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BANKSIA STUDY

Banksia incana

REPORT 6

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THE BANKSIA REVISION - Trevor Blake

The Banksia revision was published in the journal of the W.A. Herbarium 'Nuytsia' Vol. 3, No. 3 in September 1981.

As a result of this pub .cation there are now 71 named species, an increase of 10 species with a further9 varieties.

The new names are as follows, with synonymous names in brackets.

B. conferta var. conferta	- Mt. Tibrogargon, Qld.
" var. pencillata	- Mt. Darcy Glen Davis NSW
B. micrantha.	- Eneabba to Cervantes - coastal
B. saxicola	- Mt. William-Vic. Peaks in Grampians. Sealers Cove Tk. Wilsons Prom.Vic.
B. gardneri var. gardneri	(B. prostrata) Bremmer Bay to Cranbrook.
" var. brevidentata	- Stirling Range.
" var. hiemalis	- Mt. Barren, Ravensthorpe.
B. chamaephyton	- Sandplains north of Perth.
B. aculeata	- Stirling Range endemic.
B. ericifolia var. macrantha	- Murwillimbah to Grafton - coastal only
B. integrifolia var. aquilonia	- North Queensland.
B. littoralis var. seminuda	- Kalgan River, W.A.
B. sphaerocarpa var. caesia	- South-east of Perth.
" var. dolichostyla	- North of Ravensthorpe.
B. incana	- (B. sphaerocarpa var. glabrescens)
B. grossa	- Mt. Leseuer area.
B. lanata	- Sandplains north of Perth.
B. scabrella	- Walkaway - W.A.
B. telmatiaea	- Perth to Bagingarra
B. meisneri var. ascendens	- Busselton area.
B. nutans var. cernuella	- Albany to Pallinup River
B. cuneata	- Brookton to Bruce Rock
B. leptophylla	- (B. sphaerocarpa var. major. var. pniifolia).
B. plagiocarpa	- Hinchenbrook Is. Qld.
B. blechnifolia	- Lake King, W.A.
B. spinulosa var. cunninghamii	

Errors in the naming and manuscript names in Banksia Report 5 can now be changed to the following:

Lower Page 4	B. grossa	A.S. George
Page 6	B. leptophylla	A.S. George
Page 7	B. sphaerocarpa var. caesia.	A.S. George
Page 8	B. incana	A.S. George
Page 9	B. lanata	"
Page 10	B. scabrella	"
Page 11	B. telmatiaea	"
Page 12	B. saxicola	"
Page 13	B. integrifolia var. aquilonia	A.S. George
Page 14	B. conferta var. conferta	
Page 15	B. cuneata	A.S. George
Page 16	B. chamaephyton	"
Page 17	B. gardneri var. brevidentata	"
Page 18	B. blechnifolia	F. Muell.
Paee 19	B. gardneri var. gardneri	A.S. George
Page 20	B. littoralis var. seminuda	"

Descriptions of species omitted in Report 5 and notes on cultivation of all new species are included in the following pages.

Banksia spinulosa var. spinulosa - Qld. N.S.W. April - Aug.

A species which is widespread from northern Queensland around Mossman and in south-eastern Queensland with inland exceptions being found on Blackdown Tableland and with Biloela area. It is common in N.S.W. south of the Hawkesbury to the Victorian border.

This variety can be distinguished by having:-

i) A lignotuber;

ii) fine, narrow leaves with revolute margins, veins not prominent;

iii) Leaves with slight serrations towards the tip.

In cultivation this variety has proved hardy to a wide range of soils and conditions and all varieties are excellent bird attracting shrubs.

Under natural conditions there is variation within the variety, particularly just north of Sydney where intermediate and clines are evident with variety collina.

Banksia spinulosa var. collina, Qld. N.S.W. April - Aug.

This variety is distributed throughout the northern half of N.S.W. from the Hawkesbury River to south-east Qld. to Nambour. Characterised by having:-

i) A lignotuber.

ii) Broader clearly serrated cleaves with recurved margins.
iii) Veins apparent on both surfaces.

A hardy variety under cultivation suiting most soils and climates.

Banksia spinulosa var. cunninghamii April - July

Distributed from the Dandenongs (Vic.) to Lamington Plateau (Qld).
A tall shrub to small tree reaching 5m high with:-

i) No lignotuber;

ii) Leaves linear with slightly recurved to loosely revolute margins.

iii) Serrated to entire leaves covered below with fine pale brown tomentum;

iv) Nerves not prominent.

It appears to hybridise with B.ericifolia v. ericifolia.

A hardy plant under cultivation. It can grow in most soils from sands to heavier clays. It can withstand dry spells and can be grown in sun or shade.

	B. SPINULOSA var. spinulosa	var. collina	var. cunninghamii
lignotuber	lignotuber	lignotuber	no lignotuber
leaves	narrow linear	linear to obovate	linear to broadly linear
leaf margins	revolute, finely serrated towards tip.	flat, recurved strongly serrated	recurved to loosely revolute, acutely serrate to entire
leaf venation	not prominent	evident both surfaces	not prominent
leaf surface	white indumentun on lower seurface	white indumentum lower leaf surface.	pale brown tomentum on lower leaf surface
size	1-2m occasionally 3m.	1-2m.	to 5 m.
flower colour	golden, golden with dark red to purple styles.	similar to v. spinulosa	cream, with black styles to orange.
distribution	NSW/Vic. border to Hawkesbury River. Qld. several locations extending north to Mossman.	S.E. Qld. to Hawkesbury River.	Dandenongs (Vic.) to Lamington Plateau (Qld.)

BANKSIA ACULEATA . A.S. George W.A. Feb. March.

Habit
A dense bushy shrub that is closely related to B. caleyi with branches extending low to the ground. It reaches 2 m in diameter.

Leaves
The leaves are unusual in that they taper towards the stem and have 3-10 pointed and prickly lobes that form 1cm long serrations. The leaves vary in length from 4-9cm.

Flowerheads
Bud
Oval shading from pink to cream as the flowers open.

Bracts
Narrow, tapering towards the stem and covered with reddish brown hairs.

Flowerheads
Pink at the base changing to cream. 9+ cm in diameter with a pendulous habit.

Perianth
Cream, long and straight (30-45mm long) which is the longest in the Banksias.

Style 10-12mm, glabrous.

Fruit
Very large cones with very large follicles and seed. The floral parts are persistent and the species is similar to B. caleyi.

Habitat
Open, flat plains in sandy gravels growing along with other scrubby species.

Distribution
Stirling Range endemic.

Cultivation
This species has been grown and in the south eastern states has proved quite hardy.

Distinguishing Features
1. Canaliculate leaves - not seen in any other Banksia species.
2. Longest style and anthers of the genus.
3. Longer perianths.

Propagation
Seed.

Drummond was an early collector of this species in the 1840's and it was originally described as B.caleyi var. sinuosa.

It can be found on the Chester Pass Road east of Cranbrook. This species has been commonly referred to as B.caleyi - yellow flowered form.

BANKSIA blechnifolia

The striking prostrate Banksia from south of Lake King in South-West W.A. has been known for about 120 years. With striking reddish-pink flowers and deeply divided, erect, bluish, fishfern-like foliage it has been in cultivation for many years and has proved most adaptable and reliable under a variety of conditions. It was originally namedby Baron Von Mueller in 1864 as Banksia rubicunda and later (1869) referred to by him as B. pinnatisecta. He again mentioned it when the Flora Australiensis was being written by Bentham, that it was possibly a variety of B.repens. This was accepted by Bentham and it has been referred to until recently as having affinities with B.repens.

It was also referred to recently as B.rubicunda, a name that was being considered by George for the revision.

This vigorous shrub can form a dense groundcover spreading around 3m across. It grows naturally away from the coast in deep sands between Jerramungup and Gibson and flowers during spring.

It does very well in clay soils and sands but does like some moisture to produce vigorous growth.

For a detailed description see P. 18 Banksia Report 5.

Banksia chamaephyton W.A. Late Oct. - Early Dec.

Another interesting Banksia with deeply divided leaves and brown flowers is the only prostrate species found to the north of Perth. It has deeply divided 'fern-like' leaves also, but is quite similar to B. gardneri var. hiemalis.

It has variable leaves, but differs from the above, which has a lignotuber with prostrate, above-ground stems, in having underground stems. The leaves are larger with longer lobes and there are some minor variations of floral parts. The follicles on the cone are also larger.

This species was collected as recently as 1949 by Grigson and has been located from only 8 sites, some of which have been cleared. It could be ruled uncommon and is sparsely found in open heathlands on sands with some lateritic gravel.

Its habit is quite open with a spread of about 1m. We have no reports of its requirements or reliability in cultivation but know of new plants being tried.

The name simply refers to the plant being low growing.

When I first saw this species in lateritic gravels north of the Darling Range I immediately considered it another occurrence of B.blechnifolia because of the similar foliage. The plants were in poor condition and not in flower in Sept. '74.

Detailed description, p. 16, Banksia Report 5.

Banksia conferta var. conferta Qld. April-July

This species which is endemic to the Glasshouse Mountains and the Lamington Plateau, principally from Mt. Barney, has been known and grown for 30 years as a form of B.integrifolia. The typical form from the Glasshouse mountains has entire leaf margins pubescent bracts, thick tesselated bark and marginally smaller follicles than the Lamington form.

The flowers are generally crowded on this quite dense bush which has a lignotuber which possibly aids regeneration after fire.

It is found in open shrubbed or steep, well-drained sites on granite or sandstone.

Detailed description can be found on P. 14, Banksia Report No. 5.

conferta var. pencillata

This variety is closely linked with B.paludosa and was first collected in 1906 by R. Cambage from the Walgan River, NSW at an altitude of 3000'. One of the major differences with B.paludosa is the presence of a lignotuber in this species.

It is found in sandstone country in rocky sites near the tops or bases of cliffs or on steep rocky slopes in open forest or woodland in the Blue Mountains near Mt. Darcy and Glen Davis north west of Sydney.

A natural hybrid between this variety and B.marginata has been recorded from an abandoned mining site near the Clarence - Newnes Road.

	conferta var. conferta	conferta var. pencillata
	lignotuber	no lignotuber
Bark	tesselated 5-7mm thick	smooth - thin
Leaves	entire margins	serrated margins
Common Bracts	Tips closely pubescent pale.	tips, brown pencillate
Involucral Bracts	Densely pubsecent	Densely villous
Follicles	8-12mm long	11-15mm long
Leaf	venation conspicuous	less conspicuous reticulate veins.

Banksia cuneata W.A. Sept. - Dec.

This species comes from a restricted locality between Brookton and Bruce Rock and much further inland than B.ilicifolia.

It is found on deep yellow/brown sands in open woodlands to tall shrubland.

Further cultivation data is required for this species.

Detailed descriptions P. 15, Banksia Report 5.

	B.ilicifolia	B.cuneata
Habitat	Tree to 10m with single trunk	Shrub/smalltree to 5 m with several stems
Bark	Rough - fibrous and fissured	Smooth
Leaves	Larger 3-10cm long. Margins entire or up to 14 teeth - shiny leaf surfaces.	Smaller 1-4cm in diameter.
Flowers	Large 4-7cm in diameter.	Smaller 3-4cm in diameter.
Colour	Opens pink and cream turning dull red.	Opens pink turning pale brown.
Fruit	1-3 follicles, floral parts shed, larger. Follicles open after 2-3 years.	Smaller 1-5 follicles shed floral parts. Follicles remain closed.

Banksia ericifolia var. macrantha N.S.W. April - August

Found only in coastal areas in deep sand which supports open scrub to tall shrubs. Located in lower lying areas which can become quite moist it is frequently in association with B.oblongifolia.

Both varieties of this species have been in cultivation for a long time and have proved reliable, particularly if able to reach moist soils. They are hardy to a wide range of soil types from sands to clays.

	ericifolia var. ericifolia	ericifolia var. macrantha
Seedling Leaves	2-6 teeth on each side	1-2 teeth on each side
Leaves	narrow.	narrower and more crowded
Flowers	gold, orange or red styles	deeper colour larger flowers and spike
Perianth	19-22mm long	26-28mm long
Pistil	30-35mm long	46-48mm long
Perianth hairs	Limb pubescent	limb hirsute
Location	Central Coast and adjacent mountains. Ellenborough - Jervis Bay and mountains extending north to Collaroy.	Coastal only - Murwillumbah to Grafton absent from Grafton to Nambucca. Crowdy Bay.

Banksia gardneri var. gardneri

Formerly known as B.prostrata this encompasses the plants referred to as the B.prostrata complex which has been recognized by George as having three distinct varieties. These have been re-named after Charles Gardner, who was WA Government Botanist for 31 years prior to 1960. He showed tremendous interest in WA flora and named 6 new species of Banksia.

B.violacea, audax, laricina, pilostylis, benthamiana and lullfitzii.

The new name was necessary as confusion existed between Robert Brown's naming in 1810 and an earlier name given in 1775 by Forster and Forster to a different plant.

The type species of B.gardneri var. gardneri is prostrate with the stems growing along the ground surface. The leaves are erect and can reach from 10 to 40 cm with deep lobes from 1-3cm long. The flowers are orange-brown to rusty-brown and flower from Sept. - October.

It ranges from the Stirling Ranges south to the coast and from Bremer Bay westwards to Cranbrook.

The variety B.gardneri var. brevidentata can also be readily distinguished by its leaf. The leaf is broad and upright with short teeth along the margins which don't divide the leaf beyond 1/3 of its width. The flowers are rusty-brown occurring from April to July. Found almost exclusively in the Stirling Ranges with an isolated occurence north of Albany it can be mistaken for B.goodii. The obvious differences being that the latter has a pale brown flower in November and the leave margins undulate with irregular teeth.

