harsh winters, it would be preferable to plant seed in spring. In places with very wet summers and mild winters, seed can be planted in early autumn.

Alyogyne may also be grown from cuttings, which strike easily. Cuttings can be half-hardened tip cuttings 7–8 cm (3") long, although soft tip cuttings also do well. Again, the time of taking cuttings would vary according to location. Cuttings taken in spring generally establish well but cuttings can be taken in early autumn if summers are very wet and winters are not too severe. Treatment with a preparation to enhance root formation may be beneficial.

Availability

In Australia, both seeds and plants are available from suppliers of native plant seeds and nurseries that include native plants in their species list. Searching for *Alyogyne huegelii* or *Alyogyne hakeifolia* on the internet can give information on suppliers of seed and plants for Europe and USA.

Conclusion

The beauty of *Alyogyne hakeifolia* was depicted by Ferdinand Bauer 200 years ago (6). Species are currently available in Europe and both species and cultivars are grown in USA. It is hoped that this article will not only ensure accurate identification but hopefully highlight the 'distinct horticultural possibilities' noted in *Australian Plants* in 1966 (1).

The author wishes to thank Dr John Conran, Dept. of Environmental Biology, The University of Adelaide, Marcos Capelini - author of *Some Malvaceae in Brazil*, Jean-François Giraud - author of *Merveilleux Hibiscus*, Stewart Robert Hinsley - author of 'The Alyogyne Page', Brett Hall of the UCSC Arboretum and Luen Miller of Monterey Bay Nursery Inc. for their assistance.

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Cuttings - a Commercial Choice

Tony Clark

Why use cuttings? By propagating from cuttings of a plant that has certain desirable features, the plants subsequently produced will have those same desired features, whereas reproduction from seed does not give this assurance. Seedlings give unpredictable random variations.

Material — Cutting material should be from actively growing plants free from obvious disease symptoms. Plants in garden or container situations produce good material in spring, autumn and summer if well watered and fed. Dormant plant material still makes roots, but it takes much longer. Plants are dormant in winter and high summer if grown dry. The optimum time to take cuttings is 6 months from flowering. We do Geraldton Wax in January, root it in 2–3 weeks, tube it in the 4th week, pot them anytime from March till the end of May and sell them in flower August till the end of November.

Assessing Cutting Material — Plant material that is too soft will often collapse when collected or wilt on the soft tips. Soft dying material provides prime sites for fungal colonisation. Material that is flexible and will spring back from a 90° bend is about right. Material that is too hard will break if it is bent 90°. Hard material needs stronger hormones to initiate roots, takes much longer (more than 2 months), uses up stored reserves and becomes prone to disease.

Preparing Cutting Material — Collected cutting material is wrapped loosely in just damp newspaper and packed into polystyrene broccoli boxes. In summer we top the boxes with crushed ice. Cuttings must not be allowed to heat up or lie in lots of water or they will give off ethylene, defoliate and compost. If a box of cuttings begins to heat up, one should pour in a couple of litres of water to cool it down, drain it in a couple of minutes and then top it with crushed ice. Cutting material should be separated from ice by newspaper or it will suffer frostbite.

Preparing Cuttings — We use very sharp scissors rather than secateurs because they are less clumsy. They fit around fingers and thumbs and do not need to be picked up and put down between operations like stripping foliage. We prepare our cuttings by removing soft tips, gently stripping the lower leaves, cutting to about 100 mm (4") in length and standing them in a hormone-nutrient solution. We use 10 ml of 'esi-root' in 2 litres of clean water plus enough 'seasol' or 'maxicrop' to make it the colour of weak tea. Stressed material will recover after soaking (up till 12 hours). I have made thousands of cuttings at night and planted them the next day.

Removing soft tips from cuttings has several benefits. The softest part of plants is the most likely part to be colonised by botrytis etc. (along with flowers and buds). The growing tips of plants produce a hormone called abscisic acid that suppresses side bud growth and inhibits root initiation. Pinching out tips reduces cutting losses, promotes bushy growth in young plants and enhances rooting. Remove all flowers and buds, as dying buds and flowers are readily

attacked by opportunistic microbes. We do not remove soft tips on plants like Geraldton wax that we want to have a strong central leader. The consequence of growing plants with two or more leaders is that they are often badly damaged years later in gale force winds. Decisions made are based on the estimated size of a mature plant, flexibility of its branches and perceived optimum growth pattern.

Cutting media — Over the years we have used lots of different cutting media. We were initially very successful with coarse creek sand, but we noticed with our second load that our strike-rate was declining. Close examination revealed that the sand was finer in texture and our air to moisture ratios had altered. Creek sand from the centre of creeks is coarser than the sand from the edge. Heavy particles drop out first as the creek flow subsided and lighter particles float to the outside. Along the length of a creek the coarser sand is upstream and the finer sand is downstream.

To strike cuttings continuously one needs a consistently even propagation mix. We switched to 100 litres of P500 perlite mixed with 15 litres of fine chopped peat. We tried about 6 different peats and had weed problems with every one of them and some of the peats seemed to contain root-rotting organisms. Cuttings would rot off below the surface even in very open mixes. I used fungicides to try to improve the situation with mixed results.

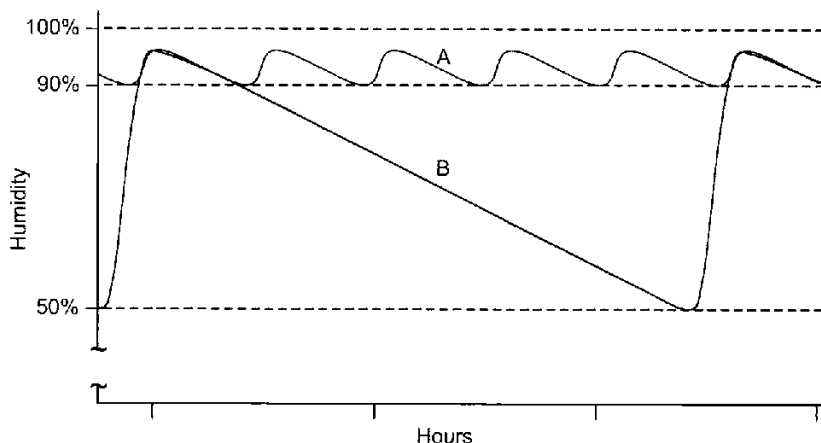
One night I sat up to 4am preparing material that had been air freighted from Perth. When I got to the nursery next day I was out of peat so I substituted fine chopped compost that had been made in a high temperature process in equal parts to replace the peat. Two things happened: 1) our weed problems disappeared and 2) our plants picked up markedly in vigour. The texture of the mix to the naked eye was the same, however the compost was loaded with aerobic organisms. Peat forms in swamps and has anaerobic organisms. Because of the high temperatures generated by bacteria in the compost heap, weed seeds were killed along with unfavourable organisms. Compost is cheaper too.

These days our propagating mix is 100 litres of P500 perlite mixed with 15 litres of composted potting mix (Nurseryman's Choice Organic) and 500 grams of Apex Gold 9-month native plant slow release fertiliser. Native plant Osmocote will also do. A mini-pelleted Osmocote, 18-2.6-10 NPK, is good for mixes intended for use in cells because it can be more evenly distributed through the mix.

We keep our propagation mix uniform throughout the year but vary the watering enormously depending on seasonal conditions. We have had endless problems with leaf mist sensors, fog and mist nozzles blocking or not covering evenly and have gone back to basic third world technology. Most growers believe that when cutting material is severed from the parent plant, because it has no roots, it will desiccate unless maintained at near constant 100% humidity. Plants in constant very humid conditions are sitting ducks for fungal attack, particularly when temperatures are at or below about 24°C. Propagators under these conditions use lots of chemicals to try to suppress diseases. Fluctuating humidity by irrigating at extended intervals breaks disease cycles within certain limits.

A. Near constant mist creates a line of humidity that oscillates between 90 and about 95% - ideal conditions for fungal attack.

B. We irrigate through ei' cheapo 25 cent plastic mist jets once a day about 1pm for one minute in winter, and up to 9 times a day for one minute in summer. Why one minute, well that's the smallest increment our controllers can do. This type of irrigation produces a saw tooth humidity graph that does not satisfy the environmental needs of pathogens but our cuttings remain turgid and root in high percentages without the need for expensive chemicals.



Because of the presence of beneficials in the root-zone they are also better able to cope with whatever they encounter in their ultimate growing sites. Symbiotic organisms are a vital part of every plant's immune system. Heavily sprayed plants lack these partners and are more vulnerable because of this. Microbial bio-control is a very poorly understood concept but it is the most efficient, cost effective way to long term healthy plants.

