

## *Melaleuca sabrina* Craven



**PUBLICATION:** *Novon* 19: 449 (2009)

**DERIVATION:** *sabrina*, the Latin name of the river nymph, Sabrina, who according to Celtic mythology was believed to dwell in, and be one with, the Severn River in the United Kingdom

**SYNONYM:** *Callistemon sabrina* (Craven) Udovicic & R.D.Spencer

**DESCRIPTION:** *Shrub or tree* 1–4 m tall; bark fibrous. *Branchlets* glabrescent, pubescent. *Leaves* alternate, 10–59 mm long, 1–3.5 mm wide, 8–27 times as long as wide, short- or long-petiolate; blade glabrescent, pubescent to sericeous-pubescent, very narrowly elliptic, very narrowly obovate, linear-elliptic or linear-obovate, in transverse section transversely linear, subulate or obsubulate, the base very narrowly attenuate, very narrowly cuneate or parallel (blade width equals petiole width), the apex very shortly acuminate or acute, the veins pinnate, 9–17. *Inflorescences* spicate, interstitial or pseudoterminal, with 5–25 monads, 30–50 mm wide. *Hypanthium* hairy, 2.6–3.5 mm long. *Calyx lobes* abaxially hairy, 1–1.9 mm long, herbaceous to the margin or scarious in a marginal band 0.2–0.3 mm wide. *Petals* deciduous, 3.2–5.3 mm long. *Stamens* 49–73 per flower; filaments red to pinkish red, 17–24 mm long; anthers yellow. *Style* 20–26 mm long. *Ovules* c. 100–200 per locule. *Fruit* 3.5–3.8 mm long, the calyx lobes deciduous; cotyledons obvolvate.

**NATURAL OCCURRENCE:** Queensland, New South Wales: the Stanthorpe–Tenterfield district.

**ECOLOGY:** Recorded as occurring on a flood plain in granite sand among boulders, and on alluvial stream banks.

**FLOWERING TIME:** Recorded as flowering from October to March.

**ESSENTIAL OIL:** This species produced only a trace of oil at best. The oil that was present was dominated by monoterpenes. The principal monoterpenes detected were 1,8-cineole (30.9%) and  $\alpha$ -terpineol (18.8%). These compounds were accompanied by lesser amounts of  $\alpha$ -pinene (2.7%), limonene (1.7%), p-cymene (2%),  $\gamma$ -terpinene (1.7%), linalool (1.5%) and terpinen-4-ol (1.0%). Sesquiterpenes were not plentiful and the major identified components were globulol (1.5%), cubeban-11-ol (1.1%) and spathulenol (1.2%). A significant amount of the oil (approximately 30%) remains unidentified.

**OIL YIELD:** The oil yield (fresh weight, w/w) was <0.1%.



## Melaleuca salicina Craven



**PUBLICATION:** *Novon* 16: 473 (2006)

**DERIVATION:** *salicina*, from *Salix*, a genus of Salicaceae, and in keeping with the earlier epithet *saligna* that apparently was given due to a perceived similarity between the leafy stems of this species and those of a species of *Salix*

**SYNONYMS:** *Metrosideros saligna* Sm.; *Callistemon salignus* (Sm.) Sweet

**DESCRIPTION:** *Tree or shrub* 2–15 m tall; bark papery, white or grey. *Branchlets* glabrescent, sericeous. *Leaves* alternate, 38–144 mm long, 5–16 mm wide, 4–15 times as long as wide, long-petiolate; blade glabrescent, sericeous, very narrowly ovate, very narrowly elliptic, narrowly elliptic or narrowly ovate, in transverse section transversely linear or broadly v-shaped, the base very narrowly attenuate or attenuate, the apex acute, the veins pinnate, 19–29, *oil glands* dense to sparse, distinct or obscure, scattered. *Inflorescences* spicate, pseudoterminal or interstitial, sometimes also upper axillary, with 10–40 monads, 20–35 mm wide. *Hypanthium* glabrous, 2.5–3.5 mm long. *Calyx lobes* abaxially hairy (with cilia on the margin only), 0.8–1.3 mm long, herbaceous to the margin. *Petals* deciduous, 2.6–4 mm long. *Stamens* 48–65 per flower; filaments green, greenish-yellow, creamy-green, very pale yellow or white, 9–14 mm long. *Style* 12–16 mm long. *Ovules* c. 100–150 per locule. *Fruit* 3.8–4.4 mm long; cotyledons obvolvate or subobvolvate (almost planoconvex).

**NATURAL OCCURRENCE:** Queensland, New South Wales: from the Biloela–Bundaberg district in Queensland to the Nowra district in New South Wales.

**ECOLOGY:** Recorded as occurring in flat open eucalypt forest, swamp woodland, coastal sand plain, *Melaleuca quinquenervia* swamp woodland, damp creek flats, notophyll vine forest on flat, near creek bed in gully between rocky ridges, with mangrove on tidal river flat, on sand, alluvial clay loam, black soil, brown silt, red-brown volcanic loam, and rocky outcrops.

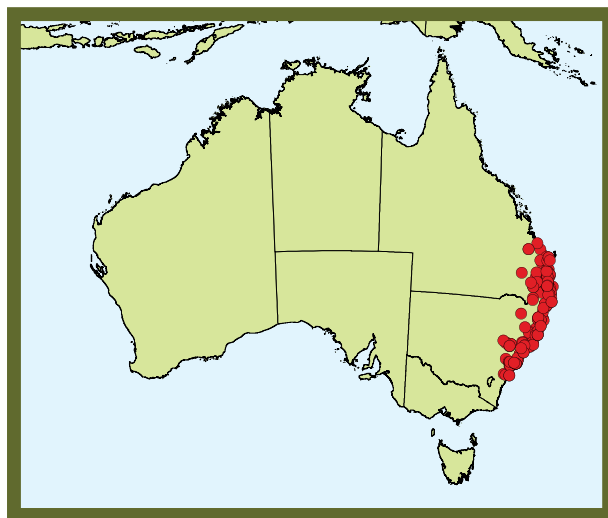
**FLOWERING TIME:** Recorded as flowering from September to December.

**ESSENTIAL OILS:** This species produced an oil in which 1,8-cineole (61–69%) was the principal component. This was accompanied by lesser amounts of  $\alpha$ -pinene (6–7%),  $\beta$ -pinene (1–2%), limonene (7–15%) and  $\alpha$ -terpineol (7–9%). The major sesquiterpenes, which overall accounted for less than 10% of the oil, were  $\beta$ -caryophyllene (1–2%), globulol (0.1–0.3%) and spathulenol (0.3–0.4%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.3%.

**REFERENCE ON ESSENTIAL OILS:** Brophy et al. 1998, as *Callistemon salignus*

**NOTES:** When transferring this species to *Melaleuca*, a new specific epithet was necessary because *saligna* was already in use in *Melaleuca* for the next species listed here. *Melaleuca salicina* is a popular large shrub or small tree for planting in gardens, parks and on road verges as it develops into a bushy, well-foliaged plant. A bonus is the brightly coloured flushes of new growth and in some respects these are more appealing than the flowers.



## *Melaleuca saligna* Schauer

**PUBLICATION:** in Walpers, *Repertorium botanices systematicae* 2: 927 (1843)

**DERIVATION:** *saligna*, from *Salix*, a genus of Salicaceae, apparently in reference to a perceived similarity between the leafy stems of this species and those of a species of *Salix*

**DESCRIPTION:** *Tree or shrub* 1–20 m tall; bark papery, whitish, brownish or grey. *Branchlets* glabrescent, sericeous-pubescent to pubescent with some shorter pubescent hairs also, or short-sericeous. *Leaves* alternate, 30–120 mm long, 5–18 mm wide, 5–14 times as long as wide, long-petiolate; blade glabrescent, lanuginulose to lanuginulose-puberulous overlaid with sericeous to sericeous-pubescent hairs, or sericeous-pubescent or appressed sericeous, narrowly elliptic or very narrowly elliptic, in transverse section transversely linear, the base attenuate, the apex acuminate to narrowly acute, the veins longitudinal, 3–7, *oil glands* moderately dense, distinct to obscure, scattered. *Inflorescences* spicate or capitate, pseudoterminal, with 5–15 triads, up to 23 mm wide. *Hypanthium* hairy, 1–2.2 mm long. *Calyx lobes* abaxially glabrescent, 0.5–0.8 mm long, scarious in a marginal band 0.1–0.3 mm wide. *Petals* deciduous, 1.8–2.2 mm long. *Stamens* 6–9 per bundle; filaments white, 5–8 mm long, the bundle claw 1.3–3.2 mm long, 0.3–0.5 times as long as the filaments. *Style* 5–8.5 mm long. *Ovules* c. 40–50 per locule. *Fruit* 1.5–2.5 mm long, the calyx lobes weathering away (the extreme basal portion may become woody and persist as a low ring or series of undulations on the hypanthium rim); cotyledons obvolvate.

**NATURAL OCCURRENCE:** Queensland: Cape York Peninsula.

**ECOLOGY:** Recorded as occurring in savannah woodland, seasonal swamps, sclerophyll woodland, gallery forest, sand dunes, edge of tidal saltwater creek, freshwater lake

edges, waterhole edges, riverbanks, on sand, solodic soil with laterite, and alluvium.

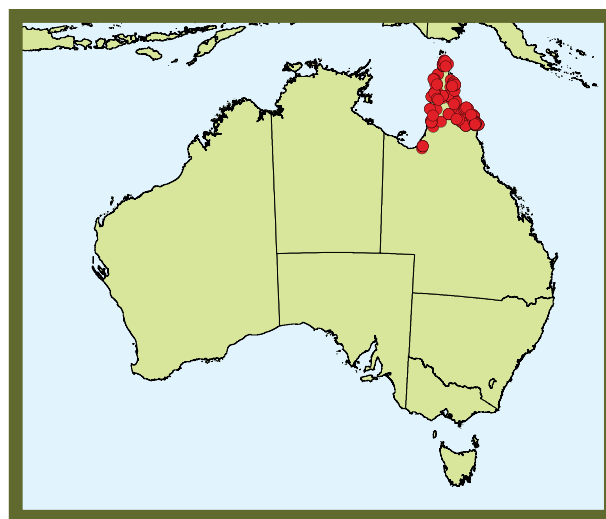
**FLOWERING TIME:** Recorded as flowering from February to November.

**ESSENTIAL OILS:** The leaf oil of this species contained both mono- and sesquiterpenes, with sesquiterpenes dominating in both number and yield. The principal sesquiterpenes were  $\beta$ -caryophyllene (5–8%),  $\alpha$ -humulene (2–4%),  $\beta$ -selinene (3–10%),  $\alpha$ -selinene (3–8%), globulol (4–6%) and viridiflorol (3–6%). The principal monoterpenes encountered were 1,8-cineole (8–28%),  $\alpha$ -pinene (2–4%) and limonene (4–8%)

**OIL YIELD:** The oil yield (dry weight, w/w) was 0.2–0.4%.

**REFERENCE ON ESSENTIAL OILS:** Brophy and Doran 1996

**NOTES:** This broad-leaved paperbark species should not be confused with *Callistemon salignus*, the name of which in *Melaleuca* is *M. salicina* (see preceding species).



## Melaleuca sapientes Craven



**PUBLICATION:** in Craven & Lepschi, *Australian Systematic Botany* 12: 901 (1999)

**DERIVATION:** *sapientes*, from the Latin *sapiens*, wise, knowing, in honour of Robert (Rob) and Ann Smart of Girraween farm near Jerramungup, Western Australia, who assisted research on *Melaleuca* quite considerably, both through sharing their knowledge of the genus within the Jerramungup region and through their generous hospitality

**DESCRIPTION:** *Shrub* 0.2–3 m tall; bark papery, white or grey. *Branchlets* glabrescent, sericeous. *Leaves* alternate, 6–19.5 mm long, 0.8–2.1 mm wide, 5–18 times as long as wide, subsessile to short-petiolate or sessile; blade usually hairy (eventually glabrescent), sericeous or rarely sericeous-pubescent, very narrowly elliptic, very narrowly obovate or linear, in transverse section sublunate, transversely linear, transversely semielliptic, shallowly lunate, transversely narrowly elliptic or sub-circular, the base attenuate to narrowly cuneate, parallel (blade width equals petiole width) or truncate, the apex acuminate, the veins longitudinal, 3, *oil glands* moderately dense, obscure, scattered to more or less in rows. *Inflorescences* capitate, pseudoterminal and sometimes also upper axillary, with 2–6 triads, up to 20 mm wide. *Hypanthium* hairy, 1.8–2 mm long. *Calyx lobes* abaxially hairy, 0.2–0.8 mm long, scarious in a marginal band

0.1–0.2 mm wide or scarious throughout. *Petals* deciduous, 1.2–2 mm long. *Stamens* 7–9 per bundle; filaments mauve, purple, pink or magenta, 6–10.5 mm long, the bundle claw 1–2.8 mm long, 0.2–0.3 times as long as the filaments. *Style* 7.5–8 mm long. *Ovules* c. 15–20 per locule. *Infructescences* peg-fruited. *Fruit* 3–4.5 mm long, with sepaline teeth or the calyx lobes weathering away; cotyledons obvolute.

**NATURAL OCCURRENCE:** Western Australia: from the Hyden–Jerramungup district eastwards to the Salmon Gums – Ponier Rock district.

**ECOLOGY:** Recorded as occurring in low eucalypt woodland with dense shrub understorey, low shrub and heath vegetation, *Melaleuca* heathland, mallee with dense *Melaleuca* understorey, on sand over laterite, calcareous plain with powdery clay, sand over clay, sandy loam, and salt flat loam.

**FLOWERING TIME:** Recorded as flowering from August to January.

**ESSENTIAL OILS:** The oil of this species was dominated by monoterpenes. The principal component was 1,8-cineole (49–61%). This was accompanied by lesser amounts of  $\alpha$ -pinene (9–16%), limonene (3–5%), E- $\beta$ -ocimene (0.7–3.0%), geraniol (1–2%) and  $\alpha$ -terpineol (6–7%). Sesquiterpenes did not contribute much to the oil. The principal members were globulol (2–4%), viridiflorol (1–3%) and viridiflorene (0.7–1.0%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 1%.

**NOTES:** *Melaleuca sapientes* is an excellent ornamental shrub and has been cultivated in Australia for many years under the name *M. holosericea* (Holliday 2004). The mauve-pink flowers contrast very well with the silvery-greyish foliage and the species should be tried more generally in Mediterranean climates.



## *Melaleuca scabra* R.Br.



**PUBLICATION:** in Aiton, *Hortus Kewensis*, ed. 2, 4: 414 (1812)

**DERIVATION:** *scabra*, from the Latin *scaber*, rough, scabby, mangy, in reference to the appearance of the leaves

**DESCRIPTION:** *Shrub* 0.2–1.2 m tall. *Branchlets* glabrous. *Leaves* alternate, 5.5–21 mm long, 0.8–1.3 mm wide, 5–20 times as long as wide, subsessile to short-petiolate; blade glabrous, linear, linear-obovate or narrowly oblong, subfalcate to falcate, in transverse section semicircular, flattened transversely semielliptic or transversely elliptic to subcircular (often the adaxial surface may be more or less channelled or the midrib area may be raised), the base attenuate to narrowly cuneate or parallel (blade width equals petiole width), the apex acuminate to narrowly acute or obtuse to rounded, the veins longitudinal, 3, *oil glands* moderately dense, obscure to distinct, scattered to more or less in rows. *Inflorescences* capitate, pseudoterminal and sometimes also upper axillary, with 1–5 triads, up to 22 mm wide. *Hypanthium* glabrous or hairy, 1.8–2.5 mm long. *Calyx lobes* abaxially glabrous (rarely a very

few scattered hairs may be present towards the sepal apex), 0.3–0.7 mm long, scarious in a marginal band 0.1–0.3 mm wide or herbaceous to the margin. *Petals* deciduous, 1–2 mm long. *Stamens* 3–7 per bundle; filaments purple, pink, mauve, magenta or deep bright pink, 6–9.5 mm long, the bundle claw 1.3–3.8 mm long, 0.2–0.5 times as long as the filaments. *Style* 6–9.5 mm long. *Ovules* 10–20 per locule. *Infructescences* globose. *Fruit* 3–4 mm long, the calyx lobes weathering away; cotyledons obovulate.

**NATURAL OCCURRENCE:** Western Australia: the Hope-toun – Israelite Bay district extending eastwards to the Mt Ragged district.

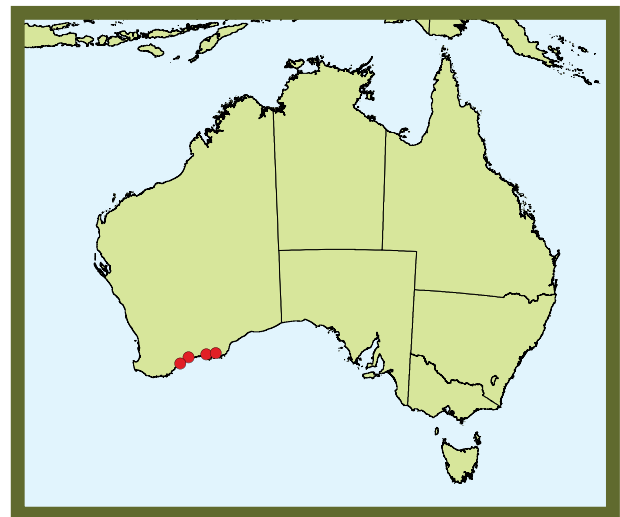
**ECOLOGY:** Recorded as occurring in low closed heath, high eucalypt shrubland, sand plain, swamps, low open heathland, on sandy loam, sand over clay, among granite boulders, sandy silt, and sandy gravel.

**FLOWERING TIME:** Recorded as flowering from July to November.

**ESSENTIAL OILS:** This species produced a leaf oil containing significant amounts of both mono- and sesquiterpenes. The principal monoterpenes encountered were  $\alpha$ -pinene (4.2%),  $\beta$ -pinene (6.9%), 1,8-cineole (4.5%) and myrtenal, trans-pinocarveol,  $\alpha$ -terpineol and myrtenol (each 2–3%). The principal sesquiterpenes encountered in the leaf oil were  $\alpha$ -cadinol (12.2%), spathulenol (6.9%) and T-cadinol, T-muurolol,  $\delta$ -cadinene, ledol and caryophyllene oxide (each 3–5%).

**OIL YIELD:** The oil yield (dry weight, w/w) was <0.3%.

**NOTES:** The name *M. scabra* has been misapplied to numerous pink- to magenta-flowered species of *Melaleuca* in southern Western Australia. Following studies of the ‘pom-pom’ species of the genus, *M. scabra* is now known to be restricted to a region in the far south of Western Australia as given above.



## Melaleuca scalena Craven & Lepschi



**PUBLICATION:** in Craven, Lepschi, Broadhurst & Byrne, *Australian Systematic Botany*, 17: 267 (2004)

**DERIVATION:** *scalena*, from the Latin *scalenus*, uneven, unequal, odd, in reference to the discordant facies that this species presents in nature, especially when it co-occurs with other species of the complex such as *M. hamata*, as *M. scalena* plants usually appear unthrifty relative to plants of other broombush species

**DESCRIPTION:** *Shrub* to 3 m tall; bark papery, peeling. *Branchlets* glabrescent, with sericeous or lanuginose-sericeous hairs. *Leaves* ascending or spreading-ascending, 19–85 mm long (often 20–50), 0.8–1.5 mm wide, 16–57 times as long as wide, petiole 0.2–1.5 mm long; blade glabrescent, sericeous or lanuginose-sericeous, linear or linear-obovate, in transverse section transversely elliptic, transversely broadly elliptic, depressed obovate or subcircular, in lateral view straight, incurved or

recurved, the base parallel or very narrowly cuneate, the apex narrowly acuminate, narrowly acute, acuminate or aristate, *oil glands* scattered. *Inflorescences* capitate with 5–14 triads. *Hypanthium* 1–1.5 mm long, 1–1.9 mm wide. *Calyx lobes* 5, indistinctly free, abaxially glabrous, 0.15–0.5 mm long. *Petals* caducous or rarely deciduous, broadly ovate, 0.9–1.3 mm long, oil glands circular to elliptic. *Stamens* 3–9 per bundle, the filaments whitish yellow or pale lemon yellow, 3–7.2 mm long, the bundle claw 0.7–2.9 mm long, 0.2–0.5 times as long as the filaments. *Style* 4.8–5.7 mm long. *Ovules* 15–18 per locule. *Infructescences* longer than wide (rarely as wide as long and very rarely shorter than wide), 6–8 mm wide, the constituent fruits closely packed and not retaining a significant separate identity (the fruiting hypanthia closely packed for their full length). Seeds 0.5–0.8 mm long, the cotyledons planoconvex.

**NATURAL OCCURRENCE:** Western Australia: from the Wyalkatchem – Mount Walker district southwards to the Woodanilling–Dumbleyung district.

**ECOLOGY:** Recorded as occurring in *Eucalyptus–Melaleuca–Acacia* woodland, mallee eucalypt–*Melaleuca* shrubland, with *Casuarina huegeliana*, *Eucalyptus–Santalum–Melaleuca–Casuarina* woodland, on brown sandy clay loam, grey sandy clay loam, light brown sandy clay loam over laterite, brown sandy clay loam with ironstone gravel over granite, yellow brown gravelly (decomposed granite?) soil, and grey brown sandy loam.

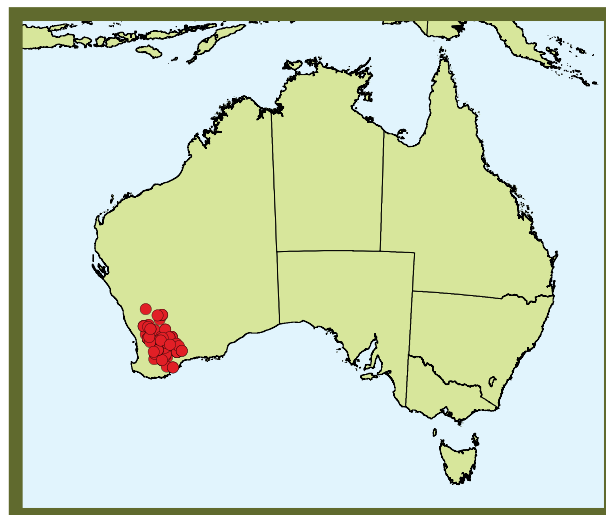
**FLOWERING TIME:** Recorded as flowering from October to December.

**ESSENTIAL OILS:** The oil from this species was dominated by monoterpenes. The principal components were 1,8-cineole (43–55%) and  $\alpha$ -pinene (25–31%). These were accompanied by lesser amounts of limonene (3–5%),  $\beta$ -pinene (1–2%), terpinen-4-ol (0.8–2.0%) and  $\alpha$ -terpineol (3–5%). The sesquiterpenes were not present in great abundance, with globulol (1–3%) and viridiflorol (1–2%) being the largest contributors and all others being present at <0.5% amounts.

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.8–1.5%.

**REFERENCE ON ESSENTIAL OILS:** Brophy et al. 2006b

**NOTES:** This species often co-occurs with *M. hamata* but the two can readily be distinguished in the field as *M. scalena* is typically scruffy in appearance.



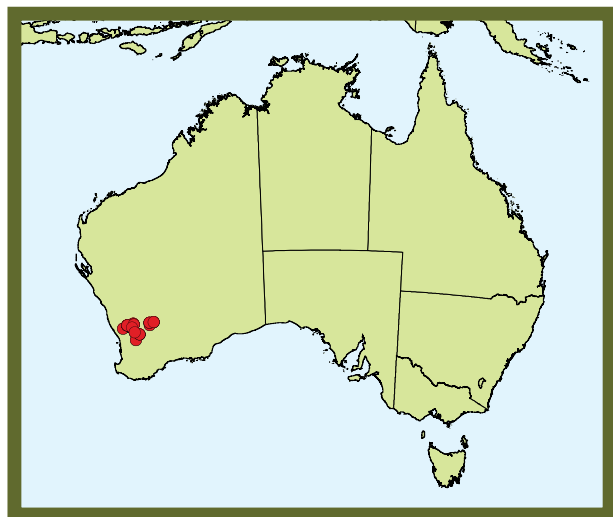
## Melaleuca sciotostyla Barlow



**PUBLICATION:** in Barlow & Cowley, *Australian Systematic Botany* 1: 102, fig. 6a (1988)

**DERIVATION:** *sciotostyla*, from the Greek *skiotos*, shaded by gradation in colour, and *stylos*, style, in reference to the distinctive colouration of the style, the distal portion of which appears to have been dipped in dye

**DESCRIPTION:** *Shrub* 0.6–1.5 m tall. *Branchlets* glabrescent, lanuginulose. *Leaves* decussate, 6–12.5 mm long, 0.8–2.2 mm wide, 4–8 times as long as wide, short-petiolate to sessile; blade glabrescent, lanuginulose,



very narrowly elliptic, narrowly elliptic or linear-elliptic, in transverse section transversely semielliptic or flattened transversely semielliptic, the base attenuate to narrowly cuneate, the apex acuminate or acute, the veins longitudinal, 3, *oil glands* sparse to moderately dense, obscure, more or less in rows. *Inflorescences* subcapitate, pseudoterminal and sometimes also upper axillary, with 1–4 monads, up to 17 mm wide. *Hypanthium* glabrous, 2.5–3 mm long. *Calyx lobes* abaxially hairy, 2.8–3.3 mm long, scarious in a marginal band 0.15–0.2 mm wide. *Petals* deciduous, 2.9–3.2 mm long. *Stamens* 12–17 per bundle; filaments cream to white, 6.5–7.7 mm long, the bundle claw 3–3.5 mm long, 0.5 times as long as the filaments. *Style* 8–11 mm long. *Ovules* c. 60 per locule. *Fruit* 5–5.5 mm long, with sepaline teeth; cotyledons flattened planoconvex to planoconvex.

**NATURAL OCCURRENCE:** Western Australia: the Cadoux – Wongan Hills – Meckering district.

**ECOLOGY:** Recorded as occurring in *Melaleuca* thicket, on sandy gravel, and clayey sand with laterite.

**FLOWERING TIME:** Recorded as flowering in August.

**ESSENTIAL OILS:** There are no data on the oils of this species at the present time.

**NOTES:** This is a poorly understood species that needs further study to more fully determine its taxonomic status. The species is morphologically very close to *M. haplantha* and in fact may be conspecific with it.



# *Melaleuca sclerophylla* Diels



**PUBLICATION:** in Diels & Pritzel, *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 35: 428 (1904)

**DERIVATION:** *sclerophylla*, from the Greek *skleros*, tough, hard, and *phyllon*, leaf, in reference to the leaf blade texture

**DESCRIPTION:** *Shrub* to 1.5 m tall. *Branchlets* glabrescent, puberulous to shortly pubescent grading to much longer pubescent to sericeous-pubescent. *Leaves* alternate, 8–28 mm long, 1.8–6 mm wide, 3–7 times as long as wide, sessile to subsessile; blade glabrescent, puberulous to shortly pubescent grading to much longer pubescent to sericeous-pubescent hairs, becoming lanuginose-pubescent to (rarely) lanuginose distally, narrowly obovate, very narrowly obovate, narrowly elliptic or very narrowly elliptic, in transverse section transversely linear or sublunate, the base attenuate, the apex obtuse to rounded or acute, the veins weakly pinnate (venation comprises a midrib

and 2 intramarginal veins with poorly developed pinnate venation), c. 9–11 pinnate veins, *oil glands* sparse to moderately dense, distinct, scattered. *Inflorescences* capitate, pseudoterminal and sometimes also upper axillary, with 7–10 triads, up to 20 mm wide. *Hypanthium* hairy, 1–2 mm long. *Calyx lobes* abaxially hairy, 0.4–0.6 mm long, scarious throughout. *Petals* deciduous, 0.8–1.6 mm long. *Stamens* 4–7 per bundle; filaments purple to mauve, 4.5–11 mm long, the bundle claw 0.9–3.8 mm long, 0.1–0.4 times as long as the filaments. *Style* 5.5–6 mm long. *Ovules* c. 10–15 per locule. *Infructescences* globose. *Fruit* 2–2.5 mm long, the calyx lobes weathering away with obscure undulations often occurring around the hypanthium rim; cotyledons obvolvate to subobvolvate (almost planoconvex).

**NATURAL OCCURRENCE:** Western Australia: from the Kalbarri district to the Wongan Hills district.

**ECOLOGY:** Recorded as occurring in heathland, open shrubland, low closed heathland, woodland, *Melaleuca* heath thicket, on sandy loam, sand over sandstone, sand over granite, shallow sand over quartzite and calcareous rock, clayey sand with laterite, quartz clay, and gravelly quartzitic laterite.

**FLOWERING TIME:** Recorded as flowering from June to October.

**ESSENTIAL OILS:** The oil from this species contained a mixture of both mono- and sesquiterpenes. The principal monoterpenes were  $\alpha$ -pinene (23.6%) and 1,8-cineole (19.0%). These were accompanied by lesser amounts of  $\beta$ -pinene (1.2%), limonene (2.2%), linalool (1.2%) and  $\alpha$ -terpineol (3.3%). The principal sesquiterpenes were  $\gamma$ -eudesmol (7.4%),  $\alpha$ -eudesmol (7.9%),  $\beta$ -eudesmol (13.7%), spathulenol (2.8%) and elemol (3.9%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.4%.



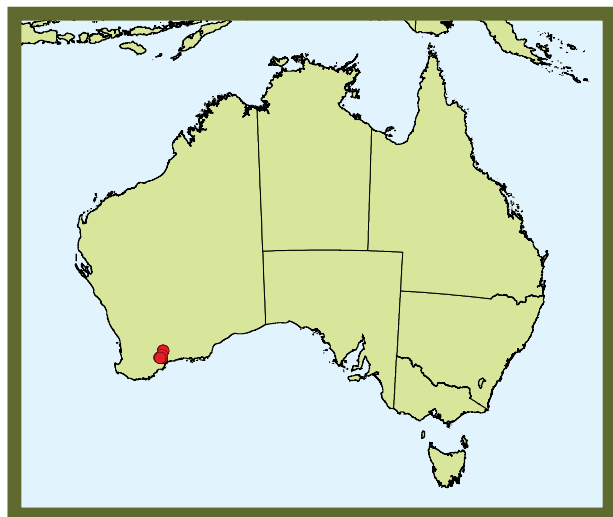
## Melaleuca sculponeata Barlow



**PUBLICATION:** in Quinn, Cowley, Barlow & Thiele, *Nuytsia* 8: 347, fig. 6b–c (1992)

**DERIVATION:** *sculponeata*, from the Latin *sculponea*, wooden shoe, in reference to a detached leaf resembling the shape of a wooden shoe

**DESCRIPTION:** *Shrub* 0.4–0.5 m tall. *Branchlets* soon glabrescent, the sericeous-pubescent to lanuginulose-puberulous or sericeous-lanuginulose hairs ephemeral. *Leaves* decussate, peltate, 1.3–3.2 mm long, 0.8–1.2 mm wide, 2.3–3.3 times as long as wide, sessile; blade soon glabrescent, the sericeous-lanuginulose to minutely sericeous (rarely approaching puberulous) hairs ephemeral, suboblong, in transverse section semicircular or transversely elliptic to subcircular (all with a shallow concavity adaxially), the base truncate, the apex rounded



or broadly acute, the veins longitudinal, 3, *oil glands* moderately dense to sparse, distinct to obscure, more or less in rows. *Inflorescences* capitate, lateral, with 4–12 monads. *Hypanthium* glabrous, 1.3–1.5 mm long. *Calyx lobes* abaxially glabrous, costate, 0.7–0.9 mm long, scarios in a marginal proximal band c. 0.1 mm wide. *Petals* caducous, 1.6–1.8 mm long. *Stamens* 8–12 per bundle; filaments white, 6–6.5 mm long, the bundle claw 3.4–3.8 mm long, 0.5–0.6 times as long as the filaments. *Style* 7–7.8 mm long. *Ovules* c. 20–25 per locule. *Fruit* 2–2.5 mm long, the calyx lobes with the proximal portion becoming more or less woody and immersed in the hypanthium wall and the distal portion weathering away; cotyledons planoconvex.

**NATURAL OCCURRENCE:** Western Australia: the Fitzgerald River district, with a disjunct occurrence in the Lake King district.

**ECOLOGY:** Recorded as occurring in regenerating mallee, and on sand over clay.

**FLOWERING TIME:** Recorded as flowering in October and February.

**ESSENTIAL OILS:** The leaf oil of this species contained approximately equal amounts of both mono- and sesquiterpenes. The principal monoterpenes encountered were  $\alpha$ -pinene (12.9%) and  $\beta$ -pinene (19.2%). These were accompanied by lesser amounts of limonene (5.5%),  $\alpha$ -terpineol (1.9%) and myrcene (1.3%). The principal sesquiterpenes were the alcohols  $\gamma$ -eudesmol (15.3%),  $\alpha$ -eudesmol (10.4%) and  $\beta$ -eudesmol (13.3%). There were lesser amounts of elemol/hedycaryol (approximately 6%),  $\alpha$ -cadinol (1.3%), T-muurolol (1.2%) and epicubenol (1.1%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.4%.

