THE ASH GROUP OF EUCALYPTS

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SUMMARY

The ash group comprises 42 taxa of the genus **Eucalyptus**. These eucalypts form Pryor and Johnson's informal series OBLIQUAE of the subgenus **Monocalyptus**.

All described species and subspecies are listed and briefly discussed. The group includes several well-known large timber trees for which species and provenance trials have recently been established. Genetic improvement programmes based on comprehensive provenance testing and local selection have been initiated for **E. regnans**, **E. fastigata** and **E. delegatensis**. Provenance tests of a limited range of seedlots have been established for **E. obliqua**, **E. oreades**, **E. fraxinoides** and **E. sieberi**.

INTRODUCTION

The ash group eucalypts best known in New Zealand are *Eucalyptus delegatensis, E. regnans, E. fastigata* and *E. obliqua.* These are tall forest trees of south-eastern Australia where they are the most important eucalypts for sawn timber and papermaking (Hillis and Brown, 1978). The wood of these trees is pale coloured, somewhat like that of the English ash (*Fraxinus excelsior* L.), is easily worked, and is low in density compared with other eucalypts; for these reasons the group has been considered worth growing in New Zealand as a future source of general-purpose hardwood.

As well as the four main species, the ash group includes several other recognised timber species of possible value in New Zealand, and a number of small trees and mallees (multi-stemmed shrubs). Several of the species are highly localised in their distribution and not well known. In this article the more obvious botanical characteristics of the group are outlined, after which a descriptive list of the species, compiled mainly from Australian literature, is given. The occurrence of each species in New Zealand is noted, where applicable.

FEATURES OF THE ASH GROUP

The ashes form a natural group within the subgenus *Monocalyptus* of *Eucalyptus* (Pryor and Johnson, 1971). Though no formal taxonomic description or diagnosis of the group has been made, the distinguishing features are generally as follows:

1. Seedling leaves decussate (i.e., opposite with successive pairs at right angles to each other) horizontally held, 2-5 pairs only, shortly petiolate or sessile, and discolorous (green above, usually purplish below).

2. Juvenile leaves vertically held, apparently alternate due to intranodal elongation, and distinctly petiolate.
3. Intermediate leaves usually with asymmetric bases.
4. Adult leaves strongly curved, the same colour on both surfaces, and with lateral veins at a sharp angle, sometimes nearly parallel, to the midrib.
5. Buds usually numerous and club-shaped.
6. Fruit usually flat-topped and pear-shaped.
7. Timber usually pale-coloured, comparatively low density, non-durable, and with easy working properties.
8. Coppicing ability usually weak.
9. Seed and chaff of similar size.

In their classification, Pryor and Johnson (1971) erected in the subgenus *Monocalyptus* the series OBLIQUAE which comprises what are generally recognised as ashes, mallee ashes, and snow gums. Based on details of internal bud morphology and seedling characters, Brooker (1977a) shows that three other groups of species in *Moncalyptus* should also be classed in the OBLIQUAE. These are the five scribbly gums, four of the peppermints, and the two stringy-barked species of Pryor and Johnson's subseries Planchonianinae. Brooker's classification is followed here: species 1-30 form the "obliqua" group with long styles, flexuose filaments, all with anthers; and species 31-42 form the "sieberi" group with short styles, inflected filaments, and with the outer filaments often lacking anthers. Seedling and seed characters provide alternative features on which the ash group eucalypts can be usefully classified (Brooker, 1977b). In one group of species, the juvenile and intermediate leaves are dull bluish-green in colour. This group includes *E. sieberi, E. delegatensis, E. fraxinoides, E. oreades, E. pauciflora, E. stenostoma,* and *E. andrewsii.* Another major group has shining green leaves, and includes *E. regnans, E. obliqua, E. fastigata, E. dendromorpha,* and *E. triflora.* The seedling leaves of *E. stellulata* and its allies are arranged in numerous opposite pairs as in the peppermint group (Brooker, 1977b).