Hormones — Actively growing plants are undergoing cell division and can be influenced to divide as a different class of cells. Plants not growing actively are making little cell division so root initiation is retarded. Actively growing material will often make roots without hormones. 90% of making good cuttings is starting with the right material. What hormones do is prompt the DNA of plant cells to divide and grow as root cells. The active cells are in the cambium layer beneath the bark. Plants with waxy coatings on the outside of the bark inhibit hormone penetration. Very light abrasion can enhance hormone penetration. *Eriostemon australasius* is such a species. Plants with very thick bark make it difficult for roots to emerge anywhere but the base of the cutting. Slitting the bark along the stripped section of the cutting allows roots to emerge from the cuts. *Eremophila fraseri* responds to this. Some cutting material becomes resinous after collection and should be rinsed in 50:50 metholated spirits and water to remove this coating, up to 3 times before preparation. The resin is a plant defence against moisture loss. During droughts these species become very resinous. *Eremophila viscida* and *Cyanostegia corifolia* are examples.

Hormone liquids, powders and gels should not be stored at room temperature or they lose their potency. They are degradable just like dairy products. All hormones should be kept below 5°C in a refrigerator. Hormones mostly do not have use-by-dates or manufacturing dates on their containers and I believe lots of hormones have lost their potency before they reach the point of purchase!

In combination with 'esi-root' we also use a powder concentrate that is made for us by Bass Laboratories at 9 Waldheim Road, Bayswater, Vic 3153 (phone 03 9720 8177). Our mix is not registered for resale but Bass will manufacture one-offs to any specifications. Their registered powder is called Rootex P and is 3,000 parts per million (ppm) Indole-3-Butyric Acid (IBA). Our mix is 60,000 ppm IBA plus 15,000 ppm Naphthalene Acetic Acid (NAA), for synergistic effect, in talc. We dilute our concentrate with Black and Gold baby powder from the local supermarket. For example one tablespoon of B&G talc thoroughly mixed with one tablespoon of 60,000 ppm IBA makes two tablespoons of 30,000 ppm IBA in talc. We use it at 10,000 ppm for hardwood and 5000 ppm for semi-hardwood, but have used it at 20,000 ppm for *Daviesia epiphylla*. We found that *Newcastelia chrysophylla* and *Lachnostachys eriobotrya* would make roots with IBA and NAA, but not with IBA or NAA by themselves.

Hormone concentration is not terribly critical, within limits, because plants can't count and don't care whether it is exactly 1,000, 3,000, 5,000 or 10,000 ppm. It just has to be within an appropriate range. Sensitive measuring equipment is not necessary to mix them. Trust your trusty tablespoon, it won't let you down.

I have also used 2-4-D to root eucalypts. Prospective trees to be propagated are bashed around the base or lignotuber and cuttings are taken from the new juvenile shoots this initiates. 2-4-D as a liquid dip is effective between 250–275 ppm. Above 300 parts per million, it kills the cuttings. For reasons unexplained, plants rooted with 2-4-D mostly last about 2 years and then die possibly from on-going hormonal effects. Spray drift from Blackberry killer diluted by the wind has initiated aerial roots on *Acacia pravissima* prostrate, the active ingredient in the spray being 2-4-5-T. The useful operating range of these compounds is very narrow and I no longer use them.

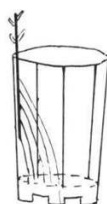
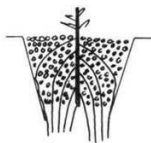
Next Stage — After soaking and before planting, for an each way bet, we dip our prepared cuttings into our chosen powder the full length of the stem to be planted. For plants to grow roots they need adequate moisture plus oxygen in the root-zone. Waterlogged conditions encourage anaerobic organisms that attack living and dying plant tissues. Moist aerated conditions favour aerobic organisms, which are natural plant root system partners and are antagonistic to the root-rotters. If the cutting medium is open and you are not watering excessively, you can grow much more vigorous plants than those treated with fungicides because fungicides also kill beneficials.

The optimum depth of media for 100–150 mm cuttings is between 35 and 50 mm. At all times the media will be wettest at the base and this is therefore the least likely place for a cutting to make roots. By applying the hormone full length the plant selects the optimum place for root formation.

We do all our cuttings into multi-celled trays, which are then placed into bottomless wooden frames. These suspend the trays 20 mm above the benches upon which they are placed in our poly-houses. They grow vertical roots down the cells and then out of the base into the air space underneath. Our poly-houses are only heated by the sun, but we manage to strike cuttings all year round. From late October to mid March the houses are covered by 70% black knitted shade cloth which moderates their internal climate. Inside temperatures can rise to near 50°C and under these conditions plants make roots in 7 to 14 days.

Roots always grow out and down. Root trainers encourage vertical root growth parallel to the stem.

- A. Cell shape, roots emerge from base of cells and hang into humid atmosphere.
- B. With plant held to the side of the tube, the soil as it goes in straightens the roots. Internal root trainers (ribs) encourage roots to grow downwards and an internal strap supports the soil above the base and facilitates drainage from the castellated base.



Rooted cuttings are tubed into Masrac P2 tubes. They are planted to the side of tubes and filled downwards. The tubes we use have effective root trainers to prevent horizontal root coiling. When cuttings are planted into smooth sided cylindrical containers, the roots spiral to the base of the container like the thread of a bolt. As the girth of the main plant stem and roots increases a tourniquet strangulation effect occurs shortening the natural life of the plant. The design of the container has a profound effect on the development of young plants and badly designed containers drastically shorten the lives of plants grown in them.

Tubed plants are kept in our hardening off area till they grow roots to the base of the tube. They can then be field planted, potted on or stored for months till we need them. The hardening off area has a plastic domed roof to keep the plants warm and exclude rainfall. Young plants under shade cloth will die in large numbers if continually saturated by rain, particularly if the weather is cold and they are just out of a warm poly-house. All our hardened tubes are kept on pallets above the ground in full sun and are fully acclimatised to whatever the weather is doing. Tubed plants are planted into pots with similar design principles to the tubes we use - these are also made by Masrac.

Potting mixes used should be preferably composted and should comply with the Australian standard for regular mixes. Both 'premium' and 'regular' mixes have a pH in the optimum range and good air/moisture ratios but premium mixes contain nutrient levels and ratios unsuitable for many Australian plants. By using regular mixes plants can be fed starting from a known low point. Obese plants have a weak floppy unnatural growth habit, whilst very heavily fertilised plants can suffer toxic high salinity leaf burning and or defoliation. When plants defoliate their roots are also severely damaged. Many good mixes are available, but those that comply with the standard are made under very strict quality control guidelines.

Calostemma purpureum

Robert Gibson

Calostemma purpureum is a rarity amongst our native flora, for it is one of the few species that forms true bulbs. The single species belongs to the large and widespread Amaryllidaceae family that includes the commonly cultivated exotic Daffodil and Jonquil. It deserves to be more widely grown. The flowers are typically yellow or purple but other colour forms occur.

Calostemma is known by a few common names, including Wilcannia Lily, Garland Lily and Native Daffodil, the last name alluding to the great similarity this species has to daffodils, or perhaps more correctly, jonquils. The plant forms a true bulb to 5 cm diameter by 3 cm high with a neck to 15 cm long that reaches the soil surface. A series of thick white roots pull the developing bulb to the optimum depth. During favourable conditions each bulb holds an array of four to eight linear dark green leaves that grow to 40 cm long by 1 cm wide. A new crop of leaves is usually triggered by a heavy rainfall event, which is also usually accompanied by one or two scapes. Each scape grows rapidly. It consists of a cylindrical stalk that grows up to 60 cm tall and supports an umbel of stalked flowers at its apex. The developing flowers are protected by a pair of often-coloured bracts that die and peel away as the flowers mature.

Each umbel has between 8 and 30 flowers, each bloom is borne singularly on a narrow pedicle that is up to 2.5 cm long. Flowers have six narrow obovate tepals (i.e. the three petals and three sepals are identical in shape, colour and orientation) that are between 10 and 18 mm long by 5 to 8 mm wide. The bases of the six stamens have a broad flange that are joined at the side to form a tube, or corona, between 6 and 12 mm long, and give the flowers the appearance of a daffodil-like flower. The base of the flowers consists of a tube that sits directly on the ovary. Each flower lasts for about 3 days, with many blooms open simultaneously. Most flowers set seed, and the ovary visibly swells from an initial 2 mm to 10 to 15 mm in the mature fruit. Most bulbs send up a second inflorescence within three weeks of the appearance of the first scape and thus a single bulb may have flowers open over a four-week period. Flowers are most commonly produced between mid summer and late autumn.