The third variety B.gardneri var. hiemalis is located much further east in the Mt. Barren-Ravensthorpe area and flowers from June to August displaying pink and brown flowers. This variety has deeply lobed triangular leaves, and has similarities with B.chamaephyton previously mentioned. The name refers to the winter flowering habit of this variety.

All of the forms of B.gardneri grow in sandy soils frequently as undershrubs in tall shrublands to open woodlands, with the var. hiemalis being found in heaths to mallee country.

Distinguishing Features of B.gardneri

	var. gardneri	var. brevidentata	var. hiemalis
Flowering Time:	Sept. - Oct.	April - July	June - August
Leaves	Lobes 1-3cm deep	Broad leaf blade with short marginal teeth.	Deeply divided with triangular lobes 0.5-2.5cm long.
Stems	On the surface in all areas.		

All forms have been in cultivation and although slow growing seem tolerant of a wide range of soil types providing they are well drained. They are at home in partially shaded situations under shrubs or trees where they receive filtered sunlight and will tolerate full sun conditions.

More detailed description can be found on p. 19 and 17 of Banksia Report 5.

Banksia grossa W.A. March-Sept.

This species is easily distinguishable from others in what was known as the B.sphaerocarpa complex. It has:

a) Broad thickened leaves 4-12cm long x 3mm wide.

b) Floral parts are much coarser than any others in this group and covered in a dense mat of long, velvety, rust-coloured hairs.

c) The seeds are much larger than any others in this group of Abietinae.

B.grossa was only recently collected in 1965.

Cultivation data is required on this species. Sandy and stony soils should produce successful results.

Details, P. 4, Banksia Report 5.

Banksia incana W.A. Nov. - April

Described in more detail, P. 8, Report 5. Originally collected in 1840 by Preiss and Drummond. This species was grouped together in the complex B. sphaerocarpa.

It is found growing naturally from suburban Perth at Orange Grove north as far as the Arrowsmith River. Usually it inhabits deep sands or sand overlying laterite which supports tall scrub or more open woodland vegetation.

It shares the habit of having a lignotuber, which is a thickened woody growth at soil level from which new stems emerge with B.micrantha and B.grossa. These new species were originally lumped together under the B.sphaerocarpa complex.

B.incana does have bright yellow flowers and fruits that are generally without dead floral parts. The tightly packed follicles vary in size, are covered in a mat of fine grey hairs.

It has a close relationship with B.micrantha which is outlined on P.12 and B. laricina.

Under cultivation this species requires sandy soils that are quite moist. It is not well known in cultivation and data is required.

Distinguishing Features

	B.telmatiaea	B.leptophylla	incana
Leaves	short (1.5-3cm)	4-10cm long	1.6cm long sharp point and broad 2mm.
Flower	cylindrical	spherical-ovoid	spherical
Habitat	Swamp	deep sands	deep sands
Colour	Golden to pale brown	pale to mid yellow or brown	bright yellow
Flowering Time	May - Aug.	Dec. - Aug.	Nov. - April
Lignotuber	Not present	not present	present.

Banksia integrifolia var. aquilonia Nth. Qld. Feb. - April

This variety is readily distinguishable from the other varieties by its very long narrow leaves.

It is found in quite a wide range of habitats in Northern Queensland from Mt. Finnigan National Park to Paluma Range and extends from the coast to the ranges. Generally in granitic sands from creek banks and moist flats to exposed ridges in open forest and scrub to the edges of rainforests, it can reach 15m tall.

Confusion has been caused over the years as this variety has been referred to as B.integrifolia var. compar. In his revision of the genus, George believes Bailey, who described this form in his 'Flora of Queensland' 1897, misapplied the name to this northern form.

Full description see P. 13, Banksia Report No. 5.

var. compar. Jan - June.

This variety occurs in south eastern Qld. and south to the central coast of NSW. Again a wide range of habitats are found with this form from the coastal dunes in the north to the basalt soils of forests of higher mountain areas with occasional occurences in periodic wetlands. Clines occur between var. compar and var. integrifolia in the eastern seaboard of northern NSW.

This form is only truly coastal from Keppel Bay Qld. northwards and is replaced by var. integrifolia to the south while var. compar is found further inland and in the hills.

Hybridization occurs in south eastern Qld. with var. integrifolia and can be found at Rainbow Beach and Bribie Island.

Some discussion can take place regarding the montane forms from Mt. Wilson to Lamington Plateau. They are usually straight-trunked and may reach 16m, whereas the normal form is irregularly shaped to about 10m. The leaves of this form are narrowly elliptical and whorled.

Distinguishing Features

	var. aquilonia	var. compar	var. integrifolia
Juvenile Leaves	7-24cm long x 6-21 mm wide	10-18cm x 1-2cm wide	3-6 x 2-3cm wide
Mature Leaves	Scattered rarely whorled 5-20cm x 6-12mm wide.	whorled - shiny above large undulating, broad 10-20cm long obovate.	whorled. Dull above 4-10cm long.
Hairs	Rigid, short hairs on each side of midrib on undersurface.	Not present	Not present
Common Bracts	Acute	Obtuse	Obtuse
Perianth	25-29mm long	22-25mm long	22-25 mm long
Distribution	Nth. Qld. only	From Proserpine Sth to Mt.Wilson central NSW, Not in Vic.	From Port Phillip Bay to Fraser Island Qld.
Hybrids	Hybrids not known.	Hybridises with var. var.integrifolia	Hybridises with var. compar.

Banksia lanata W.A. Oct. - Jan.

Another of the B.sphaerocarpa complex to be given species status. It was collected in 1948 by Charles Gardner from the northern sandplains around the Arrowsmith River.

It appears to prefer the plains or lower slopes of the low undulations of this area and is locally common throughout its range.

Found on the northern sandplains between Arrowsmith Lake, Coomooloo Creek and Tathra National Park on deep sands over laterite.

Another distinguishing feature of this species is its low bushy habit.

Cultivation data is required for this species.
Detailed descriptions P .9 Banksia Report 5.

Distinguishing Features

	B. lanata	B. scabrella	B.leptophylla
Habit	Low, bushy, spreading to 1m high x 3 m across.	2m x 3m across	2 x 3m across
Leaves	New leaves pink Leaves 3-10 cm.	Scabrid and roughened. 1-3cm long.	4-10cm long.
Bracts	Covered in white hairs.	Elongated edges to bracts. Cream to white hairs.	Green-brown to brown-cream
Flowering Colour.	Pale cream to pale brown.	Yellow and purple.	Pale to mid-yellow to brown.

Banksia leptophylla W.A. Dec. - Aug.

This name has been given to a species that has long been recognized as being a variant of the species B. sphaerocarpa. It was given the varietal name of B.sphaerocarpa var. pinifolia and var. major neither of which have been described officially.

It would appear that this species is quite variable having two readily distinguishable forms. Clines have formed between the two.

One form has very large flowers which occur in summer and the other in a small winter flowering form.

These forms distinguish themselves readily.

	Large Flowered form	Small flowered form.
Fruit	Greater size of fruits. to 12cm across.	6-8cm across.
Bracts	Obtuse	Obtuse to acutely pointed.

The flowers have great variation in colour ranging from mid yellow to pale brown with some cream colourations.

See under B. lanata for a chart of distinguishing features of similar species. (P.9)

Coastal distribution from Kalbarri to Perth and inland to Mogumber, Moora, and Tathra National Park.

It is rarely found on laterite, but usually in depressions in taller scrub to open heathlands. Deep sand, grey sandy clay or yellow and brown coastal sands over limestone are the soils which nurture this species.

Detailed descriptions are on P. 6, Banksia Report 5.

Banksia littoralis var. seminuda W.A. April-July

This 25m tree has been generally referred to as the Kalgan River form of B.littoralis. It has a trunked upright habit and the bark is hard, fissured and fire sensitive.

The name refers to the hairless perianth limb. Some leaves tend to be finely serrated along the whole of the margins length. Some forms can have entire leaf margins. This species has a red-flowering form which frequently grows with the normal yellow flowered forms.

This form extends from Banksiadale on the Darling Range to the exposed coastal heaths of Brake Inlet and Two Peoples Bay. It can be found in red loams and gravelly loams along water courses in the Jarrah forests as well as on low lying sandy flats.

Detailed description, P. 20, Banksia Report 5.

Differences

	B.littoralis var. littoralis	B.littoralis var. seminuda
Leaves	Narrower to 10mm wide.	Broader and thinner to 18mm wide.
Perianth Limb	Pubescent	Glabrous, giving deeper colour.
Habit	Leaning and gnarled.	Straight trunked, tall to 25m.
Habitat	Low scrub in exposed coastal heaths.	More exposed in some coastal sites.
Variations	Nil	Red flowered form.
Bark	Corky, short and lumpy with a fine texture. Fire tolerant.	Hard fissured and fire sensitive.

Banksia meisneri var. ascendens W.A. April - Aug.

This plant differs in one respect only - having longer, erect leaves which give a different appearance to the shrub's habit.

Leaves are 8-15mm long compared with B.meisneri var. meisneri whose leaves are only 3-7mm long.

Its habitat is limited as it is known from a few localities in predominently agricultural country in the far S.W. corner near Busselton and Scott River Plains.

This species occurs on swampy flats in deep white or grey sands that support open heaths, low shrublands and low open woodlands.

Cultivation details are required for this species.

Banksia micrantha W.A. Jan-May & Sept.

This shrub has a low sprawling habit. and is unusual in that it has almost developed an underground stem which emerges from the ground up to 60cm away from the main part of the bush. The plant has established a layer of bracts along this underground section.

Specimens are recorded back as far as 1938 from an area around Mt. Lesewer to which it is restricted. It grows in heaths or scrublands on white sand overlying laterite.

The tiny flowers and globular cones are considered significant enough to separate it as a distinct species. Frequently the older cones are devoid of most floral parts.

This is closely related to B.sphaerocarpa and differs mainly by having:

i) a sprawling habit
ii) pungent leaves
iii) large follicles
iv) small perianth with appressed hairs
v) short glabrous perianth limb.

Habit
A rounded shrub with a mass of upright branches. It is generally low growing to 60cm with 1m or more spread. The branches keep low to the ground.

Leaves
Fine narrow linear leaves are crowded along the stems and terminate in a fine point.

Flowerheads

Bud — Short oval upright bud, terminally displayed.

Bracts — Bracts up to 4mm long, covered with fine greyish hairs subtend each inflorescence.

Flowerhead — Pale yellow to purplish on occasions. Small rounded heads.

Perianth — 17-20mm long with short, finely matted hairs close to the surface.

Style — Gently curved 19-24mm long with no hairs present.
Floral parts persistent on a rounded fruit of 4-6cm in diameter.
Up to 25 follicles with flattened tops and a low ridge along the opening section.

Habitat
Found in open sand heaths to low scrub country with lateritic subsoil.

Distribution
North of Perth between Eneabba and Cervantes on the coastal plain.

Distinguishing Features
i) Sprawling habit.
ii) Sharp pointed leaves.
iii) Small closely hairied perianth.
iv) Smooth perianth limb.
v) Follicles that are covered in fine hugging hairs.

	B.micrantha	B.sphaerocarpa	B.incana
Habit	sprawling	spreading with upright stems from lignotuber	Spreading with upright stems from lignotuber
Flowering Time	Jan-May & Sept.	Jan - July	Nov. - April
Perianth	Pubescent inner surface	Densely pubescent inside	Glabrous inner surface
Fruit	Persistant old floral parts.	Floral parts persistent.	Deciduous floral parts.
Follicles	Covered in fine hugging hairs.	Loosely covered with spreading hairs.	Fine grey hugging persistent hairs.

Cultivation

Not well known in cultivation and more information is required. It does require sandy soils that are well-drained.

Propagation
Seed.

Banksia nutans var. cernuella W.A. Jan. - April

This form generally occurs in low, open woodlands to tall scrublands. Depressions in deep sandy soils are the preferred habitat.

It is distributed from the Stirling Ranges south to Albany and east to the Pallinup River valley.

The flowers are smaller than var. nutans, 5-6cm across are similar in colour (pinkish/purple) and are strongly onion scented which is true for both varieties. The fruits are 6cm across and a little longer.

The fruits are smaller (18-30mm long by 8-15 mm wide), and the follicles have flattened convex tops that are generally flanged with few wrinkles.

Cultivation data is required for this variety.

It should grow in deep well-drained soils in open sunny sites or partially shaded ones. It is partially frost tolerant and can be utilized as a soil binder. It is able to withstand limited salt exposure in coastal areas.

	B. nutans var. nutans	B. nutans var. cernuella
Habit.	Bushy and compact	More open and upright
Distribution	East of Pallinup R. to Israelite Bay	South of Stirlings to Albany and east to Pallinup Riv.
Follicles.	Rounded, wrinkled and variable by 25-40mm-15-38mm wide, larger.	Less wrinkled, smaller. 18-30mm x 8-15 mm wide.
Flowering Time.	Earlier Nov. - Feb.	Later Jan - April.
Perianth	25-33mm long	22-24mm long
Flowers	Larger 5-7 x 4-5cm long	Smaller 4-5x3-4cm wide

Banksia plagiocarpa Qld. Jan. and June.

This recently rediscovered species (1979) had originally been collected in 1867/8 by Dallachy near Townsville.

Habit
A tall spreading shrub with low branches that can reach 5m in diameter.