## *Melaleuca seriata* Lindl.



**PUBLICATION:** *Edwards's Botanical Register*, Appendix vols 1–23: viii (1839)

**DERIVATION:** *seriata*, from the Latin *series*, row, succession, train, in reference to oil glands often being in two rows

**DESCRIPTION:** *Shrub* 0.3–1.1 m tall. *Branchlets* glabrescent, pubescent (and sometimes puberulous) to lanuginose-pubescent, grading to longer pubescent hairs.

*Leaves* alternate, (2–)5.5–11(–14.5) mm long, (0.9–)1–2(–2.7) mm wide, (2–)2.5–5(–7.5) times as long as wide; blade glabrescent or glabrous, pubescent to lanuginose-pubescent to (less often) sericeous-pubescent, narrowly obovate, very narrowly obovate, obovate, linear-obovate or elliptic, in transverse section transversely linear, transversely semielliptic, sublunate or depressed obovate, the base narrowly cuneate to attenuate, the apex acute, obtuse or rounded, the veins longitudinal (some weakly developed reticulate veins are present), 3, *oil glands* moderately dense, obscure to distinct, more or less in rows to in rows.

*Inflorescences* capitate, pseudoterminal and sometimes also upper axillary, with 3–7 triads, up to 20 mm wide.

*Hypanthium* hairy, 1–2 mm long. *Calyx lobes* abaxially glabrous (rarely a few scattered hairs are present at the sepal apex), 0.5–1.3 mm long, scarious throughout or scarious in a marginal band 0.25–0.7 mm wide.

*Petals* deciduous, 1.5–3 mm long. *Stamens* 5–9 per bundle; filaments mauve, pink, rose-pink or purple, 6–9 mm long,

the bundle claw (1–)2.5–3.8 mm long, (0.1–)0.3–0.5 times as long as the filaments. *Style* 6–10 mm long. *Ovules* 10–15 per locule. *Infructescences* peg-fruited to weakly globose.

*Fruit* 2.5–4 mm long, with sepaline teeth or sometimes the calyx lobes weathering away (often only the basal portion of the sepal becomes woody and persists with the teeth then being a series of barely discernible undulations around the hypanthium rim); cotyledons obvolvate to subobvolvate (almost planoconvex).

**NATURAL OCCURRENCE:** Western Australia: from the Green Head – Coorow district south to the Perth–Bunbury district and eastwards to the Wyalkatchem and Lake King districts.

**ECOLOGY:** Recorded as occurring in understory of *Banksia* woodland, low shrubland, low open heath, tall open shrubland, seasonally wet low closed heath, margins of salt lake, along drainage lines, edge of saltmarsh, low woodland, *Melaleuca* woodland, on sandy loam, sand over lateritic gravel, clay loam over calcrete, sand over sandy loam, and calcareous soil.

**FLOWERING TIME:** Recorded as flowering in February, May and June, and from September to December.

**ESSENTIAL OILS:** This oil contained a mixture of mono- and sesquiterpenes. The principal monoterpene was  $\alpha$ -pinene (16.1%) and this was accompanied by lesser amounts of  $\beta$ -pinene (7.4%), 1,8-cineole (2.3%) and linalool (1.2%). The main sesquiterpenes encountered in the oil were spathulenol (11.0%), viridiflorol (8.1%), cubeban-11-ol (2.6%), bicyclogermacrene (6.6%) and viridiflorene (5.3%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was <0.1%.



## Melaleuca sericea Byrnes



**PUBLICATION:** *Austrobaileya* 2: 74 (1984)

**DERIVATION:** *sericea*, from the Greek *serikon*, silk, in reference to the silky indumentum of this species

**DESCRIPTION:** *Tree* 3–7 m tall; bark papery, white or grey. *Branchlets* glabrescent, sericeous (sometimes with scattered sericeous-pubescent hairs also). *Leaves* alternate, 15–65 mm long, 3–11 mm wide, 3–13 times as long as wide, short-petiolate to sessile; blade at length glabrescent, sericeous with some sericeous-pubescent to pubescent hairs around the blade base/petiole, very narrowly obovate, narrowly obovate, very narrowly elliptic or rarely linear-obovate, in transverse section transversely linear, the base attenuate, the apex acuminate or rarely acute, the veins longitudinal, 3–5, *oil glands* dense, distinct to obscure, scattered. *Inflorescences* spicate or capitate, pseudoterminal and sometimes also upper axillary, with 2–9 triads, up to 18 mm wide. *Hypanthium* hairy, 1.5–2.5 mm long. *Calyx lobes* abaxially hairy, 0.5–1.2 mm long, scarious in a marginal band 0.1–0.2 mm wide. *Petals* deciduous, 1.3–2 mm long. *Stamens* 6–14 per bundle; filaments white, cream or yellowish-white, 5.5–7.7 mm long, the bundle claw 2–3.6 mm long, 0.3–0.5 times as long as the filaments. *Style* 6–10 mm long. *Ovules* 10–15 per

locule. *Fruit* 1.5–2.5 mm long, with sepaline teeth or the calyx lobes weathering away (the lobes often persist to fruit but eventually weather, or the basal portion may become woody and persist as a low ring or series of undulations on the hypanthium rim); cotyledons subobovate (almost planoconvex).

**NATURAL OCCURRENCE:** Western Australia, Northern Territory: from the eastern Kimberley region in Western Australia eastwards to the Northern Territory.

**ECOLOGY:** Recorded as occurring in open eucalypt woodland, low *Melaleuca* woodland, on sandy loam, sand below a sandstone ridge, lateritic podsollic soil, clay plain, sandy gravel, and skeletal soil on quartzite.

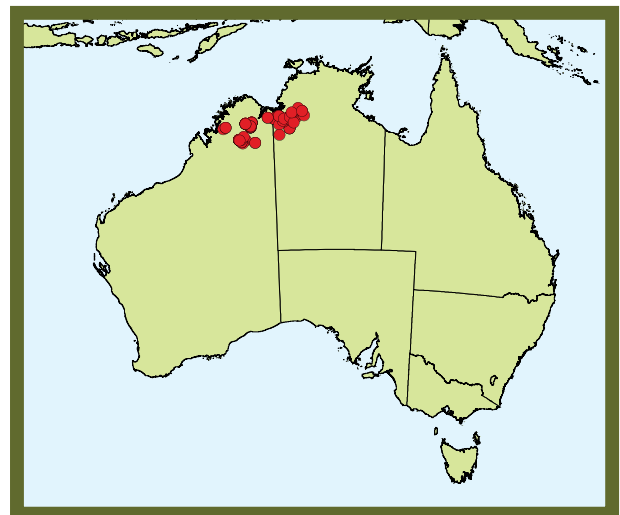
**FLOWERING TIME:** Recorded as flowering from January to September.

**ESSENTIAL OILS:** The species gave a monoterpenoid oil. In the first oil sample, the principal components were  $\alpha$ -pinene (73–77%) and 1,8-cineole (11–14%), with lesser amounts of limonene (1–4%),  $\alpha$ -terpineol (2–4%) and isovaleraldehyde (0.3–7.0%). A second collection gave  $\alpha$ -pinene (38–56%) and 1,8-cineole (26–36%) as principal components, as well as lesser amounts of limonene (6–12%),  $\alpha$ -terpineol (5–8%) and isovaleraldehyde (1–2%). Sesquiterpenes did not contribute much to the oil, with no compounds being greater than 0.5% of the total oil.

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.2% and 1.5% from two collections.

**REFERENCE ON ESSENTIAL OILS:** Brophy and Doran 1996

**NOTES:** This species can grow on quite poor, rocky sites and consequently has a poor form in those habitats but, when growing on deeper, better watered soils, it can develop a good form and possibly may sucker to produce a dense thicket. Selected genotypes of the species may therefore be suitable for shelter belts etc. in tropical environments.



## *Melaleuca serpentina* Craven

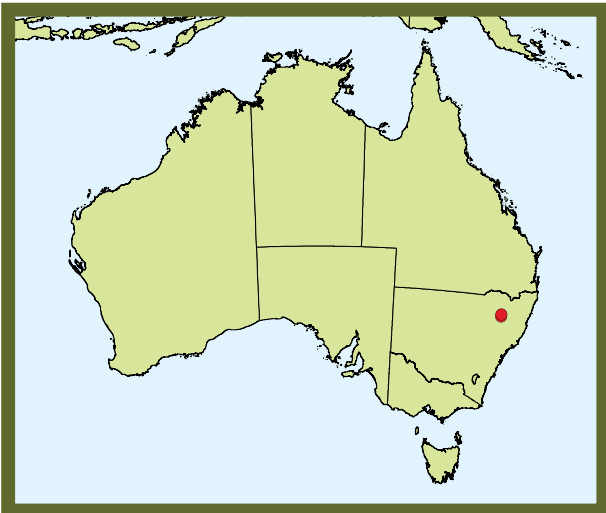


**PUBLICATION:** *Novon* 19: 450 (2009)

**DERIVATION:** *serpentina*, from serpentine, the name of a group of minerals, in reference to this species occurring on serpentine soils

**SYNONYM:** *Callistemon serpentinus* (Craven) Udovicic & R.D.Spencer

**DESCRIPTION:** *Shrub* 2.5–4 m tall; bark hard-papery, flaking. *Branchlets* glabrescent, sericeous. *Leaves* alternate, 21–53 mm long, 2–5 mm wide, 7.5–15 times as long as wide, short-petiolate; blade glabrescent, sericeous to pubescent, linear-obovate, narrowly obovate or very



narrowly elliptic, in transverse section obsublanate or transversely linear, the base very narrowly cuneate, the apex acute or very shortly acuminate, the veins longitudinal-pinnate, the pinnate veins obscure, *oil glands* moderately dense or dense, distinct, scattered. *Inflorescences* spicate, pseudoterminal and sometimes also upper axillary, with 15–35 monads, 30–40 mm wide. *Hypanthium* hairy, 3–4 mm long. *Calyx lobes* abaxially hairy or glabrescent, 0.9–1.8 mm long, scarious in a marginal band 0.4–0.7 mm wide. *Petals* deciduous, 2.2–4 mm long. *Stamens* 37–51 per flower; filaments yellow or creamy-green, 9–17 mm long; anthers yellow. *Style* 11–18 mm long. *Ovules* c. 200–300 per locule. *Fruit* 4.2–4.6 mm long, the calyx lobes abaxially deciduous; cotyledons obvolvate.

**NATURAL OCCURRENCE:** New South Wales: the Barraba district.

**ECOLOGY:** Recorded as occurring in grassy gully woodlands on serpentine soils.

**FLOWERING TIME:** Recorded as flowering in April, October and December.

**ESSENTIAL OILS:** This species produced a monoterpenoid oil, with  $\alpha$ -pinene (24.2%) and 1,8-cineole (45.5%) as principal components. Also present were lesser amounts of  $\beta$ -pinene (0.3%), limonene (5.8%),  $\alpha$ -terpineol (8.9%), geranyl acetate (4.4%), citronellyl acetate (0.4%), geranial (1.1%) and an unknown (2.5%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was <0.8%.

## Melaleuca sheathiana W.Fitzg.



**PUBLICATION:** *Journal of Proceedings of the Mueller Botanic Society of Western Australia* 1: 16 (1902)

**DERIVATION:** *sheathiana*, in honour of J. Sheath (1850–1915), one-time Superintendent of King's Park, Perth, Western Australia

**DESCRIPTION:** *Shrub or tree* 0.7–7 m tall; bark papery. *Branchlets* glabrescent, lanuginulose-puberulous to lanuginulose and often with some shortly pubescent or puberulous hairs also. *Leaves* alternate, 2–3.5 mm long, 0.9–1.3 mm wide, 1.8–4 times as long as wide, subsessile; blade glabrescent, lanuginulose to lanuginulose-puberulous and occasionally with some shortly pubescent or puberulous hairs also, elliptic to narrowly elliptic, obovate to narrowly obovate or oblong, in transverse section transversely semielliptic, depressed obovate or flattened transversely semielliptic, the base cuneate to rounded, the apex rounded to acute or obtusely shortly acuminate, the veins longitudinal, 3, *oil glands* moderately dense,

obscure, in rows. *Inflorescences* capitate or shortly spicate, with 4–11 monads, up to 15 mm wide. *Hypanthium* hairy, 1.5–2 mm long. *Calyx lobes* abaxially glabrous to glabrescent, 0.6–1 mm long, scarious in a marginal band up to 0.2 mm wide to herbaceous to the margin. *Petals* deciduous, 1.5–2.2 mm long. *Stamens* 9–14 per bundle; filaments cream or white, 3.5–4.5 mm long, the bundle claw 0.7–1.6 mm long, 0.2–0.4 times as long as the filaments. *Style* 4–5.5 mm long. *Ovules* c. 15–20 per locule. *Fruit* 2.8–4.1 mm long, the calyx lobes at length weathering away (the lobes may become more or less woody and persistent but eventually weather away, or the basal portion may become woody and persist as undulations on the hypanthium rim); cotyledons obvolvate.

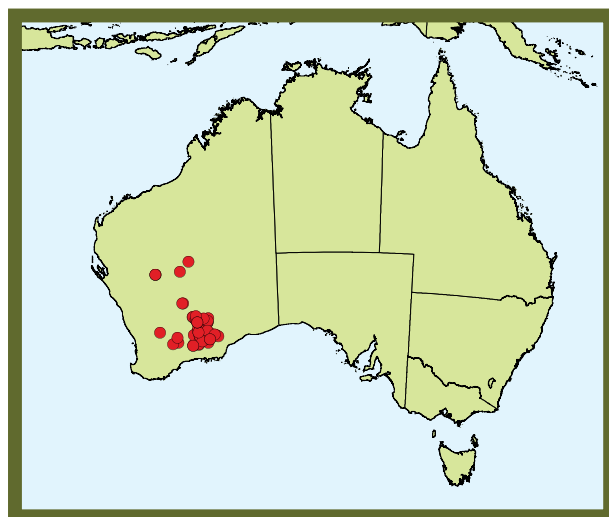
**NATURAL OCCURRENCE:** Western Australia: from the Lake Barlee district south and east to the Lake Cronin and Rawlinna districts.

**ECOLOGY:** Recorded as occurring in mallee woodland, open eucalypt forest, eucalypt and *Melaleuca* woodland and scrubland, edge of saline lake, on clayey sand over limestone, laterite outcrop, stony loamy sand, calcareous loam, stony soil on laterite, and clay over calcrete.

**FLOWERING TIME:** Recorded as flowering from September to December.

**ESSENTIAL OILS:** The leaf oil of this species was dominated by monoterpenes. The principal components were  $\alpha$ -pinene (40–46%) and 1,8-cineole (17–28%). There were lesser amounts of limonene (2–3%) and  $\alpha$ -terpineol (3–6%). The principal sesquiterpenes encountered were globulol (1–3%), spathulenol (2–4%) and  $\beta$ -eudesmol (1–2%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.3–1.0%.



## *Melaleuca shiressii* (Blakely) Craven



**PUBLICATION:** *Novon* 16: 473 (2006)

**DERIVATION:** *shiressii*, in honour of David William Campbell Shiress (c. 1862–1944), an Australian with an apparent deep interest in plants, co-collector with William F. Blakely (1875–1941) of the type specimen

**SYNONYM:** *Callistemon shiressii* Blakely

**DESCRIPTION:** *Tree or shrub* 2–12 m tall; bark papery, white. *Branchlets* glabrescent, with long sericeous-pubescent hairs overlying a layer of shorter sericeous-pubescent hairs. *Leaves* alternate, 19–66 mm long, 3–10 mm wide, 4–12 times as long as wide, short-petiolate or subsessile; blade glabrescent, sericeous-pubescent hairs overlying a layer of sericeous hairs, narrowly ovate, very narrowly ovate, rarely narrowly elliptic or very narrowly elliptic, in transverse section shallowly ob-bird-winged or transversely linear, the base very narrowly attenuate (approaching narrowly cuneate), the apex acute, the veins

longitudinal-pinnate, 12–23, *oil glands* dense or moderately dense, distinct, scattered. *Inflorescences* spicate, pseudoterminal and sometimes also upper axillary or interstitial, with 5–25 monads, 18–22 mm wide. *Hypanthium* hairy or glabrescent, 1.9–2.6 mm long. *Calyx lobes* abaxially hairy (sometimes as cilia on the margin only), 0.4–0.9 mm long, scarious in a marginal band 0.2–0.4 mm wide or scarious throughout. *Petals* deciduous, 1.7–3.3 mm long. *Stamens* 48–84 per flower; filaments cream or greenish-cream, 7–12 mm long; anthers yellow. *Style* 8–12 mm long. *Ovules* c. 75–100 per locule. *Fruit* 2.5–3.7 mm long, the calyx lobes deciduous; cotyledons obvolvate or planoconvex. **NATURAL OCCURRENCE:** New South Wales: the Singleton–Richmond district.

**ECOLOGY:** Recorded as occurring in open forest, warm temperate rainforest, along stream banks, on ridges, on sandy soil, and shale.

**FLOWERING TIME:** Recorded as flowering in September, October and January.

**ESSENTIAL OILS:** This species produced an oil in which the principal components were  $\alpha$ -pinene (11–28%) and 1,8-cineole (33–59%), which together accounted for over 60% of the oil. There were lesser quantities of limonene (2–5%),  $\delta$ -terpineol (0.2–6.0%), trans-pineocarveol (0.5–1.0%) and  $\alpha$ -terpineol (6–8%). The principal sesquiterpenes encountered were  $\beta$ -caryophyllene (0.3–1.0%), globulol (0.5–2.0%) and spathulenol (0.8–2.0%). Sesquiterpenes accounted for less than 20% of the oil.

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.1%.

**REFERENCE ON ESSENTIAL OILS:** Brophy et al. 1998, as *Callistemon shiressii*



## Melaleuca sieberi Schauer



**PUBLICATION:** in Walpers, *Repertorium botanices systematicae* 2: 928 (1843)

**DERIVATION:** *sieberi*, in honour of Franz W. Sieber (1789–1844) who collected herbarium specimens in the Sydney area, New South Wales, in the early 1800s and who made the type collection of this species

**DESCRIPTION:** *Tree or shrub* 0.5–8 m tall; bark papery, whitish or grey-brown. *Branchlets* glabrescent, lanuginulose to lanuginulose-puberulous and occasionally with some longer pubescent hairs also. *Leaves* alternate, 4–15 mm long, 0.8–4 mm wide, 2.5–7 times as long as wide, subsessile to short-petiolate; blade glabrescent, lanuginulose to rarely lanuginulose-puberulous (rarely some longer pubescent hairs may also be present), very narrowly elliptic to linear-elliptic, narrowly elliptic or elliptic, in transverse section transversely linear or sublunate, the base narrowly cuneate, the apex acute to narrowly acute or acuminate, the veins longitudinal, 3, *oil glands* dense or sparse, distinct to obscure, more or

less in rows. *Inflorescences* spicate, pseudoterminal, with 5–20 triads or monads (both conditions often occur within a plant and sometimes within an inflorescence), up to 20 mm wide. *Hypanthium* hairy or glabrescent, 2–2.5 mm long. *Calyx lobes* abaxially glabrescent or hairy, 0.7–1.1 mm long, herbaceous to the margin. *Petals* deciduous, 2.2–2.7 mm long. *Stamens* 11–33 per bundle; filaments cream, 5.5–9 mm long, the bundle claw 1.5–2.7 mm long, 0.2–0.5 times as long as the filaments. *Style* 8–10.5 mm long. *Ovules* c. 80–145 per locule. *Fruit* 3–4.5 mm long, the calyx lobes weathering away; cotyledons planoconvex. **NATURAL OCCURRENCE:** Queensland, New South Wales: from the Maryborough district in Queensland south to the Gosford district in New South Wales.

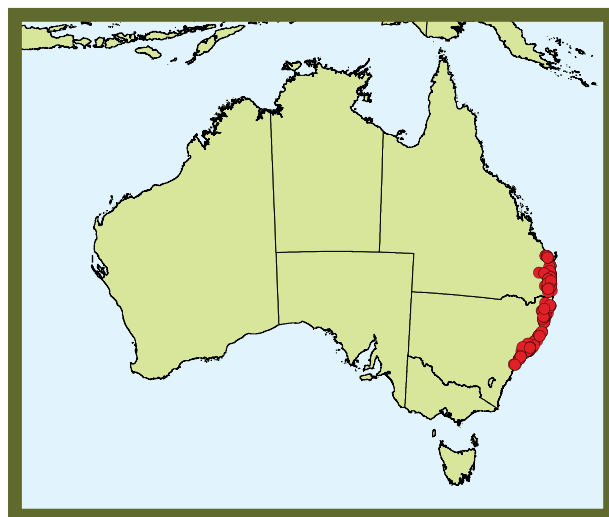
**ECOLOGY:** Recorded as occurring in wallum flats, swampy *Melaleuca* woodland, swampy area in eucalypt forest, open *Melaleuca* heathland, along creek line in eucalypt forest, on a river bank, on sandy peat, clay loam, sand pockets between granite boulders, rocky alluvium, and loamy sand. **FLOWERING TIME:** Recorded as flowering from August to March.

**ESSENTIAL OILS:** The leaf oil of this species was dominated by  $\alpha$ -pinene (69–78%). This was accompanied by lesser amounts of limonene (1–2%), p-cymene (2–4%), verbenone (1–2%) and  $\alpha$ -terpineol (0.8–2.0%). The principal sesquiterpenes encountered were globulol (1–3%), viridiflorol (1–2%), bicyclogermacrene (0.7–1.0%) and aromadendrene (1%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.4%.

**NOTES:** This species should not be confused with *Callistemon sieberi*, the name of which in *Melaleuca* is *M. paludicola*.

The species has potential for use as a screening plant, and in biodiversity and road verge plantings etc.





## *Melaleuca similis* Craven



**PUBLICATION:** in Craven & Lepschi, *Australian Systematic Botany* 12: 903 (1999)

**DERIVATION:** *similis*, from the Latin *similis*, like, resembling, in reference to the similarity this species has to other species in the Ravensthorpe–Esperance region, especially *M. plumea* and *M. stramentosa*

**DESCRIPTION:** *Shrub* to 0.6 m tall. *Branchlets* glabrescent, sericeous to more or less minutely sericeous. *Leaves* alternate, 4–9.5 mm long, 1–1.4 mm wide, 3.4–10 times as long as wide, subsessile to short-petiolate; blade glabrescent, sericeous to more or less minutely sericeous, linear, narrowly oblong, linear-obovate or very narrowly obovate, in transverse section transversely linear to narrowly obovate, depressed obovate or transversely elliptic, the base

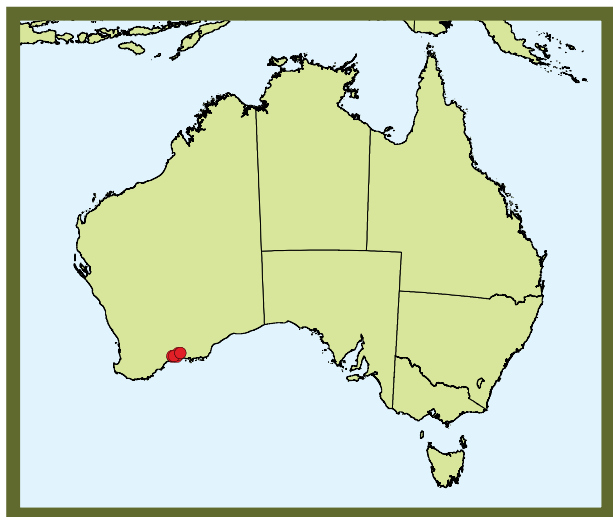
narrowly cuneate, the apex obtusely shortly acuminate, rounded to obtuse or acuminate, the veins longitudinal, 3, *oil glands* moderately dense or dense, obscure, more or less in rows to in rows. *Inflorescences* capitate, pseudoterminal and sometimes also upper axillary, with 1–4 triads, up to 12 mm wide. *Hypanthium* hairy, 1.2–1.8 mm long. *Calyx lobes* abaxially hairy, 0.5–0.8 mm long, scarious in a marginal band 0.1–0.4 mm wide or herbaceous to the margin. *Petals* deciduous, 1.2–1.7 mm long. *Stamens* 4–5 per bundle; filaments pink or magenta, 5–7 mm long, the bundle claw 1.4–2.1 mm long, 0.2–0.4 times as long as the filaments. *Style* 6–7 mm long. *Ovules* c. 15–20 per locule. *Infructescences* peg-fruited. *Fruit* 2.5–3 mm long, the calyx lobes abaxially weathering away; cotyledons planoconvex. **NATURAL OCCURRENCE:** Western Australia: the Ravensthorpe district.

**ECOLOGY:** Recorded as occurring in heathland, along a drainage line, and on sand.

**FLOWERING TIME:** Recorded as flowering in October and November.

**ESSENTIAL OILS:** Monoterpenes were the dominant components in the oil of this species. The principal compounds were  $\alpha$ -pinene (29.4%) and 1,8-cineole (34.6%). These were accompanied by lesser amounts of  $\beta$ -pinene (2.9%), limonene (2.9%), linalool (2.0%),  $\alpha$ -terpineol (5.0%) and myrcene (1.2%). Sesquiterpenes were not prominent in this oil, with the major members being globulol (1.2%), viridiflorol (0.8%), spathulenol (1.4%) and bicyclogermacrene (1.0%).

**OIL YIELD:** The oil yield (dry weight, w/w) was <0.1%.



## Melaleuca societatis Craven



**PUBLICATION:** in Craven & Lepschi, *Australian Systematic Botany* 12: 904 (1999)

**DERIVATION:** *societatis*, from the Latin *societas*, association, in reference to the spherical infructescence that is reminiscent of the shape of the ball used in the world game, i.e. soccer or Association football

**DESCRIPTION:** *Shrub* 0.4–2 m tall; bark papery. *Branchlets* glabrescent, pubescent or less often sericeous to sericeous-pubescent. *Leaves* alternate, 3.5–8.5 mm long, 0.8–1.5 mm wide, 3.5–9 times as long as wide, short-petiolate to sessile; blade glabrescent, the indumentum variable (mostly pubescent, or occasionally more or less sericeous-pubescent, rarely the indumentum may be of spreading-ascending to spreading pubescent to sericeous-pubescent hairs), linear to oblong or suboblong, in transverse section transversely elliptic to circular or depressed obovate, the base narrowly cuneate, rounded

or attenuate, the apex obtuse to rounded or acuminate, the veins longitudinal, 3, *oil glands* moderately dense, obscure, in rows. *Inflorescences* capitate or shortly spicate, pseudoterminal and sometimes also upper axillary, with 4–9 triads, up to 12 mm wide. *Hypanthium* glabrous or hairy, 1–1.2 mm long. *Calyx lobes* abaxially glabrous, 0.2–0.5 mm long, scarious in a marginal band 0.1–0.2 mm wide or scarious throughout. *Petals* deciduous, 1–1.5 mm long. *Stamens* 3–6 per bundle; filaments pink, mauve, purple or magenta, 4–7 mm long, the bundle claw 0.8–2 mm long, 0.2–0.5 times as long as the filaments. *Style* 4.5–6.5 mm long. *Ovules* 10–15 per locule. *Infructescences* globose. *Fruit* 2.5–3 mm long, the calyx lobes weathering away or replaced by sepaline teeth; cotyledons planoconvex.

**NATURAL OCCURRENCE:** Western Australia: from the Stirling Range – Jerramungup district eastwards to the Salmon Gums – Israelite Bay district.

**ECOLOGY:** Recorded as occurring in mallee scrub, eucalypt woodland with shrubby understorey, mallee heath, tall mallee, open shrub mallee, on sandy clay, sand over laterite, loam, clay, and sand over sandy clay.

**FLOWERING TIME:** Recorded as flowering from August to January.

**ESSENTIAL OILS:** The leaf oil of this species was dominated by monoterpenes. The principal component was 1,8-cineole (48–61%). This was accompanied by lesser amounts of  $\alpha$ -pinene (14–20%),  $\beta$ -pinene (3–9%), limonene (3–5%) and  $\alpha$ -terpineol (3–5%). Sesquiterpenes contributed little to this oil, with the principal components being globulol (1–4%), viridiflorol (0.7–2.0%), spathulenol (0.5–2.0%) and bicyclogermacrene (1–2%).  $\alpha$ -,  $\beta$ - and  $\gamma$ -eudesmol were also present in amounts of 0.1–2.0% of the total oil.

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.5–1.2%.



## *Melaleuca sophisma* Lepschi



**PUBLICATION:** in Craven, Lepschi & Cowley, *Nuytsia* 20: 32 (2010)

**DERIVATION:** *sophisma*, from the Greek *sophisma*, false conclusion, fallacy, in reference to the similarity of this species to another, *M. cliffortioides*, with which it had been confused

**DESCRIPTION:** *Shrub* to 1–2 m tall; bark rough, deeply fissured towards base, grey. *Branchlets* glabrous. *Leaves* alternate, reflexed, 3.1–6.3 mm long, 1.1–2.1 mm wide, 1.7–5 times as long as wide, sessile; blade early glabrescent, ciliate on youngest growth only, ovate, in transverse section lunate, the base truncate, the apex acute, recurved to incurved, not pungent, the veins longitudinal, 3–5, *oil glands* densely distributed, distinct,



more or less in rows. *Inflorescences* capitate, axillary, with 3–5 triads, 13–18 mm wide, bracteoles present on each flower. *Hypanthium* glabrous, 1.3–2.2 mm long. *Calyx lobes* abaxially glabrous, costate, triangular or broadly ovate, 1.2–1.4 mm long, scarious in a marginal band 1 mm wide, otherwise herbaceous. *Petals* deciduous, 2–2.3 mm long. *Stamens* 12–15 per bundle, filaments white at anthesis but darkening to cream or yellow with age, 6.9–9 mm long, the bundle claw 3.7–4.7 mm long, 0.5–0.6 times as long as the filaments. *Style* 6.8–10.6 mm long. *Ovules* 17–21 per locule. *Fruit* 1.7–3 mm long, with the distal rim having obtuse sepaline teeth; cotyledons planoconvex.

**NATURAL OCCURRENCE:** Western Australia: the Kundip district.

**ECOLOGY:** Recorded as occurring in mallee to mallet shrubland over heath, on brown sandy loam, grey clay loam with stony schist, and quartz.

**FLOWERING TIME:** Recorded as flowering in November and December.

**ESSENTIAL OILS:** The leaf oil of this species was dominated by sesquiterpenes. The principal sesquiterpenes identified were globulol (13.3%), viridiflorol (7.3%) and spathulenol (15.1%). These were accompanied by lesser amounts of bicyclogermacrene (2.2%), allo-aromadendrene (2.2%),  $\alpha$ -cadinol (1.9%), ledol (5.5%), cubeban-11-ol (5.4%) and several unidentified oxygenated sesquiterpenes (each 2–4%). Monoterpenes contributed very little to the oil, with the major contributors being  $\alpha$ -terpineol (7.4%),  $\alpha$ -pinene (0.9%) and  $\beta$ -pinene (0.5%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was <0.1%.

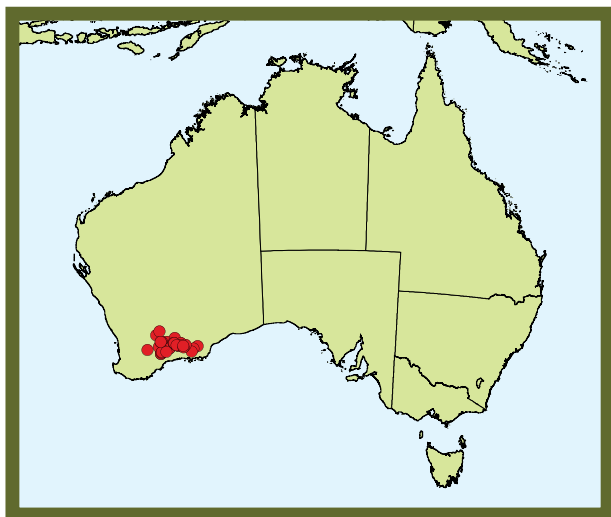
## Melaleuca sparsiflora Turcz.