Calostemma is endemic to eastern Australia, particularly within the Murray – Darling Basin, extending to the southern Mount Lofty ranges and scattered populations in central South Australia. For many decades the genus was treated as having two species: the yellow flowered *Calostemma luteum* primarily in the Darling River basin and the purple flowered *C. purpureum* in the southern and western part of the range. The former commonly occurs in deep clays on floodplains and is larger in almost all parts to the purple flowered form. They are now considered to be variants of the one species.

Heavy rain over central New South Wales in February 2002 triggered mass flowering of local populations of *Calostemma purpureum* and the often-sympathetic *Crinum flaccidum*.



Photos show a selection of local *Calostemma purpureum* colour forms in a vase, as well as close-ups of a near white flowered form, a yellow flowered form and the rare rose-pink form of *Calostemma purpureum*.

All photographs by Robert Gibson



The most widespread form has yellow flowers and grows in heavy clay soils on the floodplains. The tepals are typically yellow and the yellow corona has six maroon stripes at its base. Flowers may be up to 30 mm long and are sweetly scented. Rare plants on the floodplains have diffuse purple pigmentation on the tepal exterior and additional purple pigmentation on the corona to give these flowers an orange tone from a distance.

Purple flowered plants occur on ridges and commonly exhibit a great range in flower coloration. The most common forms have either dark or mid purple tepals with a yellow corona marked basally by six maroon stripes. Rare variants on this theme include flowers with dark red tepals and an almost completely bright yellow corona, flowers with dark purple tepals, corona and filaments, flowers with yellow-edged purple tepals, large flowers with rose pink tepals and an almost fully yellow corona, and a locally common form with almost fully white flowers with diffuse purple pigment at the base. All share a decidedly spicy fragrance. The various colour forms typically form small groups of plants with the same or very similar flower colour, with zones of mixing on their edges.

On some rises purple and yellow flowered forms grow in close proximity and in this situation it is possible to find plants with flowers showing almost every colour gradation between either end member, which is strongly suggestive of hybridisation and back crossing occurring. The distribution of pigmentation in different plants is highly variable, for example it is possible to find flowers with yellow tips and purple bases as well as purple tepals with a yellow margin.

A number of sports have been observed in these wild populations, particularly amongst the purple-petalled plants. These include flowers with extra tepals and stamens and some with short, winged anthers.

Cultivation

Calostemma purpureum is an easy plant to cultivate and propagate. It grows easily in standard potting mix in a full-length plastic pot at least 15 cm across, and grows in most garden soils. Given their bulbous nature they respond readily to changes in soil moisture levels. In dry conditions the plants become completely dormant and all above ground growth dies away. The bulbs readily produce new growth when the soil becomes moist, with a flush of new leaves and, periodically, flowers triggered by at least some periodic heavy watering. Leaves will survive for several months provided the soil or potting mix remains moist.

They occur naturally in areas that receive light winter frosts, which the leaves usually survive, however, this species is probably best thought of as a summer-growing bulb.

Slugs and snails are the main pest of this beautiful bulb, and they will readily consume all available parts of these plants, seemingly preferring these to the leaves of many other species. Keeping a vigilant eye out for them and reducing the availability of shaded, moist refuges preferred by these molluscs will help to control them. They may also be kept at bay by using standard snail bait.

Both the yellow and dark purple forms are periodically available from mail order bulb nurseries. Suppliers include 'Mainly Amaryllids Garden', Wodonga, Victoria and Andrew Vandepeer, Nairne, South Australia.

Propagation

Calostemma may be propagated two ways, by seed and division. The majority of flowers per scape set fruit. There is some debate as to whether the fruit contains seeds or juvenile clonal plants, or 'bulbils'. At any rate these produce new plants readily and may begin root growth before the fruit has fallen. Seedlings become established readily in any soil or potting mix that the parent plants thrive in but go through a particularly vulnerable stage when the reserves in the 'seed' are transferred to the developing bulb. They are particularly susceptible to slugs and snails at this stage. It is not uncommon to find that each fruit produces two plants.

Over time a mature bulb will produce offsets. These may be potted up separately and is the only way of guaranteeing the flower colour of the new plant.

The long scape with a compact cluster of flowers makes this an excellent plant for the vase. In addition, this species offers an excellent range of flower colours, not only are there strong yellow, near white, pale purple and dark purple colours, but there are forms with strongly bi-coloured combinations. The flowers are also strongly scented, although several of my colleagues preferred the sweet scent of the yellow flowers to the spicy scent of the purple flowered variants. Each inflorescence typically lasts 2 weeks in the vase, with all flowers opening. Many of these will develop fruit, which may grow to maturity by drawing upon starch reserves in the scape, and may even begin to germinate whilst on the stem.

The range in flower colours at sites in the local area strongly suggests that this species is reproducing sexually. It may be that in the absence of pollination, flowers are able to self-pollinate and yield plants of virtually identical flower colour. Controlled pollination experiments, possibly with genetic studies, will shed light on this biological aspect of the species. From this early stage it appears that there is much potential for selecting the most attractive colour forms from the wild and even developing new colour combinations.

This native bulb is a delight. It is easy to grow and propagate and has much potential for the development of highly desirable cultivars.

Acknowledgments

I wish to thank Silvana Deluca and Robert Armstrong for their assistance with fieldwork during this study.

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Dark purple *Calostemma*

Robert Gibson

Calostemma purpureum

yellow form

Robert Gibson





Calostemma purpureum
yellow form Robert Gibson

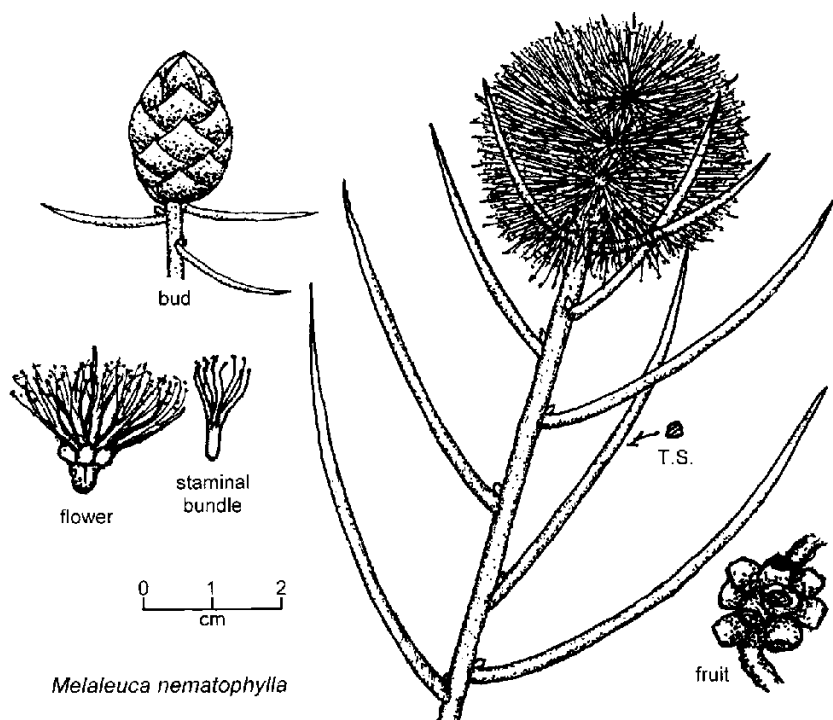


Calostemma purpureum
yellow form Robert Gibson

Melaleuca for the garden

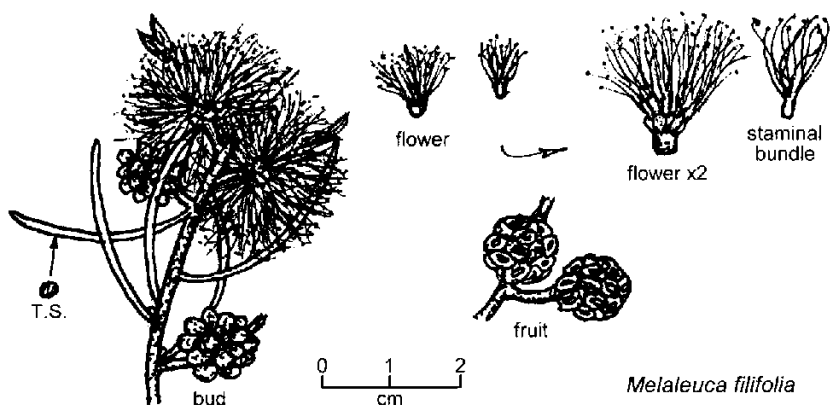
Ivan Holliday

As will be seen from the photograph on the cover and that below, one of the most spectacular *Melaleuca* species for growing in a garden is *Melaleuca nematophylla*. In my first book, *A Field Guide to Melaleuca* I misled readers by naming this plant *Melaleuca filifolia*. This was based on information I received at that time when *M. filifolia* and *M. nematophylla* were thought to be synonymous. A recent revision of the genus by Dr. Lyn Craven has established that these are quite different and separate species as illustrated on the next page.