In common with other groups (e.g. peppermints and stringybarks) of eucalypts in the *Renantheria* section of *Monocalyptus,* the ash group species have the distinctive "renantherous" floral feature, namely the kidney-shaped anthers attached to the filament at or near the middle, and with loculi confluent at the top.

In the notes that follow, the letter codes of Pryor and Johnson (1971) are given in brackets, e.g. (MAKAA).

NOTES ON SPECIES

1. *Eucalyptus obliqua* L'Herit.

Messmate stringybark (MAKAA)

The most widely distributed of the timber ash species. Occurs from the northern tablelands of New South Wales to southern Tasmania, and west to Kangaroo Island, in forest types ranging from wet sclerophyll to dry sclerophyll. An excellent timber, generally the heaviest of the major ash species. Has not grown consistently well in New Zealand, though some good examples can be found from Northland to Canterbury.

Often subject to severe insect defoliation and untidy epicormic branching in New Zealand. Several of the known faster growing Tasmanian and Victorian provenances are now under test in New Zealand. Experience in these recent tests so far is that this species is more frost tender than *E. regnans, E. delegatensis* and *E. fastigata* (Barr 1971; Green, 1971; Hall. Johnston, and Chippendale, 1975; Brown *et al.,* 1976).

2. *Eucalyptus delegatensis* R. T.Bak

Alpine ash (MAKBE)

An important high elevation timber tree in the southern highlands of New South Wales and in Victoria and Tasmania. Has been widely planted in New Zealand, especially in cold districts, though there are few large plantations and utilisation has been negligible. Hardiness and ease of establishment are important virtues. A comprehensive provenance testing programme has commenced in Australia and New Zealand. Most plantings in State Forests arise from seedlots collected from West Tapanui Forest (Crookston) in Southland. This provenance is clearly of mainland Australia origin and has proved to be hardier than some Tasmanian provenances tested. (Hall, Johnston, and Chippendale, 1975).

3. *Eucalyptus regnans* F.Muell.

Mountain ash (MAKCA)

The tallest of the eucalypts and of all flowering plants. The main stands occur below 1000 m in the mountains of southern Victoria and below 600 m in Tasmania.

Not yet widely planted in New Zealand, but pulpwood plantations are being successfully established in the Tokoroa district, using mainly southern Tasmanian provenances (Lembke, 1977). Numerous past failures in New Zealand owing to frost damage. Inland provenances from 400-600 m in southern Tasmania and high elevations (1000 m) in Victoria show consistently better survival in the Central North Island than do lowland provenances. Genetically improved seed sources are under development. The notable stand at Waitati, Otago (Anstey, 1970) has proved in tests to produce very frost tender progeny. Once established, *E. regnans* usually grows impressively. and is now the foremost eucalypt recommended for growing on cool sites with annual rainfalls exceeding 1000 mm and not subject to severe frosts. (Ashton, 1958; Eldridge, 1972; Hall, Johnston and Chippendale, 1975.)

4. *Eucalyptus fastigata* Deane et Maiden

Brown barrel (MAKCB)

Best developed at altitudes of 900-1200 m in New South Wales, extending to the Errinundra Plateau of East Gippsland, Victoria. A major wet sclerophyll species of the eastern flanks of the New South Wales tablelands and escarpments.

Widely planted on a small scale in New Zealand in both coastal and inland localities. Probably the most adaptable and consistently healthy of the ash group eucalypts in New Zealand. A programme of genetic improvement is being undertaken with emphasis on breeding to eliminate the coarse branching so characterstic of this species. (Boden, 1958; Sherry and Pryor, 1967; Hall, Johnston, and Chippendale, 1975.)

5. *Eucalyptus oreades* R.T.Bak.

Blue Mountains ash (MAKDA)

This tree is found in the Blue Mountains of New South Wales and in several further places to the north, including the Macpherson Range in southern Queensland near the New South Wales border. Occurs at altitudes of up to 1200 m.