**PUBLICATION:** *Bulletin de la Société Impériale des Naturalistes de Moscou* 20: 167 (1847)

**DERIVATION:** *sparsiflora*, from the Latin *sparsus*, sparse, scattered, and *flos*, flower, in reference to the inflorescences in this species being few-flowered

**DESCRIPTION:** *Shrub* 0.3–4 m tall. *Branchlets* glabrescent, lanuginulose-puberulous to lanuginulose. *Leaves* decussate, 3–8 mm long, 1–2.2 mm wide, 2.2–4.6 times as long as wide, sessile to short-petiolate; blade glabrescent, lanuginulose to less often sericeous-lanuginulose or lanuginulose-puberulous, elliptic to narrowly elliptic or narrowly obovate, in transverse section shallowly lunate, lunate, crescentic or depressed obovate, the base cuneate, the apex obtuse to rounded, the veins longitudinal, 3,



*oil glands* moderately dense, obscure, more or less in rows. *Inflorescences* subcapitate, pseudoterminal, with 1(–2) monads. *Hypanthium* glabrous or glabrescent, 1.5–2.8 mm long. *Calyx lobes* abaxially glabrous, 1.8–3 mm long, scarious in a marginal band 0.2–0.3 mm wide. *Petals* deciduous, 3–4 mm long. *Stamens* 11–26 per bundle; filaments white or cream, 6–10.5 mm long, the bundle claw 1.2–3.5 mm long, 0.2–0.3 times as long as the filaments. *Style* 6–10.5 mm long. *Ovules* c. 30–35 per locule. *Fruit* 3.8–5.5 mm long, with sepaline teeth or the calyx lobes weathering away; cotyledons planoconvex.

**NATURAL OCCURRENCE:** Western Australia: from the Marvel Loch district south to the Oldfield River district and eastwards to the Salmon Gums district.

**ECOLOGY:** Recorded as occurring in open eucalypt forest with dense shrubby understorey, mallee woodland, low mallee, tall mallee, mixed *Melaleuca* thicket on edge of salt lake, on sand over granite, saline depression, sand over clay, sandy soil with laterite, and clayey sand.

**FLOWERING TIME:** Recorded as flowering in September and October.

**ESSENTIAL OILS:** The essential oil of this species was dominated by monoterpenes. The principal component was 1,8-cineole (64.9%) and this was accompanied by lesser amounts of  $\alpha$ -pinene (8.4%), myrcene (4.0%),  $\beta$ -pinene (3.6%), limonene (6.2%) and  $\alpha$ -terpineol (4.8%). Sesquiterpenes were, of necessity, not abundant, with the principal members being spathulenol (2.4%), globulol (1.3%) and viridiflorol (0.8%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.6%.

## *Melaleuca spathulata* Schauer



**PUBLICATION:** in Lehmann, *Plantae Preissianae* 1: 134 (1844)

**DERIVATION:** *spathulata*, from the Greek *spathe*, a broad, flat tool for stirring, hence *spathulatus*, in reference to the spoon-like shape of the leaves

**DESCRIPTION:** *Shrub* 0.3–2 m tall; bark papery, pale grey-cream. *Branchlets* glabrescent, pubescent (rarely almost puberulous) or rarely approaching lanuginose-pubescent or sericeous. *Leaves* alternate, 2.5–9.5 mm long, 1.5–2.7 mm wide, 1.5–4 times as long as wide, sessile to short-petiolate; blade glabrescent, pubescent to less often sericeous-pubescent, rarely approaching lanuginose-pubescent and/or lanuginose-sericeous or sericeous, narrowly obovate to obovate or elliptic to narrowly elliptic, in transverse section transversely narrowly elliptic, transversely semielliptic, transversely linear or depressed obovate, the base attenuate to cuneate, the apex obtusely shortly acuminate or acute to rounded, the veins longitudinal-pinnate or pinnate (venation consists of a midrib and 2(–4) weakly developed longitudinal veins with c. 5–9 weakly developed pinnate veins), *oil glands* moderately dense,

obscure, scattered. *Inflorescences* capitate, pseudoterminal and sometimes also upper axillary, with 2–9 triads, up to 10 mm wide. *Hypanthium* hairy, 1–1.5 mm long. *Calyx lobes* abaxially hairy, 0.4–0.5 mm long, scarious in a marginal band 0.2–0.3 mm wide, or scarious throughout or herbaceous to the margin. *Petals* deciduous, 0.8–1.5 mm long. *Stamens* 2–5 per bundle; filaments mauve, pink, deep rose or purple, 3.2–7.5 mm long, the bundle claw 0.5–1.8 mm long, 0.2–0.3 times as long as the filaments. *Style* 4.5–8 mm long. *Ovules* 5–6 per locule. *Infructescences* globose. *Fruit* 2–2.5 mm long, with sepaline teeth; cotyledons planoconvex (occasionally approaching subobovulate).

**NATURAL OCCURRENCE:** Western Australia: from the Gnowangerup–Pingrup district south to the Albany – Bremer Bay district.

**ECOLOGY:** Recorded as occurring in low dense heathland, swampy ground in tall dense heath, heath with mallee, open eucalypt woodland, wandoo, on sand, clay loam, sand with laterite, and sand over clay.

**FLOWERING TIME:** Recorded as flowering from September to January.

**ESSENTIAL OILS:** This species gave an overwhelmingly monoterpenoid oil. The principal components were  $\alpha$ -pinene (30.8%) and 1,8-cineole (49.3%). These were accompanied by lesser amounts of limonene (3.9%),  $\alpha$ -terpineol (7.9%) and geranyl acetate (1.3%). Sesquiterpenes were neither common nor plentiful in this oil. The major members were E,E-farnesol (1.5%), globulol (0.4%) and spathulenol (0.3%).

**OIL YIELD:** The oil yield (dry weight, w/w) was 1.3%.

**NOTES:** This is an adaptable and highly ornamental shrub (Holliday 2004) and should be grown more widely in regions with a temperate Mediterranean climate.



## Melaleuca spectabilis (Barlow ex Craven) Craven & Lepschi



**PUBLICATION:** in Craven, Lepschi & Cowley, *Nuytsia* 20: 33 (2010)

**DERIVATION:** *spectabilis*, from the Latin *spectabilis*, worth seeing, notable, admirable, in reference to the showy flowers

**SYNONYM:** *Melaleuca longistaminea* subsp. *spectabilis* Barlow ex Craven

**DESCRIPTION:** *Shrub* 0.3–2 m tall. *Branchlets* glabrous. *Leaves* alternate, peltate, 4.5–13.5 mm long, 3–11.5 mm wide, 1.2–2.3 times as long as wide, sessile; blade soon glabrescent, the marginal cilia ephemeral, ovate to broadly ovate, in transverse section transversely linear, sublunate or rarely strongly sublunate, the base truncate, subcordate or rounded, the apex acuminate, narrowly acuminate or rarely acute, the veins longitudinal, 11–19,

*oil glands* sparse to moderately dense, obscure or distinct, more or less in rows to scattered. *Inflorescences* capitate, lateral, with 5–15 monads, up to 45 mm wide. Floral bract 5–8 mm long; bracteoles 5–8 mm long, linear, narrowly obovate, linear elliptic or linear obovate. *Hypanthium* glabrous or subglabrous, 2.3–4 mm long. *Calyx lobes* abaxially glabrous or subglabrous, costate, 1–2.5 mm long, scarious in a marginal band 0.2–0.4 mm wide. *Petals* deciduous, 4.5–6.5 mm long. *Stamens* 9–24 per bundle; filaments greenish-yellow or pale yellow, 15.5–26.5 mm long, the bundle claw 8.8–13.5 mm long, 0.5–0.6 times as long as the filaments. *Style* 19.5–27.5 mm long. *Ovules* 30–75 per locule. *Fruit* 3.5–6.5 mm long, with sepaline teeth; cotyledons planoconvex.

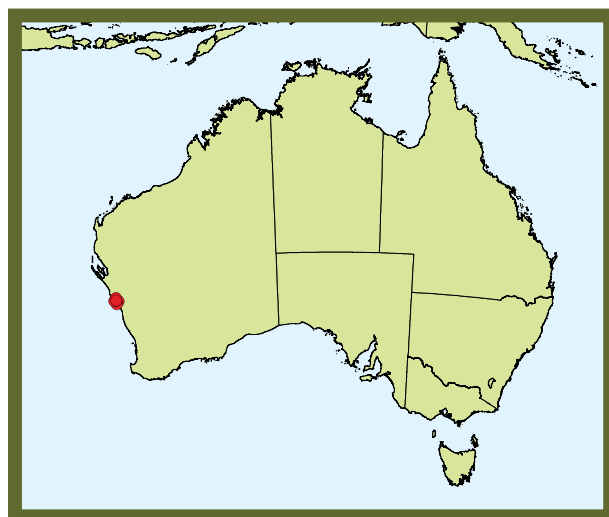
**NATURAL OCCURRENCE:** Western Australia: the Geraldton–Ajana district.

**ECOLOGY:** Recorded as occurring in scrubland, low open heath, shrubland, on sandy clay over sandstone, and gravelly clay loam.

**FLOWERING TIME:** Recorded as flowering in February and from August to October.

**ESSENTIAL OILS:** The leaf oil of this species was predominantly monoterpenoid in character, though there were significant amount of sesquiterpenes present. The principal monoterpene identified was 1,8-cineole (51.7%) and there were lesser amounts of  $\alpha$ -pinene (13.9%),  $\beta$ -pinene and limonene (both 2.2%) and  $\alpha$ -terpineol (1.0%). The main sesquiterpenes detected were  $\gamma$ -,  $\alpha$ - and  $\beta$ -eudesmol (1.8%, 3% and 8%, respectively), elemol (1.3%) and caryophyllene oxide (1.8%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.3%.



# *Melaleuca sphaerodendra* Craven & J.W.Dawson



**TAXONOMY:** Two varieties are recognised in this species: var. *microphylla* (Viot) Craven & J.W.Dawson and var. *sphaerodendra*

**PUBLICATION:** in Craven & Dawson, *Adansonia*, sér. 3, 20: 193 (1998), var. *microphylla*; in Craven & Dawson, *Adansonia*, sér. 3, 20: 192 (1998), var. *sphaerodendra*

**DERIVATION:** *microphylla*, from the Greek *micro*, small, little, and *phyllon*, leaf, in reference to the small leaves of this variety; *sphaerodendra*, from the Greek *sphaera*, sphere, ball, and *dendron*, tree, in reference to the often somewhat spheroidal shape of the crown of plants of this species

**SYNONYM:** *Callistemon gnidioides* Guillaumin

**DESCRIPTION:** *Shrub or tree* to 10 m tall. *Branchlets* with spreading to appressed hairs. *Leaves* 7–19 mm long, 2–5 mm wide, short-petiolate; blade glabrescent, the hairs similar to those on the branchlets, elliptic to obovate, the base attenuate, the apex rounded, the veins longitudinal, 3–5. *Inflorescences* pseudoterminal. *Hypanthium* 1.5–2.2 mm long. *Calyx lobes* ciliate, 0.6–0.9 mm long. *Petals* 1–2.2 mm long. *Stamens* 2–3 per bundle; filaments white, cream or creamish green, 7–11 mm long. *Style* 7–11 mm long. *Fruit* 2.2 mm long.

**NATURAL OCCURRENCE:** New Caledonia: var. *microphylla*: the north-western and central-western part of Grande Terre. var. *sphaerodendra*: the southern part of Grande Terre and also in scattered areas of its west coast.

**ECOLOGY:** var. *microphylla*: Recorded as occurring in maquis on steep scree slopes on ultramafic substrates. var. *sphaerodendra*: Recorded as occurring in open maquis on eroded soils on steep slopes on ultramafic substrates.

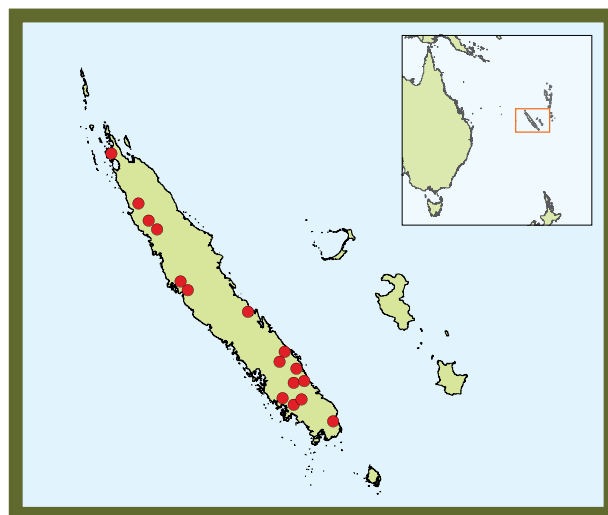
**FLOWERING TIME:** var. *microphylla*: Recorded as flowering from February to August, mainly in July. var. *sphaerodendra*: Recorded as flowering from April to November, mainly from July to September.

**ESSENTIAL OILS:** var. *microphylla*: This variety presented a sesquiterpenoid leaf oil. The principal sesquiterpenes encountered were  $\beta$ -caryophyllene (28.8%) and calamenene (11.1%). These were accompanied by lesser amounts of caryophyllene oxide (7.5%), spathulenol (3.8%),  $\alpha$ -copaene (4%) and cubenol (2.8%). A significant number of oxygenated sesquiterpenes, totalling approximately 10%, were not identified. Methyl eugenol (0.6%) was also present. The principal monoterpenes identified were  $\alpha$ -pinene (6.4%) and linalool (5.6%); the rest of the monoterpenes contributing approximately a further 3% in total. var. *sphaerodendra*: At present, no information is available on the oils of this variety.

**OIL YIELD:** var. *microphylla*: The oil yield (fresh weight, w/w) was 0.1%.

**REFERENCE ON ESSENTIAL OILS:** Hnawia et al. 2012

**NOTES:** The two varieties are distinguished as follows: var. *microphylla*: Leaves linear to narrowly obovate, 2–3 mm wide. var. *sphaerodendra*: Leaves elliptic to obovate, 3.5–5 mm wide.



## Melaleuca spicigera S.Moore



**PUBLICATION:** *Journal of Botany* 40: 25 (1902)

**DERIVATION:** *spicigera*, from the Latin *spica*, spike, and *-ger*, carrying, bearing, in reference to the spicate inflorescence of this species

**DESCRIPTION:** *Shrub* 0.2–3 m tall; bark fibrous, dark. *Branchlets* glabrescent to hairy, lanuginose-pubescent to lanuginose and often with some lanuginulose hairs also. *Leaves* alternate, 5–15 mm long, 2–6 mm wide, 1.4–3 times as long as wide, sessile; blade glabrescent, lanuginose to lanuginulose and occasionally with some lanuginose-pubescent to lanuginulose-pubescent hairs also, ovate or elliptic, in transverse section transversely linear or sublunate, the base cordate, subcordate or rounded, the apex obtusely shortly acuminate or acuminate, the veins longitudinal, 3–5, *oil glands* moderately dense, obscure to distinct, more or less in rows. *Inflorescences* spicate, lateral, with 3–28 monads, up to 20 mm wide. *Hypanthium* hairy, 1.5–2 mm long. *Calyx lobes* abaxially hairy, 0.7–1.2 mm long, scarious in a marginal band 0.1–0.3 mm wide.

*Petals* deciduous, 2.4–3.1 mm long. *Stamens* 9–16 per bundle; filaments mauve, purple, pink, mauve-pink or pale lilac, 7.5–10 mm long, the bundle claw 4–5.5 mm long, 0.5–0.6 times as long as the filaments. *Style* 7–10.5 mm long. *Ovules* 40–55 per locule. *Fruit* 3–4 mm long, with sepaline teeth; cotyledons subobovate (almost planoconvex).

**NATURAL OCCURRENCE:** Western Australia: from the Minnivale district south to the Ongerup district and eastwards to the Salmon Gums district.

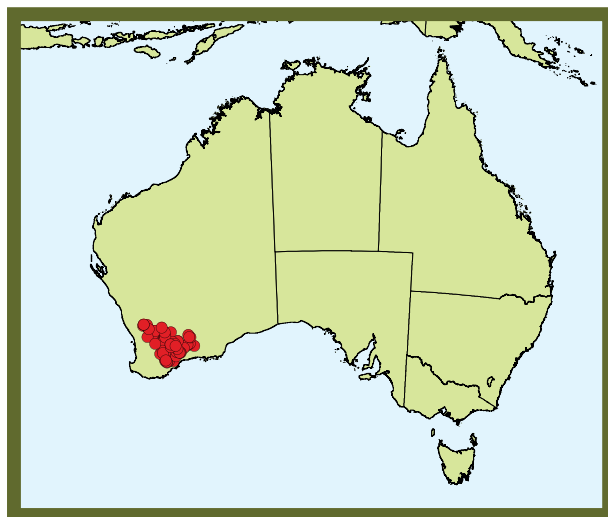
**ECOLOGY:** Recorded as occurring in shrubland with emergent mallee eucalypts, low mallee heath, low open heath, open eucalypt woodland, on loamy sand, lateritic clay sand, granite, sandy loam over clay, and sandy loam with laterite.

**FLOWERING TIME:** Recorded as flowering from September to December.

**ESSENTIAL OILS:** This species appeared to exist in two chemotypes. Chemotype I contained linalool (38.9%) and  $\alpha$ -pinene (16.0%) as its major components. These were accompanied by lesser amounts of globulol (6.1%), viridiflorol (5%), bicyclogermacrene (5.8%), viridiflorene (2.7%) and  $\beta$ -caryophyllene (1.4%). Chemotype II contained 1,8-cineole (50–64%) and  $\alpha$ -pinene (11–12%) as principal components. These were accompanied by lesser amounts of limonene (5–8%), globulol (4–6%) and viridiflorene (1–3%).

**OIL YIELD:** The oil yields (fresh weight, w/w) were 0.1% for chemotype I and 0.5–0.7% for chemotype II.

**NOTES:** According to Holliday (2004), good forms of this species are worthwhile ornamental shrubs in dry to humid temperate regions in Australia. In spite of the high linalool content of chemotype I, the poor oil yield would seem to rule out any commercial potential for this oil.





## *Melaleuca squamea* Labill.



**PUBLICATION:** *Novae Hollandiae plantarum specimen 2*: 28, t. 168 (1806)

**DERIVATION:** *squamea*, from the Latin *squama*, scale, in reference to Labillardière observing the bark of this species to be scaly and not papery

**DESCRIPTION:** *Shrub* 0.4–2 m tall. *Branchlets* glabrescent, the indumentum commonly dimorphic with a sparse layer of long, spreading pubescent to sericeous-pubescent hairs overlying a dense layer of much shorter puberulous to lanuginulose-puberulous hairs (the latter rarely lanuginulose or sericeous-lanuginulose or absent and then the indumentum consisting only of pubescent to sericeous-pubescent hairs). *Leaves* alternate, 4.5–12 mm long, 1–3 mm wide, 1.5–9 times as long as wide, subsessile to short-petiolate; blade glabrescent, pubescent to sericeous-pubescent, occasionally some puberulous to lanuginulose-puberulous hairs persisting on the petiole/leaf blade base, narrowly ovate, very narrowly ovate, linear-ovate, subulate or ovate, in transverse section transversely linear or sublunate, the base cuneate to attenuate or rounded, the apex narrowly acute to acute,

the veins longitudinal, 3–5, *oil glands* sparse, obscure to distinct, scattered. *Inflorescences* capitate or spicate, with 3–26 monads, up to 20 mm wide. *Hypanthium* glabrous or rarely glabrescent to hairy, 2–3 mm long. *Calyx lobes* abaxially glabrous or rarely glabrescent, 0.5–1 mm long, herbaceous to the margin or scarious in a marginal band up to 0.1 mm wide. *Petals* deciduous, 1.5–3 mm long. *Stamens* 4–9 per bundle; filaments purple, mauve, pink, purplish-pink or rarely cream to white, 5–7.7 mm long, the bundle claw 0.4–1 mm long, 0.1–0.2 times as long as the filaments. *Style* 7–10 mm long. *Ovules* 20–30 per locule. *Fruit* 3.5–7 mm long, the calyx lobes deciduous or weathering away (and then the extreme basal portion of the calyx may become woody and persist as a more or less prominent ring around the hypanthium rim); cotyledons planoconvex.

**NATURAL OCCURRENCE:** South Australia, New South Wales, Victoria, Tasmania: occurs disjunctly in south-eastern South Australia and south-western Victoria, much of Tasmania, and central subcoastal and north-eastern subcoastal New South Wales.

**ECOLOGY:** Recorded as occurring in riparian scrub, scrub fringing lagoon, swamp, open eucalypt woodland, subalpine forest, mixed forest, open heathland, edge of *Nothofagus* forest, low heath–sedgeland, wet sclerophyll forest, wet montane heath, on sand, sandstone, quartzite, clayey loam, peaty soil, sand dunes, and rocky areas.

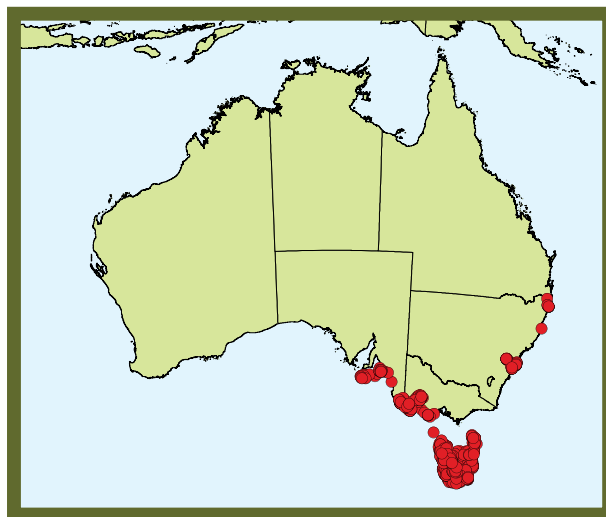
**FLOWERING TIME:** Recorded as flowering in June and from August to April.

**ESSENTIAL OILS:** This species produced an oil containing both mono- and sesquiterpenes, with the sesquiterpenes predominating. The principal sesquiterpenes encountered were  $\beta$ -caryophyllene (15–20%), globulol (7–11%), viridiflorol (9–14%), spathulenol (1–6%), aromadendrene (1–7%), viridiflorene (2–7%) and bicyclogermacrene (2–6%). The principal monoterpenes were  $\alpha$ -pinene (1–14%),  $\beta$ -pinene (0.1–5.0%) and limonene (0.3–2.0%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was <0.1%.

**NOTES:** Wrigley and Fagg (1993) noted that good colour forms should be selected as the pallid forms apparently are

less desirable horticulturally. The species is considered to be hardy in subtropical and temperate regions of eastern Australia.



## *Melaleuca squamophloia* (Byrnes) Craven



**PUBLICATION:** *Novon* 7: 118 (1997)

**DERIVATION:** *squamophloia*, from the Latin *squama*, scale, and the Greek *phloios*, bark, in reference to the hard, scaly bark of this species

**SYNONYM:** *Melaleuca styphelioides* var. *squamophloia* Byrnes

**DESCRIPTION:** *Shrub or tree* 2–7 m tall; bark hard, fibrous to scaly. *Branchlets* glabrescent, pubescent and usually with some shorter more or less puberulous hairs also. *Leaves* alternate, 4–12 mm long, 1.6–3.5 mm wide, 1.8–4.6 times as long as wide, sessile; blade soon glabrescent, the indumentum consisting of ephemeral cilia, narrowly ovate, very narrowly ovate, ovate or narrowly elliptic, in transverse section transversely linear, the base cuneate, the apex narrowly acuminate or narrowly acute, the veins longitudinal, 7–15, *oil glands* dense, distinct, scattered to more or less in rows. *Inflorescences* spicate, pseudoterminal or interstitial, with 5–16 triads, up to 20 mm wide. *Hypanthium* glabrescent, glabrous or hairy, 1.3–2.5 mm long. *Calyx lobes* abaxially glabrous or glabrescent, costate, 0.6–1.5 mm long, scarious in a marginal band 0.1–0.2 mm wide. *Petals* caducous to sometimes deciduous, 1.5–1.8 mm long. *Stamens* 15–20 per bundle; filaments white or cream, 5.5–10.2 mm long, the bundle claw 3–4 mm long, 0.4–0.6 times as long as the filaments. *Style* 7.5–8.5 mm long. *Ovules* 40–55 per locule. *Fruit* 2.5–3.5 mm long, the calyx lobes weathering away (or occasionally the basal portion of the lobes may persist

as a low ring around the hypanthium rim); cotyledons planoconvex.

**NATURAL OCCURRENCE:** Queensland: the Miles–Jandowae–Tara district.

**ECOLOGY:** Recorded as occurring in open woodland, scrubland, brigalow scrub, on clay, and clay loam.

**FLOWERING TIME:** Recorded as flowering from April to June, and from November to December.

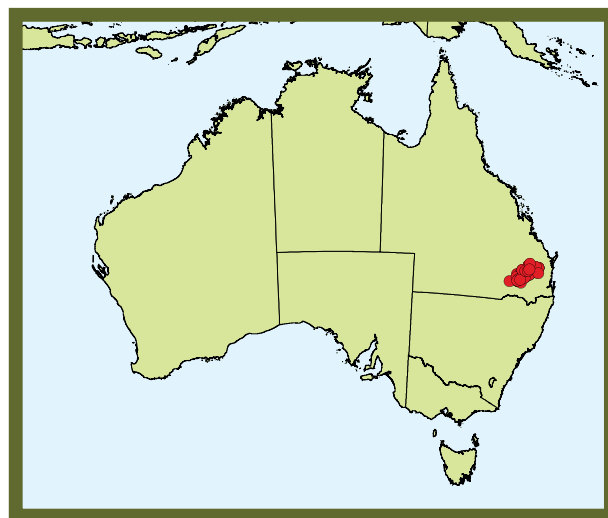
**ESSENTIAL OILS:** This species produced an aromatic oil in which the principal components were either elemicin or E-isoelemicin. In chemotype I, the principal component was elemicin (93–97%). This was accompanied by spathulenol (0.6–2.0%),  $\alpha$ -pinene (0.8–2.0%), E-methyl cinnamate (trace–2.0%) and bicyclogermacrene (0.1–0.4%). In chemotype II, the principal component was E-isoelemicin (65–79%). This was accompanied by elemicin (12–15%), Z-isoelemicin (3–4%),  $\alpha$ -pinene (3–6%) and spathulenol (0.5–2.0%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.4–3.1%, the majority being >1.7%.

**REFERENCES ON ESSENTIAL OILS:** Brophy 1999; Brophy et al. 1999

**NOTES:** The species may be suitable for shelter-belt plantings on heavier soils in dryish to humid subtropical climates.

A new species, related to *M. styphelioides*, *M. bracteata* and *M. squamophloia*, was discovered in 2012 in the Ravenshoe district, Queensland. This will be named *M. lophocoracorum*. It differs from its three relatives, inter alia, in details of the calyx, stamens and essential oil chemistry.



## Melaleuca squarrosa Donn ex Sm.



**PUBLICATION:** *Transactions of the Linnean Society of London* 6: 300 (1802)

**DERIVATION:** *squarrosa*, from the Latin *squarrosus*, rough with stiff bracts, scales, leaves etc., possibly in reference to the projecting leaves of this species

**DESCRIPTION:** *Shrub or tree* 0.5–10 m tall; bark papery, pale grey or light brown. *Branchlets* glabrescent, pubescent to sericeous-pubescent and usually grading into shorter puberulous to pubescent hairs (rarely the longer hairs may be more or less sericeous or matted). *Leaves* decussate, 5–16.2 mm long, 2.5–8.2 mm wide, 1.2–4.6 times as long as wide, short-petiolate to sessile; blade glabrescent, sericeous-pubescent to pubescent or sericeous, occasionally with some lanuginose-pubescent hairs also, ovate to narrowly ovate, broadly ovate, elliptic or broadly elliptic, in transverse section transversely linear, the base attenuate, subcordate, cordate or rounded to truncate, the apex acute to narrowly acute, acuminate or obtusely shortly acuminate, the veins longitudinal, 5–7, *oil glands* moderately dense, distinct to obscure, more or less in rows to scattered. *Inflorescences* spicate, with 4–20 triads, up to 22 mm wide. *Hypanthium* hairy (usually only at the base) or glabrous, 2–3 mm long. *Calyx lobes* abaxially glabrous

or rarely hairy, 0.7–1 mm long, scarious in a marginal band up to 0.1 mm wide or herbaceous to the margin. *Petals* deciduous, 2–2.7 mm long. *Stamens* 6–12 per bundle; filaments pale or lemon yellow to white, 6–8.6 mm long, the bundle claw 0.6–1.8 mm long, 0.1–0.2(–0.6) times as long as the filaments. *Style* 7–10 mm long. *Ovules* c. 10–20 per locule. *Fruit* 2.7–3.5 mm long, the calyx lobes weathering away (the extreme basal portion of the lobes may become woody and persist as a low ring or series of undulations around the hypanthium rim); cotyledons obvolute.

**NATURAL OCCURRENCE:** South Australia, New South Wales, Victoria, Tasmania: from the far south-east of South Australia, east into southern Victoria and northwards as far as the Sydney district in New South Wales and widespread in Tasmania.

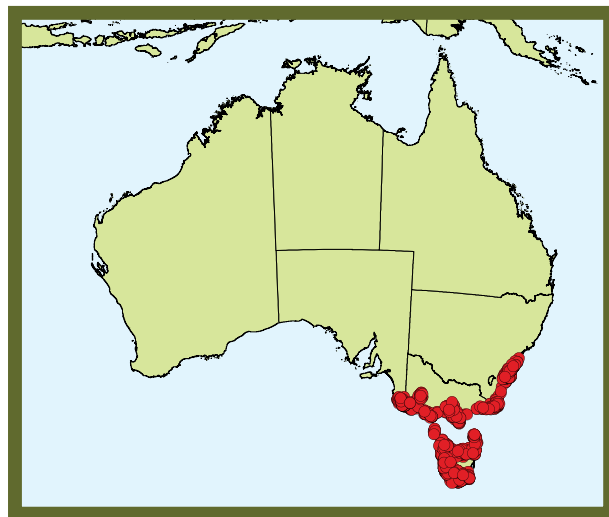
**ECOLOGY:** Recorded as occurring in marshland, wet heathlands, buttongrass plains, wet sclerophyll forest, tall coastal scrubland, riverine scrub, along waterways, on sand, peat, sandy soil over sandstone, and loamy sand.

**FLOWERING TIME:** Recorded as flowering from August to March.

**ESSENTIAL OILS:** The oil from this species was dominated by monoterpenes. The principal components were  $\alpha$ -pinene (22–38%), 1,8-cineole (24–37%) and  $\gamma$ -terpinene (9–12%). There were lesser amounts of limonene (3–5%), p-cymene (3–7%), linalool (1–3%) and  $\alpha$ -terpineol (4–6%). Sesquiterpenes contributed very little to the oil, with globulol (0.5–0.8%) being the major component.

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.2–0.4%.

**NOTES:** Wrigley and Fagg (1993) reported this to be a neat, handsome shrub with bright green foliage and perfumed flowers. It is suited to humid temperate regions and has some frost tolerance.



## *Melaleuca stenostachya* S.T.Blake



**PUBLICATION:** *Contributions from the Queensland Herbarium* 1: 50, figs 8, 14H, 15H (1968)

**DERIVATION:** *stenostachya*, from the Greek *stenos*, narrow, and *stachys*, ear of grain, spike, in reference to the narrow inflorescence

**DESCRIPTION:** *Shrub or tree* 1.5–15 m tall; bark papery or fibrous, white to dark grey. *Branchlets* glabrescent, sericeous. *Leaves* alternate, 25–120(–145) mm long, 2–16 mm wide, 3.7–18 times as long as wide, long- to short-petiolate; blade glabrescent, sericeous, very narrowly elliptic to linear-elliptic, narrowly elliptic or rarely also approaching narrowly obovate, subfalcate, in transverse section transversely linear, the base attenuate, the apex acuminate, narrowly acuminate or narrowly acute to acute, the veins longitudinal, 5–7, *oil glands* dense or moderately dense, obscure to distinct, scattered. *Inflorescences* spicate, pseudoterminal and sometimes also upper axillary, with 6–12 triads, up to 18 mm wide. *Hypanthium* hairy, 1–2 mm long. *Calyx lobes* abaxially glabrescent or glabrous, 0.6–1.2 mm long, scarious in a marginal band 0.1–0.2 mm wide. *Petals* deciduous, 1.4–2.2 mm long. *Stamens* 6–10 per bundle; filaments cream to creamy-white, 5.5–8 mm long, the bundle claw (0.8–)1.5–2.5 mm long, (0.1–)0.2–0.4 times

as long as the filaments. *Style* 7.5–9(–15) mm long. *Ovules* 25–30 per locule. *Fruit* 2–3 mm long, the calyx lobes weathering away; cotyledons obvolute.

**NATURAL OCCURRENCE:** Northern Territory, Queensland; also Papua New Guinea: from the Borroloola district in the Northern Territory eastwards to Cape York Peninsula in Queensland; southern Papua New Guinea.

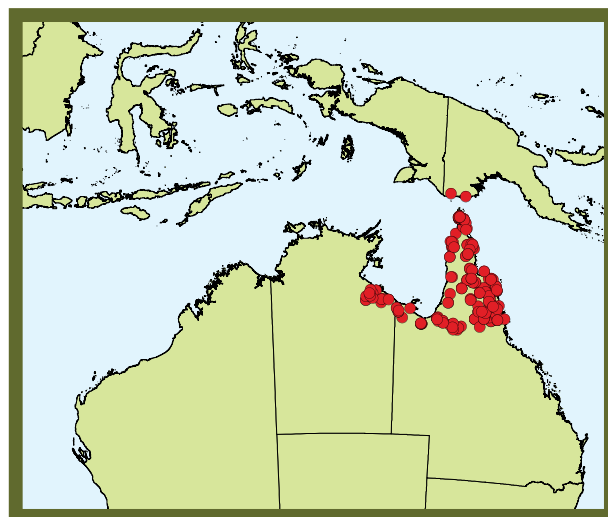
**ECOLOGY:** Recorded as occurring in open woodland, open eucalypt forest, *Melaleuca* woodland, mixed forest, tall open shrubland, seasonal swamps, along creeks, on sand, stony ridges, lateritic podsol flats, clay soil, sandy loam, sandstone, and granite.