Melaleuca nematophylla has been widely grown in gardens. It is a large; upright shrub to 4 m high or more, if left unpruned, featuring profuse, terminal, globular heads of bright pink to paler pink flowers, 4 cm or more in diameter. Leaves are terete, smooth, mostly up-curving, 4–12 cm long. Fruits are irregularly arranged in peg-like clusters.

Melaleuca filifolia is a much smaller, spreading shrub to 1m high, with bright pink, globular heads of flowers 2–2.5cm across. These are terminal but almost always arranged on a short side branchlet of about 5mm in length. The globular heads of greenish-yellow buds always seem present in numbers matching that of the flowers. Leaves are mainly 1.5–4cm long, many curving upwards in similar fashion to those of *M. nematophylla*. The fruits are distinctly soccerball-like clusters about 1cm across.



Melaleuca boeophylla from the northern Kalbarri area is so similar to *Melaleuca filifolia* at a glance, that one could be confused with the other. It differs in its much shorter, more flattened leaves (transversely semi-elliptic to semi-oblong), 0.6–1 cm long, and generally longer calyx lobes. Both species have consistently 5 calyx lobes. Photo on page 305.

Melaleuca nematophylla

An upright shrub that can grow to 4 m if left unpruned. The profuse flowering is as shown in the photograph on the front cover, the rich to paler pink, globular flower heads being 4 cm or more across. Leaves are smooth, mostly up-curving, 4–12 cm long. Fruits are irregularly arranged in peg-like clusters. The sketch above shows all its distinguishing features to the scale shown as they are actually two thirds full size. Photo on page 304.

Melaleuca fillfolia

A spreading shrub, usually about 1 m high, it has bright pink, globular heads of flowers 2–2.5 cm across. These are terminal but on a short side-branchlet of about 5mm in length and globular heads of greenish-yellow buds always seem present. The sketch above shows the distinctive flower parts full size. Photo on page 305.

Melaleuca with bright yellow globular heads of flower

There are so many new names for the various WA species that identification is often difficult. The plant labelled *Melaleuca leiopyxis* in Australian Plants volume 21 page 152 is probably *Melaleuca ciliosa*.



Above:

Meleleuca laetifica

See page 306

Below:

Meleleuca nematophylla

See page 303

All Photos by Ivan Holliday





Above Left to Right: *Melaleuca filifolia*
Melaleuca boeophylla Kalbarri strap leaf
 See page 303
 Below Left to Right: *Melaleuca coccinea*
Melaleuca eximia
 See page 306
 All Photos by Ivan Holliday



Melaleuca ciliosa, a shrub 0.4 to 1 m tall, has yellow globular flowers to 2.5 cm across as shown. It has a glabrous calyx which is usually unlobed, an unbroken ring of tissue, but if lobed the 5 lobes are without cilia (fringed with hairs). The hypanthium is 1–1.5 mm long. The fruiting clusters are globose and tightly clustered, eliminating separate identity.

Melaleuca huttensis (*M. depressa* in the *Field Guide to Australian Native Flowering Plants - Melaleucas*, page 70) is a twiggy, brittle, often rounded shrub 1–2 m high and wide. Leaves are broadly ovate, elliptic, or sub-circular, mainly 4–6 mm long by 3–5 mm wide, glabrescent, fleshy, alternate and crowded, particularly toward the ends of the branches. Flowers occur in capitate, terminal heads, about 20 mm or more across, the stamens white, or cream, supporting large, yellow anthers, giving a bright yellow appearance to the flowers. They may age to salmon. They appear over a long period from September to November. Fruits are pipe-shape, hairy and arranged in irregular clusters.

Melaleuca laetifica (*M. urceolaris* Type C in the *Field Guide to Australian Native Flowering Plants - Melaleucas*) is one of the most spectacular of the yellow flowering melaleucas. It is normally a low, ground-hugging shrub, 0.4–1 m high and wide, with terete to linear, very hairy and prominently tuberculate leaves. Flowers appear in mid-spring in showy, bright yellow capitate heads held above the foliage. Fruits occur in small, irregular clusters. Photo pg 304.

Melaleuca with large bright red bottlebrush-type flower heads occurring laterally, and with sessile leaves, ovate or cordate to subulate or linear-elliptic, reflexed, concave and in alternating opposite pairs (decussate).

Melaleuca coccinea is shown in colour on the cover of issue number 168 but the photo here shows the shrub growing in my garden. Here it is 1m high but can grow to 2 m high if left unchecked. It should be pruned each year after flowering. It flowers very well from November to March if well-watered during summer, but lives happily without extra water here in Adelaide, where summers are very dry. It is suited to most soil types. Photo on page 305.

Melaleuca eximia was illustrated by sketches on page 151 together with the closely related *M. penicula*. The photo here shows part of a plant in the wild. The stem clasping decussate narrow, subulate to linear-elliptic leaves being on near vertical branches. The young growth is softly hairy. Before the flowers open into beautiful red lateral flower spikes, each flower bud is cupped by a furry brown bract and these tube-like flower heads in bud are seen in the photograph. Take care to prune the bush for an attractive garden shrub. It has grown well here in South Australia in near-neutral clay soil in my own garden but I have little experience of its success elsewhere. Photo on page 305.

Melaleuca penicula differs in its leaves, which are narrowly ovate, about halfway between the wide leaves of *Melaleuca coccinea* and the narrow leaves of *Melaleuca eximia*.

Bracteantha Micropropagation

Janet R. Gorst and Lin O'Brien, Queensland Horticulture Institute

Introduction

Bracteantha is a recently named Australian genus that was once included in the complex *Helichrysum* that now does not occur naturally in Australia. The genus *Bracteantha bracteata* was formerly part of the genus *Helichrysum bracteatum*, itself a polymorphic complex of many taxa that was revised in the late 1980s/early 1990s (Elliot and Jones, 1990). The common name of Golden Everlasting Daisy reflects both the predominant flower colour and the texture of the inflorescence; the golden blooms have shiny yellow stiff papery bracts and can be picked and dried to hold their colour for a considerable period. *Bracteantha bracteata* plants grow well in a wide range of habitats from coastal headlands to inland semi-arid areas and occur naturally in all states of Australia. Many forms of the plant are available, ranging from prostrate to 1 m or more high and including both perennials and annuals.

In 1999, the Federal and State Governments of Australia joined to facilitate a calendar of events throughout Australia in 2001 to celebrate Australia's Centenary of Federation. One of the initiatives to come from this was the suggestion that each State select a floral emblem (different from the 'traditional' emblem) as a centrepiece for the celebrations. In Queensland, the plant chosen was a *Bracteantha* hybrid and two separate lines with different growth habits were selected; both lines were marketed under the tradename 'Federation Gold'. One of these lines was registered as 'Wanetta Sunshine' (Hockings, 2001). This line was developed by Hockings and Hockings (2000); the original pollen transfer was from a wild form of *Bracteantha bracteata* to an as yet unnamed species, *Bracteantha* "Blackfellows Gap", and then hybrids from this cross were open pollinated with commercially available *Bracteantha* hybrids to yield a number of selections including 'Wanetta Sunshine'. The Queensland Horticulture Institute was approached to assist in developing a micropropagation strategy for the rapid multiplication of 'Wanetta Sunshine' and other selections produced from the above-mentioned crosses since, although the plants can be propagated from cutting, their compact growth crown limits the quantity of cuttings that can be obtained.

Culture Initiation

The plants have a very compact habit, close to soil level (Fig. 1). Stock plants used for experimentation had already reached flowering stage and were very limited in number (e.g. a total of 6 plants of 'Wanetta Sunshine'). They had been kept outside and received overhead watering, two factors that are not recommended in the pre-treatment of stock plants prior to initiation.

