

PACIFIC CAPSULAR MYRTACEAE 13 Melaleuca and Callistemon (New Caledonia)

J. W. DAWSON

Botany Department, Victoria University of Wellington, New Zealand.

INTRODUCTION

Melaleuca Linn., Mant. 1 (1767) 14 (*nom. cons.*), and *Callistemon* R. Br., App. Flind. Voy. 2: App. 3 (1814) 547, are centred in Australia where they are represented by about 180 and 40 species respectively, including the type species of both genera. Six of the *Melaleucas* extend to New Guinea and one of these continues to south east Asia.

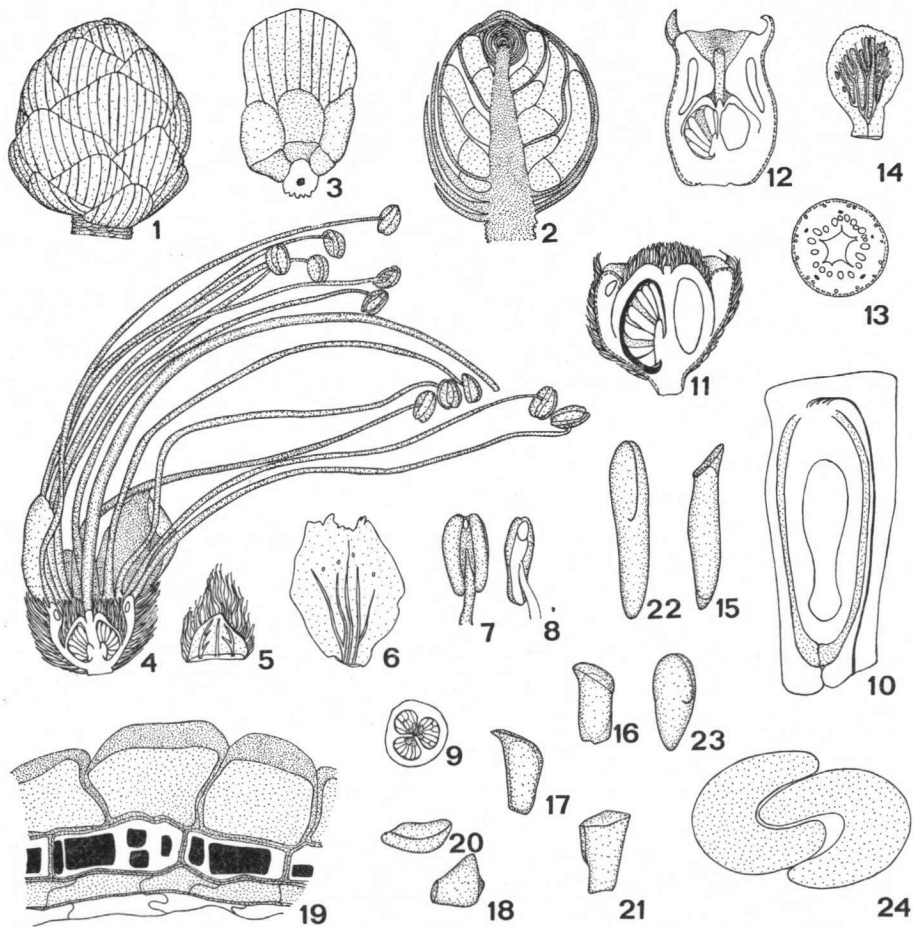
In New Caledonia there are three species of *Melaleuca*: one a common tree forming an open woodland at lower elevations mostly in non-ultrabasic areas (*M. quinquenervia* — 'Niaouli'. Also in east Australia and New Guinea); the others small-leaved shrubs at low to middle elevations in the southern ultrabasic region (*M. gnidioides*, *M. brongniartii*). *Callistemon* is represented by four species, of which three are shrubs to small trees restricted to low to middle elevation shrub associations in the southern ultrabasic area (*C. pancheri*, *C. buseanum*, *C. suberosum*) and the fourth (*C. gnidioides*), a small-leaved shrub with two varieties, also occurs on some of the northern ultrabasic areas as well as in the south.

The present study has shown that the two genera, in New Caledonia at least, share many features, so a combined description is given.