Leaves
Have a scattered arrangement with concentrations towards the branch ends. They vary from 8-20cm long by 6-17m wide and can be lance-shaped or slightly obovate with some serrations or entire margins. The leaf surfaces are covered with white woolly hairs which disappear from the upper surface on maturity and leave it glabrous.

Flowerheads
Bud
Forms in previous year's growth and is surrounded by a whorl of new season's branchlets - bluish-grey.

Bracts
Linear to terete on broad bases 2-8mm long with dense tomentum.

Flowerhead
Cylindrical head 7-14cm x 5-6cm diameter. Openly arranged florets that change from creamy-grey to pale bluish-grey/mauve prior to maturity.

Perianth
22-25 mm long and straight becoming slightly upturned at maturity.

Style
Long, straight or slightly curved style 26-28mm long glabrous.

Fruit
Oval-shaped with the old floral parts deciduous -4-5cm in diameter with approximately 60 obliquely triangular follicles per cone. These generally remain closed.

Distribution
Hinchinbrook Island and adjacent mainland. Recent collections from the northern slopes of Mt. Bowen.

Habitat
Found in low shrubby woodlands growing on granitic slopes in sandy-loam or clay loams.

Distinguishing Features

	plagiocarpa	oblongifolia	integrifolia var. aquilonia
Trunk	short stout with corky bark, 5m tall.	Several stems from a lignotuber. 3m tall.	tall solid trunk 15m tall.
Flower buds	Bluish-grey	slightly bluish-grey.	yellowish
Follicles	obliquely triangular 60	semi-circular 80	semi-circular
Leaves	Lanceolate to slightly obovate serrate to entire 8-20cm long. x 6-11 mm.	Obovate to oblong 5-8cm long	Very narrow, obovate to lanceolate. 5-20cm long. 6-12mm wide.

Cultivation

Not known in cultivation but should do well in most well-drained soils that are frost free. Has potential as a low growing windbreak in coastal areas.

Propagation
Seed.

Banksia saxicola Vic. Jan - March.

This is a widespread species growing in the Grampians above 600m in exposed and sheltered sites both in open shrubland or open forest (stringybark). It is also found at Wilsons Promontory in granitic soils in tall forests near Sealers Cove.

It has been grown for many years and known as the 'Mt. William form of B.integrifolia'.

The Grampians forms are all thick, bushy, low-branching shrubs or small trees with a good spread. The 'Prom' form is much more upright and tall, being understory in tall forest.

Detailed description p. 12, Banksia Report No. 5.

Distinguishing Features	saxicola	integrifolia
Bark	thinner, smoother	roughly fissured, tessellate
Leaves	thick broad obovate dark green	thinner, narrowly obovate to lanceolate
Flower colour	greyish yellow	yellow
Flowering Time	Jan - March.	Jan - June
Fruit	tomentose follicles remain closed	Follicles open at maturity

Banksia sphaerocarpa var. sphaerocarpa

There are now three varieties of this specis which have been regarded as part of a complex for years and have included many banksias which are now separated as species in their own right.

B. micrantha, B. grossa, B. lanata, B. scabrella, B. telmatiaea, B. leptophylla, B. incana.

Frequently called B.sphaerocarpa var. latifolia a recognized form distinguished by Mueller and published in Benthams 'Flora Australiensis'. It has now been recognised as being a form of B. sphaerocarpa var sphaerocarpa.

This shrub can reach 2m tall and is usually found in woody or shrubby country on soils with laterite present. It is widespread extending from Cape Riche to Denmark and north as far as the Stirling Range with another distribution to the north of Perth extending from the sandplains around Eneabba to the lateritic clays of the Darling Range.

Flowering from January to July with purplish brown to yellow this variety is quite variable.

var. caesia

Is quite widespread but varies little and can be mainly found south east of Perth with far less populations to the north-east. It reaches 1.5-4m tall with an occasional spread of 4m. and generally has bluish green foliage.

var. dolichostyla

This variety has a quite localized distribution known from the lateritic soils of South Ironcap and Lake Varley area well to the north of Ravensthorpe. Flowering from March to May.

The species has been quite widely cultivated in well-drained partially shaded sites with filtered sunlight, and as bushes grow low to the ground, they are useful as groundcovers or windbreaks. It does not like clay soils but seems to do well in a wide range of sandy soils.

Distinguishing features of:-
B. sphaerocarpa.

	var.sphaerocarpa	var.caesia	var.dolichostyla
Habit	0.5-2m tall	1.5-4m tall	2-3m tall, widespread
Leaves	Dark green rarely glaucous	bluish-green	bluish-green
Seeds	Follicles 15-30mm long	Small seeds and follices (8-17mm)	Large seed and follicles 15-22.
Flowering Time	Jan- July	Jan-July	March-May
Style	30-45mm long	40-45mm long	Longest of all banksias 50-65mm long.

Banksia telmatiaea W.A. May - August.

First collected by Preiss and Drummond around 1840's it was described by Meissner and later included in Brown's B.sphaerocarpa and confirmed by Bentham.

In parts of its range it does grow with B. leptophylla but differs clearly in leaf length, flowering time, habitat, and flower shape. (P.7)

It does occur along the coastal zone from Perth to Bagingarra and inhabits grey sandy loams that are swampy in winter.

Cultivation data is required on this species.

Details, P. 11, Banksia Report 5.

Banksia scabrella W.A. Sept. - Jan.

First collected by F. Mueller in 1877 from country to the East of Greenough River.

This species is quite distinctive with the roughened leaf surfaces, the long tapered hair-like bracts that give a different appearance and the way in which the branches rest on the ground.

The colour of the new buds is most striking, being pale purple.

Cultivation data is required on this species.

Detailed descriptions P. 10, Banksia Report 5.

Seed Source

Nindethana Native Plant Seeds, Narrikup, W.A. 6326. have 16 of the new species listed in their catalogue.

SOME REMARKS ABOUT THE GENUS BANKSIA IN EASTERN AUSTRALIA

Alf Salkin.

Linneaus was responsible for a system of classification known as the sexual system based on the number of male and female parts in a flower, but a more important innovation was his binomial system in which he distinguished two levels in a hierarchical system, genera based on sexual differences and species based on morphological differences within a genera. This all happened at the end of the eighteenth century and it was the generally held belief that species were immutable, not subject to variation. This was a theological belief based on an assumption that all species had been created 4,000 years before the birth of Christ. It was actually called the "Special Creation".

Linneaus himself was aware of many inconsistencies to this idea of fixity of species, apart from the new and strange plants that were being revealed by the voyages of exploration there were plants which were obviously hybrids.

One important outcome of all this collecting and classifying was that there gradually grew a belief that the "Special Creation" was a myth. Most will know of the book that attempted to shatter this myth. Whatever else it did, it brought into direct conflict the evolutionists and the special creationists.

On the origin of species by means of natural selection, (Darwin 1859) did not solve the problem of what a species is, but it did question the fixity of species, and it also provided one way, the survival of the fitter, as to how species can change, but as I wish to demonstrate, this is not the only way.

Ideas about plants are so overlain with accretions from the past that it is difficult to free ourselves from that long history, much of it belonging to Latin and mediaeval traditions established in the ancient universities of Europe. Even the Darwin controversy was a deabte conducted along these traditional lines. The important thing to note is that in classical plant taxonomy, there is still an underlying belief in the species in much the same light as Linneaus saw it. Having looked closely at a small group of plants in the genus Banksia, I do not think this system can classify the variation that I have seen and it certainly cannot explain the reason for this variety. I have accepted that Linnean level of variation called genera, that distinguishes say Banksia from Dryandra. I am, however, conscious that the differences are not as discrete as implied by this separation. If we use flower structure as the basis of our classification, it is possible to distinguish the two, but remember the Linnean system is based on flower structure. If we use some other characteristic, say leaf structure, the plants which have deep pits on the underside of their leaves would fit into a group containing both Banksia and Dryandra.

This concept is not new, Cookson and Duigan (1950) working with thirty eight million year old mummified leaves from the Yallourn Coal deposits quite rightly would not commit themselves to calling these plant remains either Banksia or Dryandra and referred them to a new genus Banksieaphyllum.

The species problem is, however, another matter and is certainly not restricted to Banksia. The problem is dealt with very fully by Heslop-Harrison (1953) and also by Briggs and Walters (1969) and concerns a new type of nomenclature to accommodate just such as genus as Banksia where hybridization occurs readily and where there is also introgressive hybridization, where genes may infiltrate from one genotype to another. Rather than talk of the Banksia spinulosa complex, we might profitably use the "new taxonomy" term of gamodeme where all

members of the taxon can interbreed providing that pollinators can span the space between them.

Let me use the eastern Oncostylis as an example. The Oncostylis are those banksias that have hooked styles and mainly because of this unusual characteristic the famous English botanist Bentham (1870) placed them into a "Section" in his Flora Australiensis. Much of the confusion about this group has been caused by the great range of variation. I have attempted to indicate the major sources of this variation graphically. I have assumed that at some time in the past speciation had taken place and that there were three parental stocks isolated from each other. Environmental changes have now brought these together again so that they can again interbreed and we now find a situation where Banksia ericifolia may cross with either B.spinulosa or B. cunninghamii.

Banksia collina is most likely to be a cross between B. cunninghamii and B. spinulosa. B. spinulosa is a low shrub with a ligno tuber and very revolute leaves, B. cunninghamii is a tall shrub with no ligno tuber and relatively broad flat leaves. B. collina shows great variation between these two extremes. It would be very nice if we could hand pollinate B. spinulosa with pollen from B. cunninghamii but as pollen in these species is already on the stigma when the flower opens there is a difficulty. I have attempted for a number of years to do just such an experiment but so far without success. What I have proved is that the pollen already on the stigma will fertilize some flowers of the spike. This can be proved by a simple bagging experiment. If you exclude all pollinators with a fine mesh nylon bag you still get seed follicles produced. One thing that I might stress here, is that in their natural habitat one representative of the gamodeme occupies one niche. Banksia spinulosa is found on wetter sites in the Blue Mountains while B. cunninghamii is found on the plateaux. Because of the great variety of niches in the Blue Mountains, there are sites for intermediates between the two previous species and B. ericifolia. Banksia collina as far as I know does not occur south of the Hawkesbury River, but becomes increasingly plentiful as one progresses north. The Victorian species which Mueller recognized as different from B. spinulosa and first called B. prionophylla (and then realised it was related to B. cunninghamii) grows in Victoria apart from a colony near Green Cape, N.S.W. Whether this crosses naturally with B. spinulosa I don't know, but there are colonies of B. spinulosa within a few miles of it. B. spinulosa sensu stricto does not occur in Victoria but appears, as do so many other species, north of that artificial line drawn from The Pilot to Cape Howe.

This phenomenon of great variation occurs also in the Eubanksia. Intermediate forms are found occupying the ecotone between two ecosystems. The most noticeable example is where B. integrifolia occupies the coastal zone and B. marginata occurs on heaths inland from the coast, an intermediate form is found between the two species. The phenomenon also occurs between B. integrifolia and B. paludosa where these are in close proximity as they are on the southern coast of N.S.W.

In the perched swamps of N.S.W. B. robur and B. aspleniifolia also freely exchange genetic material. I think it more than likely that all members of Bentham's section Eubanksia, to which the examples above belong, are in fact a gamodeme like the Oncostylis and any member of this section is capable of exchanging genetic material with any other member. It may be of interest to you to know that a recently discovered Banksia species from the Blue Mountains which grows alongside Banksia marginata has intermediates occupying the intervening space.

Not all variation in Banksia is due to hybridization. Another important force, the exact opposite of proximity - isolation, is responsible for this

phenomenon. The Sewal Wright effect is well documented for other species and is characterized by loss of genetic material, not by any pressure from the environment; but purely by chance - so called genetic drift. My own paper (Salkin 1978) attributes this effect to the variation noted in the four geographical races (Topodemes) of Banksia canei. A number of other occurrences of this form of variation is also worth noting. The first concerns a recently separated species that came to be known as the Grampians Banksia integrifolia. The species occurs in two widely separated areas, The Grampians and Wilson Promontory, and this separation of the two demes has led to slight difference, both in the plants in their natural habitat and as plants in cultivation.

Mention has already been made of the differences between Banksia cunninghamii and B. prionophylla. The colonies are 700km. apart so that no free gene exchange occurs and when grown in cultivation, slight differences such as leaf length are apparent. The juvenile leaves of Victorian populations are always much longer.

The last example concerns Banksia integrifolia. From Point Lonsdale in Victoria to Maryborough in Queensland, this species shows little variation. In the region of Keppel Bay, a form occurs with much larger undulate leaves which are glossy on the upper surface. Robert Brown called this species Banksia compar. Whether this is purely the result of isolation is difficult to say, but north of Cairns this species is replaced by Banksia dentata and it is possible that Banksia compar is yet another example of hybridization. B. dentata does have a broad dentate undulate leaf, but once again the problem might only be solved by breeding experiments.

Other forms of B. integrifolia are known and these occur in highland areas from Point Lookout near Armidale, N.S.W to the Atherton Tablelands. There is a great variety in these isolated highland colonies, but they all have narrower, longer adult leaves than coastal forms. Those from the Atherton Tableland area have been given varietal status in a recent revision by Alex George. The leaves may reach 20 cm in length and are only 6 mm wide.

Presumably at one time, all these populations were contiguous and pollinators were able to move freely within the population. Isolation now prevents this and each population has drifted. It is important to note that this has nothing to do with the survival of the fitter. How long this process has taken is difficult to say, but isolation of parts of the Great Dividing Range must be measured in millions of years and, or course, as I indicated previously, Banksia type plants have been around for over 40 million years.