**FLOWERING TIME:** Recorded as flowering from October to August.

**ESSENTIAL OILS:** This species produced a monoterpenoid oil. The principal components were 1,8-cineole (52–62%) and  $\alpha$ -pinene (19–29%). There were also lesser amounts of limonene (4–6%) and  $\alpha$ -terpineol (1–3%). A second collection (JD 2036) contained  $\alpha$ -pinene (27–29%),  $\beta$ -pinene (41–44%) and 1,8-cineole (11–13%). The main sesquiterpenes encountered in both collections were  $\beta$ -caryophyllene (2–6%), globulol and spathulenol (both <0.6%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 1.3–1.8%. For the sample JD 2036, the oil yield was 1.0–1.2%.

**REFERENCES ON ESSENTIAL OILS:** Brophy et al. 1988; Brophy and Doran 1996; Brophy 1999



## Melaleuca stereophloia Craven



**PUBLICATION:** in Craven & Lepschi, *Australian Systematic Botany* 12: 905 (1999)

**DERIVATION:** *stereophloia*, from the Greek *stereos*, hard, stiff, and *phloios*, bark, in reference to the hard bark of this species

**DESCRIPTION:** *Shrub* 1–4 m tall; bark fibrous, hard, grey. *Branchlets* glabrescent, pubescent or rarely shortly sericeous. *Leaves* alternate, 11–44 mm long, 1–2.2 mm wide, 8–30 times as long as wide, short-petiolate to sessile; blade glabrescent, pubescent or rarely shortly sericeous, very narrowly elliptic to linear-elliptic, linear or very narrowly obovate, in transverse section transversely oblenticular, flattened transversely semielliptic, transversely narrowly elliptic to transversely elliptic, transversely oblong or transversely narrowly oblong, the base narrowly cuneate to attenuate or parallel (blade width equals petiole width), the apex narrowly acuminate or acuminate, the veins longitudinal, 3, *oil glands* moderately dense, distinct, in rows to more or less in rows. *Inflorescences* capitate (in bud sometimes spicate), with 4–13 triads. *Hypanthium* hairy,

1–1.3 mm long. *Calyx lobes* abaxially glabrous (rarely a very few scattered hairs may be present but effectively glabrous), 0.2–0.5 mm long, scarious throughout. *Petals* deciduous, 0.9–2 mm long. *Stamens* 3–7 per bundle; filaments yellow, cream, creamy-yellow or creamy-white, 4–6 mm long, the bundle claw 1.5–3.5 mm long, 0.5–0.7 times as long as the filaments. *Style* 4–7 mm long. *Ovules* 15–25 per locule. *Infructescences* globose. *Fruit* 1.8–2.2 mm long, the calyx lobes weathering away; cotyledons planoconvex.

**NATURAL OCCURRENCE:** Western Australia: from the Wooramel–Meekatharra district southwards to the Coorow–Koorda district.

**ECOLOGY:** Recorded as occurring in mallee shrubland, heath, sand plain, tall shrubland, open shrubland, *Melaleuca* thicket, saline flats, edge of freshwater lake, on sand, lateritic sand, clay pan, granite, clay loam with quartz, and sandy loam over laterite.

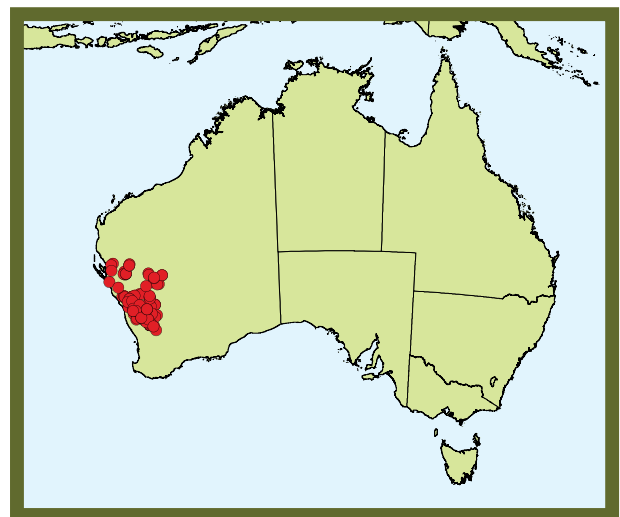
**FLOWERING TIME:** Recorded as flowering from August to October.

**ESSENTIAL OILS:** This species yielded an oil dominated by monoterpenes. The principal monoterpene was 1,8-cineole (78–83%). This was accompanied by lesser amounts of  $\alpha$ -pinene (1–5%), limonene (2–4%), myrcene (1–2%) and  $\alpha$ -terpineol (5–6%). The sesquiterpenes were neither numerous nor plentiful. The principal members were  $\alpha$ -cadinol (0.7–2.0%) and  $\delta$ -cadinene (0.5–1.0%).

**OIL YIELD:** The oil yield (dry weight, w/w) was 2–3%.

**REFERENCE ON ESSENTIAL OILS:** Brophy et al. 2006b

**NOTES:** This is a very ornamental species and should be trialled in areas with a semi-arid to dry Mediterranean climate as a garden shrub. It is a member of the broombush complex but it is not likely to be suitable for brushwood production.



## *Melaleuca stipitata* Craven



**PUBLICATION:** in Craven & Barlow, *Novon* 7: 118, fig. 2E–G (1997)

**DERIVATION:** *stipitata*, from the Latin *stipes*, stipe, in reference to the stipitate hypanthium

**DESCRIPTION:** *Tree* 3–4 m tall; bark papery, grey. *Branchlets* glabrous. *Leaves* alternate, 18.5–75 mm long, 0.8–4.8 mm wide, 9–70 times as long as wide, short-petiolate to sessile; blade glabrous, linear-obovate, very narrowly obovate, linear or very narrowly elliptic to linear-elliptic, falcate to subfalcate, in transverse section transversely linear, the base attenuate, the apex acuminate, the veins longitudinal, 3, *oil glands* dense, distinct to obscure, scattered. *Inflorescences* spicate (partly leafy), pseudoterminal or terminal, with 3–10 triads (sometimes some monads may occur), up to 15 mm wide. *Hypanthium* effectively glabrous (a few puberulous hairs may be present at the base of the stipe), 1.2–2 mm long.

*Calyx lobes* abaxially glabrous, 0.3–0.8 mm long, scarious in a marginal band 0.1–0.2 mm wide. *Petals* deciduous, 1.5–1.8 mm long. *Stamens* 7–14 per bundle; filaments white or cream, 4.5–6 mm long, the bundle claw 1.7–3 mm long, 0.4–0.5 times as long as the filaments. *Style* 5.5–6.5 mm long. *Ovules* 7–15 per locule. *Fruit* 2.2–3 mm long, the calyx lobes persistent; cotyledons planoconvex.

**NATURAL OCCURRENCE:** Northern Territory: the Bukbukluk area in the Alligator Rivers district.

**ECOLOGY:** Recorded as occurring in woodland, and on stony slopes.

**FLOWERING TIME:** Recorded as flowering in December.

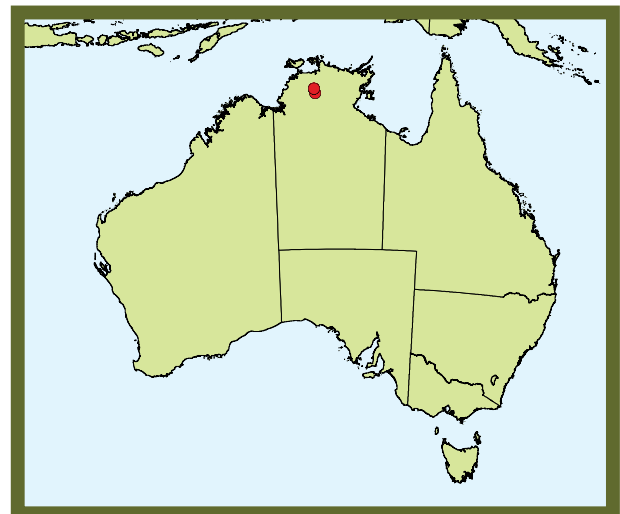
**ESSENTIAL OILS:** The oil from this species was pleasantly lemon scented and was composed primarily of monoterpenes. The principal monoterpenes identified were neral (13.7%), geranial (29.8%) and terpinen-4-ol (10.4%). These were accompanied by lesser amounts of sabinene (6.0%), 1,8-cineole (5.3%),  $\gamma$ -terpinene (5.8%) and  $\alpha$ -terpinene (3.6%). Sesquiterpenes contributed very little to this oil, the largest components being globulol, viridiflorol and spathulenol (in total <2%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 1.9%.

**REFERENCES ON ESSENTIAL OILS:** Brophy and Doran 1996; Brophy 1999

**NOTES:** The hypanthium of this species is stipitate; apparently this is the only occurrence of the character state in the genus.

The pleasant, lemon-smelling essential oil of this species contains both citral (neral and geranial) and terpinen-4-ol, substances noted for their antimicrobial activity. This oil might be suitable for commercial development but would require appropriate research and development.



## Melaleuca stramentosa Craven



**PUBLICATION:** in Craven & Lepschi, *Australian Systematic Botany* 12: 906 (1999)

**DERIVATION:** *stramentosa*, from the Latin *stramentum*, thatch, straw, in reference to the matted indumentum that is such a distinctive feature of this species

**DESCRIPTION:** *Shrub* 0.5–1 m tall. *Branchlets* glabrescent, generally slightly matted-sericeous to lanuginose-sericeous or rarely sericeous-pubescent hairs.

*Leaves* alternate, 6–12 mm long, 1–1.5 mm wide, 4.3–12 times as long as wide, sessile; blade glabrescent, more or less matted-sericeous to lanuginose-sericeous or rarely sericeous-pubescent, generally becoming lanuginose-pubescent to lanuginose distally, linear, linear-obovate or narrowly oblong, in transverse section depressed obovate,

semicircular, transversely elliptic or transversely semi-elliptic, the base truncate, the apex acuminate or obtuse to rounded, the veins longitudinal, 3, *oil glands* moderately dense, obscure, in rows to more or less in rows.

*Inflorescences* capitate, pseudoterminal and sometimes also upper axillary, with 1–4 triads, up to 17 mm wide.

*Hypanthium* hairy, 1.8–2 mm long. *Calyx lobes* abaxially hairy, 0.4–1 mm long, scarious in a marginal band 0.1–0.3 mm wide or herbaceous to the margin.

*Petals* deciduous, 1.3–2 mm long. *Stamens* 4–6 per bundle; filaments purple or deep mauve pink, 6.5–8.2 mm long, the bundle claw 1.5–3.1 mm long, 0.2–0.4 times as long as the filaments. *Style* 6.5–7.5 mm long. *Ovules* c. 10–15 per locule. *Infructescences* peg-fruited. *Fruit* 3.5–4 mm long, with sepaline teeth; cotyledons obvolvate.

**NATURAL OCCURRENCE:** Western Australia: the Ravens-thorpe district.

**ECOLOGY:** Recorded as occurring in low heathland, on gravel, and clay.

**FLOWERING TIME:** Recorded as flowering in October.

**ESSENTIAL OILS:** The oil from this species contained a mixture of mono- and sesquiterpenes, with the sesquiterpenes predominating. The principal sesquiterpenes were  $\gamma$ -eudesmol (14.3%),  $\alpha$ -eudesmol (9.7%),  $\beta$ -eudesmol (14.1%), globulol (3.5%), viridiflorol (4.8%) and spathulenol (2.5%). The principal monoterpene was  $\alpha$ -pinene (13.3%). There were lesser amounts of 1,8-cineole (3.8%),  $\beta$ -pinene (2.7%), limonene (1.5%) and  $\alpha$ -terpineol (1.1%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.3%.





## *Melaleuca striata* Labill.



**PUBLICATION:** *Novae Hollandiae plantarum specimen 2*: 26, t. 165 (1806)

**DERIVATION:** *striata*, from the Latin, *stria*, fine linear marking, groove, streak, in reference to the leaves being striate

**DESCRIPTION:** *Shrub* to 2 m tall. *Leaves* 5.7–21 mm long, 1–2.5 mm wide, sessile or short-petiolate; blade hairy or glabrescent, linear-elliptic to narrowly ovate, in transverse section sublunate or transversely narrowly

suboblong. *Inflorescences* spicate (occasionally capitate) with 7–20 triads, bracteoles absent on each flower in the floral unit. *Hypanthium* sericeous. *Calyx lobes* not costate, depressedly triangular or transversely elliptic, 0.5–0.7 mm long. *Stamens* 7–13 per bundle; filaments pink, red, mauve or purple, 5.3–10.9 mm long. *Style* 5–10.4 mm long. *Ovules* 5 per locule. *Fruit* 2.4–3.4 mm long; with the distal rim flat or more or less so.

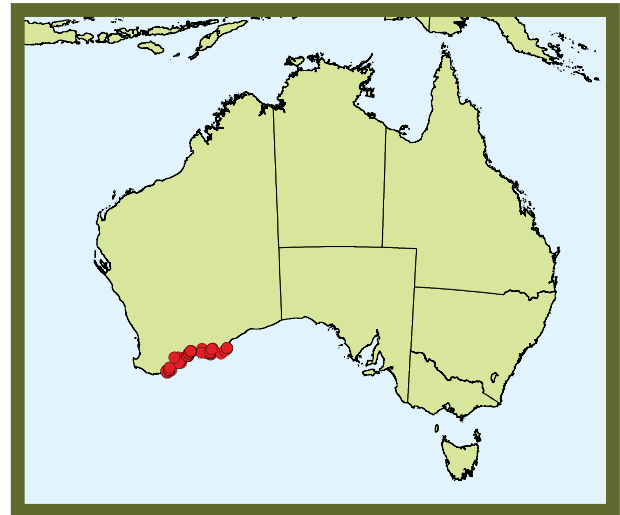
**NATURAL OCCURRENCE:** Western Australia: from Albany eastwards to Israelite Bay.

**ECOLOGY:** Recorded as occurring in heath and shrublands and sand-plain scrub; preferring sandy and gravelly soils over lateritic or granitic substrates.

**FLOWERING TIME:** Recorded as flowering from August to February.

**ESSENTIAL OILS:** Monoterpenes were the principal components of the leaf oil of this species. The major components were 1,8-cineole (52.2%),  $\alpha$ -pinene (14.1%) and  $\alpha$ -terpineol (10.1%). There were lesser amounts of linalool (3.1%), geraniol (1.9%) and limonene (5.2%). The principal sesquiterpenes encountered were bicyclogermacrene (2.5%), globulol (1.3%), viridiflorol (1.1%) and spathulenol (0.8%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.1%.



## Melaleuca strobophylla Barlow



**PUBLICATION:** in Barlow & Cowley, *Australian Systematic Botany* 1: 116, fig. 9c–d (1988)

**DERIVATION:** *strobophylla*, from the Greek *strobos*, anything twisted, cone, and *phyllon*, leaf, in reference to the twisted leaves

**DESCRIPTION:** *Tree or shrub* 1.5–12 m tall; bark papery, white. *Branchlets* glabrescent, lanuginulose-puberulous to lanuginulose. *Leaves* alternate, 4.5–12.5 mm long, 1.2–2.3 mm wide, 2.4–6.5 times as long as wide, subsessile to short-petiolate; blade glabrescent, lanuginulose-puberulous to lanuginulose, narrowly ovate, very narrowly ovate, narrowly elliptic or very narrowly elliptic, in transverse section sublunate, the base attenuate, cuneate or truncate, the apex acuminate, the veins longitudinal, 3, *oil glands* moderately dense, obscure, in rows. *Inflorescences* spicate, pseudoterminal or interstitial, with 8–23 dyads, up to 20 mm wide. *Hypanthium* hairy, 1.5–2 mm long. *Calyx lobes* abaxially

glabrescent or glabrous, 1–1.5 mm long, scarious in a marginal band 0.2–0.3 mm wide. *Petals* deciduous, 2.2–3 mm long. *Stamens* 16–27 per bundle; filaments white, 5.8–8 mm long, the bundle claw 3–4.5 mm long, 0.5–0.6 times as long as the filaments. *Style* 5–8.2 mm long. *Ovules* c. 20–30 per locule. *Fruit* 2–4 mm long, the calyx lobes weathering away (the extreme basal portion of the lobes may become woody and persist as undulations around the hypanthium rim); seeds not seen.

**NATURAL OCCURRENCE:** Western Australia: the Eneabba – Three Springs and Yalgoo districts to the Stirling Range district and eastwards to the Salmon Gums district.

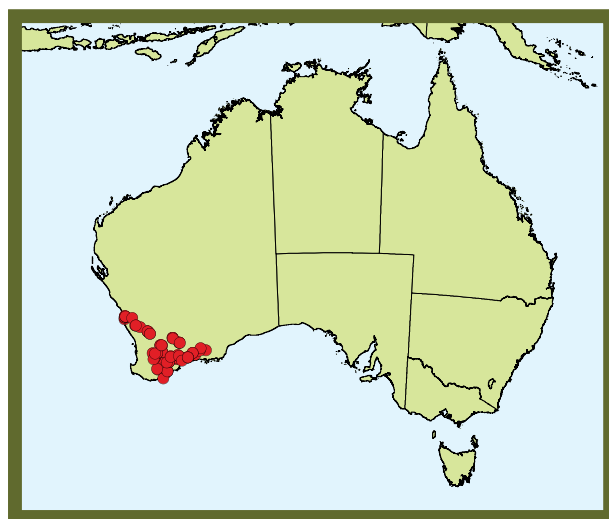
**ECOLOGY:** Recorded as occurring in low open forest, waterlogged salt flats, swamp, *Melaleuca* thicket, low woodland, creek beds, on clay loam, silty sand, sandy clay over granite, and loamy sand over clay.

**FLOWERING TIME:** Recorded as flowering from January to April, and in November.

**ESSENTIAL OILS:** The leaf oil of this species contained roughly equal amounts of mono- and sesquiterpenes. The principal monoterpene encountered was  $\alpha$ -pinene (53.6%). This was accompanied by much lesser amounts of  $\beta$ -pinene (1.8%), limonene (1.5%),  $\alpha$ -terpineol (4.1%) and geraniol (1.2%). A large number of sesquiterpenes were present, though individually not in large amounts. The principal sesquiterpenes encountered were  $\alpha$ - and  $\beta$ -eudesmol (2.2% and 2.4%, respectively), spathulenol (2.4%), globulol (2.2%), cubeban-11-ol and caryophyllene oxide (both 1.7%), aromadendrene (2.6%) and  $\beta$ -caryophyllene (1.3%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.1%.

**NOTES:** This species may be suitable for use in shelter belts, land revegetation projects etc. on winter-wet soils in dry to humid temperate regions.



## *Melaleuca styphelioides* Sm.



**PUBLICATION:** *Transactions of the Linnean Society of London* 3: 275 (1797)

**DERIVATION:** *styphelioides*, from *Styphelia*, a genus of Ericaceae, and the Greek *-oides*, resembling, in reference to the similarity between the leaves of this plant and those of species of *Styphelia*

**DESCRIPTION:** *Tree or shrub* 3–10 m tall; bark papery, white to black grey. *Branchlets* glabrescent, pubescent to sericeous-pubescent with some shorter puberulous to pubescent hairs also present. *Leaves* alternate, 4–25 mm long, 2–7.2 mm wide, 1.5–4 times as long as wide, sessile; blade glabrescent, usually ciliate on the margin only or sometimes also with minute sericeous to puberulous or lanuginulose-puberulous hairs on the lamina, ovate to narrowly ovate, broadly ovate or narrowly elliptic, in transverse section transversely linear, the base cuneate to rounded, the apex narrowly acuminate, acuminate or narrowly acute, the veins longitudinal, 15–30, *oil glands* sparse, distinct to obscure, in rows. *Inflorescences* spicate, pseudoterminal or interstitial, with 4–15 triads (some proximal nodes with monads), up to 24 mm wide. *Hypanthium* hairy, 1.7–2.6 mm

long. *Calyx lobes* abaxially hairy or glabrescent, costate, 1.3–3 mm long, herbaceous to the margin. *Petals* caducous, 1–2.5 mm long. *Stamens* 12–26 per bundle; filaments white to cream, 8.5–12.5 mm long, the bundle claw 4–5.5 mm long, 0.3–0.6 times as long as the filaments. *Style* 7–11 mm long. *Ovules* 45–55 per locule. *Fruit* 2.5–3 mm long, the calyx lobes weathering away (the basal portion of the lobes often persist as low undulations around the hypanthium rim); cotyledons obvolvate.

**NATURAL OCCURRENCE:** Queensland, New South Wales: from the Rockhampton – Mary River district in Queensland, south to the Nowra district in New South Wales.

**ECOLOGY:** Recorded as occurring in swampy areas, open eucalypt forest, near the edge of a brackish swamp, shrubland, along watercourses, open woodland, wet sclerophyll forest, and on clay soil.

**FLOWERING TIME:** Recorded as flowering from November to January.

**ESSENTIAL OILS:** This species produced very little oil and this was sesquiterpenoid in nature. The principal sesquiterpenes were caryophyllene oxide (22–26%) and

spathulenol (18–20%). There were lesser amounts of  $\beta$ -caryophyllene (4–5%), allo-aromadendrene (5–10%) and globulol (3–5%), as well as numerous unidentified oxygenated sesquiterpenes in small amounts. The main monoterpenes encountered were  $\alpha$ -pinene (0.1–7.0%), 1,8-cineole (2–4%) and p-cymene (0.1–3.0%).

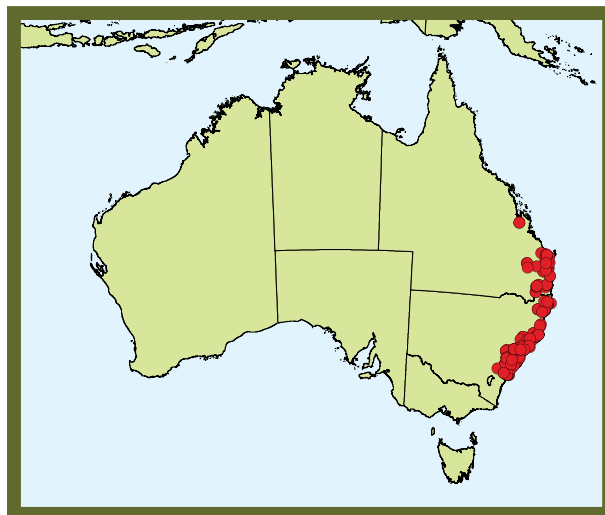
**OIL YIELD:** The oil yield (fresh weight, w/w) was <0.1%.

**REFERENCE ON ESSENTIAL OILS:** Brophy et al. 1999

**NOTES:** *Melaleuca styphelioides* is a hardy species that is successfully grown in subtropical and temperate regions in Australia. In cultivation it frequently develops into a tree and is best suited for larger gardens and parks. It has been used as a street tree to good effect. The papery bark on the trunk is a feature of the species.

A new species, related to *M. styphelioides*, *M. bracteata* and *M. squamophloia*, was discovered in 2012 in the Ravenshoe district, Queensland. This will be named *M. lophocoracorum*. It differs from its three relatives,

inter alia, in details of the calyx, stamens and essential oil chemistry.



## *Melaleuca subalaris* Barlow



**PUBLICATION:** in Barlow & Cowley, *Australian Systematic Botany* 1: 106 (1988)

**DERIVATION:** *subalaris*, from the Latin *sub-*, somewhat, not completely, a little, and *ala*, wing, upper part of the arm that joins the shoulder, hence *alaris*, axillary, in reference to the impression that the flowers are simply axillary rather than on a determinate lateral shoot

**DESCRIPTION:** *Shrub or tree* 1–5 m tall; bark papery, white. *Branchlets* soon glabrescent, the lanuginulose hairs apparently ephemeral. *Leaves* decussate, 1.8–3.7 mm long, 0.9–1.5 mm wide, 2–2.5 times as long as wide, subsessile; blade soon glabrescent, the lanuginulose hairs apparently ephemeral, elliptic or obovate, in transverse section flattened transversely semielliptic or transversely semielliptic, the base cuneate to rounded, the apex rounded to obtuse, the veins longitudinal, 3, *oil glands* moderately dense, obscure, in rows. *Inflorescences* capitate, pseudoterminal, with 1–4 monads, up to 12 mm wide. *Hypanthium* glabrous, 1.3–1.8 mm long. *Calyx lobes* abaxially glabrous, 1–1.5 mm long, scarios in a marginal band 0.1–0.3 mm

wide or herbaceous to the margin. *Petals* deciduous, 2–2.5 mm long. *Stamens* 8–18 per bundle; filaments white, cream or pale yellowish-cream, 3.8–4.6 mm long, the bundle claw 1.5–2 mm long, 0.4–0.5 times as long as the filaments. *Style* 5.2–7.8 mm long. *Ovules* 35–45 per locule. *Fruit* 3–4 mm long, with weakly developed sepaline teeth often immersed in the hypanthium wall or the calyx lobes weathering away; cotyledons flattened planoconvex to planoconvex.

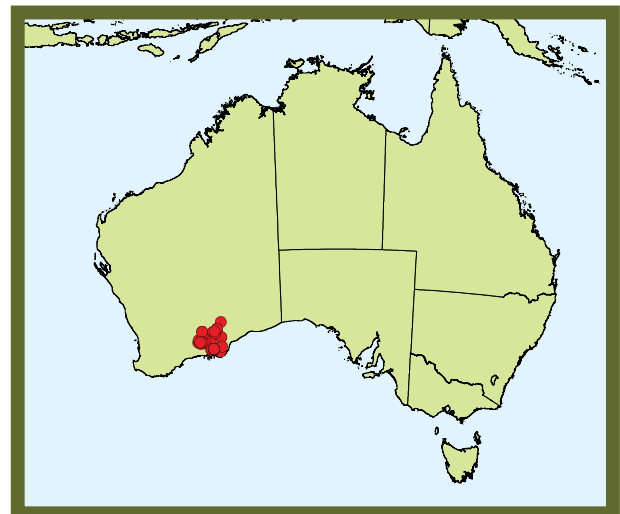
**NATURAL OCCURRENCE:** Western Australia: from the Peak Charles district eastwards to the Zanthus–Esperance district.

**ECOLOGY:** Recorded as occurring in eucalypt woodland with *Melaleuca* understorey, mallee woodland, swamp margin, open shrubland, edge of salt lake, saline depression, seasonally wet *Melaleuca* scrub, on clay, loam, sand over clay, sand over limestone, and gravelly clay with granite.

**FLOWERING TIME:** Recorded as flowering in September and October.

**ESSENTIAL OILS:** This species presented an overwhelmingly monoterpenoid oil. The principal components were 1,8-cineole (33.3%), terpinen-4-ol (13.9%) and  $\alpha$ -pinene (7.1%). These were accompanied by lesser amounts of  $\beta$ -pinene (4.6%),  $\gamma$ -terpinene (4.5%), p-cymene (4.3%), limonene (4.7%), trans-menth-2-en-1-ol (4.3%),  $\alpha$ -terpineol (2.9%) and myrtenol (2.3%). The principal sesquiterpenes detected in the oil were spathulenol (2.3%), globulol (1.0%) and bicyclgermacrene (0.6%). There were small (0.5%) amounts of two aromatic compounds present of molecular weights 222 and 238.

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.5%.



## Melaleuca suberosa (Schauer) C.A.Gardner



**PUBLICATION:** *Enumeratio Plantarum Australiae Occidentalis* 91 (1931)

**DERIVATION:** *suberosa*, from the Latin *suber*, cork, in reference to the corky bark

**SYNONYM:** *Calothamnus suberosus* Schauer

**DESCRIPTION:** *Shrub* 0.2–1 m tall; bark corky, grey. *Branchlets* soon glabrescent, the lanuginulose-puberulous to puberulous hairs ephemeral, rarely some lanuginulose hairs may also be present. *Leaves* alternate, 3–6.5 mm long, 0.8–1.5 mm wide, 3.5–6.5 times as long as wide, sessile; blade soon glabrescent, the lanuginulose hairs ephemeral, very narrowly elliptic or very narrowly obovate, in transverse section depressed obovate or transversely semielliptic, the base cuneate, the apex broadly acute or obtuse, the veins longitudinal, 3, *oil glands* moderately dense, distinct, in rows. *Inflorescences* lateral on the major stems, consisting of monads that are partly

immersed in the corky bark (often only the perianth, stamens and style are exerted). *Hypanthium* hairy, 1–1.5 mm long. *Calyx lobes* abaxially glabrous, 0.6–1 mm long, scarious in a marginal band up to 0.2 mm wide or herbaceous to the margin. *Petals* deciduous, 2–3.2 mm long. *Stamens* 9–15 per bundle; filaments pink, mauve or purple, 4.5–6.5 mm long, the bundle claw 0.7–1.3 mm long, 0.2 times as long as the filaments. *Style* 5–9 mm long. *Ovules* c. 20–30 per locule. *Fruit* 2–3 mm long, with sepaline teeth; cotyledons planoconvex to subobovulate.

**NATURAL OCCURRENCE:** Western Australia: from the Albany district eastwards to the Cocklebidly district.

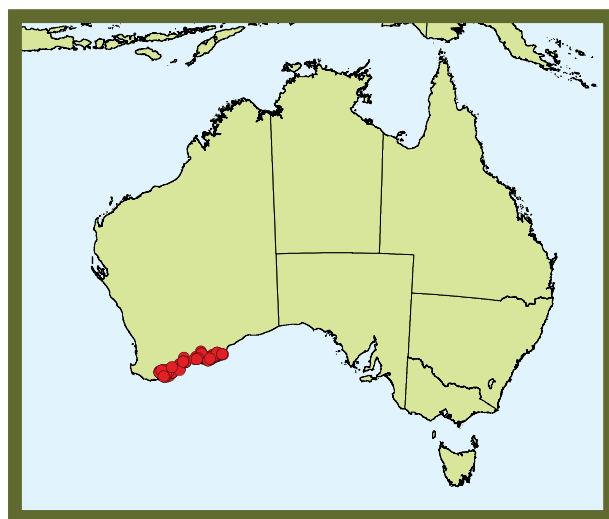
**ECOLOGY:** Recorded as occurring in heath, scrub, sand plain, mallee heath, swamp, low shrubland, on sand, sandy soil over laterite, loamy sand over quartzite, and sandy-peaty soil.

**FLOWERING TIME:** Recorded as flowering from July to January.

**ESSENTIAL OILS:** This species presented an overwhelmingly monoterpene leaf oil. The principal monoterpene was 1,8-cineole (87.3%) and this was accompanied by lesser amounts of  $\alpha$ -pinene (1.2%), limonene (2.3%) and  $\alpha$ -terpineol (1.4%). Sesquiterpenes were, of necessity, not abundant in this oil, with the major members being spathulenol (1.2%), globulol (0.7%) and viridiflorol (0.2%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.6%.

**NOTES:** The ramiflorous condition is uncommon in *Melaleuca*, with *M. suberosa* being the best known of those species in which it occurs. The corky bark also is a feature of the species. Reports on its success in cultivation as an ornamental shrub are mixed and it seems that it may be best grown on light, acidic soils in dry Mediterranean environments.



## *Melaleuca subfalcata* Turcz.



**PUBLICATION:** *Bulletin de la classe physico-mathématique de l'Académie Impériale des Sciences de Saint-Petersbourg* 10: 341 (1852)

**DERIVATION:** *subfalcata*, from the Latin *sub-*, somewhat, not completely, a little, and *falcatus*, sickle-shaped, hooked, in reference to the leaf shape

**DESCRIPTION:** *Shrub* 0.3–3 m tall; bark fibrous. **Branchlets** glabrescent, lanuginulose to lanuginulose-puberulous and occasionally with some sericeous-lanuginulose hairs also. **Leaves** alternate, 8–23 mm long, 0.9–2 mm wide, 8–16 times as long as wide, sessile to short-petiolate; blade glabrescent, lanuginulose to lanuginulose-puberulous, occasionally with some sericeous-lanuginulose hairs also, linear or linear-elliptic, subfalcate, in transverse section depressed obovate or transversely semielliptic, the base cuneate or parallel (blade width equals petiole width), the apex acuminate to narrowly acute, the veins longitudinal, 3, **oil glands** moderately dense, obscure to distinct, in rows. **Inflorescences** spicate, lateral or sometimes pseudoterminal, with 5–30 monads, up to 27 mm wide. **Hypanthium** hairy, 1.5–2 mm long. **Calyx lobes** abaxially hairy, 0.9–1.5 mm

long, scarious in a marginal band 0.1–0.2 mm wide. **Petals** deciduous, 2.5–4.5 mm long. **Stamens** 11–22 per bundle; filaments purple, mauve or pink, 8–13 mm long, the bundle claw 4–5.8 mm long, 0.4–0.6 times as long as the filaments. **Style** 7.5–14 mm long. **Ovules** 40–80 per locule. **Fruit** 2.5–3.5 mm long, the calyx lobes weathering away (the extreme basal portion of the lobes may become woody and persist as undulations around the hypanthium rim); cotyledons planoconvex.