Not well-known in New Zealand but occasionally found in farm woodlots in the North Island. There is a row of very large trees at the Forest Research Institute, Rotorua, and a vigorous stand in Kaingaroa Forest. The tree has been recently included in further species tests. Difficulty has been experienced in raising healthy plants in peat pots, but growth after planting out has been good (Anderson, 1968; Hall, 1971a).

6. *Eucalyptus leuhmanniana* F.Muell.

Yellow-top mallee ash (MAKDB)

Confined to Hawkesbury Sandstone country north and south of Sydney, New South Wales. Has distinctive quadrangular stems, coloured yellow or red, and coarse leaves.

Has been grown successfully as an ornamental at Whangarei (Hall, 1972e).

7. *Eucalyptus pauciflora* Sieb. ex Spreng. subsp. *pauciflora*

Snow gum (MAKHAA)

A tree that grows abundantly in cold climates in New South Wales, Victoria, and Tasmania. Extensive snow gum forests occur on mountain slopes above 1500 m. The species is also characteristic of cold tableland country at lower elevations in New South Wales.

There are healthy specimens at Taupo, Rotorua, in Canterbury, and near Alexandra. Central Otago (Pryor, 1957; Manning, 1978; Hall, Johnston, and Chippendale, 1975).

8. *Eucalyptus pauciflora* Sieb. ex Spreng. subsp. *niphophila* (Maiden et Blakely) L. Johnson et D. Blaxell.

Alpine snow gum (MAKHAC)

A shrubby tree found from 1600 m-2000 m in the Snowy Mountains region of New South Wales and extending to the highest mountains of Victoria.

Has been tried in the Canterbury mountains for erosion control (Johnson and Blaxell, 1973a; Hall and Brooker, 1973f).

9. *Eucalyptus pauciflora* Sieb. ex Spreng. subsp. *debeuzevillei* (Maiden) L. Johnson et D. Blaxell.

Jounama Snow gum (MAKHAD)

Confined to the northern Snowy Mountains of New South Wales and adjacent Australian Capital Territory. Glaucous, angular buds are distinctive (Hall and Brooker, 1973a; Johnson and Blaxell, 1973a).

10. *Eucalyptus gregsoniana L.* Johnson et D.Blaxell

Wolgan snow gum (MAKHF) (formerly *E. pauciflora* var. *nana*)

A mallee snow gum found in the Blue Mountains and Budawang Ranges of New South Wales at altitudes round 1000 m.

Offered by some New Zealand nurseries as a hardy ornamental (Johnson and Blaxell, 1973a; Hall and Brooker, 1974e).

11. *Eucalyptus fraxinoides* Deane et Maiden

White ash (MAKIB)

This ash eucalypt occurs in southern New South Wales on the high eastern margins of the tablelands. Fairly common in the Wairarapa region of the North Island where it is becoming a popular species for farm shelter.

Has been included with other ash group eucalypts in several recent species tests (Hall, Johnston and Chippendale, 1975).

12. *Eucalyptus triflora* (Maiden) Blakely

Pigeon House ash (MAKIC)

A small slender tree found on rocky ground in a few localities in south-eastern New South Wales. Has attractive leathery, glossy, dark green juvenile leaves. Recently tried in species tests in the Rotorua region (Hall and Brooker, 1973e).

13. *Eucalyptus dendromorpha* (Blakely) L. Johnson et D. Blaxell

Budawang ash (MAKID)

A tree found locally in New South Wales in the Blue Mountains, Illawarra escarpment, Fitzroy Falls area, and the Budawang Ranges. A Budawang Range provenance was tried in species trials near Rotorua and showed good frost hardiness (Anderson, 1968; Johnson and Blaxell, 1972; Boland and Kleinig, 1978).

14. *Eucalyptus obtusiflora* DC

Port Jackson mallee (MAKIE)

This mallee is found on the central coast and in the Jervis Bay district of the south coast, New South Wales (Hall, 1972c).