Having spent some time describing the variation in Banksia, and what I believe are the reasons for it, I now want to look at what we, as a society, should be responsible for. Firstly, I would like to say that I am quite alarmed about the implications of all this. The original aims of this society were centered around ways of protecting our plants by cultivation, but if we bring these wild banksias into garden culture, within a very short time we will have a great mixture of plants and we will have lost those unique plants that took millions of years to evolve. That is, unless we also aim to preserve the plants in their natural habitat. Some people I know are already concerned about what has happened to the genus Grevillea. The abundance of hybrids, the so called cultivars, is clear evidence that all grevilleas belong to a hologamodeme and individuals, irrespective of species, can interbreed with a very high degree of freedom.

The danger is so great that even some of the early cultivars are in danger of being diluted by outbreeding. Rodger Elliott tells me he has been trying to find the original Crosbie Morrison cultivar but so far without success. This, of course, does not happen with cuttings, but there seems to be a penchant

to use seed in the hope of getting a plant with even more desirable horticultural attributes.

In northern Queensland, a species of Banksia was collected in 1867 by John Dallachy, one of Mueller's collectors. Mueller never described this species. When Alex George did his revision of the Banksias, he asked botanists in Queensland to try to relocate this species. It was eventually found by David Hocking of the Queensland Department of Agriculture. It is very localized and rare. My chief concern for this species is that it will, like Banksia goodii in Western Australia, be robbed of its seed by those who would bring it into cultivation for whatever dubious motive. In this way, it could possibly disappear from its natural habitat.

Once in cultivation, it will breed with other Banksia spp. and its unique attributes will be swamped by genetic material from other species. These "new" plants may have great horticultural potential, but we will have lost another natural species that has taken millions of years to evolve.

Without a reserve of natural material in natural areas, our aim of preservation by cultivation will be very hollow indeed. Our society cannot be merely a horticultural society, it must also be a society devoted to preservation and protection in reserves and national parks. But even more, each member will need to have at the forefront of his or her consciousness, the ethic required for such an ideal.

BANKSIA GROWING IN TASMANIA by Barbara Henderson - Legana, Tas.

Tasmania had another hot dry summer this year(1982) approx. 50 - 75mm of rain fell, a large amount of that in late March and several days of temperatures in the 30°s C. The majority of our Banksias survived the summer including a 5 week stint without any water at all, though some B. baxteri died in their pots although these were well watered.

Most of our specimens had been planted last November ('81) and were 1 year old from seed. They had survived the winter outside in pots in a makeshift shelter to protect them from frosts. They are now in a raised bed with approximately 20 cms of sandy loam over gravel and loam, with a clay subsoil. Those growing steadily are B. media, B. serratifolia, B. lemanniana, B. caleyi, B. baueri, B.ornata and especially B. canei; B. dryandroides is growing well except that it is showing signs of chlorosis as is B. paludosa and to some degree B. asplenifolia. B. baxteri appeared to be burnt by the sun - does this species need shade?

In a different area - not a raised bed - where there is sandy loam over clay B. prionotes and B. coccinea survived a cold winter with many frosts and very high rainfall (329 mm in winter months). B. collina is flowering at 1 metre high and is 2 years old.

Our most established Banksia is B. marginata. These are 3-4 metres high and 1-2 metres wide after 4 years. They are all flowering profusely and are visited regularly by 6 species of honeyeaters. One eastern state Banksia which fails to thrive is B. ericifolia yet a neighbour's specimen is over 3 metres high and has many cones.

B. robur is growing steadily in damp areas (over a french drain) and we plan to try them around a dam which fills during winter. One specimen has flower spikes but these seem to have aborted.

REVISION OF BANKSIA SPECIES IN EASTERN AUSTRALIA - Alf Salkin

The publication late in 1981 of Alex George's revision of the genus Banksia (George 1981) has done much to resolve the taxonomic problems of this difficult genus.

The revision is interesting in a number of ways; it does not rely on herbarium specimens alone but places great reliance on cultivated material particularly the shape and size of cotyledons and seedling leaves as well as the presence or absence of lignotubers. Having done a field trip with Alex George and observed the way in which he personally inspected species in the field and the meticulous way he photographed and collected material for herbarium specimens I can only say that the time the revision took is completely justified.

One of the great difficulties in looking at variations in living organisms is to decide at which level a particular form of variation should be classified. Briggs and Johnson, in looking at variations in the genus Eucalyptus were prepared to institute a number of new genera. Nothing as drastic as this has happened to Banksia but two sub genera are proposed. Banksia and Isostylis. The Isostylis are those banksias that do not have their flowers in spike and are represented by two western Australian species B.ilicifolia and B.cuneata. All eastern Banksia spp. belong to the subgenus Banksia. The subgenus Banksia is divided into two sections Section Banksia and section Oncostylis, both these sections are represented in Victoria. Each section is then divided into a number of series,9 in the section Banksia and 3 in the Banksia occur in eastern Australia, these are series Salicinae and series Orthostylis. The series Orthostylis correspond to Bentham's section Orthostylis and includes B.serrata, B.aemula (syn. B.serratifolia) and B. ornata.

The major changes occur in the series Salicinae this corresponds to Benthams Section Eubanksia and includes B.dentata, B.integrifolia with 3 varieties var. integrifolia. The coast form, var. compar New England and inland Queensland form and var aquilonia the narrow leaf form from the Atherton Tablelands.

A newly described species is B. conferta and 2 varieties are recognized var. conferta from the Glasshouse Mountains and McPherson Range and var penicillata from the western fall of the Blue Mountains notably at Mt. Darcy and Glen Davis. Banksia marginata is put in the too hard box but the great variety of forms is recognized. B.canei is described and my own paper on the 4 topodermes of this species is acknowledged. Another new species is B.saxicola which is what was previously known as the Grampians Banksia integrifolia, because of its cone and its requirement for stratification, it is now thought of as being closely related to B.canei

B.oblongifolia is synonymous with B.asplenifolia. The Cavaniles name is preferred over Salisbury's name like B.aemula over B.serratifolia because of lack of a type specimen and inadequate description. B.robur and B.paludosa are also described.

The last species, to be described is done so in an addendum. This last minute addition was a species that was thought to be lost, two collections having been made in 1868 by John Dallachy, but none since. It was rediscovered on Mt. Bowen on Hinchinbrook Island by David Hocking. It is closely related to B.oblongifolia and has been given the name B.plagiocarpa because of the obliquely triangular follicles.

In the section Oncostylis which corresponds to Bentham's section of this name 3 series are proposed only one of these series the Spicigerae, those with flowers on a tall spike, are represented in eastern Australia. Two species are recognized B.spinulosa and B.ericifolia. B.spinulosa is divided into 3 varieties B.spinulosa var. spinulosa is the form with a lignotuber and very revolute leaves. B.spinulosa var. collina also has a lignotuber but the leaves are flat. The

last variety is the form that grows in Victoria neither of the other two varieties occur in Victoria, this is B.spinulosa var. cunninghamii. Two varieties of Banksia encifolia are named B.ericifolia var. ericifolia. This is the form with serrated juvenile leaves and orange flowers, it is found in the Budawang Range, Blue Mountains and coastal from Jervis Bay to the Collaroy, NSW. The northern form from the Byron Bay district has smaller entire seedling leaves and the flower styles are darker orange to almost maroon. Its flowering time is later than B. ericifolia var ericifolia. Its varietal name is macrantha.

List of Eastern Banksia species

Subgenus Banksia
Section Banksia

Series Salicinae		
1	B.dentata	
2	B.integrifolia	var. integrifolia
3	"	var. compar
4	"	var. aquilonia
5	B.conferta	var. conferta
6	"	var. penicillata
7	B.marginata	
8	B.canei	
9	B.saxicola	
10	B.oblongifolia	
11	B.robur	
12	B.paludosa	
13	B.plagiocarpa	
Series Orthostylis		
14	B.serrata	
15	B.aemula	
16	B.ornata	

Section Oncostylis

Series Spicigerae		
17	B.spinulosa	var. spinulosa
18	B.spinulosa	var. collina
19	B.spinulosa	var. cunninghamii
20	B.ericifolia	var. ericifolia
21	B.ericifolia	var. macrantha

References, George, A.S., 1981, The Genus Banksia L.f. (Proteaceae) Nuytsia Vol. 3 (3).

POLLINATION OF BANKSIA

Malcolm Calder and a number of botany students at Melbourne University are undertaking studies into the pollination of Banksia and have overcome the problem of determining which flowers have become fertilized by using a fluorescent stain on the pollen. Pollen tubes fluoresce under ultra violet light. Work of this nature should lead to a better understanding of the role of pollinators and establish how Banksia spp. are able to out-breed and whether in fact they are capable of being fertilized by pollen already on the stigma.

PROTEACEAE IN POTS

Graeme O'Neill, Reprint - Canberra Newsletter

Any person who grows Western Australian Proteaceae species in the open garden in Canberra expects to suffer pain, and is usually not disappointed. I have, indeed, been richly rewarded with pain in the past three years.

In fact, I have been able to add an extra dimension to the basic, economy size pain pack by choosing to domicile myself in the frost-blasted, phytophthora-ridden swamp of Macgregor depths (the denizens of Macgregor heights, having chilled their winter air, send it coursing downhill to us. On midwinter mornings, the silence is broken only by the sound of magpies falling off the clothesline and shattering on the ground).

The system is very simple. Mix two parts of coarse, washed sand with one part Australian peat moss and one part perlite. Plant your plant. Water once a month with half strength Aquasol. Wait. Fall on ground in ecstasy at first sign of bud.

The system is foolproof, but one can strike a blow for idiocy by leaving prize specimens in black pots to the mercy of midsummer sun, which generates root temperatures high enough to kill a clinical thermometer. Plants survive if they have enough water, but roots at the edge of the pot die and set back growth several months, and terminal growth dies back.

The system is essentially hydroponic, although the sand contains some nutrients. Aquasol, a low-phosphate liquid fertiliser, seems to provide for the plants' needs, and I use a once-a-year sprinkling of trace elements.

There is no possibility of overwatering, and excess nutrients are simply leached out through this very porous mixture. Provided seedlings have been raised in the same mix, and not purchased in normal potting mix, there is no danger of phytophthora.

The pH of the mix is about 6.5, ideally suited to most species of Proteaceae. The perlite and peat moss, hold plenty of water, although watering must be done every two days in summer when the plants get large.

I grow my larger WA banksias in large Hostess pots (45cm dia.) which are cripplingly expensive. The coloured ones do not overheat as much but they do crack in about three years (usually not beyond recall, just superficial), whereas black ones do not, and are slightly cheaper. Small species are grown in smaller hostess pots (32cm), or in 25cm or 20cm black nursery pots.

Growth rates are excellent, and for larger plants, pruning to prevent legginess is essential. For example, Banksia ashbyi has grown from 60cm to 120cm in a season, after removal of two prunings of 10cm to promote branching. Like B. coccinea, it is wilfully apically dominant, and is slow to respond to secateur discipline.

I have flowered three species so far - B. burdettii (which set four magnificent orange and white flowers from an initial bud count of 15, curse the wog which bores into stem apices!), B. baxteri, with two flowers,and B.sp.aff.repens (Lake King).

The last-named species has beautiful reddish-brown flowers that become laden with nectar. Having shared a car with it to an SGAP evening in Wagga, I can describe the scent as pure Channel No. 9 (Lower Molonglo Sewage Works). If it sustains small birds or mammals with its nectar, evolution in its infinite wisdom must have atrophied their noses and taste buds.

In bud in smaller pots I have B. violacea and one of the B.sphaerocarpa group, the first two years old, the other three.

Other Banksias in pots are: B.brownii, B. candolleana, B. solandri (superb foliage, suspicious bracts present but no buds), B. hookerana (ditto), B. praemorsa, B. elderana, B. lindleyana, B. laricina, B. meisneri (a delightful, delicate species in foliage, great potential as a pot specimen), B. pulchella, B. tricuspis, B. victoriae, B. goodii (prostrate), B. prostrata (ditto) and B. petiolaris (ditto), plus another four forms of the B.sphaerocarpa group which may soon be accorded species status.

I also have about 25 Dryandra species making good progress in 20cm pots, four Isopogon, spp, Petrophile linearis, Synaphea petiolaris, and sundry non-Proteaceae species.

One of the advantages of larger pots is that one can plant other species in with the Banksias as an 'understorey'. I have been using mainly Lechenaultias for this purpose - L. biloba, L. floribunda, L. formosa, L. laricina and L. tubiflora are all thriving, with an odd Hibbertia stellaris, a Dampiera purpurea and Diplolaena angustifolia (Rutaceae) plus the eastern species Wahlenbergia gloriosa and W. ceracea.

In short, the method seems very versatile, and for non-Proteaceae genera a slightly more generous nutrient, perhaps using Osmocote, could extend its usefulness.

It's cheating, of course, something like running under the hurdles in a steeplechase. One can even move the pots out of the frost.

Cheating results in vigorous, magnificently healthy plants with wonderful flowers. When the precious species die in the garden, one can weep crocodile tears into the container of surviving sibling, without fear of inducing salinity.

AUSTRALIAN BANKSIAS

Graeme O'Neill
Reprint W.A.P.S. Newsletter

Australia's Banksias rank with the most spectacular flowering plants in the world, yet very few of the sixty species currently recognised have found any regular place in Australian gardens.