**NATURAL OCCURRENCE:** Western Australia: from the Ongerup district eastwards to the Lake King and Israelite Bay districts.

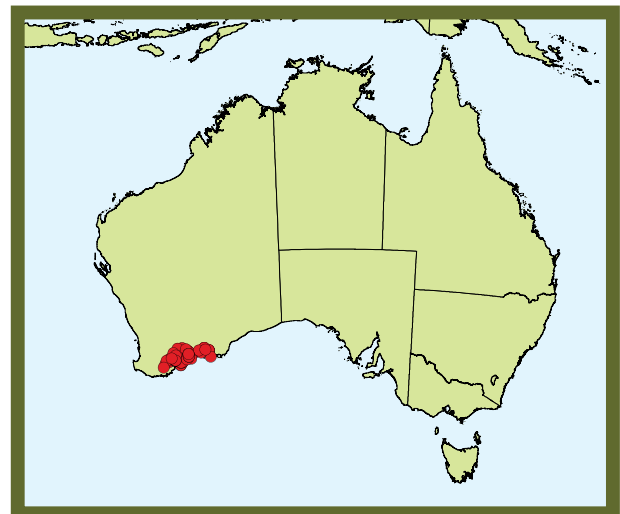
**ECOLOGY:** Recorded as occurring in heath with mallee, low woodland with dense shrubby *Melaleuca* understorey, dense heath under mixed open mallee, scrub, open eucalypt woodland, on sand, sand over clay, laterite, and quartzitic clay.

**FLOWERING TIME:** Recorded as flowering from November to March.

**ESSENTIAL OILS:** The leaf oil of this species was dominated by monoterpenes. The principal monoterpenes were 1,8-cineole (56–63%) and  $\alpha$ -pinene (11–17%). These were accompanied by lesser amounts of limonene (5–7%),  $\beta$ -pinene and myrcene (both 1–2%) and  $\alpha$ -terpineol (2–4%). The principal sesquiterpenes encountered in the oil were globulol (1–7%), spathulenol (0.4–2.0%) and aromadendrene (0.4–0.6%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.2–0.8%.

**NOTES:** This shrub is regarded as being a satisfactory ornamental shrub in Australia, suited to low rainfall and temperate regions.



## Melaleuca subtrigona Schauer



**PUBLICATION:** in Lehmann, *Plantae Preissianae* 1: 139 (1844)

**DERIVATION:** *subtrigona*, from the Latin *sub-*, somewhat, not completely, a little, and *trigonus*, three-angled, in reference to the leaves being somewhat trigonous

**DESCRIPTION:** *Shrub* 0.2–1 m tall. *Branchlets* glabrescent, puberulous to short-pubescent, rarely distinctly dimorphic with dense short puberulous to pubescent hairs overlaid with scattered, much longer pubescent hairs.

*Leaves* alternate, 2.5–10.5 mm long, 0.7–1.2 mm wide, 3–10 times as long as wide, subsessile to short-petiolate; blade glabrescent, the indumentum variable, generally with more or less sericeous to lanuginose-sericeous and sericeous-pubescent hairs, often with some lanuginose-puberulous to puberulous and/or shortly pubescent hairs as well, rarely dimorphic, very narrowly obovate, linear-obovate or very narrowly elliptic to linear-elliptic, in transverse section depressed obovate, semicircular to transversely semielliptic or transversely narrowly elliptic, the base narrowly cuneate, rounded or parallel (blade width equals petiole width), the apex obtuse to acute or rounded, the veins longitudinal, 3, *oil glands* moderately dense, distinct, more or less in rows to scattered.

*Inflorescences* capitate, pseudoterminal, with 2–6 triads, up to 16 mm wide. *Hypanthium* hairy, 1.3–2 mm long.

*Calyx lobes* abaxially glabrous or glabrescent, 0.5–1.3 mm long, scarious in a marginal band 0.3–0.8 mm wide or scarious throughout. *Petals* deciduous (occasionally tardily caducous), 1.5–2.5 mm long. *Stamens* 3–7 per bundle; filaments pink, purple, magenta or mauve, 5.5–10.5 mm long, the bundle claw 1.3–4 mm long, 0.2–0.6 times as long as the filaments. *Style* 6.5–10.5 mm long. *Ovules* c. 12–20 per locule. *Infructescences* peg-fruited. *Fruit* 2.5–4 mm long, with sepaline teeth or the calyx lobes weathering away; cotyledons obvolvate.

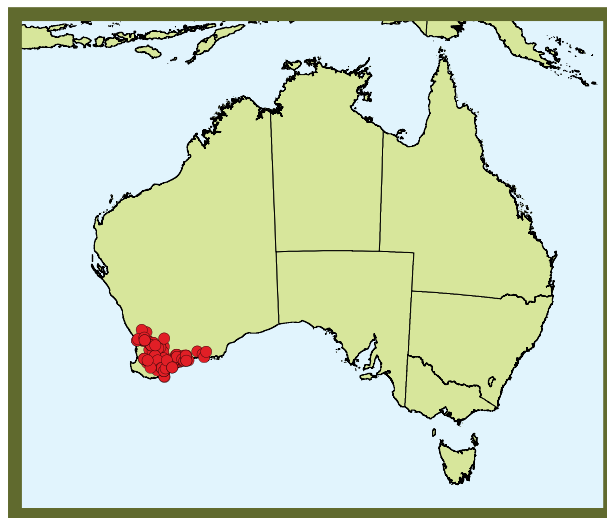
**NATURAL OCCURRENCE:** Western Australia: the Brookton – Stirling Range – Ravensthorpe district.

**ECOLOGY:** Recorded as occurring in heath with mallee, sand plain, open heathland, stunted mallee to low heath, open eucalypt woodland, swampy areas, on sand, sand over clay, laterite, sandy loam over granite, clay loam and laterite, granitic clay, and a laterite ridge.

**FLOWERING TIME:** Recorded as flowering in August and from October to January.

**ESSENTIAL OILS:** The leaf oil of this species contained roughly more mono- than sesquiterpenes. The principal monoterpenes encountered were  $\alpha$ -pinene (10–35%) and 1,8-cineole (11–29%). These were accompanied by lesser amounts of  $\beta$ -pinene (6–16%), limonene (1–4%), linalool (1–2%), trans-pinocarveol (trace–5%) and  $\alpha$ -terpineol (2–4%). The main sesquiterpenes were bicyclogermacrene (1–8%), globulol (4–6%), viridiflorol (1–5%), viridiflorene (0.3–4.0%), cubeban-11-ol (0.6–2.0%) and spathulenol (1–10%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.1–0.4%.





## *Melaleuca subulata* (Cheel) Craven

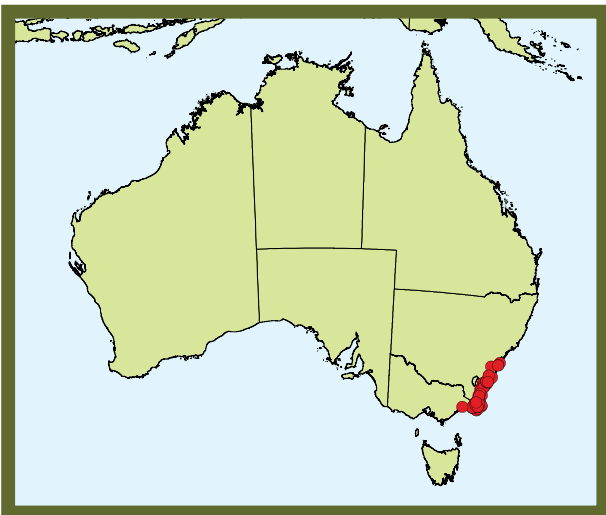


**PUBLICATION:** *Novon* 16: 473 (2006)

**DERIVATION:** *subulata*, from the Latin *subula*, a fine sharp point, hence an awl, in reference to the leaf shape

**SYNONYM:** *Callistemon subulatus* Cheel

**DESCRIPTION:** *Shrub* 0.8–2.5 m tall; bark fibrous, hard. *Branchlets* glabrescent, lanuginulose. *Leaves* alternate, 18–50 mm long, 1–3.1 mm wide, 9.5–25 times as long as wide, short- or long-petiolate; blade glabrescent, sericeous-lanuginulose, linear-obovate, linear-elliptic, narrowly obovate or narrowly elliptic, in transverse section transversely linear or shallowly sublunate, the base very narrowly attenuate or very narrowly cuneate, the apex acute or very shortly acuminate, the veins longitudinal-pinnate (the pinnate veins obscure), *oil glands* sparse, distinct or obscure, scattered. *Inflorescences* spicate, interstitial or pseudoterminal, sometimes also upper axillary, with



20–80 monads, 30–60 mm wide. *Hypanthium* hairy or glabrous, 2.1–3.9 mm long. *Calyx lobes* abaxially glabrous or hairy (sometimes with marginal cilia only), 0.7–1.8 mm long, scarious in a marginal band 0.3–0.4 mm wide. *Petals* deciduous, 2.5–5.2 mm long. *Stamens* 16–27 per flower; filaments red or deep pink, 15–24 mm long; anthers red. *Style* 17–27 mm long. *Ovules* c. 100–130 per locule. *Fruit* 3–5.1 mm long, the calyx lobes deciduous; cotyledons obvolvate or concavoconvex.

**NATURAL OCCURRENCE:** New South Wales, Victoria: the Mittagong–Heathcote district in New South Wales to East Gippsland in Victoria.

**ECOLOGY:** Recorded as occurring in beds of creeks and rivers among rocks or on small islands, on stream banks, in shrubland of *Acacia* and rainforest scrub, eucalypt forest beside river, on sand, black sandy loam, and rock.

**FLOWERING TIME:** Recorded as flowering from November to May.

**ESSENTIAL OILS:** This species produced a monoterpenoid leaf oil. The principal component was 1,8-cineole (58–69%). This was accompanied by the monoterpenoid hydrocarbons  $\alpha$ -pinene (7–10%), limonene (6–8%) and  $\alpha$ -terpineol (8–10%). Sesquiterpenes were not plentiful, with the principal members encountered being globulol (1–3%), an unidentified oxygenated sesquiterpene,  $C_{15}H_{26}O$  (1–2%), and viridiflorol (1–2%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.1–0.2%.

**REFERENCE ON ESSENTIAL OILS:** Brophy et al. 1998, as *Callistemon subulatus*

**NOTES:** This species is commonly cultivated as an ornamental shrub in temperate regions of Australia and can be quite floriferous. Its appeal is limited by the unattractive foliage.

## Melaleuca sylvana Craven & A.J.Ford



**PUBLICATION:** *Muelleria* 20: 3 (2004)

**DERIVATION:** *sylvana*, from the Latin *sylva*, wood, forest, woodland, in reference to the habitat in which this species is commonly found

**DESCRIPTION:** *Tree or shrub* to 5 m tall, open-crowned. *Branchlets* glabrous, terete. *Leaves* decussate, imbricate, amplexicaul, peltate, 1.5–3.7 mm long, 0.9–1.7 mm wide, 1.4–2.3 times as long as wide, sessile; leaf blade glabrescent, the indumentum with minute very ephemeral puberulous hairs on the distal abaxial surface and deciduous cilia on the margin, obovate or broadly obovate (to obovate-elliptic), in transverse section lunate (i.e. concavoconvex) to sublunate, the base truncate, the apex truncately acuminate to obtusely and shortly acuminate or acuminate, the veins longitudinal, 7–11, *oil glands* moderately dense to sparse, distinct or obscure, circular. *Inflorescences* capitate or spicate with (1–)2–10 monads. *Hypanthium* glabrous, 2–2.2 mm long. *Calyx lobes* 5, abaxially glabrous, costate, herbaceous in the proximal-central zone and scarios in a narrow marginal band up to 0.2 mm wide. *Petals* deciduous, 2 mm long. *Stamens* 9–12 per bundle; filaments pure white, 7–8.5 mm long, the bundle claw 4.25–4.5 mm long, 0.5–0.6 times as long as the filaments. Style glabrous, 8–10 mm long. *Ovules* 27–30 per locule. *Infructescences* longer than wide to shorter than wide, 9 mm in diameter. *Fruit* 4–4.25 mm long, the calyx lobes replaced by sepaline teeth; cotyledons obvolvate.

**NATURAL OCCURRENCE:** Queensland: the Herberton–Ravenshoe district.

**ECOLOGY:** Recorded as occurring in open forest, in heath on rhyolite, in low open eucalypt woodland with a closed

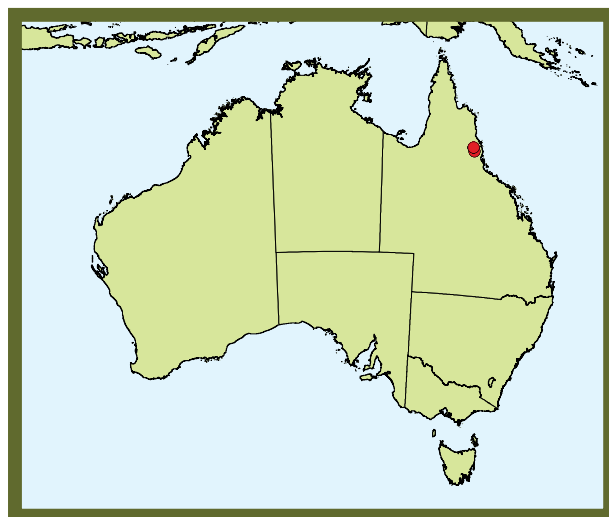
heathland of *Melaleuca* and *Micromyrtus*, *Casuarina inophloia* – *Callitris* – eucalypt woodland, grassy eucalypt woodland, on weathered rhyolite, and soil derived from rhyolite.

**FLOWERING TIME:** Recorded as flowering in December.

**ESSENTIAL OILS:** The leaf oil of this species was split between mono- and sesquiterpenes. The principal monoterpene encountered was  $\alpha$ -pinene (26–62%) and there were lesser amounts of  $\beta$ -pinene (5–8%), limonene (1–2%) and  $\alpha$ -terpineol (1–2%). The principal sesquiterpenes were  $\beta$ -caryophyllene (5–13%), bicyclogermacrene (3–11%), viridiflorol (1–3%), globulol (1–5%) and spathulenol (3–9%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.1–0.3%.

**REFERENCE ON ESSENTIAL OILS:** Brophy et al. 2008



## *Melaleuca systema* Craven



**PUBLICATION:** in Craven & Lepschi, *Australian Systematic Botany* 12: 907 (1999)

**DERIVATION:** *systema*, from the Greek *systemos*, tapering to a point, in reference to the shape of the leaves

**SYNONYM:** *Melaleuca acerosa* Schauer

**DESCRIPTION:** *Shrub* 0.2–2 m tall. **Branchlets** glabrescent or glabrous, puberulous to shortly pubescent overlaid with sparse longish pubescent hairs, dimorphic or the hairs grading. **Leaves** alternate, 4–15.5 mm long, 0.6–1.4 mm wide, 4.5–18 times as long as wide, subsessile to short-petiolate; blade glabrescent or glabrous, pubescent, or with more or less pubescent hairs with some longish spreading-ascending to spreading pubescent hairs overlying these, or with sericeous to sericeous-pubescent hairs (with some puberulous hairs also) overlaid with a sparser layer of spreading pubescent hairs, very narrowly elliptic to linear-elliptic, very narrowly obovate, linear-obovate, linear or suboblong, in transverse section transversely semielliptic, transversely elliptic, depressed obovate, subcircular or transversely linear, the base narrowly cuneate, parallel (blade width equals petiole width) or attenuate, the apex acuminate, obtusely shortly acuminate or narrowly acute to obtuse, the veins longitudinal, 3, **oil glands** dense, obscure or distinct, scattered. **Inflorescences** capitate, pseudoterminal and sometimes also upper axillary, with 3–9 triads, up to 20 mm wide. **Hypanthium** hairy or glabrous, 1.5–2.5 mm long. **Calyx lobes** abaxially glabrous or hairy, 0.6–1 mm long, scarious throughout or scarious in a marginal band 0.2–0.5 mm wide (occasionally the lobes are imperfectly

formed and a continuous ring of tissue is present; then up to 5 distinct (usually more or less ovate) areas of herbaceous tissue may occur). **Petals** caducous, 1.5–2.5 mm long. **Stamens** (7–)10–15(–16) per bundle; filaments yellow, cream or white, 5–8.5 mm long, the bundle claw 2.5–3.6 mm long, 0.4–0.5 times as long as the filaments. **Style** 9.5–11.5 mm long. **Ovules** 10–20 per locule (usually c. 13). **Infructescences** peg-fruited. **Fruit** 3–6 mm long, with sepaline teeth or the calyx lobes weathering away; cotyledons obvolvate.

**NATURAL OCCURRENCE:** Western Australia: from the Shark Bay district south to the Augusta district.

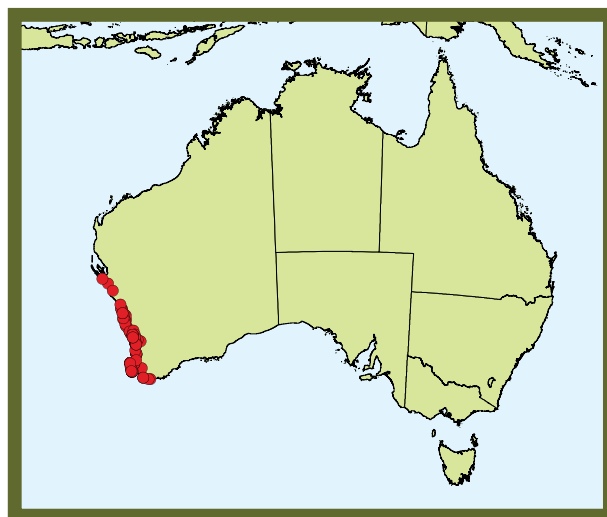
**ECOLOGY:** Recorded as occurring in heathland, *Banksia* woodland, coastal scrub, on white dune sand, rocky limestone sand, dry ridge top, yellow sand, gravelly lateritic soil, and calcareous soils.

**FLOWERING TIME:** Recorded as flowering from June to January, and in March.

**ESSENTIAL OILS:** Monoterpenes dominated this oil. The principal components detected were  $\alpha$ -pinene (28.9%),  $\beta$ -pinene (17.7%) and linalool (29.9%). These were accompanied by lesser amounts of myrcene (1.6%), limonene (1.1%),  $\alpha$ -terpineol (1.9%) and geraniol (1.5%). Sesquiterpenes were, of necessity, minor components of the oil, with the main members being globulol (1.3%), spathulenol (1.0%) and  $\alpha$ -,  $\beta$ - and  $\gamma$ -eudesmol (each approximately 2%).

**OIL YIELD:** The oil yield (dry weight, w/w) was 0.2%.

**NOTES:** This species previously was known as *M. acerosa* but its name was changed to *M. systema* as there was a pre-existing name, *M. acerosa* (Colla) G.Don, that had nomenclatural priority. *Melaleuca systema* should be more widely grown in regions with a Mediterranean climate as it appears to be a successful ornamental shrub when planted on diverse soil types.



## Melaleuca tamariscina Hook.f.



**PUBLICATION:** in Mitchell, *Journal of an expedition into the interior of tropical Australia*: 262 (1848)

**DERIVATION:** *tamariscina*, from *Tamarix*, a genus of Tamaricaceae, in reference to the leafy branchlets of this species being perceived to be similar to those of a species of *Tamarix*

**DESCRIPTION:** *Shrub or tree* 1–15 m tall; bark papery, white to grey. *Branchlets* glabrescent, densely pubescent or sparsely puberulous. *Leaves* alternate, peltate, 0.5–4.3 mm long, 0.5–1.2 mm wide, 1.5–3.2 times as long as wide, sessile; blade glabrescent, the indumentum consisting of marginal cilia, ovate to broadly ovate, more or less rounded angular-ovate, in transverse section strongly lunate to crescentic, the base truncate, the apex acuminate to narrowly acute, obtusely shortly acuminate, rounded or narrowly acuminate, the veins longitudinal, 5–15, *oil glands* moderately dense, distinct to obscure, in rows. *Inflorescences* spicate, interstitial, with 5–25 triads (the proximal nodes sometimes with monads instead of triads), up to 18 mm wide. *Hypanthium* glabrous, 1–1.3 mm long. *Calyx lobes* abaxially glabrous, costate, 0.6–1 mm long, scarious in a marginal band 0.1–0.2 mm wide. *Petals* deciduous, 1.7–2.2 mm long. *Stamens* 5–18 per bundle; filaments creamy-white to white, 5.8–7.6 mm long, the bundle claw 3–5 mm long, 0.5–0.7 times as long as the filaments. *Style* 5–8 mm long. *Ovules* 25–35 per locule. *Fruit* 2–3.5 mm long, with sepaline teeth or the calyx lobes at length weathering away (persistent and effectively unmodified for some time, even on mature fruits); cotyledons obvolvate.

**NATURAL OCCURRENCE:** Queensland: from the Torrens Creek district south to the Jericho district.

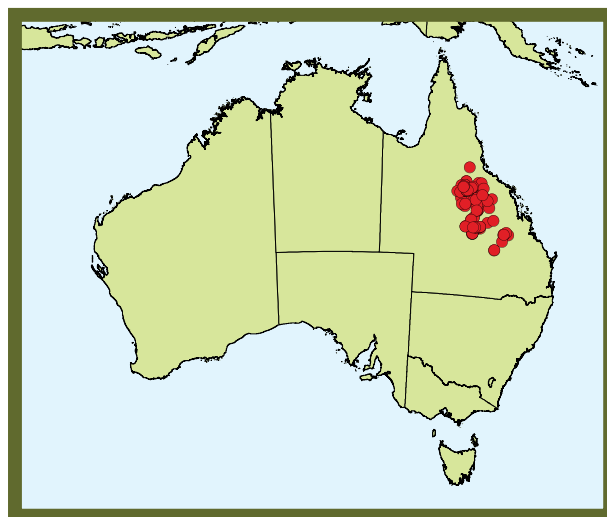
**ECOLOGY:** Recorded as occurring in low *Melaleuca* woodland with shrubby understorey, low eucalypt woodland, open plain, low open scrubland, mixed woodland, on sand, sandy loam with pebbles, lateritic gravel, shallow sand over sandstone, and sandy clay.

**FLOWERING TIME:** Recorded as flowering from March to May, and from September to November.

**ESSENTIAL OILS:** This species produced an oil that was dominated by  $\alpha$ -pinene (84–85%). There were lesser amounts of  $\beta$ -pinene (3–5%) and  $\alpha$ -terpineol (2–3%). The main sesquiterpenes encountered were aromadendrene (0.3%), globulol and spathulenol (both <0.3%). An unknown, molecular weight 236, suspected of being a phenolic ether, was also present (1–3%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.2–0.3%.

**REFERENCE ON ESSENTIAL OILS:** Brophy and Doran 1996



## *Melaleuca teretifolia* Endl.



**PUBLICATION:** *Enumeratio plantarum* 49 (1837)

**DERIVATION:** *teretifolia*, from the Latin *teres*, rounded, cylindrical, and *folium*, leaf, in reference to the shape of the leaves

**DESCRIPTION:** *Shrub* 1–4 m tall; bark papery. *Branchlets* soon glabrescent, the lanuginulose-puberulous to lanuginulose hairs ephemeral. *Leaves* alternate, 30–90 mm long, 0.6–1.2 mm wide, 2.7–7 times as long as wide, subsessile or short-petiolate; blade soon glabrescent, the lanuginulose hairs ephemeral (rarely some lanuginulose-puberulous hairs may be present also), linear, in transverse section subcircular or depressed obovate, the base parallel (blade width equals petiole width) or rarely approaching narrowly cuneate, the apex narrowly acuminate or narrowly acute, the veins longitudinal, 3, *oil glands* moderately dense, obscure, scattered. *Inflorescences* capitate, lateral, sometimes below the leaves, with 4–15 monads, up to 25 mm wide. *Hypanthium* glabrous, 1.5–2.5 mm long. *Calyx lobes* abaxially glabrous, 0.6–0.8 mm long, scarious in a marginal band 0.1–0.2 mm wide. *Petals* deciduous, 1.3–2.5 mm long. *Stamens* 6–8(–12) per bundle; filaments white, creamy-white, yellow, pink or mauve, 4.5–11 mm long, the

bundle claw 1.5–3.2 mm long, 0.2–0.4 times as long as the filaments. *Style* 9–12 mm long. *Ovules* 30–60 per locule. *Fruit* 2.5–4 mm long, the calyx lobes weathering away; cotyledons subobovate (almost planoconvex).

**NATURAL OCCURRENCE:** Western Australia: from the Watheroo district south to the Capel district.

**ECOLOGY:** Recorded as occurring in swamps, *Melaleuca* scrubland, open woodland, along watercourses, on sand, sandy clay, and laterite.

**FLOWERING TIME:** Recorded as flowering from October to January.

**ESSENTIAL OILS:** This species occurred in two chemotypes. The leaf oil of chemotype I was dominated by 1,8-cineole (81–88%). There were lesser amounts of  $\alpha$ -pinene (1–3%), limonene (3–4%), terpinen-4-ol (1–3%) and  $\alpha$ -terpineol (1–6%). Sesquiterpenes contributed very little to this oil, with the principal components being globulol, spathulenol and aromadendrene (all <0.3%). Chemotype II gave an oil in which neral (29.1%) and geranial (38.8%) were the principal components. These were accompanied by lesser amounts of myrcene (9.8%), terpinen-4-ol (3.4%), E-isocitral (2.4%) and geraniol (2.1%). Sesquiterpenes were absent.

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.2% (chemotype I) and 1.5% (chemotype II).

**REFERENCES ON ESSENTIAL OILS:** Southwell et al. 2003, 2005

**NOTES:** The species is cultivated to a limited extent as an ornamental shrub in temperate Australia on well-drained soils. The crimson-flowered cultivar, ‘Georgiana Molloy’, appears to be well worth growing.

Chemotype II of this species has been developed commercially for oil products in Western Australia (see The Paperbark Co. 2013).



## Melaleuca teuthidoides Barlow



**PUBLICATION:** in Barlow & Cowley, *Australian Systematic Botany* 1: 110, fig. 8a–c (1988)

**DERIVATION:** *teuthidoides*, from the Greek *teuthis*, squid, and *-oides*, resembling, in reference to the mature calyx superficially resembling the tentacles of a squid

**DESCRIPTION:** *Shrub* 0.5–3 m tall; bark rough, fissured, grey. *Branchlets* glabrescent, lanuginulose to lanuginulose-puberulous. *Leaves* alternate, 2.5–8 mm long, 0.9–1.3 mm wide, 1.7–8 times as long as wide, sessile to short-petiolate; blade glabrescent, lanuginulose to rarely lanuginulose-puberulous (the latter hair type occasionally approaching sericeous-lanuginulose), very narrowly elliptic, very narrowly ovate, narrowly elliptic, narrowly obovate or linear-elliptic, in transverse section transversely elliptic, depressed obovate, flattened transversely semielliptic or subcircular, the base attenuate or cuneate, the apex obtusely shortly

acuminate, acuminate or rounded to acute, the veins longitudinal, 3, *oil glands* moderately dense, obscure, in rows. *Inflorescences* capitate or spicate, pseudoterminal and sometimes also upper axillary, with 3–9 monads, up to 20 mm wide. *Hypanthium* hairy, 2–2.8 mm long. *Calyx lobes* abaxially glabrescent, 1.6–2.4 mm long, herbaceous to the margin. *Petals* deciduous, 2.5–3 mm long. *Stamens* 12–16 per bundle; filaments white, 6–9 mm long, the bundle claw 2–3 mm long, 0.3 times as long as the filaments. *Style* 9–12 mm long. *Ovules* 35–50 per locule. *Fruit* 4–5.5 mm long, the calyx lobes weathering away; cotyledons subobovate (almost planoconvex).

**NATURAL OCCURRENCE:** Western Australia: from the Marvel Loch district south and eastwards to the Ravenshorpe and Balladonia districts.

**ECOLOGY:** Recorded as occurring in heath on crests, mallee woodland in depressions, woodland with *Melaleuca* understorey, low eucalypt forest, tall eucalypt shrubland, dense low heath under mixed mallee, on sandy loam, sandy clay, sand over laterite, clay with quartz, and clay.

**FLOWERING TIME:** Recorded as flowering from September to January.

**ESSENTIAL OILS:** This species produced an oil that was dominated by monoterpenes. The principal monoterpene encountered was 1,8-cineole (62%), and this was accompanied by lesser amounts of  $\alpha$ -pinene (14%), limonene (2–3%) and  $\alpha$ -terpineol (3–4%). The principal sesquiterpene was spathulenol (7–8%), with much lesser amounts of globulol (0.7%), bicyclogermacrene (0.4%) and epicubenol (0.2–1.0%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.2–0.3%.



## *Melaleuca thapsina* Craven



**PUBLICATION:** in Craven & Lepschi, *Australian Systematic Botany* 12: 908 (1999)

**DERIVATION:** *thapsina*, from the Greek *thapsinos*, yellow, in reference to the flower colour

**DESCRIPTION:** *Shrub* 0.7–4 m tall; bark fibrous or papery, white to dark. *Branchlets* glabrescent, sericeous-pubescent or less often sericeous. *Leaves* alternate, 11–56 mm long, 1–1.6 mm wide, 10–40 times as long as wide, subsessile to short-petiolate; blade glabrescent, sericeous-pubescent becoming lanuginose-sericeous to lanuginulose-pubescent distally or less often sericeous, linear, in transverse section circular to subcircular or transversely elliptic, the base attenuate or parallel (blade width equals petiole width), the apex acuminate, the veins longitudinal, 3, *oil glands* dense or moderately dense, distinct or obscure,

scattered. *Inflorescences* capitate, pseudoterminal and sometimes also upper axillary, with 2–13 triads, up to 18 mm wide. *Hypanthium* hairy, 1–1.5 mm long. *Calyx lobes* abaxially glabrous to glabrescent, 0.2–0.4 mm long, scarious throughout. *Petals* deciduous, 1–2.2 mm long. *Stamens* 6–8 per bundle; filaments yellow, cream, pale lemon or pale yellowish-white, 5–7.6 mm long, the bundle claw 1.2–2.5 mm long, 0.2–0.4 times as long as the filaments. *Style* 7–8 mm long. *Ovules* (10–)15–25 per locule. *Infructescences* globose. *Fruit* 2–2.5 mm long, the calyx lobes weathering away; cotyledons planoconvex.

**NATURAL OCCURRENCE:** Western Australia: the Lake King – Norseman – Ravensthorpe – Esperance district.

**ECOLOGY:** Recorded as occurring in shrub mallee, low eucalypt woodland, low open woodland with *Melaleuca* shrub understorey, heathland with emergent eucalypts, scrubland, on loamy clay, lateritic clay over granite, sand, sand over clay, lateritic clay over laterite, and sandy soil over limestone.

**FLOWERING TIME:** Recorded as flowering from September to November.

**ESSENTIAL OILS:** The leaf oil of this species contained significant amounts of both mono- and sesquiterpenes. The principal monoterpene was 1,8-cineole (34.2%) and this was accompanied by lesser amounts of  $\alpha$ -pinene (4.4%),  $\alpha$ -terpineol (0.8%) and terpinolene (0.5%). The principal sesquiterpenes were spathulenol (12.2%),  $\gamma$ -eudesmol (7.2%),  $\alpha$ -eudesmol (3.9%),  $\beta$ -eudesmol (14.1%), globulol (3%) and bicyclogermacrene (2.2%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.3 %.



## Melaleuca thymifolia Sm.



**PUBLICATION:** *Transactions of the Linnean Society of London* 3: 278 (1797)

**DERIVATION:** *thymifolia*, from *Thymus*, a genus of Lamiaceae, and the Latin *folium*, leaf, in reference to the similarity between the leaves of this species and those of a species of *Thymus*

**DESCRIPTION:** *Shrub* 0.3–1.5 m tall; bark grey. *Branchlets* glabrous or soon glabrescent (when present, the ephemeral hairs lanuginulose-puberulous to puberulous). *Leaves* decussate, 5–15 mm long, 1–3.5 mm wide, 2–7 times as long as wide, subsessile to short-petiolate; blade soon glabrescent, the lanuginulose-puberulous to puberulous hairs ephemeral, narrowly elliptic to elliptic or very narrowly elliptic, in transverse section transversely linear, the base narrowly cuneate to cuneate, the apex acute, acuminate or obtusely shortly acuminate, the veins

longitudinal, 3, *oil glands* dense, distinct, scattered or in rows. *Inflorescences* spicate or subcapitate, interstitial or pseudoterminal, with 2–10 monads, up to 25 mm wide. *Hypanthium* glabrous, 2–3.3 mm long. *Calyx lobes* abaxially glabrous, 1.4–2 mm long, scariosus in a marginal band 0.2–0.3 mm wide. *Petals* deciduous, 3–5 mm long. *Stamens* 30–60 per bundle; filaments mauve, lilac or violet, 11.5–13 mm long, the bundle claw 7.2–9.3 mm long, 0.6–0.7 times as long as the filaments. *Style* 8–10.5 mm long. *Ovules* c. 95–120 per locule. *Fruit* 3.5–4.5 mm long, with sepaline teeth; cotyledons planoconvex.