15. *Eucalyptus burgessiana* L. Johnson et D. Blaxell

(MAKIF)

A stout multi-stemmed mallee confined to sandstone ridge tops in the Faulconbridge-Linden area of the Blue Mountains, New South Wales (Johnson and Blaxell, 1972).

16. *Eucalyptus stricta* Sieb. ex Spreng

Blue Mountains mallee (MAKIG)

The commonest and best known of the mallee ashes. Occurs in the Blue Mountains and several other areas of poor soils, including heathlands near the coast in New South Wales (Hall, 1972a).

17. *Eucalyptus apiculata* R.T. Bak. et H.G. Sm.

Narrow-leaved mallee ash (MAKIH)

Restricted to tablelands and high ridges in a few localities in the central tablelands of New South Wales (Hall and Brooker, 1973d).

18. *Eucalyptus rupicola* L. Johnson et D. Blaxell

Cliff mallee ash (MAKIJ)

A small multi-stemmed mallee confined to cliff edges in the Blue Mountains, New South Wales (Johnson and Blaxell, 1972; Kleinig and Brooker, 1974).

19. *Eucalytpus approximans* Maiden subsp. *approximans*

Barren Mountain mallee (MAKIKA)

This is a whip-stick mallee of restricted distribution found locally in high country in the New England region of New South Wales. An unnamed subspecies (MAKIKB) occurs in southern Queensland (Hall and Brooker, 1974a).

20. *Eucalyptus approximans* Maiden subsp. *codonocarpa* (Blakely et McKie) L. Johnson et D. Blaxell

(MAKIKC)

A mountain mallee of restricted distribution first described from Pheasant Mountain in the New England tablelands of New South Wales (Johnson and Blaxell, 1973b; Hall and Brooker, 1974a).

21. *Eucalyptus paliformis* L. Johnson et D. Blaxell

Wadbilliga ash (MAKIM)

This is a slender pole-like tree known so far from just one small stand near Wadbilliga Trig in the upper Tuross River area, New South Wales (Johnson and Blaxell, 1973a; Boland and Brooker, 1977).

22. *Eucalyptus kybeanensis* Maiden et Cambage

Kybean mallee ash (MAKKA)

A high altitude mallee forming thickets. Found locally in the high country of southern New South Wales and eastern Victoria. It might be worth trying for erosion control in New Zealand on cold sites (Hall and Brooker, 1973b).

23. *Eucalyptus mitchelliana* Cambage

Mount Buffalo gum (MAKLA)

Confined to the Mt Buffalo plateau, Victoria, where it grows in association with *E. pauciflora* subsp. *pauciflora* (Hall and Brooker, 1973c).

24. *Eucalyptus stellulata* Sieb. ex DC.

Black sally (MAKMA)

A small hardy tree found on cold, wet, frosty tablelands in New South Wales and Victoria.

Specimens occur in Victoria Park, Christchurch. This could be useful as a low shelter or cover species in New Zealand in bleak situations (Hall, Johnston and Chippendale, 1975).

25. *Eucalyptus moorei* Maiden et Cambage var. *moorei*

Narrow-leaved sally (MAKMC)

A mallee or small tree found locally at high altitudes in New South Wales, usually with such species as *E. glaucescens* and *E. kybeanensis* (Hall, 1972b).

26. *Eucalyptus moorei* Maiden et Cambage var. *latiuscula* Blakely

(MAKMB)

A mallee confined to the Wadbilliga Trig area, upper Tuross River, New South Wales.

27. *Eucalyptus piperita* Sm. subsp. *piperita*

Sydney peppermint (MATHAA)

Although traditionally classed as a peppermint, and having the characteristic leaf oils and bark type of that group, this species is a typical ash in many respects, particularly the seedlings. A common tree in the Blue Mountains of New South Wales.

There is a healthy stand near Rotoehu Forest, Bay of Plenty (Hall, Johnston and Chippendale, 1975).