Their attention is reflected in a recent massive purchase of seends of some of the beautiful Western Australian species, such as B.prionotes, B. menziesii and B. hookerana by Israeli and Hawaiian commercial growers, to produce flowers for the world cut flower trade. The two countries bought a total of 180,000 seeds and when it is considered that Banksia inflorescences may bring $5-$10 each in overseas florists,the magnitude of Australia's commercial loss to overseas entrepreneurs can be fully appreciated.

Banksias are an ancient plant genus, as evidenced by fossils found in 35-45 million-year-old coal deposits in Victoria. At least six species grew in Victoria at this time,and the similarity of the leaves and cones to species extant today suggests there has been very little evolution since those times.

The ancestral Banksia was probably a rainforest tree similar to the tropical species of today, B. dentata. During the time when Australia's climate was warmer and wetter than today, it may have colonised the continent as part of a pan-Australian flora. With the trend towards a much drier climate, the banksias evolved characters which enabled them to survive outside moist environments, and today are one of the plants best-adapated to harsh environments.

They are predominantly plants of heathland and woodland, and in heathland in particular are the dominant genus, along with their relatives, the hakeas. Their success in impoverished sandy and boggy soils is largely attributable to their remarkable proteoid root system, which enables them to capture nutrients, particularly phosphate, with much greater efficiency than plants with non-proteoid roots. The banksias also possess the rare ability to store phosphate until it is needed, whereas the great majority of other plants must use it immediately.

While these two adaptations fit the plants superbly to nutrient-deficient environments, they also render them susceptible to fertiliser overdoses. Phosphate toxicity from 'normal' application of fertilisers in the garden has given banksias a reputation for being difficult to grow, especially the Western Australian species. However, with a little care and knowledge, they can be grown successfully. Frost presents an additional problem in Canberra, but among the species which have proved frost hardy are the Western Australian species from the Great Australian Bight area.

NOTES ON THE CULTIVATION OF BANKSIAS IN EUROPE IN THE 18th and 19th CENTURIES

Tony Cavanagh.

Some aspects of the discovery and naming of the Eastern Banksias have been given recently in the excellent series of articles by Alf Salkin in the Victorian Naturalist. Additionally, Alex George in his revision of Banksias in Nuytsia gives in his Table 1, a chronological listing of dates on which the 72 Banksia species were described. However, neither attempts the somewhat daunting task of determining which species were cultivated in Europe and when this occurred. It is even more difficult to find out who grew particular plants, while the most difficult task of all lies in discovering just how long individual cultivated plants actually lived. We know from the writings of John Smith, for many years Chief Cultivator at Kew Botanic Gardens, that some Proteaceous plants lived for more than 50 years in the Kew glasshouses, though others, such as Western Australian Grevilleas from tropical areas, proved impossible to keep alive for more than a few years.

If one is to judge from the attached listings, Banksias proved very popular glasshouse subjects with over 40 species being cultivated. Dryandra likewise were well accepted with 26 species being grown. While I haven't yet completed listings for Hakeas and Grevilleas, it appears these each might exceed 50, surely an indication of versatility of this wonderful family of plants.

Uncommon or difficult genera were also grown such as Telopea, Stenocarpus, Lambertia and Xylomelum among the Proteaceae, and Hockings estimated that by 1888 over 1200 species of Australian plants had been cultivated in England. Impressive though this figure is, I believe it underestimates the actual number quite considerably. Hockings used as his source Geoge Nicholsons "Illustrated Dictionary of Gardening" which discusses just 13 Banksias and 6 Dryandras i.e. out of the known number of 66. If this pattern is followed for other genera and families, the number of Australian plant species grown in England last century might well exceed 2000.

I have given details of the cultivation practices followed for Proteaceae in Dryandra Study Group Newsletters No. 6 and 9 and will only give a brief resume here. Because of the rigours of the English climate, Banksias (like Dryandras) were grown in pots in glasshouses. The early gardeners very soon learned that they required excellent drainage and writers such as Knight and Sweet emphasize this point and provide detailed descriptions of soil preparation and potting practice. The soil used was a good quality soapy loam to which was added coarse sand and plants were generally repotted yearly, in the months of March to May. From about May to October, most pots were kept outdoors in a sheltered spot, protected from wind and hot sun and were transferred back inside with the approach of winter. As some large individual growers had over 6000 species in glasshouses, conservatories and store houses, the yearly transfer of plants must have been a hectic and backbreaking time - more especially as plants such as B.integrifolia and B.serrata were often 3-5m tall in their pots! The practice over winter was to restrict the growth of the plants by minimal watering and where possible to provide as much outside ventilation as possible, weather permitting, by opening the windows and roof lights.

Surprisingly for Proteaceae, propagation from cuttings was widely practised and both Sweet and Knight give precise details of the techniques employed - using well ripened wood, cut off at a joint and planted in pure sand.

Both advised against shortening of leaves "except on the part that is planted in the sand" and suggested that the cuttings should not be placed too deep in the sand. Use of bottom heat was not recommended though cuttings should be covered by a bell jar. Sweet also recommended that rooted cuttings (and seedlings) should be potted as soon as posible, being gradually hardened to the air; bottom heat was claimed to "destroy their roots". He also made the interesting statement - "Plants raised this way (i.e. from cuttings) have better roots, grow faster and flower sooner than plants raised from seed." This claim may be challenged today as the feeling among many growers is that the root system of cutting grown plants is less adaptable to drought conditions than that of seed grown specimens - particularly among the Banksias.

The attached table shows what details are available on Banksias grown in Europe last century. I would be interested in learning of any species I have missed or of references which describe their cultivation. It is almost certain that the more popular plants were grown in many other gardens than those listed but I have no details of these. I would be particularly interested in finding information on the life-span in pots of individual species as this material has so far proved very elusive to discover. In the meantime we can only sit and marvel at the skill and determination of these early gardeners as they strove to grow and flower so many exotic plants under what can only be described as highly unfavourable conditions.

REFERENCES

A.I. Salkin (1981), "A Short History of the Discovery and Naming of Banksias in Eastern Australia", Victorian Naturalist : Vol. 98, pp. 69-71, 106-109; 160-162; 191-194; 254-256.

A.S. George (1981), "The Genus Banksia L.f. (Proteaceae) Nuytsia 3, (2) pp. 239-473.

Joseph Knight (1809) "On the Cultivation of Plants belonging to the Natural Order of Proteacae " William Savage, London.

R. Sweet (1831) "The Hot House and Greenhouse Manual or Botanical Cultivator" 5th ed. James Ridgeway, London.

Mrs. Loudon et al (1880) Londons Encyclopaedia of Plants", New Impression, Longmans Green and Co. London.

BANKSIAS IN CULTIVATION IN EUROPE IN THE 18th and 18th CENTURIES

CURRENT NAME	YEAR INTRODUCED	SEED SUPPLIER	GARDENS	FLOWERING TIME
aemula*	1788	White	C.B.G. W.A. (j); (k)	Jan-June
"(as elatior)	1824		C.B.G.	-
attenuata	1794	Menzies	K;C.B.G.; W.A.	Jan-Oct.
baueri*	1830	Baxter	C.B.G.	-
baxteri*	1830	Baxter	C.B.G.; G.B.G.; E.B.G. (a); (i);	-
brownii	1830	Baxter	C.B.G.	May-Aug.
caleyi	1830	Baxter	C.B.G.	-
coccinea*	1803	Good	C.B.G.; W.A.	July-Nov.
dentata*	1822		C.B.G.; W.A.	Jan-June
dryandroides*	1824	Baxter	C.B.G.; S.D.;	Mar-June
ericifolia*	1788	Thomas Watson	K; C.B.G.; W.A.; S.D.;(d)	Jan-Dec.
gardneri*	1824	Baxter	C.B.G.; S.D. (g)	-
goodii	1836		C.B.G.	-
grandis	1894	Menzies	K; C.B.G.; W.A.	May-Aug.
ilicifolia	1824	Baxter	C.B.G.	-
integrifolia*	1788	Thomas Watson	K; C.B.G.; E.B.G.	May-Aug.
" var. compar	1823		C.B.G.	April-June
littoralis*	1803	Good	K; C.B.G.; W.A.; S.D.	April=July
marginata*	1804	Caley	K; C.B.G.; W.A. (c); (f)	May- Aug.
" as australis*	1816 (1822)		C.B.G.; (b);	May-Aug.
" as insularis	1823		C.B.G.	-
" as marcescens	Bonpl. (see under Australis above)			
media	1794	Menzies	C.B.G.; W.A.	May-Aug.
menziesii	1837		C.B.G.	-
nutans	1803	Good	K; C.B.G.	June-Sept. Apr.June
oblongifolia*	1788	Lee and Kennedy	K; C.B.G. (e);(f)	May-Aug.
occidentalis*	1803	Good	K; C.B.G.; W.A.; E.B.G.; G.B.G.	May-Aug.
paludosa*	1805		K; C.B.G.; W.A.; S.D. (f); (h); (d).	Jan - Apr.
praemorsa (as marcescens)	1794	Menzies	K; C.B.G.; W.A.; S.D.; G; (d).	Jan-Dec.
pulchella	1803/1805	Good	K; C.B.G.; W.A.	Feb.-Aug.
quercifolia	1805	Brown	K; C.B.G.; W.A.; (e)	Mar-Apr.

CURRENT NAME	YEAR INTRODUCED	SEED SUPPLIER	GARDENS	FLOWERING TIME
repens	1803	Good	K; C.B.G.; W.A.; S.D.	May-Aug.
robur* (as latifolia)	1802	Thomas Hay	K; C.B.G.; W.A.; S.D.; (c).	May-Aug.
serrata	1788	Lee and Kennedy	K; C.B.G.; W.A.; S.D.; (e); (j);	July-Sept.
solandri	1830	Baxter	C.B.G.; S.D.	-
speciosa*	1805	Brown	K; C.B.G.; W.A.; S.D.; E.B.G.;	May-Aug.
sphaerocarpa	1803	Good	K; C.B.G.;	-
spinulosa*	1788	Banks	K; C.B.G.; W.A.; S.D.	Dec-May
" var. collina	1800/1810	Caley	K; C.B.G.; W.A.	Dec-May
" var. cunninghamii (E.littoralis Lindl and ledifolia Curn ex Meissner).	1822		C.B.G.; E.B.G.; (i);	May-Aug.
verticillata*	1794	Menzies	K; C.B.G.; W.A.; L.B.G.	July-Nov.
huegelii (identity of this is unknown).	1837	Huegel	C.B.G; S.D.	-

NOTES:

1.* Indicates species illustrated in colour in published descriptions.

2. K = Kew Botanic Gardens.
CBG = Cambridge Botanic Gardens.
W.A. = Woburn Abbey (Collection of the Duke or Bedford)
S.D. = San Donato (Collection of Prince A. de Demidoff at San Donato near Florence).

3. G.B.G. = Glasnevin Botanic Gardens, Dublin.
E.B.G. = Edinburgh Botanic Gardens.
G = Glasgow Botanic Gardens
L.B.G. = Liverpool Botanic Gardens.

4. a) Also Duke of Northumberland and Mr. Henry Berens, Sidcup.
b) Mr. Colvill of Chelsea.
c) Mr. Edward Gray of Haringay House.
d) Mr. Geoge Hibbert, Chapham Common.
e) Lee and Kennedy Nurserymen, Hammersmith
f) Loddiges Nursery, Hackney
g) Lows Nursery, Clapham
h) Mr. Miller, Nurseryman at Bristol
i) Duke of Northumberland
j) Count de Vandes Garden, Bayswater
k) Mr. Wills, Redleaf near Tunbridge

Those of us who have tried many times unsuccessfully to flower B.coccinea in the Eastern States might well wonder how it could possibly be grown in England - and grown outdoors at that! However, the climate of the Scilly Isles is relatively mild and the Tresco Abbey Gardens have had considerable success with Australian and South African plants. The winter minimum temperature at the Gardens rarely drops below 5°C and it is unusual for more than one or two days of heavy frost to occur in a year. The summer temperatures are mild, rarely exceeding 24°C in the day with 12.5 - 15.5°C night temperatures. The average rainfall, mostly in October to March, is about 800mm while the months of May and June are "drought months". (Information from Mr. Peter Clough, Head Gardener).

Seedlings of B.coccinea were planted at Tresco in October 1964 in a fairly open position, on a spongy but well drained peat bank with a southerly aspect. The group of three plants reached 1.5m x 1m across in 6 years and one plant flowered in June 1970. In 1972, all three flowered, one producing 10 inflorescences. According to Dr. Jim Willis, they were as healthy as any plants of B.coccinea he had seen.

Banksia baxteri was originally introduced to England in 1830 and flowered in several collections before suffering the fate of other Australian plants in the 1850's - 1860's. A plant was grown at Kew in 1969 from seed collected in the wild. It was potted in a well drained, acid compost of peat and very sharp sand, and maintained on a capillary bench in a well-ventilated, gently heated glasshouse, with minimum winter temperature held at 5-10°C. Flowering occurred in the summer of 1973.

I would be interested to learn of other Banksias currently being grown in the United Kingdom.

Tony Cavanagh

Further Notes on the History of Cultivation of Banksias in Europe.

After I had completed my original article on this topic, I was able to peruse a copy of Alex George and Celia Rosser's book "Banksias" and also do some further checking on cultivation during this century. Alex George referred to a book published in 1880 called "Records of the Royal Botanic Gardens Kew". This was written by J. Smith, for many years Curator of Live Plants at Kew, and gives details of 38 Banksias which were grown at Kew up to the late 1860's. Some species reached tree proportions and were remarkably long lived, as the following records show:-

B.ericifolia	-	35 years old, 10 feet high x 6 feet wide.
B.marginata	-	40 years old, a tree 24 feet high with a trunk girth of 2 feet.
B.littoralis	-	40 years old, 8 feet high
B.serrata	-	40 years old, a tree 18 feet high x 10 feet wide.