**NATURAL OCCURRENCE:** Queensland, New South Wales: from south-eastern Queensland (with an outlier in the Carnarvon Range district) southwards to south-eastern New South Wales.

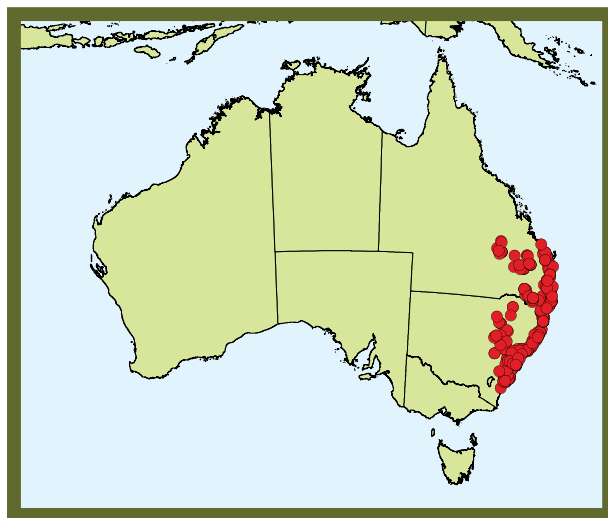
**ECOLOGY:** Recorded as occurring in coastal sand plain, scrub and sedgeland, swampy heath, eucalypt woodland, on sand, clay, peaty soil, sandy loam, and granite soils.

**FLOWERING TIME:** Recorded as flowering from January to December.

**ESSENTIAL OILS:** This species gave a monoterpenoid oil. The principal components were 1,8-cineole (63–65%),  $\alpha$ -pinene (5–7%), limonene (9–11%), terpinolene (3–5%), terpinen-4-ol (0.9–2.0%) and  $\alpha$ -terpineol (0.7–0.9%). The main sesquiterpenes encountered in the oil were aromadendrene, globulol and spathulenol (all <0.5%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.7%.

**NOTES:** *Melaleuca thymifolia* is commonly cultivated in subtropical and temperate Australia as a small ornamental shrub. Several named cultivars are available.





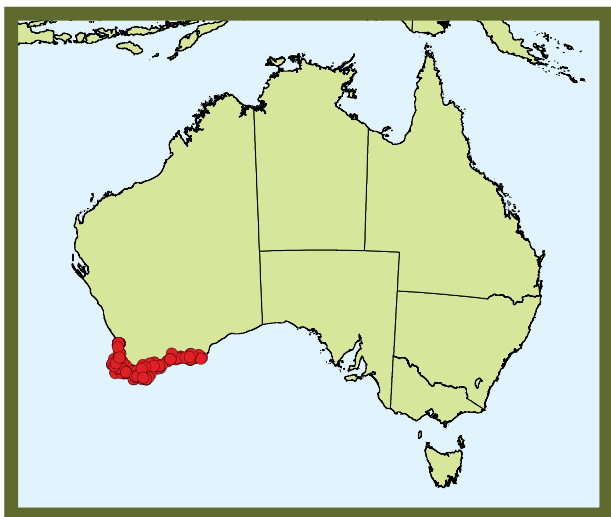
## *Melaleuca thymoides* Labill.



**PUBLICATION:** *Novae Hollandiae plantarum specimen* 2: 27, t. 167 (1806)

**DERIVATION:** *thymoides*, from *Thymus*, a genus of Lamiaceae, and the Greek *-oides*, resembling, in reference to the similarity between the leafy branchlets of this species and those of a species of *Thymus*

**DESCRIPTION:** *Shrub or tree* to 3 m tall. *Leaves* 2.4–13.8 mm long 0.7–3.6 mm wide, subsessile or short-petiolate; blade hairy or glabrescent, narrowly obovate to narrowly ovate or ovate to elliptic, in transverse section obsubnate, transversely linear or transversely narrowly oblong. *Inflorescences* capitate or spicate with



2–15 triads; bracteoles absent on the central flower in the floral unit. *Hypanthium* sericeous-pubescent to pubescent. *Calyx lobes* costate, triangular to very broadly triangular, 0.4–0.7 mm long. *Stamens* 7–11 per bundle; filaments yellow, 4–6.1 mm long. *Style* 4.7–6.7 mm long. *Ovules* 3–4 per locule. *Fruit* 2.3–4 mm long; with the distal rim flat or more or less so.

**NATURAL OCCURRENCE:** Western Australia: from the Perth–Albany region eastwards to Cape Arid.

**ECOLOGY:** Recorded generally near the coast, mainly in heath and shrublands but also in woodlands and open forests; apparently preferring to grow on sand dunes and sandy soils over granitic, lateritic and quartzite substrates.

**FLOWERING TIME:** Recorded as flowering from August to February.

**ESSENTIAL OILS:** The leaf oil of this species contained significant amounts of both mono- and sesquiterpenes. The principal monoterpenes encountered were  $\alpha$ -pinene (6–15%) and  $\beta$ -pinene (12–34%), with lesser amounts of limonene (2–5%), linalool (0.3–2.0%), terpinen-4-ol (0.6–2.0%) and  $\alpha$ -terpineol (0.8–2.0%). The principal sesquiterpenes identified in the oil were bicyclogermacrene (3–12%), globulol (4–11%), viridiflorol (2–6%) and spathulenol (7–13%), while there were lesser amounts of viridiflorene (1–5%), cubeban-11-ol (1–3%),  $\beta$ -caryophyllene (1–4%) and aromadendrene (0.8–2.0%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was <0.1%.

## Melaleuca thuyoides Turcz.



**PUBLICATION:** *Bulletin de la Société Impériale des Naturalistes de Moscou* 20: 167 (1847)

**DERIVATION:** *thuyoides*, from *Thuja*, a genus of Cupressaceae, and the Greek *-oides*, resembling, in reference to the similarity between the leafy branchlets of this species and those of a species of *Thuja*

**DESCRIPTION:** *Shrub or tree* 0.4–5 m tall; bark papery. *Branchlets* glabrescent, minutely puberulous. *Leaves* alternate, peltate, 0.9–2.2 mm long, 0.8–1.2 mm wide, 1.1–2.2 times as long as wide, sessile; blade glabrescent or glabrous, the indumentum (when present) consisting of marginal cilia, broadly angular-ovate, depressed angular-ovate, broadly obovate or angular-ovate, in transverse section crescentic, shallowly lunate or broadly obtriangular, the base rounded, truncate or cuneate, the apex rounded to obtuse, obtusely shortly acuminate, acuminate or narrowly acuminate, the veins longitudinal, c. 7–13, *oil glands* moderately dense, obscure to distinct, in rows. *Inflorescences* spicate or capitate, interstitial or pseudoterminal, with 4–24 triads, up to 15 mm wide. *Hypanthium* glabrous, 1.2–1.5 mm long. *Calyx lobes* abaxially glabrous, costate, 0.3–0.7 mm long, herbaceous to the margin. *Petals* deciduous, 1.5–1.8 mm long. *Stamens* 4–10 per bundle; filaments white, 4.5–7.5 mm long, the bundle claw 2.5–4 mm long, 0.5–0.7 times as long as the filaments. *Style* 5–7 mm long. *Ovules* c. 30–40 per

locule. *Fruit* 1.5–3 mm long, the calyx lobes persistent (persisting more or less unmodified and becoming immersed in the hypanthium wall, the extreme distal portion may weather away); cotyledons planoconvex.

**NATURAL OCCURRENCE:** Western Australia: from the Lake Monger district south to the Ongerup district and eastwards to the Cape Arid district.

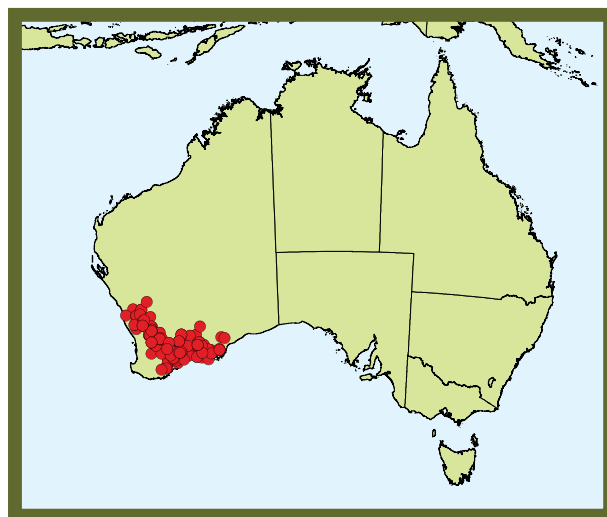
**ECOLOGY:** Recorded as occurring in mallee woodland, edge of salt lakes, tall eucalypt shrubland, swampy area in sand plain, *Melaleuca* shrubland, on clay, shallow loam over clay, clay pan with sandy surface, sandy clay, and sand over laterite.

**FLOWERING TIME:** Recorded as flowering from August to January.

**ESSENTIAL OILS:** This species presented a variable oil, with one collection being predominantly sesquiterpenoid while two other collections were monoterpenoid. In the collection B JL 1694, the main compounds were the sesquiterpenes globulol (10–16%), viridiflorol (7–19%), spathulenol (12–26%), aromadendrene (1–9%), allo-aromadendrene (1–9%) and bicylogermacrene (2–6%). The main monoterpene was  $\alpha$ -pinene (12–23%). In collection TRL 435, the principal components were the monoterpenes  $\beta$ -pinene (12–34%),  $\alpha$ -pinene (6–15%) and limonene (2–6%), with the sesquiterpenes globulol (4–10%), viridiflorol (2–6%), spathulenol (7–12%) and bicylogermacrene (5–13%). The collection LAC 9090 was similar to TRL 435, but also contained significant amounts of trans-pinocarveol (11–14%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.1–0.3%.

**NOTES:** While the very small leaves give the foliage of this species a novel appearance, the species can be free flowering and it is used as an ornamental shrub in temperate regions of Australia. It may have some potential for use in mixed plantings on saline soils.



## *Melaleuca tinkerii* Craven



**PUBLICATION:** in Craven & Lepschi, *Australian Systematic Botany* 12: 909 (1999)

**DERIVATION:** *tinkerii*, in honour of Allan Neil Tinker (1942–) of North Eneabba, Western Australia, who has an excellent knowledge of the flora in the Eneabba district, one of the especially interesting botanical regions in Western Australia, and is actively promoting its conservation

**DESCRIPTION:** *Shrub* 0.2–1 m tall. *Branchlets* glabrescent, more or less sericeous to lanuginose-sericeous and sericeous-pubescent, rarely some lanuginulose-puberulous hairs may also occur. *Leaves* alternate, 8–34 mm long, 0.6–1.5 mm wide, 7.5–30 times as long as wide, sessile to subsessile; blade glabrescent, sericeous-pubescent, rarely with some appressed sericeous or lanuginose-sericeous hairs as well or rarely only sericeous to lanuginose-sericeous hairs occur, linear, linear-obovate or very narrowly obovate, in transverse section transversely elliptic to transversely narrowly elliptic (occasionally very

narrowly so, rarely approaching very depressed obovate), the base truncate or parallel (blade width equals petiole width), the apex obtuse to acute or narrowly acute to acuminate, the veins longitudinal, 3, *oil glands* moderately dense, distinct, scattered. *Inflorescences* capitate, pseudoterminal and sometimes also upper axillary, with 4–12 triads, up to 17 mm wide. *Hypanthium* hairy, 1–2 mm long. *Calyx lobes* abaxially hairy, 0.4–0.6 mm long, herbaceous to the margin. *Petals* deciduous, 1–1.5 mm long. *Stamens* 3–6 per bundle; filaments pink, purple, mauve or magenta, 4–9.5 mm long, the bundle claw (0.5–)1.5–2.5 mm long, (0.1–)0.2–0.4 times as long as the filaments. *Style* 7.5–9 mm long. *Ovules* 10–12 per locule. *Infructescences* globose. *Fruit* 2.5–3 mm long, the calyx lobes weathering away or rarely weakly developed sepaline teeth present (often only as barely discernible undulations around the hypanthium rim); cotyledons obvolvate.

**NATURAL OCCURRENCE:** Western Australia: the Yandanooka – Gairdner Range district.

**ECOLOGY:** Recorded as occurring in low open heath, mallee heath, sand plain, low shrubland, on sand, shallow sand over laterite, gravelly sand over laterite, and granite.

**FLOWERING TIME:** Recorded as flowering from July to December.

**ESSENTIAL OILS:** The leaf oil of this species contained both mono- and sesquiterpenes. The principal monoterpene was  $\alpha$ -pinene (10–22%) and this was accompanied by lesser amounts of  $\beta$ -pinene (1–3%), 1,8-cineole (3–30%) and  $\alpha$ -terpineol (1–5%). The principal sesquiterpenes were bicyclogermacrene (6–7%), cubeban-11-ol (0.8–3%), spathulenol (5–8%), viridiflorol (2–4%), T-cadinol, T-muurolol and  $\delta$ -cadinol (all < 2%) and  $\alpha$ -cadinol (4%).

**OIL YIELD:** The oil yield (dry weight, w/w) was 0.3–0.8%.



## *Melaleuca torquata* Barlow



**PUBLICATION:** in Barlow & Cowley, *Australian Systematic Botany* 1: 110, fig. 8f–g (1988)

**DERIVATION:** *torquata*, from the Latin *torquatus*, adorned with a necklace or collar, in reference to the crown-like, lobed rim of the fruit

**DESCRIPTION:** *Shrub* 0.8–2.5 m tall. *Branchlets* glabrescent, lanuginulose to lanuginulose-puberulous. *Leaves* alternate (decussate or ternate conditions occur rarely), 4.5–12.8 mm long, 1.2–2.5 mm wide, 2.4–8 times as long as wide, subsessile to short-petiolate; blade glabrescent, lanuginulose to lanuginulose-puberulous, very narrowly elliptic, very narrowly ovate, narrowly elliptic, suboblong or subulate, in transverse section transversely semielliptic to semicircular or strongly depressed obtriangular, the base narrowly cuneate to attenuate, the apex acuminate,

obtusely shortly acuminate or acute, the veins longitudinal, 3, *oil glands* sparse to moderately dense, usually obscure, scattered to more or less in rows. *Inflorescences* capitate or shortly spicate, pseudoterminal or sometimes upper axillary, with 4–11 monads, up to 18 mm wide. *Hypanthium* glabrous, 2–3 mm long. *Calyx lobes* abaxially glabrous, 0.5–1 mm long, herbaceous to the margin. *Petals* deciduous, 1.5–1.8 mm long. *Stamens* 3–13 per bundle; filaments white (often recorded as ageing to pink, rarely recorded as red), 4.5–8 mm long, the bundle claw 0.5–1.8 mm long, 0.1–0.2 times as long as the filaments. *Style* 8–10 mm long. *Ovules* 30–60 per locule. *Fruit* 3–4.5 mm long, with sepaline teeth; cotyledons planoconvex.

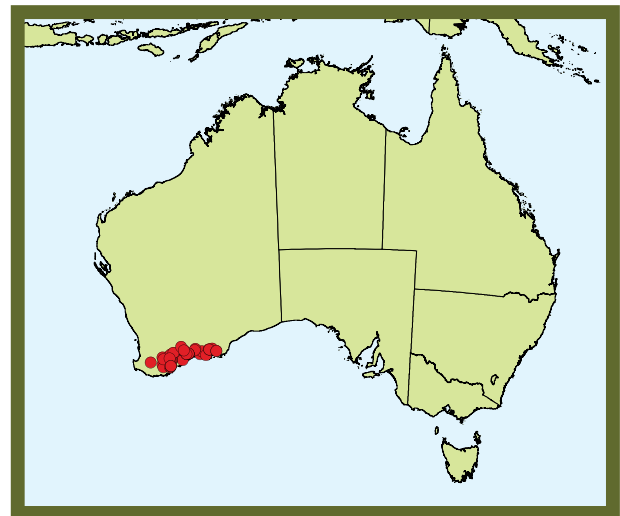
**NATURAL OCCURRENCE:** Western Australia: the Kating – Stirling Range – Cape Arid district.

**ECOLOGY:** Recorded as occurring in sand plain, *Melaleuca* thicket, mallee heath, tall shrubland, *Melaleuca* swamp, lake edge, open shrub mallee, low eucalypt woodland with dense shrubby understorey, on loamy sand, sand over clay, loamy clay over granite, sand with laterite, and sandy silt.

**FLOWERING TIME:** Recorded as flowering from August to October.

**ESSENTIAL OILS:** This species produced an oil dominated by monoterpenes. The principal compound was 1,8-cineole (60%) and this was accompanied by lesser amounts of  $\alpha$ -pinene (14.6%), limonene (4.0%),  $\beta$ -pinene (1.2%) and  $\alpha$ -terpineol (1.5%). The main sesquiterpenes were globulol (2.2%), spathulenol (2.2%), viridiflorol (0.5%) and aromadendrene (1.0%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.2%.



## Melaleuca tortifolia Byrnes



**PUBLICATION:** *Austrobaileya* 2: 74 (1984)

**DERIVATION:** *tortifolia*, from the Latin *torti-*, twisted, and *folium*, leaf, in reference to the twisted leaves

**DESCRIPTION:** *Shrub* 0.6–3 m tall. *Branchlets* glabrescent, the indumentum often dimorphic with a sparse layer of long, sericeous-pubescent to pubescent hairs overlying a layer of much shorter lanuginulose to lanuginulose-puberulous hairs and usually with some puberulous to rarely shortly pubescent hairs, or occasionally the shorter layer may be puberulous to shortly pubescent or approach more or less sericeous and grade into the longer layer (on older growth, the hairs often become appressed and matted, obscuring the short layer). *Leaves* decussate, 8–15 mm long, 2–4.5 mm wide, 3–5 times as long as wide, short-petiolate to subsessile; blade glabrescent, sericeous-pubescent to sericeous and usually with some sericeous-lanuginulose to lanuginulose-pubescent hairs at the apex, narrowly ovate to ovate, twisted, in transverse section transversely linear, the base cuneate, the apex narrowly acute, the veins longitudinal, 3(–5), *oil glands* moderately dense to sparse, obscure, scattered. *Inflorescences* shortly spicate

or capitate, pseudoterminal, with 2–10 triads (sometimes monads may be present proximally and/or distally, in very few-flowered inflorescences the flowers may be in monads only), up to 23 mm wide. *Hypanthium* hairy, 2.5–2.8 mm long. *Calyx lobes* abaxially hairy, 1–1.5 mm long, herbaceous to the margin. *Petals* deciduous, 2.5–3 mm long. *Stamens* 10–16 per bundle; filaments white to cream, 6–6.6 mm long, the bundle claw (0.5–)1–1.2 mm long, (0.07–)0.2 times as long as the filaments. *Style* 6–9 mm long. *Ovules* c. 60–65 per locule. *Fruit* 3.5–5 mm long, the calyx lobes weathering away or sepaline teeth present (the proximal c. half of the lobes usually becomes woody and persists as blunt rounded teeth or a series of undulations around the hypanthium rim); cotyledons planoconvex.

**NATURAL OCCURRENCE:** New South Wales: the Ebor district.

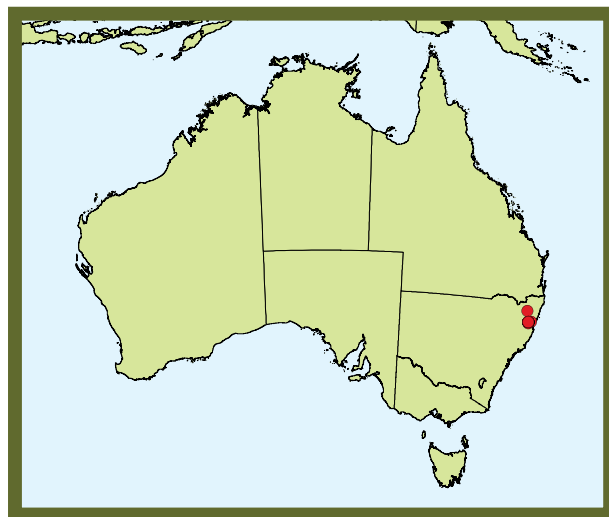
**ECOLOGY:** Recorded as occurring in heathland, swamp heath, on trachyte, rocky plateau, and sandstone.

**FLOWERING TIME:** Recorded as flowering in December.

**ESSENTIAL OILS:** This species produced an oil, in very poor yield, that contained more sesquiterpenes than monoterpenes. The principal monoterpene identified was  $\alpha$ -terpineol (14–16%).  $\beta$ -phellandrene (trace–1%), fenchol (1–3%) and  $\alpha$ -pinene (trace–1%) were the only other monoterpenes present in amounts >0.1%. The principal sesquiterpenes encountered were cubeban-11-ol (7–11%), globulol (7–11%), viridiflorol (6–8%), spathulenol (3–6%),  $\alpha$ -cadinol (1–4%),  $\beta$ -caryophyllene (1–3%), viridiflorene (1–2%) and epiglobulol (2–3%). Nonanal (1–3%), nonanol (1–2%) and octanal (0.1%) were also detected.

**OIL YIELD:** The oil yield (dry weight, w/w) was <0.05%.

**NOTES:** This little-known species should be trialled as an ornamental shrub in temperate regions as it may prove to be reasonably hardy.



## *Melaleuca trichophylla* Lindl.



**PUBLICATION:** *Edwards's Botanical Register*, Appendix vols 1–23: viii (1839)

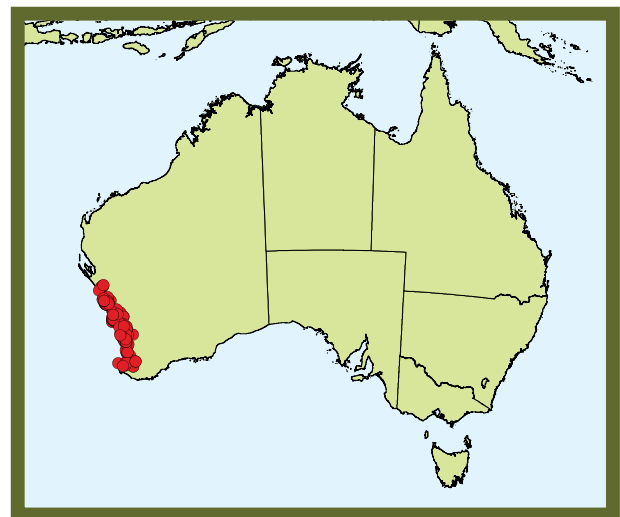
**DERIVATION:** *trichophylla*, from the Greek *thrix*, hair, and *phyllon*, leaf, in reference to the hairy leaves

**DESCRIPTION:** **Shrub** 0.2–1.5 m tall; bark light grey. **Branchlets** glabrescent (or occasionally glabrous), pubescent and occasionally more or less dimorphic (with pubescent to puberulous hairs overlaid with much longer pubescent hairs). **Leaves** alternate, 8–31.5 mm long, 0.5–1.2 mm wide, 9–80 times as long as wide, subsessile to short-petiolate; blade glabrescent (or occasionally glabrous), pubescent or rarely dimorphic with pubescent to (very rarely) more or less lanuginulose-puberulous hairs overlaid with spreading pubescent hairs, linear, linear-obovate or very narrowly obovate, in transverse section subcircular to transversely narrowly elliptic, transversely elliptic to circular or depressed obovate, the base narrowly cuneate or parallel (blade width equals petiole width), the apex narrowly acute, acute, acuminate or obtuse, the veins longitudinal, 3, **oil glands** dense or moderately

dense, obscure to distinct, scattered to more or less in rows. **Inflorescences** capitate or shortly spicate, pseudoterminal and sometimes also upper axillary, with 2–12 triads, up to 35 mm wide. **Hypanthium** hairy (or rarely glabrous), 1.5–3 mm long. **Calyx lobes** abaxially hairy or rarely glabrous, 0.5–2.5 mm long, scarious in a marginal band 0.1–0.6 mm wide or scarious throughout. **Petals** deciduous, 1.8–4 mm long. **Stamens** 5–11 per bundle; filaments pink, purple, mauve, magenta or bright carmine-pink, very rarely white, 7.5–20.5 mm long, the bundle claw 3.7–12 mm long, 0.4–0.6 times as long as the filaments. **Style** 9.5–20 mm long. **Ovules** (5–)10–15(–20) per locule. **Infructescences** peg-fruited to globose. **Fruit** 2–4.5 mm long, the calyx lobes weathering away or weakly developed sepaline teeth present (the extreme proximal portion of the lobes becoming woody and persisting as a series of undulations around the hypanthium rim); cotyledons obvolvate. **NATURAL OCCURRENCE:** Western Australia: from the Northampton district southwards to the Busselton district. **ECOLOGY:** Recorded as occurring in heath, low open woodland, dense shrubland, *Banksia* woodland, dense forest, low open heathland, sand plain, jarrah forest, on sand, red loam, clayey sand over sandstone, sand over clay, sand over laterite, and at the base of granite outcrops. **FLOWERING TIME:** Recorded as flowering from July to March.

**ESSENTIAL OILS:** The leaf oil of this species contained significant amounts of both mono- and sesquiterpenes. The principal monoterpenes were  $\alpha$ -pinene (14–19%), linalool (1–28%) and  $\alpha$ -terpineol (1–3%). The principal sesquiterpenes encountered were globulol (9–13%), viridiflorol (6–13%), spathulenol (4–9%),  $\beta$ -caryophyllene (0.4–3.0%) and viridiflorene (1–5%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.1–0.2%.



## Melaleuca trichostachya Lindl.



**PUBLICATION:** in Mitchell, *Journal of an expedition into the interior of tropical Australia*: 277 (1848)

**DERIVATION:** *trichostachya*, from the Greek *thrix*, hair, and *stachys*, spike, in reference to the hairy axis of the inflorescence

**DESCRIPTION:** *Tree or shrub* 1–13 m tall; bark papery, white or grey to brown. *Branchlets* glabrescent, lanuginulose to lanuginulose-puberulous (grading to lanuginose-pubescent to pubescent). *Leaves* usually decussate or sometimes alternate, 9–45 mm long, 0.7–2.8 mm wide, 6–22 times as long as wide, subsessile to short-petiolate; blade glabrescent, lanuginulose to lanuginulose-puberulous (grading to lanuginose-pubescent to pubescent), very narrowly elliptic to linear-elliptic, in transverse section transversely linear or sublunate, the base attenuate, the apex acuminate to narrowly acute, the veins longitudinal, 3, *oil glands* dense, distinct to obscure, scattered. *Inflorescences* spicate, typically pseudoterminal or sometimes upper axillary, with 3–22 monads, up to 24 mm wide. *Hypanthium* glabrous or rarely hairy, 1.2–1.5 mm long. *Calyx lobes* abaxially glabrous or rarely hairy, 0.6–1.4 mm long, scarious in a marginal band 0.1–0.2 mm wide or herbaceous to the margin. *Petals* deciduous, 2.5–4 mm long. *Stamens* 34–105 per bundle; filaments white to cream, 8.2–12 mm long, the bundle claw 5.5–8.2 mm long, 0.7 times as long as the filaments. *Style* 4–7.5 mm long. *Ovules* 25–45 per locule. *Fruit* 2–3 mm long, the calyx

lobes weathering away or somewhat persistent; cotyledons obvolvate to subobvolvate (almost planoconvex).

**NATURAL OCCURRENCE:** Northern Territory, South Australia, Queensland, New South Wales: from southern Northern Territory and north-eastern South Australia eastwards into Queensland and northern New South Wales.

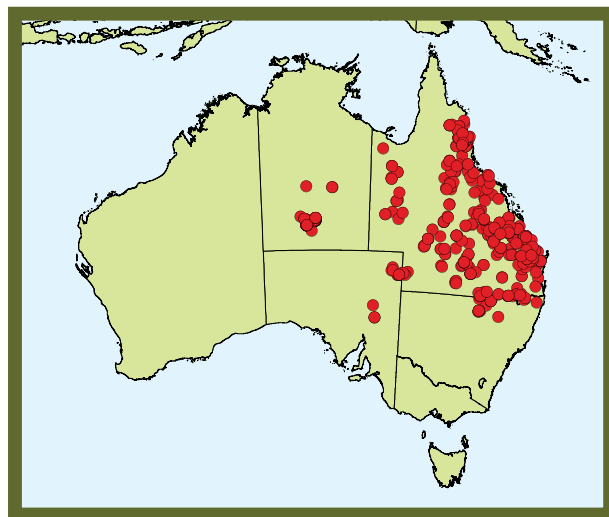
**ECOLOGY:** Recorded as occurring in open forest, dry creek beds, open woodland, *Melaleuca*-sedge swamp, rainforest, along watercourses, on sandy loam, rocky sandstone, lateritic soil, sandy soil over granite, heavy clay, sandy gravel, and seasonally wet alluvial soil.

**FLOWERING TIME:** Recorded as flowering from February to December.

**ESSENTIAL OILS:** Two chemotypes were found in the oils of this species but others might be discovered with further sampling. Chemotype I (JRC 9623) contained 1,8-cineole (45–58%) and terpinen-4-ol (11–16%) as the principal components. These were accompanied by lesser amounts of  $\alpha$ -pinene (1–2%), limonene (5–6%),  $\gamma$ -terpinene (8–12%) and  $\alpha$ -terpineol (5–7%). Sesquiterpenes did not contribute much to this oil, with spathulenol (trace–0.2%) being the biggest component. In chemotype II (BVG 2526), terpinolene (47–66%) was the principal component. This was accompanied by lesser amounts of  $\alpha$ -pinene (1–4%),  $\alpha$ -phellandrene (2–4%), limonene (2–3%), 1,8-cineole (9–12%), terpinen-4-ol (1–3%) and  $\alpha$ -terpineol (1–4%). Once again, sesquiterpenes did not contribute much to the oil, with spathulenol (0.2–0.4%) being the principal member.

**OIL YIELD:** The oil yields were 1.6–2.3% (dry weight, w/w) for JRC 9623 and 1.0–1.5% (fresh weight, w/w) for BVG 2526.

**REFERENCES ON ESSENTIAL OILS:** Southwell et al. 1992; Brophy and Doran 1996; Brophy 1999





## *Melaleuca triumphalis* Craven



**PUBLICATION:** *Muelleria* 11: 1 (1998)

**DERIVATION:** *triumphalis*, from the Latin *triumphalis*, pertaining to a triumph, triumphal, in reference to both the results achieved by Ferdinand Mueller while a member of the Gregory expedition in northern Australia and the collection of this previously unknown species on an expedition commemorating Mueller's work

**DESCRIPTION:** *Shrub* to 2.5 m tall. *Branchlets* hairy, 0.1–0.2 mm wide. *Leaves* alternate, 60–140 mm long, 15–25 mm wide, 4–6 times as long as wide, long-petiolate; blade hairy, 0.1–0.2 mm wide, narrowly elliptic, in transverse section transversely linear or oblunate, the base narrowly cuneate or attenuate, the apex acute or narrowly acute, the veins longitudinal, 3–5, *oil glands* moderately dense, distinct, scattered. *Inflorescences* capitate or shortly spicate, with 10–20 triads (sometimes some dyads may be present), up to 65 mm wide. *Hypanthium* hairy, 2.8–4.6 mm long. *Calyx lobes* abaxially hairy, 1.9–2.5 mm long, herbaceous to the margin. *Petals* deciduous, 5.1–7 mm long. *Stamens* 7–12 per bundle; filaments green (ageing to yellow), 19.5–24.3 mm long, the bundle claw 2–16.5 mm long, 0.1–0.7 times as long as the filaments. *Style* 27.5–35.3 mm long. *Ovules* c. 120–160 per locule.

**Fruit** 3.7–5.6 mm long, the calyx lobes persisting for several years but at length are deciduous or weather away; cotyledons obvolute.

**NATURAL OCCURRENCE:** Northern Territory: the Victoria River district.

**ECOLOGY:** Recorded as occurring on sites with perennial seepage near the base of ephemeral waterfalls, either at the top of scree slopes or in crevices near the base of the cliffs.