28. *Eucalyptus piperita* Sm. subsp. *urceolaris* (Maiden et Blakely) L. Johnson et D. Blaxell.

Urn-fruited peppermint (MATHAC)

This subspecies of the Sydney peppermint occurs on tableland sandstone country in New South Wales, south of Sydney. Some of the Rotoehu trees have the urn-shaped fruit characteristic of this subspecies (Anderson, 1968; Johnson and Blaxell, 1973a).

29. *Eucalyptus sphaerocarpa* L. Johnson et D. Blaxell

Blackdown stringybark (MAIBA)

Confined to the Blackdown Tableland in Queensland where it grows to a good size. Not known in New Zealand (Johnson and Blaxell, 1972; Hall and Brooker, 1974b).

30. *Eucalyptus planchoniana* F. Muell

Needlebark stringybark (MAIBB)

This tree occurs at low elevations in northern New South Wales and southern Queensland, usually near the coast. Has the typical ash group seedling features, but the fruits are unusual in being the largest among the ashes.

Not known in New Zealand (Hall, 1971b).

31. *Eucalyptus consideniana* Maiden

Yertchuk (MAKEA)

This fibrous-barked ash eucalypt occurs in the warm coastal forests of east Gippsland, Victoria and neighbouring New South Wales. Generally considered one of the poorest ash timber trees. Recently included in a species trial at Whangapoua Forest, but otherwise not known in New Zealand (Hall, Johnston and Chippendale, 1975).

32. *Eucalyptus remota* Blakely

Kangaroo Island mallee ash (MAKEB)

A small multi-stemmed mallee confined to Kangaroo Island, South Australia (Hall and Brooker, 1974c).

33. *Eucalyptus sieberi* L. Johnson

Silvertop ash (MAKED)

Found on drier and poorer sites than the other major ash eucalypts. Best stands occur in hill country of south coast of New South Wales and East Gippsland, Victoria. Common in sandstone country of the central New South Wales tablelands, and also in coastal regions of north-east Tasmania.

Not common in New Zealand, the most notable stands being those in Whakarewarewa Forest, Rotorua, where natural regeneration has been considerable.

Several provenances are currently under test in both the North and South Islands (Johnson, 1962; Hall, Johnston and Chippendale, 1975).

34. *Eucalyptus multicaulis* Blakely

Whipstick mallee ash (MAKEE)

A mallee or small tree found in heathland communities on very poor sandstone soils in New South Wales, mainly near the coast (Hall, 1972d).

35. *Eucalyptus andrewsii* Maiden subsp. *andrewsii*

New England blackbutt (MATHDA)

A common dry sclerophyll forest tree in western districts of the New England tablelands, and extending as far north as Eungella in central coastal Queensland thereby being the most northerly of the ashes. A provenance from Mt Mitchell, New South Wales, was included in recent species tests in the North Island.

This and *E. andrewsii* subsp. *campanulata* have generally been classified with the peppermints, but are typical ashes in many respects (Gay, 1961; Hall and Brooker, 1974d).

36. *Eucalyptus andrewsii* Maiden subsp. *Campanulata* (R.T. Bak et S.G. Sm) L. Johnson et D. Blaxell

New England ash (MATHDB)

A common forest tree in the eastern ranges of the New England tablelands, New South Wales, and in coastal hill forests of northern New South Wales and southern Queensland (e.g., with *E. acmenoides, E. microcorys* and *E. grandis*).

A good specimen tree has been noted in Hamilton. Recently planted in species tests in Rotorua district (Gray, 1961; Johnson and Blaxell, 1973a; Hall, Johnston and Chippendale, 1975).

37. *Eucalyptus haemastoma* Sm.

Scribbly gum (MATKA)

This is the common scribbly gum of central coastal New South Wales, being characteristic of Hawkesbury sandstone country in the Sydney district.

As in the other scribbly gums the wood is reddish. Some large examples of this species occur at F. W. Bartlett's property, Silverdale (Hall, 1970a).