Though the text does not make it clear, I believe these plants were probably grown in the ground in Conservatories or perhaps even in a sheltered spot outdoors, though this is unlikely in London. An even more interesting record from this century concerns a specimen of B.serrata at the Royal Botanic Gardens, Edinburgh, featured in Curtis' Botanical Magazine of 1942 (t9642). In June 1939 the plant was estimated to be 50 years old and stood 15 feet high. It was growing "on a wall in one of the plant house corridors under dry, cool glasshouse conditions. From two to five flower trusses are produced each year." (in June)

The late nineteenth and twentieth centuries.

The pages of Curtis' Botanical Magazine reveal all too clearly the decline in popularity of Australian Proteaceous plants from about 1840. Up to this date, about 10 Banksias had been featured and several others had appeared in some of the numerous horticultural magazines of the period. From 1840 until well into this century, only one other Banksia was apparently grown to flowering - B.baxteri (described as B.victoriae) in 1856. The reasons for the decline are complex but appear to centre around two things:-

(i) a change in fashion of desirable plants.

(ii) a change in the method of glasshouse heating, from the use of dry stoves to steam and hot water heating.

The latter produced a more humid atmosphere, necessary for the soft-wooded species then in favour, and the moist atmosphere coupled with heavy watering and lack of attention to the drainage of pots, virtually wiped out the collections of Australian plants. Cultivation of showy plants and extensive use of fancy floral beds became the rage and it wasn't until the 1860's-1870's that some Proteaceae such as Grevilleas and Hakeas came back into favour.

This century, at least 4 Banksia have been flowered in the United Kingdom - B.spinulosa in approx. 1967, B.serrata (previously referred to), B.baxteri in the summer of 1973 and B.coccinea in June 1970. The latter two are worth considering in detail.

PROTEACEAE - A NOT SO NEW APPROACH TO THEIR CULTIVATION - A.D. Chapman

CANBERRA REGION NEWSLETTER

In discussion with nurserymen in the Sydney area recently, I found that the general consensus there is that there is a decline in the demand for native plants in that area. The reasons put forward to me were that too many species had been pushed by nurserymen and, instead of recommending up to about a dozen species or fewer in each of the larger Genera as being suitable to the area, nurserymen have been pushing upwards of 20 to 50 species in some genera, many of them not being suitable. As a result, customers end up with a large loss rate, and natives in general are given a bad name. Maybe the Proteaceae have suffered as a result of this more than others, and particularly so, I feel, because many Western Australian species of Banksia and other Proteaceae, not at all suitable to the area, are sold by nurserymen and garden centres without any warnings being given as to the difficulty of their cultivation.

Suitability to an area, of course, is a difficult topic, and one can modify an area to suit the species. For example, we have recently seen the formation of the Calcium Nutrition Study Group, for the study of one aspect of that problem, I feel, however, that we must look at the general consumer of Australian plants - the person who buys a plant and wants to take it home, plant it, and leave it to look after itself. After all, it is this person who supplies the Nursery trade with most of its business, and S.G.A.P. with most of its members.

To come back to the Proteaceae, many have proved rather difficult subjects in cultivation. This is particularly so of such genera as Banksia and Dryandra, and to a lesser extent Hakea. Some of the earliest Australian plants cultivated in Europe were members of these genera, and one could easily obtain plants from nurserymen throughout Britain prior to the 1830's. The boom in the Australian, and African, Proteaceae was followed by a decline leading up to the 1850's. Here in Australia we have been through a similar boom period in the growing of Proteaceae, but now, I fear, we are about to see a substantial decline in their popularity, particularly, in the Eastern states. The reasons for both declines are, I think, similar, and it is worth having a look at the reasons put forward for the British decline, and at the suggestions made then for overcoming the problems of Proteaceae cultivation. I can do this best by quoting directly from a paper written by John Smith, a gardener at the Royal Gardens, Kew, in the middle of the last Century, who had this to say on this very topic.

Smith, 1850

"Within the last twenty or thirty years the cultivation of Proteaceae has declined; the species have gradually disappeared from most of the private collections around London; and but few nurserymen now take an interest in them. This change may be partly owing to the supposed difficulty of preserving them, for under certain circumstances the plants suddenly die, even when in vigorous health. In theRoyal Gardens(Kew) Proteaceae have maintained their place, more especially those that are native of Australia; and as there are some at this time between forty and fifty years of age, and others of a large size half that age, it may be inferred that Proteaceae are not so short-lived in a state of cultivation as they are generally supposed to be. Within our recollection it was common practice to grow them in some kind of light soil, usually peat. The hygrometric condition of such soil is easily affected by changes of the surrounding atmosphere; becoming quickly dry during hot weather, and apt to become sodden with moisture in Winter, and the spongioles or rootlets of Proteaceae are very sensitive to either extreme; the use of light soil, therefore, in our opinion accounts for the frequent sudden death of plants of this kind. In the Bot. Mag. for 1836 at t.3500, we have given our views on the cultivation of Proteaceae. We use good yellow loam, to which, for small plants, we add a little sharp sand.

In shifting or repotting a plant we make it a rule to keep the ball of roots a little elevated above the surface of the new mould, to prevent a super-abundance of water from lodging round the base of the stem. In the Winter care must be taken to give no more water than is required to keep the soil moderately moist, but in Summer water may be given freely in the evening or early in the morning. It is important that the plants be so placed that the sun's rays do not strike the sides of the pot."

From this we can see that Smith regarded the water regime of the soil as one of the most important factors in Proteaceae Cultivation. We, today, recommend that most, if not all, Proteaceae require good drainage, and the necessity for good drainage cannot be denied; however, because of this we tend to use light sandy soil, and this, in some cases, may be causing problems with the plants becoming too dry. Robert Sweet, another English gardener, in an article in 1821 on the cultivation of Banksia, stated that the plants must be very well drained but, he said, "care must be taken not to let them flag for want of water, as they seldom recover if allowed to get too dry." Sweet, 1821.

The use of peat to which Smith refers in his paper could, of course, have had an added side affect by lowering the pH of the medium, and we have heard a lot recently on the use of lime in raising the pH, and its effects on the Western Australian Proteaceae.

Just how much do we know about the requirements of the Proteaceae under cultivation? And just how far have we come in the last 120 years? Is lime the answer? Is it water, or maybe Phytophthora?, or is it something else- the cold perhaps? It is, I feel, much more complicted than any of these, and is sure to be a combination of a whole host of factors. I think we should be very careful in over simplification, of jumping in and saying - the frost killed my Banksia, or it died of Phytophthora, or the soil was too acid - it needed lime. I fear that we all look for the too simple answer, but it is just not there!

We have a lot to learn, not only in the cultivation of the Proteaceae,but of Australian plants generally, and maybe we can take some short cuts by not starting from scratch, but by studying those that have cultivated before us.

If there is going to be a decline in the cultivation of the Proteaceae, what can we do to help avert it? I feel that both nurserymen, and the Society must be very careful when recommending a species for an area. If a species is marginal, then it should be so stated and advice on its cultivation given. We should not be recommending too many species of Genus for an area, and those that are recommended must be reliable. I am not against specialist nursery's , and members of S.G.A.P. propagating rare and difficult plants, in fact I'm all for it; but the general buying public must be made aware of any difficulties in a species' cultivation, so that the person who wants a reliable specimen doesn't get sold a plant that will be lucky to see the season through. It is in our interests that Australian plants do not get a bad name, and in the interests of nurserymen whose livelihood may depend on the sale of Australian plants. We must look more fully into the requirements of the plants we are recommending, and publish information that will be of help to those attempting their cultivation, and we must start propagating from plants that have proved their reliability in the area. We have recently set up a cuttings exchange group within the Society, and we must continue to support this by notifying those concerned of particularly good forms, not only as to their appearance, but as to their frost hardiness, drought resistance,etc.

We as a Society must take a lot of the responsibility for the name Australian plants obtain, be it good or bad, let us make sure that it is not the latter.

Ref: Smith, J. (1850) - Curtis's Bot. Mag. t. 4528
Sweet, R. (1821) - Bot. Cult. p. 147.

PHOSPHORUS TOXICITY IN AUSTRALIAN NATIVE PLANTS

by D.G. Nichols and D.V. Beardsell.

Nurserymen who specialise in growing Australian native plants generally try to produce as wide a range of species as they can. This often leads to difficulties in management. In nature the plants are found growing under widely different soil conditions. Some species have adapted to growth in low fertility heathlands while others have developed in nutritionally rich rain forests. In attempting to grow them all under the same conditions in a nursery is bound to create problems. Poor growth of native plants has often, in the past, been blamed on over fertilization, however, recent research at the Horticultural Research Institute at Knoxfield has shown that many species are susceptible specifically to phosphorus toxicity.

Species Affected

The plants usually affected by phosphorus toxicity are those belonging to the Proteaceae family. The common Australian genera in cultivation in nurseries are GREVILLEA, BANKSIA, HAKEA, ISOPOGON and ADENANTHOS.

Not all species are affected, for instance GREVILLEA 'Poorinda Firebird' is very susceptible, G. rosmarinifolia only slightly and G. ROBUSTA not at all. BANKSIA ericifolia is susceptible but B. integrifolia is not. South African members of the family such as PROTEA, LEUCADENDRON and LEUCOSPHERMUM are also variably affected.

Phosphorus toxicity may occur in species in other families and work is continuing to determine what these might be.

Symptoms

The symptoms of phosphorus toxicity initially shows up as "necrosis" (burning or discolouration) of the tips and margins of older leaves. The discolouration varies from grey in G. 'Poorinda Firebird' to black in G. gaudi chaudi. In B. spinulosa and B. collina it is usually a rust colour. As the condition develops the older leaves drop off giving a bare appearance to the base of the stems. Chlorosis (yellowing) of younger foliage often occurs and in severe cases the plant dies.

The Effect of Soil

Some nurserymen are often puzzled why they have failed to grow good Grevilleas while others have little trouble. The reason is often due to the amount and type of soil used in the mixture. Heavy soils such as clay loam will strongly fix (tie up) phosphorus so that it is only partially available to the plant. The use of these soils in the mixture goes a long way to avoiding the effects of phosphorus toxicity. Completely soilless mixtures have no fixing capacity and are most likely to give trouble. The control of phosphorus in the mixture is much less critical if a suitable soil is present than when there is no soil at all.

The Effect of Fertilizers

Clearly fertilizers containing phosphorus should be avoided for sensitive plants. Superphosphate should not be used at all. Blood and bone also contains large amounts of phosphorus. Slow release fertilizers such as Osmocote should be used sparingly and preferably only the material with a 7-9 month release rate. Liquid feeding with phosphorus containing fertilizers is also hazardous. The safest slow release fertilizers to use are I.B.D.U. and Ureaformaldahyde which contains no phosphorus, or hoof and horn which has only a small amount.

Management

The easiest way to overcome the problem is to formulate two fertilizer mixtures one for members of the PROTEACEA family in which very low quantities of phosphorus are used and one for all other plants in which normal amounts of phosphorus are used.

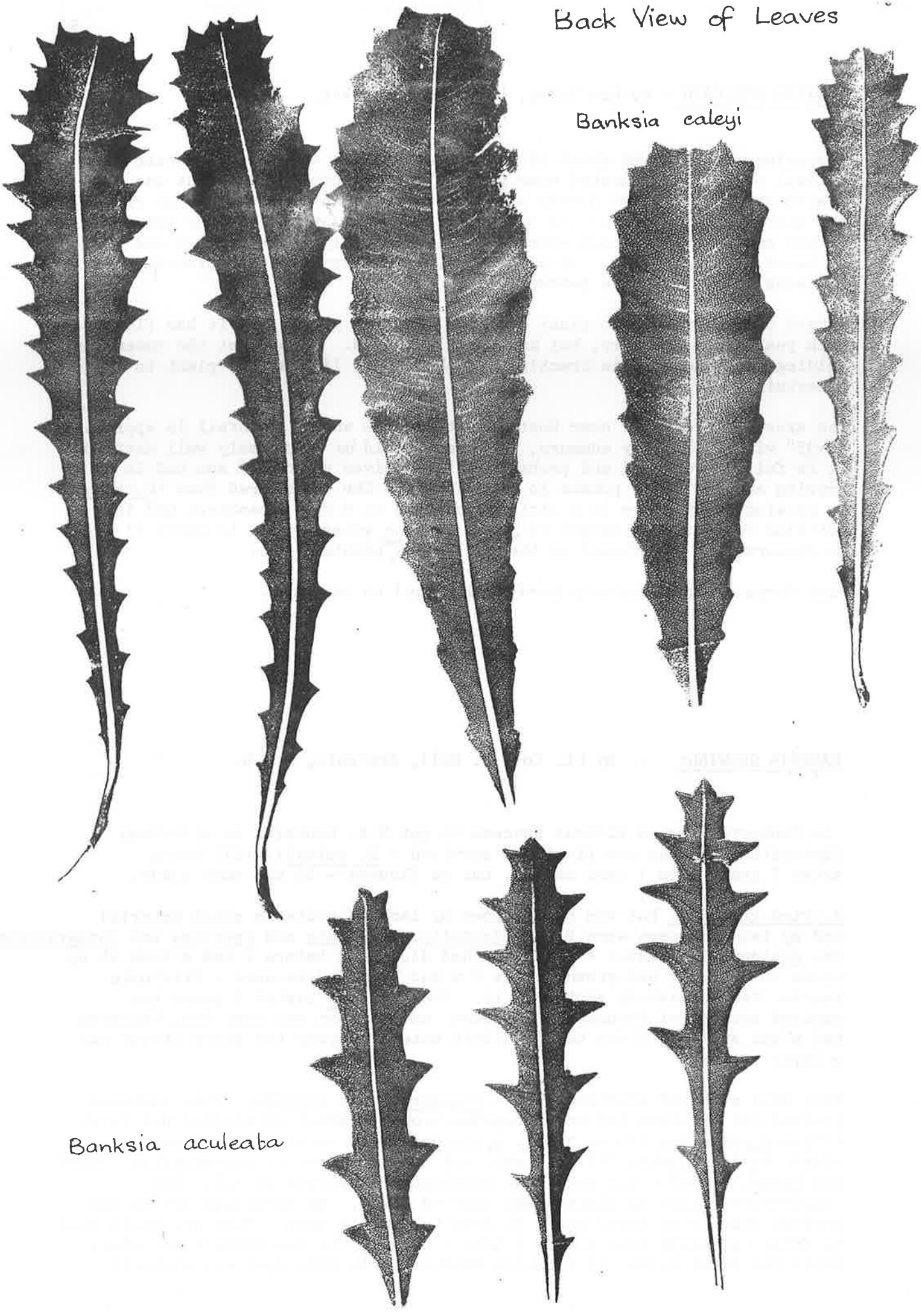
BANKSIA ACULEATA A.S. GEORGE IN CULTIVATION - Tony Cavanagh

Banksia aculeata is one of the 'new' Banksia species, being first described in the recent revision by Alex George. However, there is in the Melbourne Herbarium a specimen collected by James Drummond in the Stirling Ranges around 1843-1848 while the plant has been grown for quite a number of years, at least in the Eastern states, sometimes known as a form of B.caleyi and sometimes as an un-named species.