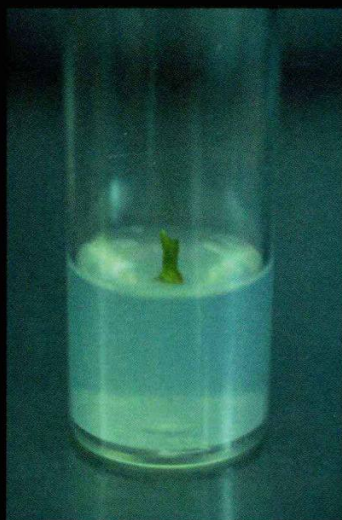
Consequently, there was some disease (e.g. *Alternaria*), insect damage (caterpillars, aphids) and the leaf axils were very dirty; these factors presented problems in disinfestation.

Continued on Page 315

Fig 1. Trimmed stem lengths prior to running water treatment. **Fig 2.** Trimmed bud explant. **Fig 3.** Subculture of cultures on multiplication medium showing a) basal area of a culture after 3 weeks incubation b) individual axillary shoots obtained from the culture c) the trimmed main stem d) the trimmed main stem cut longitudinally to produce two further explants. **Fig 4.** Rooted cultures after 18 days. **Fig 5.** Flowering plants of *Bracteantha* 'Wanetta Sunshine' showing growth habit - tissue cultured plants, 96 days after transfer to soil.



Fig. 1



Fi



a

Fig. 3



b



c



d



Fig. 4



Fig. 5



Stylidium graminifolium
Grass Trigger Plant,
See page 310 D. Darnowski



Backhousia anisata
See page 311 D. Jenkinson

Trigger-Plants

book review by Lesley Waite

This book by Douglas W. Darnowski - Rosenberg Publishing (Kenthurst) is a wonderful introduction to the intriguing world of trigger-plants (*Stylidium* spp). The author is an American with a doctorate in 'Field Plant Biology', but writes from a wholly Australian perspective - although he lives in Maryland, USA, he has a network of friends here and visits on a regular basis.

Trigger-plants are attractive and tough, the wide variety of species withstanding heat and cold, drought and flooding from the Alpine peaks of Tasmania to the coast of the Northern Territory and very many places in between. With their unique 'trigger' (a column of fused male and female reproductive parts) they are marvels of the botanical world, rivalled by few other plants anywhere. Of the many genera of Australian plants, *Stylidium* is fifth or sixth in terms of the greatest number of species (200 to date and more being discovered every year), yet have been widely ignored in horticulture. Darnowski has written this book to encourage interest in these plants. His hope is that: *'this book will inspire you to go out and find some trigger-plants. Play with the flowers and see how they work. Buy some seeds and grow your own Australian treasures.'*

In an easy-to-read and informal style, he is able to provide a wealth of information, leading us through the story of *Stylidium* in surprising detail. He shows us how it uses its 'trigger' to 'whack' the head and back of a visiting insect with pollen so it can go on to pollinate another *Stylidium* of the same species (each species has a precise area of the insect that it 'whacks' to guard against cross-pollination). He then goes on to describe how the 'trigger' resets itself and what chemical, anatomical and physiological processes it uses in doing so and then details the more common species - what they are, where to find them in the wild and how to propagate and grow them yourself.

Finally, he explores the relation ship between *Stylidium* spp, carnivorous plants and the nutrient-poor soils on which they both grow and poses the question: 'Could trigger-plants be carnivorous too?' They certainly seem to produce enzymes similar to those that digest proteins (i.e. insects) in known carnivorous plants such as Sundews (*Drosera* spp). These enzymes are found in the sticky hairs on the *Stylidium* flowers and on the parts that hold the flowers aloft and could be used to trap insects that are much smaller than the plant's pollinators. However, a lot more research is required into this subject and Darnowski even suggests projects that interested parties may do to begin exploring the carnivorous nature of *Stylidium* spp.

If I was to criticise the book, it would be to say that the illustrations are a little too simplistic and do not always help illustrate the point that Darnowski is trying to make and the photographs are also sometimes a little out of focus. But this irritation did not detract from my overall enjoyment of the book. Darnowski's strength lies not photography/illustrations but in his botanical knowledge and ability to interest and enthuse the rest of us in his subject. I certainly recommend that you give him the chance to do exactly that.

Serendipitous Science

Peter Wilson

It's often difficult to keep up with the many name changes that have occurred in the Australian flora over the past decade or so and you might have missed the change affecting the Aniseed Myrtle, formerly *Backhousia anisata* and now *Anetholea anisata*. The interesting thing about this change is that it occurred through a chance discovery.

Peter Wilson of the NSW Herbarium (Peter.Wilson@rbsyd.nsw.gov.au) takes up the story...

It seems that the time is ripe to tell you the story of the name change for *Backhousia anisata*. It is a fine case of serendipitous science!

Valued as an aromatic spice with many culinary applications for both its leaf and oil, the Aniseed Myrtle is a rare rainforest tree that is virtually confined to the Nambucca and Bellingen valleys of northern New South Wales. It was described and named by the botanist Joyce Vickery in 1941 as *Backhousia anisata* because of its apparently typical fruit type.

Our discovery of the true identity of this species came more-or-less by accident while we were doing DNA sequencing of a wide range of genera of Myrtaceae. We had already sequenced *Backhousia myrtifolia* and intended to sequence a second species. I had had *B. citriodora* in mind for this but our research assistant, Marcelle, sequenced *B. anisata* instead. When she had the results, she called me and told me that this species wasn't grouping with *Backhousia* at all but with the Lilly Pillies (*Syzygium* and *Acmena*). After checking that we hadn't mixed up the samples, we examined the morphology and anatomy of this species in more detail to see if the DNA results would be supported by them. Supporting evidence was not hard to find once we started looking. Unlike *Backhousias*, the Aniseed Myrtle is glabrous, has a different ovary structure and embryo, and distinctive wood anatomy, almost all of these being very similar to the condition in the Lilly Pillies. So it seemed that superficial appearances had masked the species' true relationships for almost 60 years!

There was one slight problem with this hypothesis. The Aniseed Myrtle did not look even remotely like a Lilly Pilly fruit - its fruit is small and dry. Perhaps, we thought, the fruit of the Aniseed Myrtle might be something like the fruit of the ancestor of the Lilly Pilly group. This would also reinforce the view coming from the DNA studies that the fleshy fruit found in the family Myrtaceae has arisen independently in the Lilly Pilly group and that they are only very distantly related to other fleshy-fruited genera such as *Psidium* (Guava) and the local *Austromyrtus* (Midgen Berry).

Our findings were published (in July 2000) and the Aniseed Myrtle was placed in a new genus, *Anetholea*, making the new name for the species *Anetholea anisata*. The name *Anetholea* is taken the chemical name for the aniseed oil, anethole.



Asterolasia buxifolia Rediscovered

160 years Later _____ Bob Makinson

Almost 200 years of grazing, clearing, and weed invasion have left little intact native vegetation on the valley bottoms in the Blue Mountains west of Sydney. So it was a pleasant shock when Lithgow naturalist, Helen Drewe, showed me a beautiful patch of valley-floor bushland in late 2000.

Our interest initially was in *Grevillea rosmarinifolia*, collected by the early botanist Allan Cunningham on the old Bathurst Road. That 'Type form' of the species was long thought extinct in the wild, but survives in small patches. The Australian Plants Society Grevillea Study Group had found a couple of plants not far away, and I was delighted when Helen showed me a large 'new' population. A lucky combination of fencing and landform meant that this area had not changed much since Cunningham's day.

An unexpected find

One of the other shrubs growing on the site has turned out to be *Asterolasia buxifolia* (family Rutaceae), known only from collections made by the Cunningham brothers, Allan and Richard, in the 1830s, from 'Bells Road, Blue Mountains' – and not seen or collected since.

The species remained so poorly known that for most of the 20th century, Cunningham's specimens were thought to be variants of *A. asteriscophora*. For this reason, *A. buxifolia* has never been listed as endangered or presumed extinct under NSW legislation.

In 1998, Paul Wilson at the Western Australian Herbarium, using the old specimens, reinstated *A. buxifolia* as a good species, using features of the leaves, flowers and fruit (*Nuytsia* 12(1): 83-88, 1998). His work is supported by another *Asterolasia* specialist, Bryan Mole at the Royal Botanic Gardens Melbourne.

A. buxifolia is separated from *A. asteriscophora* and other east-Australian *Asterolasias* by its hairless carpels (ovary), golden centres to the star-like hairs on the petals, and a hairless leaf upper surface. The nearest occurrence of true *A. asteriscophora* is in the Tumut area.

Not for the home garden

A. buxifolia is a spindly shrub to about 2m tall, with small rounded leaves and yellow flowers in Spring. Its growth rate appears to be very slow, and the flowering season short.