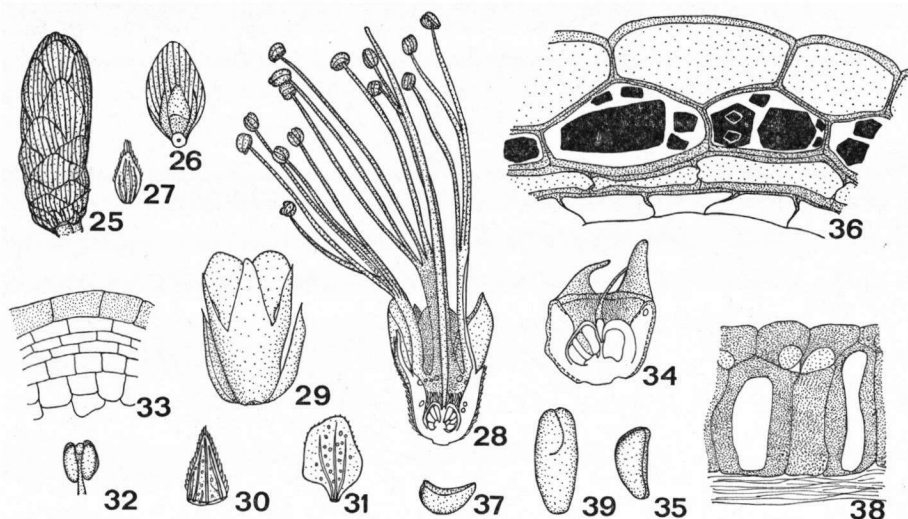
COMBINED DESCRIPTION OF MELALEUCA AND CALLISTEMON (NEW CALEDONIA)

Shrubs or trees; branching monopodial; bud scales numerous, broad, striate (figs. 1, 25); leaves leptophyllous to microphyllous, isobilateral, alternate; primary veins several to many, more or less parallel; veins of leaves, bud scales, and sometimes the flower parts with sheaths of sclereids; young vegetative parts with short to long, white, woolly or silky hairs, older parts becoming glabrous or glabrescent. *Inflorescences* (fig. 2) compound, terminal or terminal and axillary, each ending in a dormant vegetative bud (fig. 2). *Flowers* sessile, crowded, three in each scale axil (fig. 3) or reduced to two or one (fig. 26); bracteoles present (fig. 26) or absent (fig. 3); exterior hypanthium and sepals, interior hypanthium and the free part of the ovary glabrous or moderately to densely pubescent; hypanthium with a ring of prominent oil glands (figs. 4, 28) or tubes (figs. 12, 13) internal to the vascular bundles and below the insertion of the stamens or at a lower level, and smaller oil glands external to the vascular bundles (fig. 13); sepals five (figs. 5, 30), acute to rounded; petals five (figs. 6, 31), more or less orbicular to spatulate, white or yellow, rarely red, fimbriate, sometimes with oil tubes* instead of glands (fig. 14); stamens two to many times the number and several times the length of the petals, in a single series (figs.

* *Callistemon buseanum* and *Melaleuca quinquenervia*.



Figs. 1—24. *Callistemon* R. Br. — 1. *C. suberosum*. Inflorescence bud; $\times 1.7$. 2. L.S. inflorescence bud. Flower buds open stipple, diagrammatic. Vegetative bud at tip of axis; $\times 1.7$. 3. Bud scale with 3 axillary flower buds; $\times 1.7$. — 4. *C. pancheri*. L.S. flower; $\times 3$. 5. Sepal; $\times 5$. 6. Petal; $\times 5$. — 7. *C. suberosum*. Anther. Dorsal view; $\times 10$. 8. Anther. L.S. through connective; $\times 10$. — 9. *C. pancheri*. T.S. ovary; $\times 3$. 10. L.S. ovule, inner integument stippled; $\times 70$. 11. L.S. fruit, on the cut surface fertile seeds and cork stippled; $\times 3$. — 12. *C. buseanum*. L.S. fruit, on the cut surface fertile seed and cork stippled; $\times 3$. 13. T.S. free hypanthium. Vascular bundles black, oil tubes and glands open circles, cork layer stippled; $\times 3$. 14. Petal. Oil tubes stippled; $\times 5$. — 15. *C. pancheri*. Fertile seed; $\times 10$. — 16. *C. suberosum*. Fertile seed; $\times 10$. — 17. *C. gnidioides* var. *microphyllum*. Fertile seed; $\times 10$. — 18. *C. suberosum*. Fertile seed; $\times 10$. — 19. *C. suberosum*. Cell detail T.S. testa fertile seed. Crystals black, wall thickening close stipple, pigmentation open stipple; $\times 600$. — 20. *C. gnidioides* var. *microphyllum*. Sterile seed; $\times 10$. — 21. *C. buseanum*. Sterile seed; $\times 10$. — 22. *C. pancheri*. Embryo; $\times 15$. — 23. *C. suberosum*. Embryo; $\times 15$. — 24. *C. pancheri*. T.S. cotyledons; $\times 85$. [*Callistemon suberosum*: WELTU 9622; *C. pancheri*: McKee 24044, WELTU 12227 (fig. 24); *C. buseanum*: WELTU 9620; *C. gnidioides* var. *microphyllum*: Virot 13113].