My plant is now 5 years old and was bought as B.lindleyana. It, like the closely related B.caleyi is one of the hardiest of the Western Banksias and does well in relatively heavy, shallow loam soil over clay, the garden being raised some 15-20cm to provide better drainage. Its habit is a rounded, compact shrub about 1.25 x 1.5m, though I have seen much more sprawling examples in the Points Reserve at Coleraine and in South East South Australia. The plant has many of the characteristics of B.caleyi, though the flower-heads are much less attractive, being a dull, creamy red and lacking the striking deep red colour of this latter species. They are also sparse and usually well hidden in the foliage. Unlike B.caleyi, B.aculeata is an infrequent flowerer, my plant having produced only 3 flowers in 5 years, and these occurred in the second and fifth years. It has not set seed. Additionally, the flowering period is very brief, a couple of weeks in late summer. and as in B.caleyi the pendulous flower heads are not suitable for picking.

Another characteristic difference between the two species is the leaf shape and size. Banksia aculeata usually has shorter leaves, with from 3 to 10 pungent lobes on each margin ;the leaves also have a distinct shallow "V" configuration unlike those of most other Banksia species which are relatively flat. Some of the differences, as well as the variability in leaves of B.caleyi can be seen in the attached leaf prints.

Back View of Leaves



BANKSIA ACULEATA - by Don Yates, Devon Meadows, Vic.

A specimen was planted about 10 years ago, and was supplied by mistake from a local nursery who donated some plants to the school. The plant was placed at the corner of a very high brick embankment (about 4' high from the surrounding pathways) and the soil is typical Cranbourne grey sand, it has probably never been watered and is presently about 5' high and at least the same width. It occas ionally receives a severe pruning as it tends to overhang the pathway.

I have only noticed that plant over the last 3-4 years, and it has flowered each year about February, but has never set seed. At present the embankment holding back the soil is cracking and the future life of the plant is uncertain.

The area we live in is near Westernport and the annual rainfall is approx. 30-35" with fairly dry summers, the plant would be extremely well drained. It is fairly protected and probably only receives about 1/2 sun and is growing amongst other plants in a shrubbery. The normal red form (B.caleyi) is growing at my place in a similar position on a dry embankment and is settling down after a couple of years with no watering and is about 2' high, no flowers, but did flower in the pot before being planted out.

Both forms are particularly hardy and suited to our area.

BANKSIA GROWING: - by Lt. Col. H. Bell, Armidale, N.S.W.

In Canberra I tried without success to get W.A. Banksias to withstand Phytophthora. Only one plant has survived - B. caleyi; still going after 7 years when I last saw it, but no flowers - in too much shade.

I tried grafting but was handicapped by lack of suitable scion material and my two successes were B. occidentalis, marginata and speciosa and integrifolia The occidentalis lasted 4 years but had died just before I had a look at my house in 1978. It had grown to 1 x 2 m but had died because a Tristania laurina had completely smothered it. The speciosa lasted 3 years but expired because of drought. I am sure, as the spot was very dry, Canberra had a bad spell, and the tenant didn't water! Anyway the stock itself was a layer cutting.

Have done a bit of grafting here - praemorsa onto serrata. W.A. banksias planted out herehave had no Phytophthora trouble (after 20 months) but frost killed B. praemorsa (15 cm high), B. victoriae (10 cm high), stripped but didn't kill prionotes (25 cm high), and had no effect on occidentalis (30cm) and baueri (40cm) - all seedlings germinated in winter of '78. The temperature around my plants gets down to - 6°C. My seedlings are on the western side of my house where it gets to - 6° or less. They are unaffected by frost (although some yellow a bit) - because the sun doesn't get there until the frost melts. (I flowered Sturt's Pea in this spot all winter!).

GRAFTING NATIVE PLANTS

By: Colin Wilson,
Melbourne.

Grafting is the general term for the operation of placing a small portion of one plant (bud or scion) into or on a stem, root or branch of another (the stock) in such a way that a union is formed and both parts continue to grow as one complete plant.

In horticulture, grafting is used for the following reasons:

1. To repair injured trees.
2. To produce dwarf trees or shrubs.
3. To avoid certain diseases or pathogens -
   e.g., Red stem canker - Eucalyptus ficifolia.
   Cinnamon fungus - Phytophthora cinnamomi.
4. To retain varietal characteristics -
   e.g., flower colour - Eucalyptus ficifolia.
5. To adapt varieties to adverse soil or climatic conditions -
   e.g., Banksias, Clianthus formosus.
6. To ensure pollination.
7. To produce multifruited or multiflowered plants.
8. As the only method of propagation of some species.

Approach grafting of Eucalyptus ficifolia was recorded as far back as 1870 in the Canary Islands - so the technique is not new.

The ability of two plants to continue to grow as one, when grafted, depends on both physiological and environmental factors. Thus, if you hope in the future to grow grafted natives, such as Banksia, you should ensure you pick a stock which is suited to your garden conditions.

The establishment of union between grafted components is effected through the formation of a loose growth of cells (called callus) contributed by both elements. Later re-organisation of this tissue results in the formation of continuous cell layers, i.e., cambium, phloem and xylem. Development of a large amount of callus often occurs when plants are compatible.

The main points relating to establishing a good graft union include -

- Use of a sharp knife.
- A high standard of cleanliness around the plants and work area, i.e. no dead material.
- The closest fit possible between stock and scion.
- Matching of cambium of stock and scion.

- The grafting operation must be done at a time when the stock and scion are in the proper physiological state.

- Proper care of plants following grafting.

- Compatibility.

When closely related plants (i.e., within the same genus) are grafted together, they may unite readily and continue their growth as one plant. When entirely unrelated plants are grafted together, the usual result is the complete failure of the graft union. In between these two extremes, all sorts of results are experienced that are entirely unpredictable. Some scion stock combinations may grow very well, but the reciprocal graft is a failure. Certain combinations will grow in a normal manner for a few weeks or perhaps a few years, but then the scion will die or break off at the graft union. Other combinations may grow well for many years, even until the tree is mature, then during a windstorm will break off cleanly at the graft union.

Some combinations unite, but abnormal symptoms, such as dwarfed or stunted growth, yellow foliage, or tissue breakdown at the graft union, soon become apparent. Such combinations usually last for a time, then die.

Surprisingly some closely related plants which would be expected to graft readily, either fail to form a union or unite only in very low percentages. As there is no short cut method to predicting the success of a graft combination, the answer can only be found by large numbers of trials.

One of the challenges of carrying out trials to find new combinations is the clarity of failures and the uncertainty of probable successes. The second or third flowering of a grafted plant is a great incentive to continue. However, if it is the only one in existence you cannot guarantee it will not blow over in the next freak gust of wind. This actually happened with a plant of Banksia speciosa grafted to a Banksia integrifolia stock.

Perhaps the search for a successful combination can be related to a search for a plant which will form roots on a cutting. If only one or two plants out of several hundred over a large area of the natural habitat will provide such material, what are the chances of collecting that material the first time?

Considering the possible magnitude of the project required to establish successful graft combinations, perhaps two questions should be answered.

1. Will it be worth it?

2. What is the best method of achieving it?

The answer to the second question may lie in either co-ordination of effort by a large number of people, or, by horticultural groups encouraging Colleges providing training in horticulture to involve their students in such a project.

RESULTS

Nomenclature follows that of Holliday and Watton (1) as presented in the previous paper (2, 3). It is realised that a review of the Banksia genus has recently been published. However, the problems of applying new specie names to plants that died some years ago has prompted continued use of the original nomenclature.

TABLE 1: Results of approach grafts (A), wedge grafts (W), and grafted cuttings (GC) using as stock: Banksia ericifolia L.f.

SCION	METHOD	MONTH	AGE (Months)	COMMENTS
B. brownii Baxter	W	Mar.	14	Scion died
B. laricina C.A. Gardn	A	Nov.	18	Scion died
	A	Mar.	11	Scion died
	W	Mar.	9	Plant died
B. nutans R. Br.	A	Oct.	96	Healthy, no sign of flowering.
	A	Oct.	84	Tends to die back in late winter each year.
	W	Mar.	36	Healthy, no flowers.
	GC	Mar.	79	Healthy, no flowers.
B. sphaerocarpa R. Br.	A	Mar.	21	Scion died.
	W	Mar.	15	Scion died.
B. sphaerocarpa var. pinifolia	W	Mar.	12	Scion died.

RESULTS (Continued).

TABLE 2: Results of grafts using as stock: Banksia integrifolia L. f.

SCION	METHOD	MONTH	AGE (Months)	COMMENTS
B. baueri R. Br.	W	Mar.	9	Scion died
B. brownii Baxter	W	Mar.	19	Scion died
B. coccinea R. Br.	A	Nov.	13	Scion died
B. grandis Willd.	W	Sep.	25	Healthy
B. laevigata Meisn. ssp laevigata	W	Mar.	11	Scion died
B. laricina C.A. Gardn.	W	Aug.	62	1½ m. high, in bud.
B. media R. Br.	W	Mar.	8	Scion slowly yellowed and died, probably not compatible.
B. occidentalis R. Br.	W	Oct.	36	Healthy, no flowers.
B. pilostylis C.A.Gardn.	W	Mar.	79	Healthy, flowered and set seed three times.
B. praemorsa Andr.	W	Mar.	10	Stock died.
B. sceptrum Meisn.	W	Mar.	8	Scion slowly deteriorated - loss of leaves.
B. speciosa R. Br.	A	Oct.	48	Flowered at 18 months and set seed. Flowered following two years, then blown over by wind when 2m. high.
B. verticillata R. Br.	W	Mar.	42	Blown over by wind when 2m. high, little callus formed.
B. violacea C.A.Gardn.	W	Aug.	62	Healthy, flowered once.

TABLE 3: Results of grafts using as stock: Banksia marginata Cav.

SCION	METHOD	MONTH	AGE (Months)	COMMENTS
B. brownii Baxter	W	Jan.	81	1½m. high, no flowers.
	W	Mar.	79	2½m. high, no flowers.
B. praemorsa Andr.	W	Mar.	11	Graft opened, whole plant died.

TABLE 4: Results of grafts using as stock: Banksia serrata L.f.

B. prionotes Lindl.	A	Nov.	80	Flowered prior to scion dying, shoots at base of stock a constant problem.
B. sceptrum Meisn.	A	Jan.	58	Died after being transplanted to position with more sun. Shoots at base of stock a constant problem.

TABLE 5: Results of grafts using as stock: Banksia spinulosa var. cunninghamii .

B. ashbyi E.G. Baker	A	Aug.	97	Dwarfed growth, buds form and abort, compatibility doubtful.
B. brownii Baxter	A	Dec.	106	4m. high, healthy condition, no sign of flowering.
	W	Dec.	36	Healthy.
	GC	Mar.	10	Plant died, poor root development.
B. caleyi R. Br.	A	Sep.	22	Scion died.
B. lemanniana Meisn.	A	Mar.	103	1½m. high, healthy flowers and sets seed regularly.
B. occidentalis R. Br.	A	Mar.	12-24	Slow decline of scion. Probably not compatible.
	GC	Mar.	10	Poor development of roots, plant died.

TABLE 6. OVERALL RESULTS OF GRAFTING COMBINATIONS ATTEMPTED.