There are definitely better species for the home garden, available from the specialist nurseries, such as *A. asteriscophora* (similar in form and flower colour), *A. hexapetala*, and the very attractive and hardier dwarf species *A. trymalioides*.

Continued on Page 314

Photo Opposite:

Asterolasia buxifolia – Close up of flower and bush (inset).

Photographs by Bob Makinson

Flindersia revisited

Correction to *Australian Plants* Vol 21. No. 170 (March 2002), page 274.

John Wrigley would like to point out an error in his article on *Flindersia* published in the above issue. This paper was written prior to a paper published in *Austrobaileya* Vol. 5 No. 4, (December 2000), pp. 667–669, which indicated a name change for *Flindersia oppositifolia*. This paper, which resulted from DNA analysis, showed that *F. oppositifolia* and *F. pimenteliana* were genetically indistinguishable. It has been suggested that the names should be *F. pimenteliana* forma *pimenteliana* and *F. pimenteliana* forma *oppositifolia* as morphologically the two taxa are quite different. The description and cultural information given in the article are still correct but the names should be changed accordingly.

Asterolasia buxifolia Rediscovered

Continued from Page 313

Remnant bush sites, given half a chance, will often look after themselves, but they still need to be treated with care. The exact location of the site is being kept dark, and visits discouraged, as there are only 50 or so *Asterolasia* plants and the few seedlings are easily trampled.

Another risk is accidental introduction, on dirty boots, of the Dieback soil fungus (*Phytophthora*), which could devastate the *Asterolasia*, the *Grevillea*, and other species.

Mount Annan Botanic Gardens is trialling cuttings, and eventually the species will be on display there. In the meantime, co-operation in leaving the wild plants alone would be appreciated. The Royal Botanic Gardens is working together with the National Parks & Wildlife Service, the Dept of Land & Water Conservation, and the Lithgow City Council on management for the site that will preserve its many values.

Keep your eyes peeled

There are good lessons from this rediscovery. The first is that I did not know what I had got! In my books, the plant keyed to *A. asteriscophora* and I was unaware of the recent reinstatement of *A. buxifolia* as a separate species. Many bush-plant enthusiasts are in the same position. So it pays, when finding something unusual, to take a good specimen (leaves, flowers and fruit) and send it to your local herbarium, or to the group specialist if you can identify one – most herbaria list staff and their research areas on their web-sites.

The second lesson is the extraordinary value of even small remnant patches of bush. The site harbours a good array of native plants and a lot of fauna species as well. Even small sites, given basic protection, can be islands of heritage.

About the Author

Bob Makinson is the Co-ordinator of the Centre for Plant Conservation at the Royal Botanic Gardens, Sydney

The standard procedure followed for all explants was that the stock plant was cut off at soil level and the upper parts were given a gentle scrub under running water to remove loose dirt. Following this, the parts containing explants were then trimmed further (Fig. 2) and placed under running water for 60–90 minutes. Over the course of initiation work, a number of disinfestation treatments were then tried using various concentrations of sodium hypochlorite (NaOCl) [+ 0.1% (v/v) Tween 20 as a wetting agent].

The main target explants were axillary buds. The number of axillary buds on a plant seems to vary considerably and, unusually, there does not appear to be a bud in the axil of every leaf. Many side-shoots are actually reproductive rather than vegetative and, hence, do not yield vegetative buds. Removal of buds necessitated destructive harvesting of a plant since the buds are located on a very short, compact stem. All of this means that even a fairly large plant may yield only 6 – 8 explants and, because there is no re-growth, that plant is lost.

Initially quite large explants (about 1 cm tall) consisting of a whole node (with laminae trimmed right back to the stem) were used but there were high contamination losses. Contamination was mostly bacterial and appeared to originate from inside the explants as it was manifested as a 'halo' extending into the culture medium. The poor health of the stock plants was probably the factor that contributed most to this contamination problem. In the end, nodes were soaked in 70% (v/v) ethanol for 2 – 3 minutes then placed in a sterile petri dish containing 1% (v/v) available chlorine for about 5 minutes while excess parts were cut/peeled off under the dissecting microscope. Individual explants that were several mm tall and contained only bud tissue (Fig. 3) were placed into 1% (v/v) available chlorine for a further 5 minutes with agitation and then rinsed thoroughly in sterile water.

The explants were placed on a basal solid (0.65% w/v Bacto Difco Agar) modified MS (Murashige & Skoog, 1962) medium containing half strength macronutrients, micronutrients and growth factors but full strength (30 g/L) sucrose (henceforth referred to as $\frac{1}{2}$ MS). This medium was selected based on the reports of work on other Australian native species (see, e.g. Johnson, 1996) that show lower strength nutrient media may be more applicable. All experimental work was done using 30 ml polycarbonate tubes (with polypropylene screw caps) containing 10 ml medium and 1 explant per tube. Throughout the course of the work, all cultures were incubated in a growth room where they received overhead light of 20 - 50 $\mu\text{mol m}^{-2} \text{s}^{-1}$ (depending on shelf position) with a 16/8 photo-period (supplied by cool white fluorescent lamps) and temperatures of around 27° C (day) and 25° C (night).

Multiplication

From an initial 28 bud explants (obtained from 2 stock plants of a single line), only 12 cultures were obtained that were apparently free of contamination as well as showing some growth. All of these cultures, however, showed marked hyperhydric symptoms with swollen, hydrated leaves. The strategy adopted was to try and develop a medium that would give some multiplication so that numbers could be built up for a more systematic and high replicate approach to medium optimisation. As a 'best

guess', 2 media were initially selected and compared with the $\frac{1}{2}$ MS initiation medium for an ability to encourage shoot multiplication. These media were $\frac{1}{2}$ MS + 10 μ M benzylamino purine (BAP) and $\frac{1}{2}$ MS + 1 μ M BAP. Eventually, testing of a range of cytokinins, plus levels of nutrients, growth factors and sucrose (for a full description of these experiments see Gorst & O'Brien, 2002) indicated that $\frac{1}{2}$ MS + 1 μ M BAP gave a good multiplication rate (around x2 [including wastage losses] every 3 weeks) while maintaining reasonable plant health. An important point to note is that cultures deteriorated rapidly after about 3 weeks incubation and, as a result, 3 week subculture passages became, and have remained, the standard. Losses due to wastage (e.g. browning/death of explants, hyperhydricity) ranged from around 4% - 40%, with no apparent consistency, throughout the first 12 months of multiplication, but tended to remain more consistently at the lower level in the second 12 months, presumably as the cultures have adapted to the in vitro conditions. At subculture (Fig. 4a) explants that were transferred to fresh medium included both trimmed axillary shoots (Fig. 4b) and longitudinally-cut segments from stems consisting of tightly clustered leaves (Fig. 4c,d). The various lines have now been in culture for nearly 2 years without any noticeable deterioration. During intensive production, of 'Wanetta Sunshine' cultures were grown in 250 ml polycarbonate containers (with polypropylene screw caps) containing 30 ml medium and 6 cultures/pot.

Rooting

Early experiments with multiplication media indicated that low (0.01 μ M) or no levels of BAP in the medium were sufficient to allow roots to grow out on cultures. Using this as a starting point, a number of media were tested to optimise rooting percentages and quality of roots (see Gorst & O'Brien, 2002). The explants used for transfer to rooting media were the same as those for multiplication. In the end, a $\frac{1}{2}$ MS medium containing 0.1 μ M indole-3-butyric acid (IBA) became the standard (Fig. 5). Plants were left for around 25 days on the rooting medium before planting out. During the production phase of 'Wanetta Sunshine', rooting percentages of around 85% were maintained. Plants that did not root were re-cycled back through the multiplication phase.

Planting Out

Plants were removed from the agar and any excess agar was gently squeezed off the roots. The plants were placed into individual cells of polystyrene speedling trays (60 cells/tray each cell with 4.4 cm x 4.4 cm width at the top, 0.7 cm x 0.7 cm width at the bottom, 7.5 cm deep) in a pasteurised soil mix containing 1 part vermiculite + 2 parts perlite + 1 part poly balls + 1 part sand (with fertilizer added at the rate of 300 g Dolomite + 100 g Pot nitrate + 100 g blood and bone + 95 g Flowfeed BM7 all per 50 litres of mix).

After planting, the trays were moistened with a spray dispenser. Initially the trays were placed inside a humid chamber in the glasshouse where humidity was gradually decreased from 90% to 75% over 12 days. Later on in the experimentation, we found that the humidifier treatment was not necessary and plants could be transferred straight from culture tube to the glasshouse bench where they were watered twice daily. The plants received no supplementary lighting. Temperature in the glasshouse was maintained at approx. 25° C.