Figs. 25—39. *Melaleuca gnidioides*. Br. et Gr. — 25. Inflorescence bud; $\times 3$. — 26. Bud scale with axillary flower bud and pair of bracteoles; $\times 3$. — 27. Bracteole; $\times 3$. — 28. L.S. flower; $\times 5$. — 29. External view flower and bracteoles, stamens and style removed; $\times 5$. — 30. Sepal; $\times 5$. — 31. Petal; $\times 5$. — 32. Stamen, dorsal view; $\times 10$. — 33. Cell detail T.S. ovule. Pigmented cells stippled; $\times 270$. — 34. L.S. fruit, on the cut surface fertile seed and cork stippled; $\times 5$. — 35. Fertile seed; $\times 10$. — 36. Cell detail T.S. testa fertile seed. Crystals black, wall thickening close stipple, pigmentation open stipple; $\times 600$. — 37. Sterile seed, $\times 10$. — 38. Cell detail T.S. testa sterile seed. Wall thickening close stipple, pigmentation open stipple; $\times 270$. — 39. Embryo; $\times 15$. [WELTU 9623, McKee 28027 (Figs. 28, 29)].

4, 28); anthers (figs. 7, 8, 32) dorsifixed, versatile, with a single prominent oil gland at the tip of the connective or sometimes several oil glands. *Ovary* semi-superior (fig. 4) to nearly superior (fig. 28), three-locular (fig. 9); style about as long as or a little longer than the longest stamen, set in to the top of the ovary; stigma small, flat; placentas (figs. 4, 28) axile, oblique to vertical in the lower parts of the locules, separated from the style base; ovules (fig. 10) anatropous, several to many, close set all over the surface of the placenta; each integument two-layered and the nucellus two- to three-layered in the median transverse plane of the ovule (fig. 33), the outer layer of the outer integument with brown pigmentation; all ovules potentially fertile. *Fruits* (figs. 11, 12, 34) long persistent and developing a narrow layer of cork, the capsule included to shortly exserted, the inner hypanthial tissue bulging inwards, generally with five lobes opposite the sepals (figs. 12, 13); sepals sometimes persistent (figs. 12, 34). *Seeds* as long as (fig. 18) to several times longer than broad (fig. 15); fertile seeds (figs. 15, 16, 17, 18, 35) few; testa (figs. 19, 36) derived from both integuments, the outer layer of the outer integument with brown contents and moderately to heavily thickened outer walls; the inner layer of the outer integument colourless and with slightly to moderately thickened walls and one or two large and several to many small prismatic crystals in each cell; the outer layer of the inner integument flattened tangentially with moderately thickened inner and outer walls and brown contents; inner layer of inner integument mostly thin-walled and colourless. *Sterile seeds* (figs. 20, 21, 37) similar in shape to the fertile, testa derived from the outer integument and crushed remains of the inner integument (fig. 38); outer layer of the outer

integument with thick outer and radial walls and brown contents; the inner layer of the outer integument palisade like with all walls thickened. *Embryo* (figs. 22, 23, 39) straight; hypocotyl about as long as the cotyledons; no hypocotyl sheath; cotyledons broader than the hypocotyl and partly enclosing each other (fig. 24).

DISCUSSION

The main difference between the two genera is stated to be that in *Melaleuca* the stamens are partly fused in bundles opposite the petals, while in *Callistemon* they are free and not grouped. However, in New Caledonia *Callistemon buseanum* and *C. gnidioides* tend to have the stamens in groups of two or three opposite the petals and sometimes these groups are shortly fused at the base. This is similar to the situation in *Melaleuca brongniartii* where there are only a few stamens per bundle, fused only at the base.

Although based on only a few representatives of each genus the present study does indicate that *Melaleuca* and *Callistemon* are very closely related if not congeneric.

At the tribal level the two genera are usually placed in the *Leptospermeae*, one of whose definitive features is given as 'flowers single in bract axils'. This is certainly not the case with some species in New Caledonia (fig. 3) and Australia. Elimination of this feature from the definition of the *Leptospermeae* would narrow the gap between it and the *Metrosiderae*. Nevertheless, the New Caledonian representatives of *Melaleuca* and *Callistemon*, with their alternate, parallel-veined, isobilateral leaves; veins with sclereid sheaths; oil tubes in the flowers of some species; cork tissue in the fruits; and overlapping cotyledons, seem well separated from typical *Metrosideros*.

ACKNOWLEDGEMENT

I would again like to acknowledge the assistance of my botanical friends in New Caledonia, particularly Dr H. S. McKee, who has kept me well supplied with herbarium and preserved material.