SCION \ STOCK	B. ERICIFOLIA	B. INTEGRIFOLIA	B. MARGINATA	B. ROBUR	B. SERRATA	B. SPINULOSA
B. ashbyi		(3) ++		(1) +		(3) +++ #
B. audax		(6) ++				(1) ++
B. baueri (brown)		(6) ++				
B. baueri (grey)		(4) ++	(2) +			
B. burdettii		(2) +	(1) +			(1) ++ #
B. brownii	(3) ++	(2) ++	(5) +++*	(3) +		(15) +++*
B. caleyi						(1) ++
B. coccinea	(1) + #	(4) ++				(4) + #
B. elegans		(2) +			(1) +	
B. grandis		(3) +++*				
B. hookerana				(1) ++		(1) + #
B. laevigata ssp laevigata		(1) ++				
B. laricina	(3) ++	(2) +++*				
B. lemanniana		(2) ++		(2) ++		(5) +++*
B. media		(4) ++ #				
B. meis neri	(1) +	(1) +				(1) +
B. menziesii		(2) +		(1) +	(4) +	(1) +
B. nutans	(10) +++*					(2) ++
B. occidentalis	(1) + #	(4) +++*		(1) +		(3) ++ #
B. pilostylis		(2) +++*				
B. praemorsa		(2) ++ #	(1) +			
B. prionotes		(3) +			(4) +++	
B. quercifolia	(1) + #	(2) + #		(1) +		(1) +
B. sceptrum		(1) ++			(1) +++	(1) + #
B. speciosa		(3) +++ #		(1) +	(2) +	(1) + #
B. sphaerocarpa	(5) ++					( ) +
B. tricuspis	(1) +	(1) ++				(1) ++
B. verticillata		(5) +++ #				
B. violacea	(2) ++	(2) +++*				(2) ++

KEY: (-) Number attempted
\+ Died within 4 months
++ Died within 24 months
+++ Survived longer than 24 months
} Best result achieved.

* Probably compatible
\# Probably not compatible.

DISCUSSION

The overall results indicate that if a graft lasts longer than two years then it is possible that the particular combination will succeed, provided the stock and scion appear to be in balance, i.e., little or no tendency for shoots to be produced on the stock and acceptable growth rate by the scion. Results using Banksia serrata as stock (Table 4) indicate a lack of balance.

No long term success has been achieved using either B. asplenifolia or B. robur as stocks.

B. lemanniana appears to be very successful on B. spinulosa var cunninghamii if started by approach grafting. The correct timing and conditions have not been investigated thoroughly for successful wedge grafting of this combination.

Indications given in the initial paper as to the extent of further developments were not realised due to problems of soil fungi and the size of the project requiring more than a hobby level operation.

Further work needs to be carried out by others to at least establish whether the combinations marked with an asterisk in Table 6 will succeed. These are considered most likely to be compatible.

Anyone undertaking grafting trials could also check the effect of the following points:

1. Overnight chilling of scion material in the non-freezing section of a refrigerator which can influence the formation of the union.
2. The height of the union on the stock plant which can affect compatibility.

LITERATURE CITED:

1. Holliday I. and Watton G. 1975. A Field Guide to Banksias. (Rigby).
2. The International Plant Propagators' Society, Combined Proceedings Vol. 25, 1975 pp. 246 - 251.
3. S.G.A.P. Victorian Region Newsletter, March 1976 (Reprint of 2).

Reference for grafting: Plant Propagation by Hartman and Kester.

BANKSIA GROWING : Kaye Bartlet, Jervois, S.A.

Banksias seem slow growing in our conditions, then they do not receive a great amount of water as most are planted in plantations receiving three or four waterings a summer once established.

Banksia baxteri is one of the faster growing ones and is in its fourth year and second year of flowering. B. ericifolia is the oldest of my Banksias being around 14 years, was close to 8 before it flowered. It is growing in the garden area, hence it receives more water than most of the others. B. repens is also in the garden and flowered this year for the first time, doing exceptionally well. Around 3 yrs. B. media, lemanniana are both large bushes near 5 yrs, have yet to produce blooms. B. hookerana has flowered at 4 yrs. B. prionotes has never grown being only 10 inches after 5 yrs. I have this year planted another as I felt perhaps something had retarded the other. It has always looked a good colour and even produced last year a bloom. B. prostrata has been slow, has couch grass to compete with. B. speciosa when I first germinated and grew this species I was too frightened to put it into our soil, so my first was grown in an old washing machine bowl and has proved a wonderful pot specimen, flowering every year. Once I had another to spare I put one in the ground and it has grown and flowered really well, being over six feet in four years and flowered in its second year. Banksia sphaerocarpa, my variety being collected on sand plains between Perth and Dongarra, is doing very well, only a small bush, dense and flowers well. Many other varieties have been planted in the past 12 months and are growing well.

I had exceptional results with seed germination this year, planted in April and with excess rain water, watered with rain water until Aug., seedlings were looking exceptional until the change to river water and then yellowing started and once this starts it is hard to keep them going. Hakeas grown at the same time were planted out into the ground and have gone ahead in leaps and bounds, other years I have tried holding the Hakeas over the summer only to find I lose a good many, so this year I tried planting out whilst small which proved worthwhile. The few which were left have yellowed.

Many different Banksias are to be found growing in gardens around this area which is predominently limestone area, but like home where they are doing well there is very sandy soil and a Ph which would be close to neutral.

BANKSIA GERMINATION

Brian Stuckey, Drouin West

My seed raising method is as follows; soil mixture 50%, Bush sand or builders white sand and 50% "Attunga" potting mixture. (only the Attunga mixture has been tried, others may be as good or better).

This mixture is placed in trays or any other recepticle and has a whole newspaper placed under it, this is watered with a solution of Dexon (half a teaspoon to 10 litres of water, this is many times stronger than specifications but even on live plants I have never had adverse effects of any kind, the seed is then scattered on to the soil and a random scattering of the soil mixture is placed over it any depth as long as it covers the seed but not more than an 1/8 of an inch for fine seed (violacea) and 1/4 of an inch for coarse seed (repens), this is then watered to a point where it is wet then covered with newspaper to allow no light. All the seeds are placed inside a solar-sheet house (completely enclosed) and only enough air to keep the house from reaching a boiling temperature is let in. (Average temp. by day 70 to 85° F at night 60 to 65°F) the seed is watered as regularly as is needed to keep soil very moist (as many as 6 times a day or as few as once every 2 days) and left until germination. As soon as germination is evident paper is taken off and full light allowed. The seedlings are grown under cover until two true leaves, when they can be placed in the open if desired.

Germination times in 1981/2 have been from seed planted in late October.

	days		days
B. ashbyi	15	media	14
attenuata (dwarf)	17	meisneri	20
benthamiana	22	menziesii	17/19
blechnifolia	24	occidentalis	15
brownii	14	ornata	24
candolleana	13	paludosa	14
coccinea	56*	prionotes	14
dryandroides	47*	prostrata	19
elderana	22	pulchella	52*
grandis	13	repens	26
hookerana	13	robur	12
integrifolia v. integrifolia	14	sceptrum	17
laricina	22	speciosa	13
leptophylla	17	victoriae	14/17
lemanniana	14	violacea	20

* These excessively long germination times resulted from late planting (January). It is thought that the time of planting may be significant in the success of this method. Further investigation is required.

EDITED

Letter from Anne McGarry invalid pensioner previously of Toowoomba now at Oakey, Queensland.

Long experience propagating and growing Banksias. The majority were propagated in the early '70s and planted out at Brookvale Park Nursery near Toowoombah. Forty western species planted out. Only Banksia prionotes and B. lemanniana can be said to be doing well but a dozen species have survived.

At present Mrs. McGarry is trying a new garden at Oakey. The environment consists of native bush mainly Wilga Eucalyptus and Cassia.

Soil mix for plants includes 2/3 Wilga compost. Lance Cockburn of Brookvale Park uses a mix which has 1/2 sawdust which is initially good but eventually produces yellowing of leaves. This is a treatment used and abandoned by nurseries in Perth. Seed bought mainly from Nindethana in 100 seed lots. Seedlings grown in long black tubes 4 to 5 inches high by 3 inches across.

Seedlings are raised in Perlite Vermiculite sand soil. Peatmoss mix has found Fungarid invaluable germination times.

B.ashbyi	July	17 days
B. brownii	July	10 days
B. grandis	August	14-16 days
B. hookerana	Sept.	14 days
B.littoralis	July	17 days
B.menziesii	July	7-10 days
B. prae morsa	July	18 days
B. prionotes	October	14 days

AN AMATEUR'S ATTEMPT AT GROWING BANKSIAS

- A. McGarry

Over the past six years I have collected quite a variety of Banksia seed. I have sown some of this seed during this period but with limited success. I had reasonable results with germination, but I lost a lot at the potting up stage, probably due to damping off.

A local nurseryman, Mr. Stan Clark, told me of the success that he has had using composted Eucalyptus bark for growing Banksias. He has had almost no losses from 'damping off'. Stan gave me a bag of this Eucalyptus bark compost to experiment with. I tried growing some seed in this and some in pure sand, obtained from Clarks of Huonville. This sand is recommended by a number of nurserymen for propagating. It is coarse and creamy coloured.

The roots of the seedlings grown in the Eucalyptus bark compost went straight to the bottom of the pan and formed a flat layer on the floor of the container. The roots of the seedlings grown in the Clarks sand formed a thick bunch of fine roots in the sand below the surface. When they developed their first set of true leaves, I potted them into black sandy loam from Males. This sandy loam comes from South Arm and I believe that it is drawn from as far down as 15 feet below the surface.

For some months after these were potted I lost only 2 or 3 plants out of 100 or so. Since then about 6 have died, but I believe it to be caused by the situation where they are kept, which is too damp and cold. They receive a lot of shade during the winter (probably 80%), only because I haven't anywhere else, at present, that would be suitable and provide adequate warmth.

In Spring I plan to sow more Banksia seed but this time to use a mix of 1 part Clarks sand and 1 part Eucalyptus bark compost. I will pot them into 3 parts Males sandy loam and 1 part Eucalyptus bark compost.

I have a number of Banksias 'growing' in my garden, but only B.spinulosa and B.media are doing well. They are planted close to a brick wall facing west in a deep sand bed over a French drain. I mustn't forget to mention a very nice B. marginata, but this 'old faithful' will grow anywhere.

In the meantime, I have many healthy Banksia plants and no room in my garden! However 150' of our property joins on to a Park of Australian plants (Poimena Reserve) which is being developed by the local Council. I approached the Superintendent of Parks and Reserves, and he agreed to supply and has delivered to the area adjacent to our place, a large quantity of Males black sandy loam. With this I can form long flat ridges, over our heavy clay-based loam, in which to grow the Banksias. If they are successful they will make a valuable addition to the Councils Reserve. Reading in the 'Banksia Report No. 5' of Alf Salkin's success with growing Banksias at Cranbourne 'where sand has been mined, using no watering or fertilizers', I feel that it will be worth trying my Banksias in these built-up plots. Unfortunately there will be more shade than is desirable, but this is beyond my control.

Having read of the experiments undertaken by Jim Webb in Canberra on Calcium Nutrition requirements of Australian plants, I plan to develop two raised plots, one with a high ph. and the other with a low ph. As the sandy loam has a ph. of 5.1, it is probably not necessary to add anything to this plot. I have thought that I would add dolomite, but it is hard to know how much. However if I add a little at a time and constantly check the ph., I should have these plots ready in a couple of months to plant one of each of the following species in each plot. B. ashbyii, B.attenuata, B. baueri, B. baxteri, B. burdettii, B. candolleana, B. dryandroides, B. elderana, B.ericifolia, B. grandis, B. hookerana, B. laricina, B.lullfitzii, B.nutans, B. occidentalis, B. ornata, B. praemorsa, B. prostrata, B. pulchella, B. serrata and B. spinulosa.

RULES FOR SUCCESS - by Bill Wilson, Moe.

I have learnt a couple of things which the members probably know anyway about the growing of Banksias.

No. 1. Leave in containers until they are bursting out of them.

No. 2. Full sun (very important).

No. 3. Mulch. I use 4 ins. depth of river stones, various colours and sizes. They retain heat in themselves and of course the ground, hours after the sun has gone.

No. 4. Soil type not critical as with my plantings I have plants growing in various types of brews that I concoct myself, all thriving.

Although lots of gravel helps.

I am at an altitude of 1400 ft. Odd light snow falls occur during the extreme winters. Rainfall averages 38 in. per year. Most of it during winter and autumn although some heavy showers are experienced during spring and summer. The soil is moist almost all the year round in fact hence a theory I have that banksias both eastern and western varieties like water. Soil depth is chocolate in colour to around 2 feet, then graduating to a lighter shade of red and finally to a brick red at around 4 feet. It is quite friable though, even at this depth. I experience very little frost if any, although this year our area was quite white for the first time in at least 4 years. Soil P.H. is 6.4. If I may suggest an odd variety for the enthusiast to start with, not including the eastern species, I would recommend B. occidentalis. My biggest one is four years old (7-8 ft) with 300 cones at various stages of flowering. Last year in its 1st flowering it had about 80 cones and they looked good for about 9 months of the year. They faded during the first hot days in December and it seemed no time before new young cones were appearing. I have 2 distinct forms of B. burdettii which are very reliable like B.praemorsa and B.media. I know of quite a few B.praemorsa in different areas around here which also appear reliable.

Total failure to date has been B.prionotes, B.ashbyi and B.sceptrum. I'm sure it's just too cold here for the last two. B.lindleyana and B.verticillata have shown good steady growth.

I plant banksias at any time of the year including summer and water twice weekly in the 1st year.

The Banksia Reports are periodic publications of the Banksia Study Group led by Trevor Blake, 22 Vista Ave, East Ringwood, 3135. Ph. 8704379.

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