Continued on page 319

Cypress Pine Forests

Seedling Recruitment and Litter Dynamics in Disturbed Cypress Pine (*Callitris glaucophylla*) Communities

Mark Harris

Although white cypress pine (*Callitris glaucophylla*) forests have been actively managed for over a century, little documented research has been directed toward the investigation of their ecology. This is particularly surprising given that they are an extremely useful species. They have naturally termite-resistant timber and possess a considerable variety of complex chemical compounds that are used to combat viruses, brain tumours and skin cancers; in the preparation of pill coatings in the pharmaceutical industry; the manufacture of confectionery, artist's varnishes and incense.

I felt that it was important to undertake a study that focused upon litter dynamics and seedling recruitment in order to help expand current knowledge. As the pine is harvested from naturally occurring populations, I wanted to contribute to the current awareness about seedling recruitment to promote sustainability of the forestry industry.

In central and western Queensland white cypress pine occurs in varying densities and may occur in pure stands or mixed with various eucalypts depending on soils and topography. It is distributed in drier areas of the Queensland landscape, mostly occurring within the rainfall boundary of 300–650 mm and is relatively tolerant of dry conditions. Cypress pine is known to be extremely sensitive to fire, with reports of almost total elimination of populations following intense wildfires. In Queensland State Forests, prescribed fuel-reduction burning is carried out in buffer zones that surround merchantable, higher quality cypress stands every 6–10 years in order to reduce wildfires affecting productive sections of the forest. The buffer zones typically contain poorer quality cypress stands and high densities of eucalypts, the latter of which produce extremely flammable fuels.

Selective harvests of cypress pine are undertaken every 40 years in productive compartments of the forest. Current management practices ensure that 80 seed trees are retained per hectare within merchantable size classes to promote future seedling regeneration. All Queensland State Forests containing cypress pine in the Darling Downs have now been completely logged at least twice.

The aims of my Ph.D. research were 1) to determine how human-induced disturbance, in the forms of prescribed burning and selective logging, affected litterfall patterns; 2) to determine the rate of decomposition in disturbed vs. undisturbed forest communities; and 3) to determine what effect these disturbances have upon seedling populations. The investigation of these aims required extensive fieldwork at Barakula State Forest, located 45 km north of Chinchilla, QLD. Barakula, the Aboriginal term for 'big timber', is the largest State Forest in Queensland and covers an area of approximately 350,000 ha.

The litterfall study involving the establishment of four 50 m x 50 m field sites were established in each of four different disturbed forest areas: recently logged, older burnt, recently burnt and a (undisturbed) control. Eight 1 m x 1 m litter traps were randomly set out at each site and litter was collected at

regular intervals over the course of 2.5 years. The decomposition study involved the "pegging out" of replicate mesh bags containing 3 litter types (cypress, eucalyptus, mixed) of a known weight (20 g) around 3 randomly selected trees within each of the 16 sites. The bags were then collected at 3, 6, 12 and 18 months and re-weighed to determine the rate of decay. The seedling population study involved the establishment of twenty-eight 50 m x 4 m belt transects within each disturbed area. Seedling density, seedling height and seedling species (*Eucalyptus*, *Callitris*, *Acacia* or *Allocasuarina*) were then recorded within each belt transect.

In a general sense, litterfall in cypress pine communities was found to fluctuate with seasonal shifts (shown in Figure 1) and disturbance type determined the nature of recorded litterfall patterns. For example, prescribed burning (a frequent, widespread and low intensity disturbance) resulted in a large, but short-term production of litter. This form of disturbance was found to be extremely patchy on a small scale and was likely to have produced a mosaic of soil-nutrient accumulation largely determined by the uneven intensity and spread of the fire. Recovery time from post to pre-burn conditions of nutrient deposition, following this type of disturbance, appeared to be fast (≥ 2 years), although this time was likely to vary with the intensity of the prescribed burn.

On the other hand, selective logging (an infrequent, localised and highly intense disturbance) did not have a noticeable impact on litter production. However, logging did appear to limit nutrient input to the system. Although only undertaken every 40 years, forest recovery is not likely to be rapid given the slow growth rate of *C. glaucophylla* and the low productivity of the soils in the sections of the forest that are regularly logged. The sustained practice of selective logging is likely to limit nutrient return to these forests unless adequate recovery time (>100 years) is given to these communities.

Cypress pine litter decay appeared to be favoured by prescribed burning, although it was likely affected by the greater distribution of decomposing organisms on the more productive soils found in the regularly burnt margins. The morphological resistance to decomposition of the sclerophyllous eucalyptus litter accounted for it being relatively unaffected by site disturbance. The larger mixed litter type had an overall slower rate of decay than both cypress and eucalyptus.

Callitris seedling recruitment appeared to be unaffected by disturbance, with its survival dependent upon adequate protection from insolation (direct sun exposure) by litter cover. Cypress pine regeneration was not abundant, although the relatively low densities probably stemmed from an asynchrony between seed supply and above-average rainfall. Based on these observations, current management practices do not seem to be adversely affecting successful *Callitris* recruitment. However, given its slow growth rate, the capability of the species to attain merchantable-sized stands from the current seedling pool in sufficient time for the next logging cycle would appear doubtful.

The future of the commercial forestry industry in cypress pine forests is wholly dependent upon successful seedling recruitment. Current

management practices do not appear to be limiting the survival of seedling populations in some areas, but steps need to be taken to ensure logged areas will support successful forest recovery, so that the industry will be sustainable in the longer term. I'm hopeful that my research will be considered as a useful indicator of the success of seedling recruitment, especially at the Barakula State Forest.

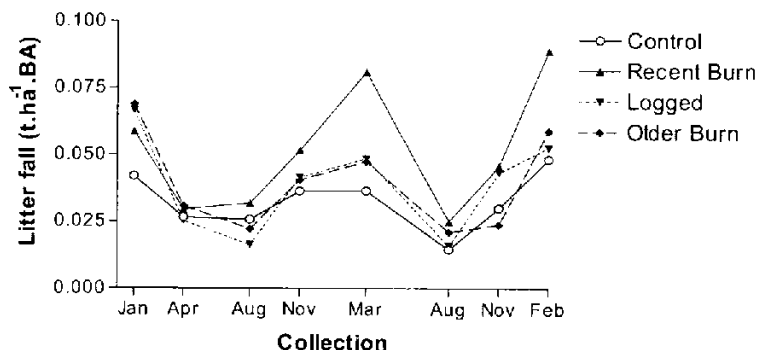


Figure 1: The pattern of litterfall across the four forest disturbance treatments. Litterfall is expressed as a function of stand basal area per hectare. Litter was collected from January 2000-February 2002.

Bracteantha Micropropagation

Continued from page 316

Rooted plants quickly adapted to growth in soil and developed a vigorous root system. They were re-potted to larger pots as necessary. Plants left in the glasshouse environment started to develop flowering heads after 40 - 60 days in soil and could be moved to a shadehouse (50% shade) without trouble (see Fig. 1). A total of 200 tissue-cultured plants of 'Wanetta Sunshine' were tested in trials around the state (at Cleveland, Emerald, South Johnstone, Longreach, Mt Coot-tha and Stanthorpe) in mid 2000 to gauge their suitability for performance in a wide range of climatic conditions within Queensland. The plants were grown outside in both pots and the field. No problems that might be attributable to growth of plants in vitro were encountered and the plants performed well. Tissue cultured plants were subsequently produced and sold for the Centenary of Federation celebrations in 2001.

Summary

This work describes a successful project, that developed within a tight time-frame and with limited parent material, for the micropropagation of the Queensland Centenary of Federation floral emblem (Federation Gold - 'Wanetta Sunshine') and several other *Bracteantha* hybrids with similar lineage. Four genotypes of *Bracteantha* hybrids have been successfully initiated and multiplied in vitro and then grown on successfully in soil using the procedures described.

Acknowledgements

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Hardy Cultivars

from Nellie Nursery, SA

Tony Clark

We have grown over 5000 species in the last 22 years. In a fit of horticultural madness I attempted to grow the entire Australian flora at once and in 1988 we had nearly 3000 varieties. Many of these plants went onto the dump, because although they were sought after varieties, the general public did not purchase them in sufficient numbers for us to make a living from them.