38. *Eucalyptus sclerophylla* (Blakely) L. Johnson et D. Blaxell

Scribbly gum (MATKB)

This scribbly gum is related to *E. haemastoma* and occurs in the Blue Mountains and Central and Southern coastal areas of New South Wales (Johnson and Blaxell, 1973a).

39. *Eucalyptus signata* F. Muell.

Scribbly gum (MATKD)

Occurs on the north coast of New South Wales and in south-eastern part of Queensland in rather open types of coastal forest. Frequently reduced to a shrub on the poorest sites (Specht *et al.*, 1974).

40. *Eucalyptus racemosa* Cav.

Scribbly gum (MATKE)

A tree of dry sclerophyll forest in the central coastal ranges of New South Wales, typically on poor standstone soils with species such as *E. gummifera* and *E. sieberi* (Hall, Johnston and Chippendale, 1975).

41. *Eucalyptus rossii* R.T. Bak. et H.G. Sm.

Scribbly gum (MATKF)

Unlike the other scribbly gums, which are mainly coastal species, this tree is characteristic of the tablelands and western slopes of northern, central and southern New South Wales.

Commonly associated with dry sclerophyll forest species such as *E. macrorhynca* subsp. *macrorhynca* and *E. mannifera* subsp. *mannifera.*

Specimens occur in the Waikato, e.g., near Lake Rotoroa, Hamilton (Hall, 1970b).

42. *Eucalyptus stenostoma* L. Johnson et D. Blaxell

Jillaga ash (MAKIA)

A tree of very restricted distribution in south-eastern New South Wales, inland from Bodalla.

Recently tried in trials near Rotorua but did not withstand winter frost except on sites with good air drainage. Attractively glaucous and resembling *E. sieberi* in the seedling stage (Johnson and Blaxell, 1972; Kleinig and Brooker. 1975).

HYBRIDS

Numerous hybrid combinations have been reported between ash group species, and also between ash group species and other species in *Monocalyptus* e.g., peppermints and stringybarks. Some of the more common natural hybrids involving ash group species are *E. pauciflora* subsp. *pauciflora* × *E. dives* (Pryor, 1950), *E. rossii* × *E. radiata* subsp. *robertsonii* (Pryor, 1951), *E. fastigata* × *E. radiata* subsp. *robertsonii* (Pryor, 1951), *E. fastigata* × *E. radiata* subsp. *radiata* (Pryor, 1951), *E. regnans* × *E. obliqua* (Ashton, 1958) and *E. sieberi* × *E. amygdalina* (Jackson. 1958).

In the course of genetic improvement programmes with ash group species, seedlings have been noted from New Zealand exotic seedlots suggestive of the following hybrid combinations: *E. regnans* × *E. delegatensis, E. fastigata* × *E. delegatensis, E. regnans* × *E. obliqua, E. obliqua* × *E. pilularis,* and *E. fraxinoides* × *E. delegatensis. E. regnans* × *E. delegatensis* hybrids occur in appreciable numbers in certain New Zealand seedlots collected from *E. regnans* mother trees growing near stands of *E. delegatensis.* The latter species was obviously the male parent in these cases since no other *Monocalyptus* species were present in the vicinity, and the hybrids seem intermediate in leaf and bark characters between the two species.

E. delegatensis × *E. obliqua* hybrids are common in some seedlots of *E. delegatensis* imported from southern Tasmania, and *E. regnans* × *E. obliqua* hybrids occur in several New Zealand plantations. *E. obliqua* × *E. pilularis* hybrids are known from the Clevedon district, south of Auckland (E. H. Bunn, pers. comm.).

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——— 1972c: Port Jackson Mallee. **Eucalyptus obtusiflora** DC. **Forest Tree Series No. 38. Aust. Govt. Publishing Service, Canberra.**

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——— 1973e: Pigeon House Ash. **Eucalyptus triflora** (Maiden) Blakely. **Forest Tree Series No. 113. Aust. Govt. Publishing Service, Canberra.**

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