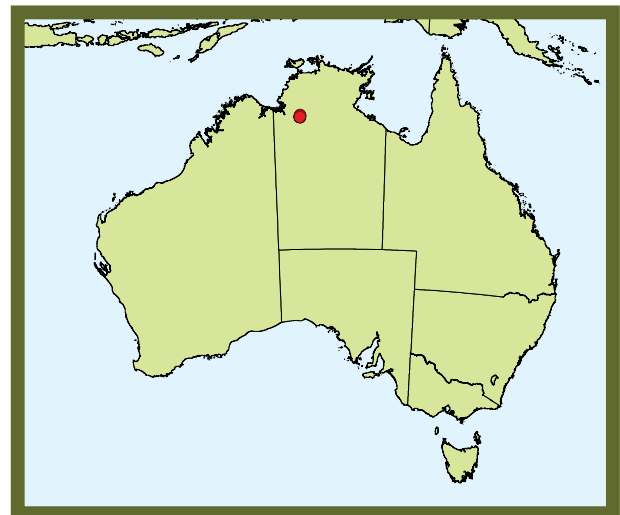
**FLOWERING TIME:** Recorded as flowering in September.

**ESSENTIAL OILS:** The leaf oil of this species was dominated by a terpene,  $\alpha$ -pinene, and an alicyclic diketone, triumphalone. The principal components were  $\alpha$ -pinene (16–30%),  $\beta$ -caryophyllene (2–5%), caryophyllene oxide (4–8%) and spathulenol (1–3%). The other major compound present was triumphalone (1 $\beta$ -pentyl-1 $\alpha$ ,6 $\alpha$ -dihydroxy-3,3,5,5-tetramethyl cyclohexa-2,4-dione) (35–65%). Also present, at about 3–5%, was the isomer, isotriumphalone (1 $\beta$ -pentyl-1 $\alpha$ ,3 $\alpha$ -dihydroxy-4,4,6,6-cyclohexa-2,5-dione). It is not known if this latter compound is an artefact.

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.3%.

**REFERENCE ON ESSENTIAL OILS:** Brophy et al. 2006a

**NOTES:** *Melaleuca triumphalis* should be trialled as an ornamental shrub in monsoonal climates. The flower colour contrasts well with the greyish foliage.



## Melaleuca tuberculata Schauer



**TAXONOMY:** Three varieties are recognised in this species: var. *arenaria* (C.A.Gardner) Craven, var. *macrophylla* Craven and var. *tuberculata*

**PUBLICATION:** in Craven & Lepschi, *Australian Systematic Botany* 12: 911 (1999), var. *arenaria*; in Craven & Lepschi, *Australian Systematic Botany* 12: 911 (1999), var. *macrophylla*; in Lehmann, *Plantae Preissianae* 1: 139 (1844), var. *tuberculata*

**DERIVATION:** *arenaria*, from the Latin *arena*, sand, in reference to the sandy soils in which this plant is found; *macrophylla*, from the Greek *makros*, large, and *phyllon*, leaf, in reference to the large leaves; *tuberculata*, from the Latin *tuberculum*, tubercle, in reference to the prominent oil glands on the leaves

**SYNONYM:** *Melaleuca arenaria* C.A.Gardner

**DESCRIPTION:** *Shrub* 0.2–2 m tall. *Branchlets* glabrescent or occasionally glabrous, when hairy pubescent, rarely with some lanuginose-pubescent to lanuginulose-puberulous hairs also. *Leaves* alternate, 2–19 mm long, 0.8–3.5 mm wide, 1.4–14 times as long as wide, subsessile to short-petiolate; blade glabrescent or occasionally glabrous, when hairy pubescent and rarely with some lanuginose-pubescent hairs also, very narrowly obovate, linear-obovate, obovate, broadly elliptic, narrowly obovate or linear, in transverse section depressed obovate, transversely semi-elliptic to semicircular, sublunate, transversely linear or transversely narrowly elliptic, the base narrowly cuneate or truncate to rounded, the apex obtusely shortly acuminate, obtuse to rounded or acuminate, the veins longitudinal, 3, *oil glands* moderately dense, distinct to obscure, scattered to more or less in rows. *Inflorescences* capitate or shortly spicate, pseudoterminal and sometimes also upper axillary, with 1–7 triads, up to 25 mm wide. *Hypanthium* hairy, 1.5–3 mm long. *Calyx lobes* abaxially hairy or sometimes glabrescent or glabrous, 0.9–1.7 mm long, scarious throughout or scarious in a marginal band 0.6–0.9 mm wide. *Petals* caducous, 1.5–3 mm long. *Stamens* (4–) 6–10 per bundle; filaments pink, mauve-pink, mauve or purple, ageing to whitish, 6.5–12 mm long, the bundle claw (0.9–)2–5 mm long, 0.2–0.5 times as long as the filaments. *Style* 8.5–12 mm long. *Ovules* c. 15–20 per locule. *Infructescences* peg-fruited. *Fruit* 3–4 mm long, the calyx lobes usually weathering away (very rarely some barely discernible undulations may occur around the hypanthium rim); cotyledons obvolute.

**NATURAL OCCURRENCE:** var. *arenaria*: Western Australia: the Bending–Kulin–Hyden–Pingaring district. var. *macrophylla*: Western Australia: from the Kulin–Jerramungup district eastwards to the Grass Patch – Israelite Bay district. var. *tuberculata*: Western Australia: from the Brookton–Narrogin district eastwards to the Esperance – Israelite Bay district.

**ECOLOGY:** var. *arenaria*: Recorded as occurring in open eucalypt woodland with dense shrubby understorey, tall open shrubland, on sand over clay, gravel over laterite, and sandy loam with some gravel. var. *macrophylla*: Recorded as occurring in open heath with emergent eucalypts, open shrubland, sand plain, sandy swampy depression, mixed low scrubland, low open woodland mallee, dense shrubland, on sand, gravelly clay, skeletal soil over granite, lateritic sandy loam, and sandy gravel over limestone. var. *tuberculata*: Recorded as occurring in heathland, sand plain, dense scrubland, eucalypt woodland, open woodland, mixed heath, on gravelly clay loam, sandy soil over laterite, sandy clay with some quartzite, and laterite.

**FLOWERING TIME:** *var. arenaria*: Recorded as flowering from September to November. *var. macrophylla*: Recorded as flowering from September to December. *var. tuberculata*: Recorded as flowering from August to December.

**ESSENTIAL OILS:** *var. arenaria*: This variety produced a leaf oil with roughly equal amounts of mono- and sesquiterpenes present. The principal monoterpenes encountered were 1,8-cineole (29.1%) and  $\alpha$ -pinene (9.5%). These were accompanied by lesser amounts of limonene (1.8%), linalool (3.5%) and  $\alpha$ -terpineol (4.0%). The major sesquiterpenes present in the oil were  $\beta$ -eudesmol (7.8%),  $\alpha$ -eudesmol (5.2%),  $\gamma$ -eudesmol (4.9%), spathulenol (2.4%), viridiflorol (3.3%) and globulol (9.8%). *var. macrophylla*: The leaf oil of this variety contained both mono- and sesquiterpenes, overall in equal amounts. The principal monoterpenes encountered in LAC 9368 were  $\alpha$ -pinene (13.2%) and linalool (24.8%), with lesser amounts of Z- $\beta$ -ocimene (2.3%) and myrcene (1.1%). The main sesquiterpenes in this sample were globulol (9.5%), viridiflorol (8.0%) and spathulenol (6.3%). A second sample, LAC 9544, contained  $\alpha$ -pinene (19.2%) and 1,8-cineole (27.1%) as the principal monoterpenes, with lesser amounts of linalool (7.7%) and  $\alpha$ -terpineol (4.9%). The main sesquiterpenes were globulol (6.9%), viridiflorol (7.1%) and spathulenol (1.7%). *var. tuberculata*: There appeared to be two chemotypes in this variety, one of which contained large amounts of linalool and the second had the three eudesmol isomers as major components. In chemotype I, the principal components were linalool (57.2%) and  $\alpha$ -pinene (21.9%), with lesser amounts of globulol, viridiflorol, spathulenol and  $\alpha$ -,  $\beta$ - and  $\gamma$ -eudesmol (all 1–2%). Chemotype II contained

$\alpha$ -eudesmol (11–17%),  $\beta$ -eudesmol (13–21%) and  $\gamma$ -eudesmol (15–24%) as principal components, with lesser amounts of linalool (2–8%), 1,8-cineole (6–13%),  $\alpha$ -pinene (10–15%) and  $\alpha$ -terpineol (1–3%).

**OIL YIELD:** *var. arenaria*: The oil yield (fresh weight, w/w) was 0.5%. *var. macrophylla*: The oil yield (fresh weight, w/w) was 0.2% in both samples. *var. tuberculata*: The oil yield (fresh weight, w/w) was in all cases 0.4%.

**NOTES:** *Melaleuca tuberculata* is an extremely variable species. Although the variation is considerable, the three more or less distinctive morphs can be recognised on the basis of leaf dimensions as follows: *var. arenaria*: Leaves 2–4.2 mm long, 1.1–2.3 mm wide, 1.4–2.3 times as long as wide. *var. macrophylla*: Leaves 4.5–18.5 mm long, 1.2–3.5 mm wide, 2.5–7.3 times as long as wide. *var. tuberculata*: Leaves 2.5–13.5 mm long, 0.8–1.3 mm wide, 2.7–13.5 times as long as wide.



## Melaleuca ulicoides Craven & Lepschi



**PUBLICATION:** in Craven, Lepschi & Cowley, *Nuytsia* 20: 34 (2010)

**DERIVATION:** *ulicoides*, from *Ulex*, a genus of Fabaceae, and the Greek *-oides*, resembling, in reference to the similarity in habit between this species and gorse, *Ulex europaeus*

**DESCRIPTION:** *Shrub* 0.6–1 m tall. *Branchlets* glabrescent, pubescent. *Leaves* alternate, 3.9–12 mm long, 1.1–2.7 mm wide, 2.3–7.5 times as long as wide, sessile; blade glabrescent, ciliate and long pubescent to sericeous pubescent, narrowly triangular to narrowly ovate, in transverse section lunate, the base truncate, the apex narrowly acute with a pungent mucro, the veins longitudinal, 5, but mostly obscure except for the midrib, *oil glands* densely distributed, distinct. *Inflorescences* capitate, terminal, with 1–3 monads,

5–20 mm wide, bracteoles present on each flower. *Hypanthium* sericeous, 2–3 mm long. *Calyx lobes* abaxially glabrescent, sericeous, costate, broadly or transversely ovate, 1.6–2.1 mm long, scarious in a marginal band 0.2–0.4 mm wide, otherwise herbaceous. *Petals* deciduous, 3–4.5 mm long. *Stamens* 18–28 per bundle; filaments white or cream, 13–17 mm long, the bundle claw 4.2–11.2 mm long, 0.2–0.9 times as long as the filaments. *Style* 15–18 mm long. *Ovules* 30–52 per locule. *Fruit* 2.7–4 mm long, with the distal rim having round sepaline teeth. Seeds brown with membranous testa, cotyledons planoconvex.

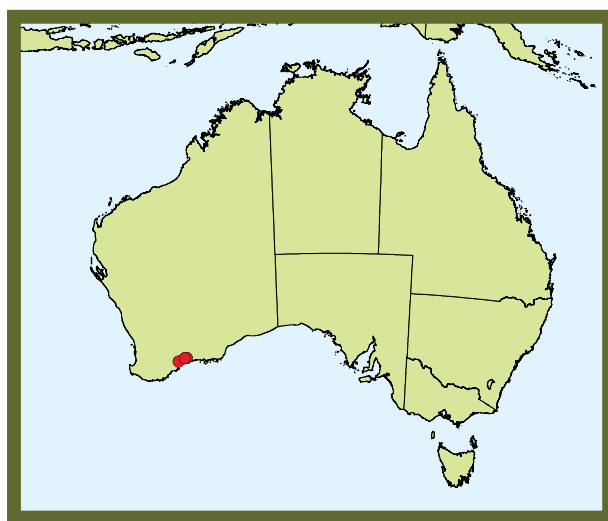
**NATURAL OCCURRENCE:** Western Australia: the Hope-toun–Ravensthorpe district.

**ECOLOGY:** Recorded as occurring in open mallee and heath, on brown loamy clay with small gravel, and laterite.

**FLOWERING TIME:** Recorded as flowering in October and November.

**ESSENTIAL OILS:** The leaf oil of this species presented a completely sesquiterpenoid oil in poor yield. The principal sesquiterpenes encountered were bicyclgermacrene (19.0%), globulol (15.0%) and spathulenol (8.9%). These were accompanied by lesser amounts of cubeban-11-ol (4.6%), viridiflorene (2.6%), germacrene-D (2.0%), palustrol (1.2%) several unknown oxygenated sesquiterpenes of formula  $C_{15}H_{26}O$  (each 3–4%) and  $\alpha$ -cadinol (1.7%). Monoterpenes were not detected in the oil, though hexanol and hex-3-en-1-ol were present at <0.1% levels.

**OIL YIELD:** The oil yield (fresh weight, w/w) was <0.1%.



## *Melaleuca uncinata* R.Br.



**PUBLICATION:** in Aiton, *Hortus Kewensis*, ed. 2, 4: 414 (1812)

**DERIVATION:** *uncinata*, from the Latin *uncinus*, hook, barb, in reference to the shape of the leaf apex

**DESCRIPTION:** *Shrub* to 4(–7) m tall; bark papery, peeling. *Branchlets* sericeous or sericeous to lanuginose-sericeous, glabrescent. *Leaves* ascending to spreading-ascending, 19–56 mm long, 0.8–1.2 mm wide, 21–53 times as long as wide, petiole 0.3–2 mm long; blade glabrescent, sericeous or sericeous to lanuginose-sericeous, linear, in transverse section quadrate or transversely oblong, in lateral view straight, the base very narrowly cuneate or parallel, the apex aristate or narrowly acuminate, recurved, *oil glands* large in rows along the corners of the blade and smaller scattered through the intervening tissue. *Inflorescences* capitate or spicate, with 4–19 triads. *Hypanthium* 1–1.4 mm long, 1–1.5 mm wide. *Calyx lobes* 5, free, abaxially glabrous or hairy, 0.2–0.3 mm long. *Petals* deciduous, broadly ovate, subcircular or circular, 0.9–1.3 mm long, oil glands elliptic to subcircular. *Stamens* 3–5 per bundle; filaments cream, white or pale greenish-cream, 2.3–5 mm long, the

bundle claw 1.2–2.3 mm long, 0.4–0.5 times as long as the filaments. *Style* 6–8.5 mm long. *Ovules* 25–30 per locule. *Infructescences* longer than wide (rarely as wide as long and very rarely shorter than wide), 7–13 mm wide, the constituent fruits closely packed and not retaining a significant separate identity (the fruiting hypanthia closely packed for their full length). Seeds 0.6–1 mm long, the cotyledons obvolute and subfoliaceous.

**NATURAL OCCURRENCE:** Western Australia, South Australia, Queensland, New South Wales, Victoria: the Munglinup – Norseman – Mt Ridley district in Western Australia, southern South Australia through western Victoria to New South Wales and Queensland (see below).

**ECOLOGY:** Recorded as occurring in eucalypt woodland with *Melaleuca*, *Casuarina*–mallee–*Xanthorrhoea* vegetation, eucalypt–acacia woodland, mallee woodland, heath, mallee–broombush community, sand plain, eucalypt scrub, eucalypt–*Callitris* woodland, mallee shrubland, mallee spinifex scrub, open woodland, on deep red sand, gravel, sandy soil, sandstone, sand hills, red gravelly loam, red sandy soil, skeletal soil over granite, calcareous red earth, fine grey sand with laterite, and limestone.

**FLOWERING TIME:** Recorded as flowering from August to December.

**ESSENTIAL OILS:** The leaf oil obtained from this species showed that it occurred in at least two chemotypes. Chemotype I (LAC 9079) contained 1,8-cineole (44–57%) as its major compound, with lesser amounts of  $\alpha$ -pinene (6–13%), limonene (1–7%) and  $\alpha$ -terpineol (2–4%). The principal sesquiterpenes identified were  $\alpha$ -cadinol (1–3%), allo-aromadendrene (0.6–2.0%), globulol (1–2%) and an unknown,  $C_{15}H_{24}O$  (2–4%). Chemotype II (LAC 9089) contained terpinen-4-ol (27–31%) as the principal component. This was accompanied by lesser amounts of sabinene (8–14%),  $\gamma$ -terpinene (10–14%),  $\alpha$ -terpinene (6–8%), limonene (2–6%) and  $\alpha$ -terpineol (1–3%). The principal sesquiterpenes were  $\alpha$ -cadinol (3–8%), T-cadinol (2–3%), T-murolol (0.7–3.0%) and globulol (0.7%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.3–0.5% for chemotype I and 1.3% for chemotype II.

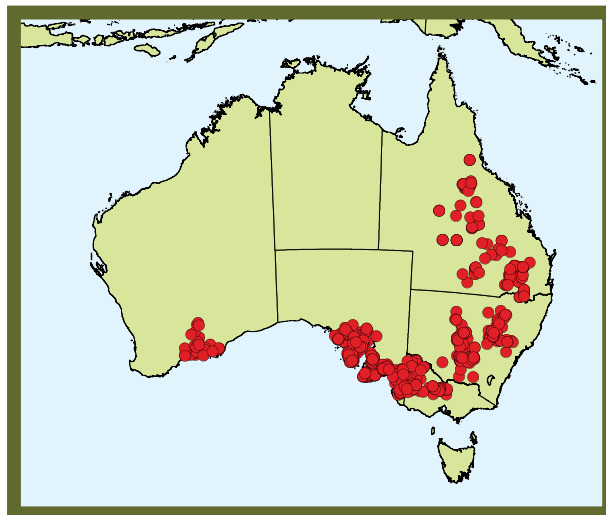
**REFERENCES ON ESSENTIAL OILS:** Brophy 1999; Lassak and Brophy 2004; Brophy et al 2006b

**NOTES:** The taxonomy of the *M. uncinata* complex in Western Australia was clarified by Craven et al. (2004) and the circumscription of *M. uncinata* sensu stricto was much amended. As now understood, *M. uncinata* sensu stricto is restricted to the Munghlinup – Norseman – Mt Ridley district in Western Australia and at least the Eyre Peninsula district in South Australia, western Victoria and south-western New South Wales. The *M. uncinata*

complex in south-eastern and eastern Australia has not yet been studied in detail and it is not known how far northwards *M. uncinata* sensu stricto occurs. The populations in northern New South Wales and Queensland possibly represent another taxon of the complex.

Naturally occurring populations of *M. uncinata* in south-eastern Australia have long been harvested for brushwood fencing; plants resprout after cutting. For this reason, the species could well be used in land rehabilitation etc., with the stands periodically cut to provide a cash crop.

The leaf oil of chemotype II could be investigated for its efficacy. It has reasonable levels of terpinen-4-ol and higher yielding forms might be identified with wider screening.



## *Melaleuca undulata* Benth.



**PUBLICATION:** *Flora Australiensis* 3: 135 (1867)

**DERIVATION:** *undulata*, from the Latin *unda*, wave, in reference to the leaf blade being wavy

**DESCRIPTION:** *Shrub* 0.3–2.6 m tall; bark flaking, off-white. *Branchlets* glabrescent, pubescent to sericeous-pubescent or sometimes approaching sericeous-pubescent, sericeous-lanuginulose or lanuginulose-puberulous. *Leaves* alternate, 3–15 mm long, 1.5–4 mm wide, 1.3–6 times as long as wide, sessile or subsessile; blade glabrescent, the indumentum consisting of marginal cilia, narrowly ovate to ovate, broadly ovate, narrowly obovate, narrowly elliptic to elliptic or subcircular, in transverse section sublunate or transversely linear, the base cuneate, truncate or subcordate, the apex acuminate, narrowly acute to acute or narrowly acuminate, the veins longitudinal, 7–11, *oil glands* moderately dense, distinct to obscure, more or less in rows. *Inflorescences* capitate, lateral, with 1–18 monads, up to 27 mm wide.

*Hypanthium* glabrous or rarely hairy, 1.2–2.5 mm long. *Calyx lobes* abaxially glabrous or rarely hairy or glabrescent, costate, 0.6–1.5 mm long, scarious in a marginal band 0.15–0.3 mm wide. *Petals* deciduous, 2.5–3.5 mm long. *Stamens* 8–30 per bundle; filaments white to cream, 8.5–11 mm long, the bundle claw 3.8–6.8 mm long, 0.5–0.7 times as long as the filaments. *Style* 7–10.5 mm long. *Ovules* 15–30 per locule. *Fruit* 2.5–4 mm long, with sepaline teeth (these may become more or less immersed in the hypanthium wall at maturity); cotyledons planoconvex.

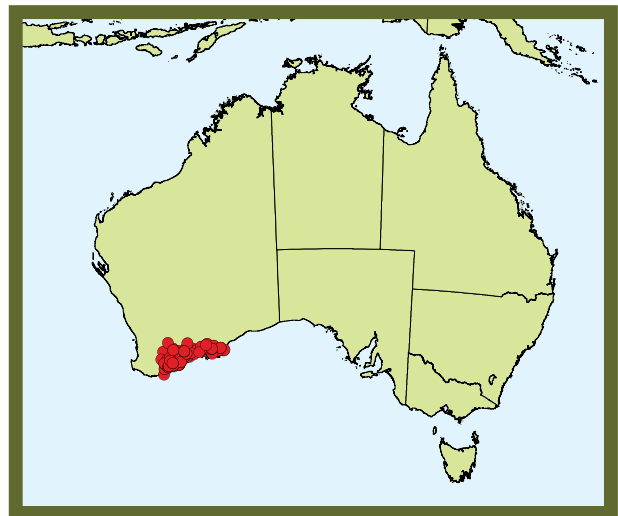
**NATURAL OCCURRENCE:** Western Australia: from the Stirling Range – Broomehill district eastwards to the Israelite Bay district.

**ECOLOGY:** Recorded as occurring in open mallee, heathland, swampy areas, low forest, saline areas, river beds, edge of clay pans, tall eucalypt shrubland, on sand, clay, shallow sand on clay and laterite gravel, loamy sand, and sandy silt.

**FLOWERING TIME:** Recorded as flowering in May, July and from October to March.

**ESSENTIAL OILS:** This species presented a predominantly monoterpenoid oil. The principal monoterpenes were 1,8-cineole (48–70%),  $\alpha$ -pinene (5–14%), limonene (2–3%) and  $\alpha$ -terpineol (1–3%). A second collection contained 1,8-cineole (25.5%), p-cymene (11.9%),  $\beta$ -pinene (4.9%), terpinen-4-ol (14.8%) and  $\alpha$ -terpineol (2.1%). The principal sesquiterpenes in both collections were spathulenol (3–12%), globulol (1–3%),  $\beta$ -caryophyllene (0.1–5.0%) and allo-aromadendrene (0.6–2.0%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.1–0.2%.



## Melaleuca urceolaris F.Muell. ex Benth.



**PUBLICATION:** *Flora Australiensis* 3: 154 (1867)

**DERIVATION:** *urceolaris*, from the Latin *urceus*, pitcher, urn, in reference to the shape of the fruiting hypanthium

**DESCRIPTION:** *Shrub* 0.5–3 m tall; bark papery.

**Branchlets** glabrescent, dimorphic with a dense layer of puberulous to shortly pubescent hairs overlaid with sparser pubescent hairs. **Leaves** alternate, 6.7–20 mm long, 0.6–1 mm wide, 7–30 times as long as wide, subsessile; blade glabrescent, pubescent and rarely with some shorter puberulous to shortly pubescent or (rarely) lanuginose-pubescent hairs also, linear or linear-obovate, in transverse section depressed obovate or transversely elliptic to transversely narrowly elliptic, the base parallel (blade width equals petiole width), the apex narrowly acute to acute or acuminate, the veins longitudinal, 3, **oil glands** moderately dense, distinct to obscure, scattered. **Inflorescences** capitate, pseudoterminal, with 2–12 apparent monads, up to 25 mm wide. **Hypanthium** hairy, 1.5–2.5 mm long. **Calyx lobes** abaxially hairy, 0.6–1.7 mm long, scarious throughout. **Petals** deciduous, 1.8–3.5 mm long. **Stamens** 9–15 per bundle; filaments white to cream, yellow or lemon-yellow, ageing to salmon to pinkish or red, 8.4–13.2 mm long, the bundle claw 3.3–5.7 mm long, 0.4–0.5 times as long as the filaments. **Style** 10–14 mm long. **Ovules** 8–10 per locule. **Infructescences** peg-fruited.

**Fruit** 2.8–4 mm long, the calyx lobes usually weathering away (the extreme basal portion of the lobes may become woody and persist as undulations or rarely blunt rounded teeth around the hypanthium rim); cotyledons obvolvate.

**NATURAL OCCURRENCE:** Western Australia: the Arrino – Jurien Bay – Gingin district.

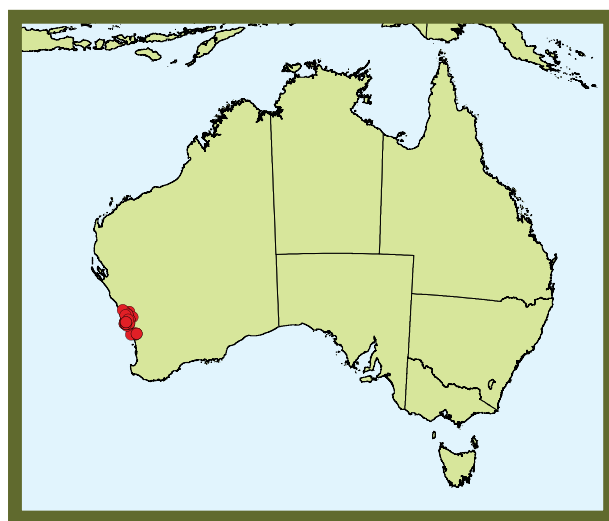
**ECOLOGY:** Recorded as occurring in dense heath, low shrubland, open woodland, woodland over low heath, on sand, sand over laterite, sandy clay, and gravel.

**FLOWERING TIME:** Recorded as flowering from August to November.

**ESSENTIAL OILS:** This species presented a monoterpene leaf oil. The principal components were  $\alpha$ -pinene (23.2%), 1,8-cineole (21.5%) and linalool (27.5%). These were accompanied by lesser amounts of  $\alpha$ -terpineol (2.5%), geraniol (1.1%), limonene (1.7%), myrcene (1.4%) and  $\beta$ -pinene (1.6%). The major sesquiterpenes present in the oil were globulol (5.7%), viridiflorol (2.2%), spathulenol (0.7%) and bicyclogermacrene (1.2%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.6%.

**NOTES:** This name commonly has been misapplied to many yellowish-flowered species of the *M. scabra* group. *Melaleuca urceolaris* occurs only in the sand-plain country north of Perth. The species should be trialled as an ornamental shrub in Mediterranean and temperate regions as the colour pattern created by the newly opened whitish to yellow flowers subsequently ageing to salmon to orange-red gives a very unusual effect.





## *Melaleuca uxorum* Craven, G.Holmes & Sankowsky



**PUBLICATION:** *Muelleria* 18: 3 (2004, as 2003)

**DERIVATION:** *uxorum*, from the Latin *uxor*, wife, spouse, consort, in collective honour of Kirsty, Jenny and Nada, the wives, respectively, of each of the authors of this name, for their companionship in the field and enthusiasm for plants generally

**DESCRIPTION:** *Shrub* to 1 m tall (usually 0.5–0.6 m tall). Bud scales absent (but prophylls present on lateral shoots). *Branchlets* glabrescent or subglabrous, minutely puberulous, terete, subcompressed or irregularly angled, very slightly excavated. *Leaves* decussate, 2–4.5 mm long, 1.3–2.7 mm wide, 1.3–2.3 times as long as wide, sessile; leaf blade glabrescent, the abaxial surface glabrous, the margin with stoutish cilia, dull, broadly elliptic, broadly ovate or subcircular, in transverse section lunate, strongly lunate or broadly v-shaped, the base rounded or truncate, the apex acuminate, narrowly acute or obtusely shortly acuminate, the veins longitudinal, 11–17, *oil glands* not visible on either surface, sparse. *Inflorescences* capitate or spicate with 4–12 triads, 18–25 mm wide. *Hypanthium* glabrous,

1.2–2.6 mm long. *Calyx lobes* abaxially glabrous (margin is minutely ciliate), costate or not (distinctly costate when dried), 0.8–1.2 mm long, herbaceous almost to the margin or herbaceous in the proximal-central zone and scarious in a narrow marginal band, the band 0.1–0.2 mm wide. *Petals* deciduous, 1.8–2.2 mm long. *Stamens* 6–12 per bundle; filaments pure white, 7.5–11 mm long, the bundle claw 3.7–6 mm long, 0.5–0.6 times as long as the filaments. *Style* 8–10.3 mm long. *Ovules* c. 33–37 per locule. *Fruit* 5–3.5 mm long, the calyx lobes replaced by sepaline teeth or weathering away; cotyledons obvolute.

**NATURAL OCCURRENCE:** Queensland: the northern Herberton Range.

**ECOLOGY:** Recorded as occurring as low continuous shrubberies on rock pavements in low open woodland dominated by *Eucalyptus lockyeri* on acidic volcanic rock.

**FLOWERING TIME:** Recorded as flowering from November to February.

**ESSENTIAL OILS:** This species gave an oil that contained more sesquiterpenes than monoterpenes. The principal sesquiterpenes encountered were globulol (13.6%), viridiflorol (9.2%), spathulenol (13.2%) and bicyclogermacrene (6.2%). Monoterpenes accounted for less than 20% of the oil, the main component being  $\alpha$ -pinene (16.1%), with lesser amounts of  $\beta$ -pinene,  $\gamma$ -terpinene and terpinen-4-ol (each <1.5%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.8%.

**REFERENCE ON ESSENTIAL OILS:** Brophy et al. 2008



## Melaleuca venusta Craven



**PUBLICATION:** in Craven & Lepschi, *Australian Systematic Botany* 12: 912 (1999)

**DERIVATION:** *venusta*, from the Latin *venustus*, beautiful, graceful, in reference to the pleasing contrast of the purple to mauve flowers with the grey to silvery foliage

**DESCRIPTION:** *Shrub* to 1 m tall. *Branchlets* hairy to glabrescent, pubescent to less often sericeous-pubescent or rarely sericeous. *Leaves* alternate, 18–45 mm long, 6–11 mm wide, 3–4 times as long as wide, short-petiolate; blade sericeous, becoming sericeous-pubescent to pubescent proximally and on the petiole, obovate to narrowly obovate or elliptic, in transverse section transversely linear, the base attenuate, the apex acuminate, obtusely shortly acuminate or rounded, the veins longitudinal, 5(–7), *oil glands* moderately dense, obscure, scattered.

*Inflorescences* capitate or shortly spicate, pseudoterminal and sometimes also upper axillary, with 6–13 triads, up to 32 mm wide. *Hypanthium* hairy, 1.5–2 mm long. *Calyx lobes* abaxially hairy, glabrescent or glabrous, 0.7–1.5 mm long, scarious throughout. *Petals* caducous, 1.5–2.5 mm long. *Stamens* 7–11 per bundle; filaments purple to mauve, ageing to white, 8–14 mm long, the bundle claw 2.3–3.7 mm long, 0.2–0.3 times as long as the filaments. *Style* 11.5–15 mm long. *Ovules* 7–10 per locule. *Infructescences* globose. *Fruit* 2.5–3.5 mm long, the calyx lobes weathering away; cotyledons obvolute.

**NATURAL OCCURRENCE:** Western Australia: the Kalbarri district.

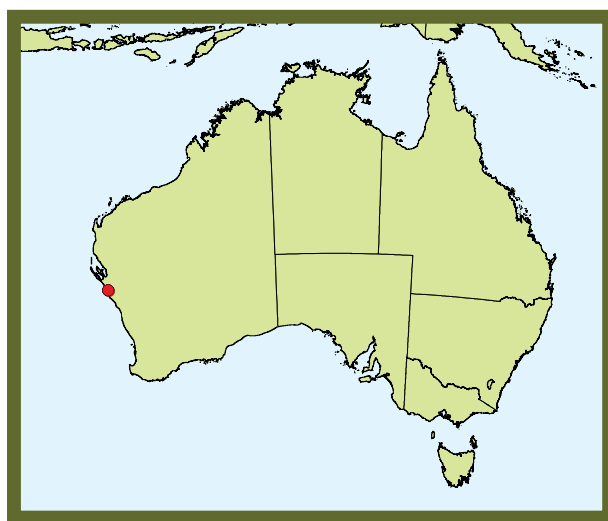
**ECOLOGY:** Recorded as occurring in low heath on skeletal sand over limestone.

**FLOWERING TIME:** Recorded as flowering in July, October and November.

**ESSENTIAL OILS:** The leaf oil of this species was dominated by sesquiterpenes. The principal sesquiterpenes encountered were spathulenol (23–36%), globulol (4–17%), viridiflorol (1–8%), viridiflorene (1–5%) and bicyclogermacrene (0.8–9.0%). The main monoterpenes encountered were 1,8-cineole (0.1–24.0%, most <0.5%) and limonene (trace–6%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was <0.1%.