Better presentation and a smaller range of varieties were needed for us to survive as a business. We spent a lot of money on colour separations and printing to improve the public's acceptance of our plants. We earn royalties on some of the varieties we have introduced. We have yet to patent (PVR or PBR) any of our varieties and offer unrestricted access to those that wish to grow them. Third parties have made labels for some of the varieties we have introduced. Examples include *Alyogyne* 'Elle Marie' and *Alyogyne* 'Melissa Anne', named after two of Rob Grundy's daughters in Sydney. Rob Grundy was a Sydney nurseryman who grafted grevilleas and grew some of our cultivars along with other Australian plants. Vandals trashed his nursery and he decided not to continue.

The *Alyogyne* photos on the label are a bit deceptive. The photographer picked a bunch of flowers and tied them in one spot for a close-up. The background shot shows the true nature of the plant. The first label, 'Melissa Anne' was colourised on a computer to create the second, 'Elle Marie'.

***Alyogyne* 'Melissa Anne'** was collected more than 15 years ago near the Pinnacles in WA, just south of Cervantes. Its natural habitat is very alkaline beach sand and it grows with *Templetonia retusa*, *Melaleuca huegelii*, upright *Hemionandra pungens*, various coastal acacias and *Thryptomene baeckekeacea*.

***Alyogyne* 'Elle Marie'** has been in the nursery trade under various names for over 20 years and comes from somewhere on Jurien Bay WA, I believe.

Both varieties need good drainage, particularly in high rainfall areas (over 600 mm) and will suffer root and collar rot in heavy wet soils. They will also grow to 1.5 metres in 12 months in full sun and friable soil. A frost to -3° damages tips (which re-grow in spring) and a frost to -6° is often fatal.

***Grevillea* 'Winpara Gold'** is a garden hybrid from Kay Bartlett's garden near Jervois, SA. The original plant was planted as a seedling on the opposite side of the river at Westbrook. They are very alkaline soil tolerant, very fast growing and one plant survived a frost to -18° in Cooma, NSW in 1985.

***Eremophila* 'Summertime Blue'** is a bush hybrid, very vigorous, between *Eremophila polyclada* and *Eremophila divaricata*. Both plants are Murray Darling floodplain species growing in heavy and sometimes slightly saline soils. Either species and the hybrid will withstand extended flooding and the hybrid has been grown successfully in an area of 3750 mm (150 inches) of rainfall without fungal leaf spots. I suspect it would make a good rootstock for grafting of some *Eremophila* species.



Eremophila racemosa Neil Marriott
See Page 323

***Eremophila* 'Mingineu Gold'** was collected inland from Geraldton, WA in the early eighties and is a green leafed, yellow flowered form of *Eremophila glabra*. Our plants have been undamaged by frost at -5°C and some of my originals are still growing at 15 years after planting. Tip pruning young plants makes them branch and helps them to form a denser ground cover. *Eremophila* 'Mingineu Gold' is very good for attracting birds, being in flower almost 12 months of the year at Mannum, SA.

***Eremophila* 'Kalbarri Carpet'** is a beach sand plant from near Kalbarri, WA. *Eremophila* 'Kalbarri Gold' (1 m x 1 m) is closely related and grows about 500 metres back from the coast. These are alkaline soil, sandy soil and heavy soil plants that are worth growing for their white foliage alone as a foliage contrast, although both can also have prolific winter, spring, summer yellow flowers. The white foliage is an illusion. Under magnification the plants have green leaves with millions of stellate hairs which bust up the ambient light into multiple frequencies which we see as white. In high rainfall areas (over about 600 mm) these hairs trap moisture at the leaf surface creating suitable conditions for fungal attack. Although grafted *Eremophilas* may have more robust root systems they are still subject to leaf fungal attack.

***Eremophila* 'Winter Gold'** was one of the first labels I made. When the photos were scanned some fruit and out of focus flowers got into the picture. Mostly these days I try to focus on close-ups with an out of focus blue background, which gives the illusion of sky blue and provides much stronger contrast. Many photographers make the mistake of not ensuring that the background of their shots contrasts enough with their intended subject. This makes it harder to see what is actually meant to be in the resulting photograph. At the time of pressing the cameras button one may be concentrating on the subject and not seeing the image back ground. Digital cameras enable a photo to be deleted as soon as it played back and seen to be worthless whereas film based photos only reveal their ugliness when they come back from the photo lab.

***Eremophila* 'Winter Gold'** was collected many years ago by Len Richardson at Calperum Station in South Australia's Riverland, and was an odd colour variant in a wild population of *Eremophila maculata* and *Eremophila glabra*.

Eremophila maculata is an immensely variable species that is always found in nature on creek-lines or flood-out areas in heavy soil. One year I examined lots of creeks that crossed the Stuart Highway and found that each creek had slightly different populations of *Eremophila maculata* and that they also varied along the creeks. On three sites I have also collected hybrids between *Eremophila maculata* and *Eremophila duttoni*. One on the Ernest Giles Road in the Northern Territory had pink flowers nearly 50 mm (2") long. *E. maculata* can be damaged by frost at -5°C but re-grows in the spring.

Because many forms of *Eremophila maculata* flower 9–12 months of the year and are particularly prolific in winter they are excellent varieties for establishing bird populations in gardens. *Eremophila maculata* is bird pollinated. An active population of birds in gardens is a very useful way of reducing pest numbers (grubs and sucking insects). The insects are the

protein part of the meal and the nectar is the dessert! *Eremophila maculata* withstands some water-logging, grows in all soil textures and can be cut back to the ground as it will re-grow from the stump. My partner, Lindy Fox, tells people to 'treat 'em like daisies'!

***Eremophila racemosa* 'Peaches and Cream'** is a startling colour variant of *Eremophila racemosa*. *E. racemosa* is a fire response species and in the wild peters out after about 10 years. It originally grew throughout the wheat belt in WA but now is restricted to a few roadsides and has become extinct in many areas. This cultivar is now widely grown in SA and is becoming better known in WA and the eastern states. Growing to 1.5 m x 1.5 m, the yellow buds open to creamy white spotted flowers in autumn and spring.

Eremophila nivea* x *Eremophila glabra* ssp. *carnosa is a 1.5 m upright shrub from Tom Loffler's place near Waikerie, SA. It has soft smoky foliage and pale violet flowers.

Eremophila stenophylla is a shrub eventually growing to a small tree (6–7 m) from south-west Queensland. It has silvery grey foliage and soft pink flowers (the colours of a galah) and grows slowly in alkaline soils with little or no irrigation. We have never seen frost damage or fungal leaf spots on this plant. *Eremophila stenophylla* roots readily from cuttings in autumn.

***Grevillea* 'Flora Mason'** was crossed by us from the parents of *Grevillea olivacea* and *Grevillea pinaster*. We named the plant after a South Australian plant collector who helped us with many varieties of new plants in the 1980s.

Grevillea 'Flora Mason' is a bullet proof screening plant for almost any soil, anywhere in Australia. It flowers autumn, winter and spring, starting inside the plant and flowering all over in late spring on a good plant. This plant is now widely available in southern Australia.

***Lobelia* 'Summer Skies'** is an oddity because it is a deciduous, perennial, Australian groundcover, which we for some years thought was a *Scaevola* but could never identify it. We originally sold it as *Scaevola* 'Whatsit?' The original forms that we selected from were suckering shoots re-growing after a bushfire in the Darling Ranges (on a private property). *Lobelia* 'Summer Skies' suckers up out of the ground in spring and flowers from October to April. It is very easily propagated by transplanting suckers or slicing up potted plants in a pizza fashion. Plant out the wedges.

Acacia ashbyae (prostrate) is a rare and endangered plant in Western Australia. This form must be grown from cuttings to keep the low habit. One 5 year old plant is 1 m high and 6 m across, growing on very alkaline soil with almost no irrigation in a 250 mm rainfall area.

Lysiosepalum involucreatum is a nifty little understorey shrub from mallee areas of WA. It has soft green-grey foliage, dark red buds and massed pink paper lantern flowers in winter and spring in South Australia. We have never seen frost damage on this plant and know of specimens growing in many different soil textures with a pH range of 5.5 to 9. It is fairly adaptable and tolerates full sun or dense shade and is closely related to *Thomasias*, *Guichenotias* and the like.



Eremophila Maculata X Duttoni
see page 322 Tony Clark



Eremophila 'Winter Gold'
see page 322 Tony Clark



***Eremophila* 'Kalbarri Gold'**
see page 322 Tony Clark



***Eremophila* 'Kalbarri Carpet'**
see page 322 Tony Clark

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Alyogyne hakeifolia (above)
Alyogyne cuneiformis (below)
See page 283 G. Bujanda