**NOTES:** *Melaleuca venusta* is a very beautiful plant and it merits trial as an ornamental shrub in dry Mediterranean climates.



## *Melaleuca villosisepala* Craven



**PUBLICATION:** in Craven & Lepschi, *Australian Systematic Botany* 12: 913 (1999)

**DERIVATION:** *villosisepala*, from the Latin *villus*, shaggy hair, hence *villosus*, hairy, and *sepalum*, sepal, in reference to the hairy calyx lobes

**DESCRIPTION:** *Shrub* 0.2–1.3 m tall. *Branchlets* glabrescent, pubescent (the indumentum may appear more or less dimorphic but the hair types grade) or occasionally approaching lanuginose-pubescent, rarely sericeous-pubescent. *Leaves* alternate, 3.5–15 mm long, 0.7–1.3 mm wide, 3–15 times as long as wide, subsessile to short-petiolate; blade glabrescent, pubescent to sericeous-pubescent, generally more or less lanuginose-pubescent on younger growth, rarely more or less sericeous to sericeous-pubescent, suboblong, oblong, linear, linear-obovate or narrowly obovate, in transverse section subcircular to circular, transversely elliptic or depressed obovate, the base narrowly cuneate to attenuate, rounded or parallel (blade width equals petiole width), the apex rounded to obtuse or obtusely shortly acuminate, the veins longitudinal, 3, *oil glands* moderately dense, obscure to distinct,

in rows to scattered. *Inflorescences* capitate, pseudoterminal and sometimes also upper axillary, with 1–6 triads, up to 20 mm wide. *Hypanthium* hairy, 1.5–3 mm long. *Calyx lobes* abaxially hairy or glabrescent, 0.7–1.5 mm long, in texture imperfectly differentiated and more or less scarious throughout or scarious in a marginal band 0.2–0.3 mm wide. *Petals* caducous, 1.5–3 mm long. *Stamens* 5–9 per bundle; filaments purple, mauve, pink, bright pink or magenta, ageing to whitish, 6.5–12 mm long, the bundle claw 1.5–4.2 mm long, 0.2(–0.5) times as long as the filaments. *Style* 7–13 mm long. *Ovules* 15–20 per locule. *Infructescences* peg-fruited. *Fruit* 2.5–4.5 mm long, the calyx lobes weathering away; cotyledons obvolute.

**NATURAL OCCURRENCE:** Western Australia: from the Southern Cross – Coolgardie district south to the Stirling Range – Ravensthorpe district.

**ECOLOGY:** Recorded as occurring in sand plain, low open mallee, open woodland, mallee heath, on shallow sandy soil, sand over laterite, granitic loam, sand over sandy clay over granite, and gravelly clay.

**FLOWERING TIME:** Recorded as flowering from September to February.

**ESSENTIAL OILS:** The leaf oil of this species contained major amounts of monoterpenes, the principal members of which were 1,8-cineole (26–36%),  $\alpha$ -pinene (10–12%) and  $\beta$ -pinene (6–8%). These were accompanied by lesser amounts of  $\alpha$ -terpineol (6–8%), limonene (2–3.0%), fenchol (0.1–2.0%), linalool (0.8–3.0%), terpinen-4-ol (0.7–1.0%) and geraniol (0.9–2.0%). The principal sesquiterpenes encountered in the oil were globulol (5–9%), viridiflorol (4–11%), cubeban-11-ol (1–5%), two unidentified alcohols of formula  $C_{15}H_{26}O$  (each 1–4%) and  $\alpha$ -,  $\beta$ - and  $\gamma$ -eudesmol (each 0.4–2.0%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.4–0.5%.



## Melaleuca viminalis (Sol. ex Gaertn.) Byrnes



**TAXONOMY:** Two subspecies are recognised in this species: subsp. *rhododendron* Craven and subsp. *viminalis*

**PUBLICATION:** *Novon* 19: 451 (2009), subsp. *rhododendron*; *Austrobaileya* 2: 75 (1984), subsp. *viminalis*

**DERIVATION:** *rhododendron*, from the Greek *rhodon*, rose or rose-coloured, and *dendron*, tree, in reference to the staminal filament colour and habit of the plant; *viminalis*, from the Latin *vimen*, a pliant twig, osier, in reference to the flexible, typically pendulous branchlets

**SYNONYMS:** *Metrosideros viminalis* Sol. ex Gaertn.; *Callistemon viminalis* (Sol. ex Gaertn.) G. Don; *Callistemon viminalis* var. *minor* Byrnes (synonym of subsp. *viminalis*); *Callistemon viminalis* subsp. *rhododendron* (Craven) Udovicic & R.D. Spencer

**DESCRIPTION:** *Multi- or single-stemmed shrub or tree* 1–35 m tall; bark fibrous, hard. *Branchlets* glabrescent, with long

pubescent hairs overlying a layer of short pubescent hairs, or the hairs sericeous. *Leaves* alternate, 25–138 mm long, 3–27 mm wide, 4.3–20 times as long as wide, long- or short-petiolate; blade glabrescent, sericeous to sericeous-lanuginulose, very narrowly elliptic, narrowly elliptic, narrowly obovate or elliptic, in transverse section transversely linear, sublunate or obsubllunate, the base very narrowly attenuate or very narrowly cuneate, the apex acute, the veins pinnate, 9–27, *oil glands* moderately dense or dense, distinct or obscure, scattered. *Inflorescences* spicate, pseudoterminal or interstitial, sometimes lateral below the leaves, with 15–50 monads, 35–50 mm wide. *Hypanthium* hairy to glabrous, 3.1–4.3 mm long. *Calyx lobes* abaxially hairy or glabrescent, 1.5–2.2 mm long, herbaceous to the margin. *Petals* deciduous, 3.4–5.9 mm long. *Stamens* usually in 5 distinct bundles but sometimes these obscure (particularly when the claw is very short), 9–14 per bundle; filaments red to crimson, 13–26 mm long, the bundle claw up to 2.2 mm long, c. 0.1 times as long as the filaments; anthers dark purple or reddish. *Style* 16–29 mm long. *Ovules* c. 100 per locule. *Fruit* 3.8–4.8 mm long, the calyx lobes usually deciduous (rarely with sepaline teeth or persistent sepals); cotyledons obovulate.

**NATURAL OCCURRENCE:** subsp. *rhododendron*: Queensland: the Injune district. subsp. *viminalis*: Western Australia, Queensland, New South Wales: the Kimberley region of Western Australia, eastern Queensland and New South Wales from Cape York Peninsula to the Grafton district, extending to the western slopes of the Great Dividing Range in central and south-eastern Queensland and northern New South Wales and with isolated occurrences in the Boulia district of Queensland.

**ECOLOGY:** subsp. *rhododendron*: Recorded as occurring along a creek bank in basalt soil. subsp. *viminalis*: Recorded as occurring in the beds and on the banks of creeks and rivers, where it forms riparian shrublands and forests in both woodland and rainforest country, on rock, and sandy rocky soils.

**FLOWERING TIME:** subsp. *rhododendron*: Recorded as flowering in September and October. subsp. *viminalis*: Recorded as flowering throughout the year.

**ESSENTIAL OILS:** subsp. *viminalis*: The major compounds in the oils were the monoterpene hydrocarbons  $\alpha$ - and  $\beta$ -pinene, myrcene, limonene and p-cymene, and the oxygenated monoterpenes 1,8-cineole and  $\alpha$ -terpineol. Sesquiterpenes, while numerous, did not contribute significantly to the oil, in all accounting for less than 10% of the overall oil. The main sesquiterpenes encountered were aromadendrene,  $\beta$ -caryophyllene, viridiflorene, bicyclgermacrene, globulol, viridiflorol and

spathulenol. Also detected in the oils, in trace amounts, were two  $\beta$ -triketones, leptospermone and flavesone. As a generalisation, the essential oils that contained the most 1,8-cineole (60–82%) came from the more southern latitudes (29°14' to 20°16' S), while those oils with less 1,8-cineole (0.5–47.0%) came from the more northerly latitudes (12°53' to 25°18' S). There was overlap in the region 25°S to 22°S, though the majority of samples from this region contained the high 1,8-cineole values. **subsp. *rhododendron*:** There are no oils data on this subspecies at present.

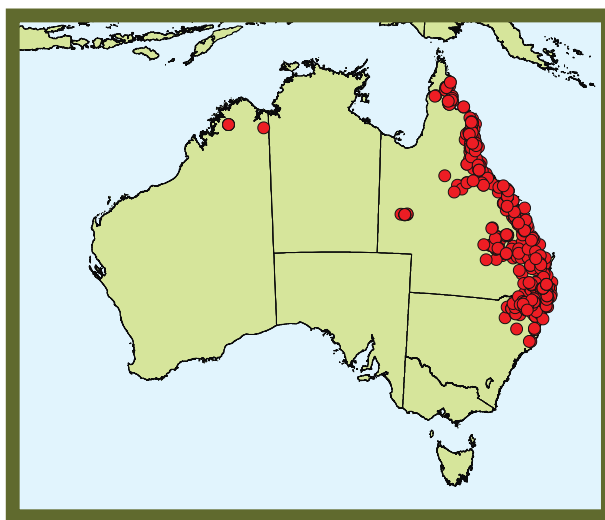
**OIL YIELD:** **subsp. *viminalis*:** The oil yield (fresh weight, w/w) was 0.1–0.6%. This appeared to be independent of latitude.

**REFERENCES ON ESSENTIAL OILS:** Brophy et al. 1985, 1997, 1998, as *Callistemon viminalis*

**NOTES:** The two subspecies may be distinguished as follows: **subsp. *rhododendron*:** Single-stemmed tree to 35 m tall. **subsp. *viminalis*:** Several-stemmed shrub or tree to 15 m tall.

*Melaleuca viminalis* is very well known in cultivation and is widely grown in tropical to temperate regions in Australia for its showy red flowers. It is an unusual member of

the callistemon (i.e. bottlebrush) group in that its staminal filaments are fused into five bundles; most of the other bottlebrush species have free stamens. Subspecies *rhododendron* is not known to be in cultivation but it is likely to be a useful tree for planting in parks and larger gardens. In view of its tree form, it may also have potential as a source of timber.



## Melaleuca viminea Lindl.



**TAXONOMY:** Three subspecies are recognised in this species: subsp. *appressa* Barlow, subsp. *demissa* Quinn ex Craven and subsp. *viminea*

**PUBLICATION:** in Quinn, Cowley, Barlow & Thiele, *Nuytsia* 8: 349, fig. 6d (1992), subsp. *appressa*; in Craven & Lepschi, *Australian Systematic Botany* 12: 913 (1999), subsp. *demissa*; *Edwards's Botanical Register*, Appendix vols 1–23: viii (1839), subsp. *viminea*

**DERIVATION:** *appressa*, from the Latin *appressus*, in reference to the appressed leaves; *demissa*, from the Latin *demissus*, low, humble, drooping, in apparent reference to the curvature of the leaf blades; *viminea*, from the Latin *vimen*, a pliant twig, osier, in reference to the flexible branchlets

**DESCRIPTION:** *Shrub or tree* 0.5–14 m tall; bark papery or fibrous, whitish or grey. *Branchlets* glabrescent, puberulous to lanuginulose-puberulous (sometimes with dense lanuginulose hairs also) or lanuginulose. *Leaves* alternate

or sometimes subternate or ternate, 3–20 mm long, 0.6–2 mm wide, 1.7–15 times as long as wide, short-petiolate to sessile; blade glabrescent, puberulous to lanuginulose-puberulous, occasionally with some lanuginulose hairs also and rarely with some sericeous-lanuginulose hairs, or lanuginulose, very narrowly elliptic to linear-elliptic, narrowly elliptic, very narrowly ovate, very narrowly obovate or elliptic, in transverse section transversely semielliptic, transversely linear, shallowly lunate to semicircular, strongly depressed obtriangular or flattened transversely semielliptic, the base attenuate to narrowly cuneate, the apex narrowly acute to acute, obtusely shortly acuminate, acuminate, rounded or obtuse, the veins longitudinal, 3, *oil glands* moderately dense, obscure, in rows. *Inflorescences* spicate or capitate, pseudoterminal or lateral, with 4–50 monads, up to 25 mm wide. *Hypanthium* glabrous or rarely hairy, 1.3–2.7 mm long. *Calyx lobes* abaxially glabrescent to hairy or glabrous, 0.5–1 mm long, herbaceous to the margin or scarious in a marginal band up to 0.3 mm wide. *Petals* deciduous, 1.2–2.6 mm long. *Stamens* 3–16 per bundle; filaments cream, pale yellow or white, 3.7–7.3 mm long, the bundle claw 1.8–6 mm long, 0.3–0.6 times as long as the filaments. *Style* 6–12 mm long. *Ovules* 30–75 per locule. *Fruit* 2–4 mm long, the calyx lobes weathering away or the lobes replaced by sepaline teeth; cotyledons planoconvex.

**NATURAL OCCURRENCE:** subsp. *appressa*: Western Australia: three disjunct populations in the Ongerup, Mt Burdett and South Yilgarn districts. subsp. *demissa*: Western Australia: the Walpole–Manypeaks district, with an isolated record from the Fitzgerald River district. subsp. *viminea*: Western Australia, Victoria: from the Kalbarri district south to the Busselton and Albany districts, and eastwards to the Muntadgin and Fitzgerald River districts. Naturalised locally in southern Victoria.

**ECOLOGY:** subsp. *appressa*: Recorded as occurring in thickets, along a seasonal creek, on shallow sand over clay, and clayey loam over granite. subsp. *demissa*: Recorded as occurring in sparse shrubland, dense shrubland, low dense heath, coastal heathland, on sand, sandy loam, sand with granite outcrops, and gravelly sand. subsp. *viminea*: Recorded as occurring in low eucalypt forest, mallee, *Melaleuca* thickets, open eucalypt woodland, sand plain, tall closed heath, open heath, open swampy woodland, along watercourses, on sand, gravelly sand over laterite, clayey sand over laterite, decomposed granite, clayey sand over sandstone, and peaty soil.

**FLOWERING TIME:** subsp. *appressa*: Recorded as flowering in September and October. subsp. *demissa*: Recorded

as flowering in September and October. **subsp. *viminea*:** Recorded as flowering from July to November.

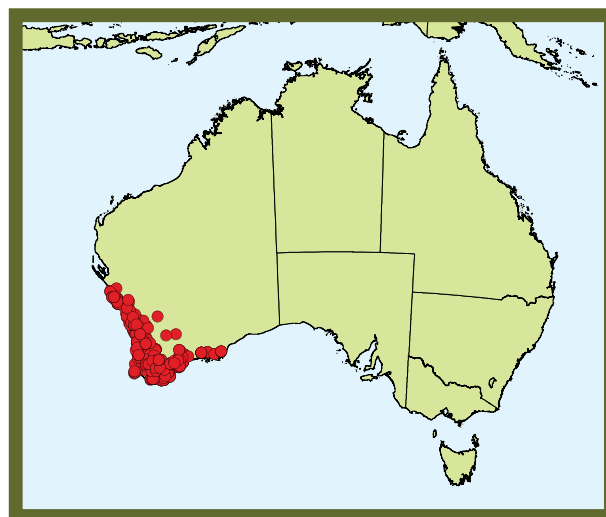
**ESSENTIAL OILS:** **subsp. *appressa*:** There are no oils data on this subspecies at present. **subsp. *demissa*:** There are no oils data on this subspecies at present. **subsp. *viminea*:** The leaf oil of this subspecies contained significant amounts of both mono- and sesquiterpenes and at least two chemotypes are indicated. In chemotype I, the principal monoterpenes encountered were  $\alpha$ -pinene (10–46%), limonene (1–2%), terpinolene (0.1–6.0%) and  $\alpha$ -terpineol (1–4%). The main sesquiterpenes identified were globulol (4–9%), viridiflorol (2–6%), spathulenol (4–6%), E,E-farnesol (2–11%), aromadendrene (1–7%) and bicyclogermacrene (5–13%). In chemotype II, the principal monoterpene was  $\alpha$ -pinene (20.3%) and this was accompanied by lesser amounts of 1,8-cineole (3.5%) and  $\beta$ -pinene (1.3%). The major sesquiterpenes were  $\gamma$ -,  $\alpha$ - and  $\beta$ -eudesmol (8.4%, 14.2% and 22.5%, respectively), with lesser amounts of elemol (1.9%), spathulenol (2.0%), bicyclogermacrene (3.1%) and  $\beta$ -selinene (1.2%).

**OIL YIELD:** **subsp. *viminea*:** The oil yield (fresh weight, w/w) was <0.1% for chemotype I and for 1.4% for chemotype II.

**NOTES:** The three subspecies are distinguished as follows: **subsp. *appressa*:** Leaves in lateral view straight (at the very apex incurved), appressed to ascending. **subsp. *demissa*:** Leaves in lateral view recurved to straight (at the very apex recurved or straight, rarely incurved), usually spreading, sometimes spreading-ascending; staminal filaments 5–12 mm long. **subsp. *viminea*:** Leaves in lateral

view recurved to straight (at the very apex recurved or straight, rarely incurved), usually appressed to spreading-ascending, sometimes spreading; staminal filaments 5–7.3 mm long.

This species should be investigated with the objective of selecting superior genotypes for ornamental plantings, shelter belts, roadside plantings etc. in at least temperate and subtropical regions. Wrigley and Fagg (1993) reported that the species can grow well in tropical regions. It could be a preferable alternative to species such as *M. armillaris*. The stems ('sticks') of this species are used in Western Australia to make lobster pots and for bean sticks in the Carnarvon vegetable production area for supporting climbing beans (Peter White, pers. comm.).



## Melaleuca vinnula Craven & Lepschi



**PUBLICATION:** in Craven, Lepschi, Broadhurst & Byrne, *Australian Systematic Botany* 17: 269 (2004)

**DERIVATION:** *vinnula*, from the Latin *vinnulus*, delightful, in reference to the appearance of this species

**DESCRIPTION:** *Shrub* to 2.2 m tall; bark papery, peeling. *Branchlets* glabrescent with sericeous-pubescent (sometimes with a few sericeous-lanuginose hairs) or sericeous. *Leaves* ascending or spreading-ascending, 19–50 mm long, 1.1–2.8 mm wide, 11–28 times as long as wide, petiole 0.7–1.2 mm long; blade glabrescent, sericeous-pubescent (sometimes with a few sericeous-lanuginose hairs) or sericeous, linear, linear-obovate or linear-elliptic, in transverse section transversely linear or transversely narrowly oblong, in lateral view straight, the base very narrowly cuneate or narrowly cuneate, the apex narrowly acuminate, narrowly acute or acuminate, *oil glands* scattered. *Inflorescences* capitate, with 6–16 triads. *Hypanthium* 0.9–1.3 mm long, 1–1.2 mm wide. *Calyx lobes* 5 or sometimes 4, free or connate, abaxially glabrous, 0.15–0.4 mm long. *Petals* caducous, subcircular to circular, or very broadly ovate, 1–1.4 mm long, oil glands subcircular to circular or elliptic. *Stamens* 3–7 per bundle (usually 5–7), the filaments white to yellow, 3–4.5 mm long, the bundle claw 1.4–2.5 mm long, 0.5–0.7 times as long as the filaments. *Style* 4.5–7 mm long. *Ovules* 14–25 per locule. *Infructescences* longer than wide (rarely as wide as long and very rarely shorter than wide), 6.5–11 mm wide, the

constituent fruits closely packed and not retaining a significant separate identity (the fruiting hypanthia closely packed for their full length). Seeds 0.4–0.8 mm long, the cotyledons planoconvex.

**NATURAL OCCURRENCE:** Western Australia: from the Coorow–Tampu district south-eastwards to the Wyalkatchem – Mukinbudin – Southern Cross district.

**ECOLOGY:** Recorded as occurring in eucalypt woodland, with *Borya*, *Casuarina*, *Melaleuca eleuterostachya*, *Callitris*, *Acacia* spp., *Eucalyptus kochii* and *Hakea*, in *Eucalyptus–Melaleuca–Acacia–Casuarina* woodland, on red clayey sand, red brown clayey sand over granite, and brown clay sand.

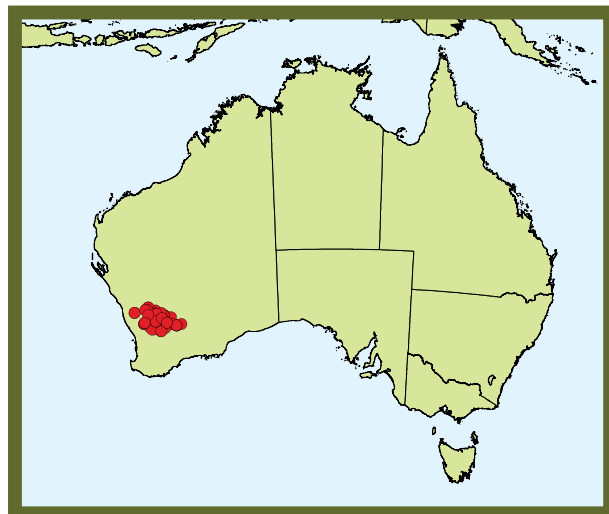
**FLOWERING TIME:** Recorded as flowering in November and December.

**ESSENTIAL OILS:** There was variation in the leaf oil of this species, which tentatively indicated two chemotypes were present. Chemotype I contained  $\alpha$ -pinene (65.3%) as its major component. This was accompanied by lesser amounts of  $\beta$ -pinene (2.5%), bicyclogermacrene (7.7%), elemol (2.6%) and  $\gamma$ -,  $\alpha$ - and  $\beta$ -eudesmol (all 2–4%). Chemotype II contained 1,8-cineole (58–64%) as its principal component. This was accompanied by lesser amounts of  $\alpha$ -pinene (11–18%), limonene (4–5%),  $\alpha$ -terpineol (4–7%), bicyclogermacrene (2–4%) and elemol (0.7%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 1.2% for chemotype I and 1.9–2.8% for chemotype II.

**REFERENCE ON ESSENTIAL OILS:** Brophy et al. 2006b

**NOTES:** This species is a member of the broombush group. It deserves to be trialled as an ornamental shrub in dry temperate regions and may even have potential for brushwood production.





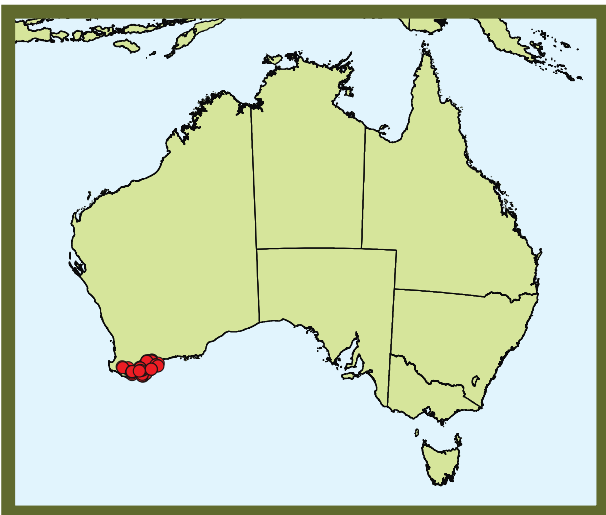
## *Melaleuca violacea* Schauer



**PUBLICATION:** in Lehmann, *Plantae Preissianae* 1: 146 (1844)

**DERIVATION:** *violacea*, from the Latin *violaceus*, violet-coloured, i.e. purple, in reference to the flower colour

**DESCRIPTION:** *Shrub* 0.1–1.5 m tall. *Branchlets* glabrous. *Leaves* decussate, 5–18 mm long, 2–8 mm wide, 1.8–4 times as long as wide, subsessile, sessile or short-petiolate; blade glabrous, ovate to narrowly ovate or narrowly elliptic to elliptic, in transverse section transversely linear or sublunate, the base rounded, subcordate, cordate or cuneate, the apex acute, the veins longitudinal, 3, *oil glands* dense, distinct to obscure, scattered. *Inflorescences* spicate or subcapitate, lateral, with 1–6 monads, up to 12 mm wide. *Hypanthium* glabrous, 1.5–2 mm long. *Calyx lobes* abaxially glabrous, 1.3–1.7 mm long, scarious in a marginal



band 0.15–0.3 mm wide. *Petals* deciduous, 2.5–4 mm long. *Stamens* dimorphic or grading and then more or less monomorphic, up to 25 per bundle (10–25 proximal stamens and 4–6 distal); filaments purple or mauve, 5.5–8.2 mm long, the bundle claw 2.8–4.6 mm long, 0.5–0.6 times as long as the filaments. *Style* 5.5–6 mm long. *Ovules* c. 20–45 per locule. *Fruit* 2.5–3 mm long, with well-developed sepaline teeth; cotyledons planoconvex.

**NATURAL OCCURRENCE:** Western Australia: from the Walpole district north to the Ongerup district and eastwards to the Ravensthorpe district.

**ECOLOGY:** Recorded as occurring in low closed heath, open mallee woodland with dense shrubby understorey, heathy shrubland with mallee, on clay, sandy soil with limestone, clay over limestone, sandy gravel, and sandy soil over clay.

**FLOWERING TIME:** Recorded as flowering from July to November.

**ESSENTIAL OILS:** This species presented an overall monoterpene oil, though there were substantial numbers of sesquiterpenes in small amounts. The principal monoterpene was 1,8-cineole (49.5%). This was accompanied by lesser amounts of limonene (4.8%), geranial (1.4%) and myrcene (1.3%). The principal sesquiterpenes encountered were  $\beta$ -caryophyllene (1.7%), viridiflorene (1.4%), globulol (5.0%),  $\gamma$ -eudesmol (2.0%),  $\alpha$ -eudesmol (2.4%) and  $\beta$ -eudesmol (3.8%).

**OIL YIELD:** The oil yield (dry weight, w/w) was 1.3%, but was obtained on a very small sample and could be inaccurate.

**NOTES:** The dimorphism of the stamens is a feature shared with *M. pulchella*.

## Melaleuca virens Craven

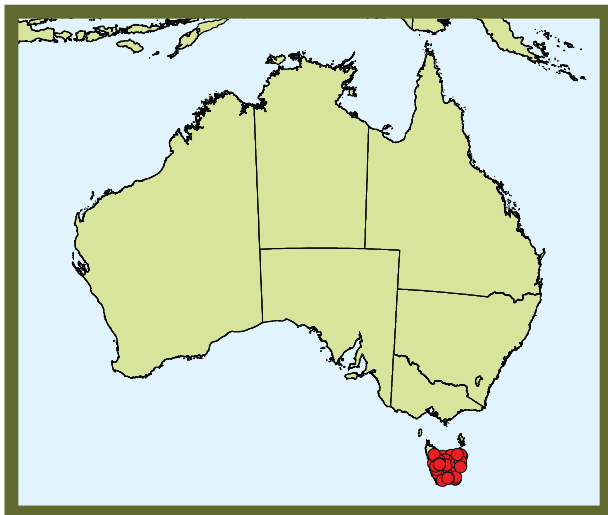


**PUBLICATION:** *Novon* 16: 473 (2006)

**DERIVATION:** *virens*, from the Latin *viridis*, green, in reference to the replaced epithet *viridiflorus*, itself derived from the Latin *viridis*, green, and *flos*, flower

**SYNONYMS:** *Metrosideros viridiflora* Sims; *Callistemon viridiflorus* (Sims) Sweet

**DESCRIPTION:** *Shrub or tree* 1–3 m tall. *Branchlets* glabrescent, pubescent (rarely appearing appressed and then the hairs matted). *Leaves* alternate, 14–37 mm long, 1.8–5 mm wide, 4–13 times as long as wide, long- or short-petiolate; blade glabrescent, pubescent to sericeous-pubescent, narrowly elliptic, narrowly ovate or ovate, often slightly falcate, in transverse section transversely linear (occasionally slightly sublunate), the base narrowly cuneate to very narrowly obtuse, the apex narrowly acute or shortly acuminate, the veins longitudinal-pinnate (the pinnate veins obscure), 3(–7) longitudinal veins, *oil glands* sparse



or moderately dense, distinct, scattered. *Inflorescences* spicate, pseudoterminal or rarely approaching interstitial, sometimes also upper axillary, with 20–80 monads, 30–50 mm wide. *Hypanthium* glabrous, 2.8–4 mm long. *Calyx lobes* abaxially glabrous, 1–2.2 mm long, herbaceous to the margin. *Petals* deciduous, 2.7–4.9 mm long. *Stamens* scattered around the hypanthium apex or 5-grouped opposite the petals, 19–36 per flower; filaments yellow or green, 12–23 mm long; anthers yellow. *Style* 14–22 mm long. *Ovules* c. 100–150 per locule. *Fruit* 4.5–6 mm long, the calyx lobes deciduous; cotyledons flattened planoconvex.

**NATURAL OCCURRENCE:** Tasmania: well distributed across the island.

**ECOLOGY:** Recorded as occurring in swamps, buttongrass moorland, open heath, forest marsh, buttongrass-rainforest boundary, stream banks, and wet bogs.

**FLOWERING TIME:** Recorded as flowering from November to May.

**ESSENTIAL OILS:** This species produced an oil in which the major component was 1,8-cineole (49–56%). This was accompanied by other monoterpenes in lesser amounts, including  $\alpha$ -pinene (3–5%), limonene (7–9%), p-cymene (4–8%) and  $\alpha$ -terpineol (6–8%). Sesquiterpenes contributed approximately 10% to the oil, with spathulenol (0.7–4.0%), globulol (0.2–2.0%) and  $\beta$ -caryophyllene (0.4–1.0%) being the major members.

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.3%.

**REFERENCE ON ESSENTIAL OILS:** Brophy et al. 1998, as *Callistemon viridiflorus*

**NOTES:** This species required a new epithet when transferred from *Callistemon* to *Melaleuca* as the epithet, *viridiflora*, was already in use for the following species.

## *Melaleuca viridiflora* Sol. ex Gaertn.



**PUBLICATION:** *De fructibus et seminibus plantarum* 1: 173, t. 35, fig. 1 (1788)

**DERIVATION:** *viridiflorus*, from the Latin *viridis*, green, and *flos*, flower, in reference to the green to greenish staminal filaments

**DESCRIPTION:** *Shrub or tree* (1–)5–10(–25) m tall; bark papery, white, light brown or grey. *Branchlets* glabrescent, sericeous. *Leaves* alternate, 70–195 mm long, 19–76 mm wide, 1.6–8.5 times as long as wide, long-petiolate; blade glabrescent, sericeous, narrowly elliptic to elliptic, narrowly obovate to obovate, broadly elliptic or ovate, in transverse section transversely linear, the base attenuate, the apex acute, obtusely shortly acuminate, obtuse or emarginate, the veins longitudinal, 5–9, *oil glands* dense or moderately dense, obscure, scattered. *Inflorescences* spicate, pseudoterminal and

sometimes also upper axillary, with 8–25 triads, up to 55 mm wide. *Hypanthium* hairy or sometimes glabrous, 3–3.5 mm long. *Calyx lobes* abaxially hairy or glabrescent or glabrous, not costate (the linear glands may give the appearance of costae), 1.2–2 mm long, scarious in a marginal band 0.3–0.6 mm wide. *Petals* deciduous, 4–5.3 mm long. *Stamens* with the bundles rarely weakly connate at the base, 6–9 per bundle; filaments greenish-cream, green, greenish-white, greenish-yellow, cream, white or red, 18.8–23 mm long, the bundle claw 3–5.2 mm long, 0.1–0.2 times as long as the filaments. *Style* 16–25 mm long. *Ovules* c. 45–80 per locule. *Fruit* 2.3–5.5 mm long, the calyx lobes deciduous or weathering away (very rarely the extreme basal portion of the lobes may become woody and persist as undulations on the hypanthium rim); cotyledons obvolvate.

**NATURAL OCCURRENCE:** Western Australia, Northern Territory, Queensland; also Indonesia, Papua New Guinea: from the Dampier Peninsula district in Western Australia eastwards through much of northern Australia to the Maryborough district in Queensland; southern Papua province, Indonesia, and southern Papua New Guinea.

**ECOLOGY:** Recorded as occurring in closed woodland, open eucalypt forest, swampy plain, heathland, *Melaleuca* forest, seasonal swamps, low grassy woodland, around waterholes and lagoons, on edge of gallery forest, low open forest, on sand, sandy loam, clay loam, laterite gravel, basaltic soil, silty soil over granite, sand over sandstone, and rocky loams.

**FLOWERING TIME:** Recorded as flowering from January to December.

**ESSENTIAL OILS:** This species existed in two basic chemotypes, one of which was quite variable. Chemotype I gave a terpenic oil, in which there seemed to be three variants. The principal components of variant one were  $\gamma$ -terpinene (39%), terpinolene (33%) and  $\alpha$ -pinene (9%). Variant two contained 1,8-cineole (49%),  $\beta$ -caryophyllene (10%), limonene (5%) and  $\alpha$ -terpineol (6%) as major components. Variant three contained  $\alpha$ -pinene (29%), 1,8-cineole (12%) and spathulenol (16%) as principal components. Chemotype II contained E-methyl cinnamate (81%) as its principal component, with lesser amounts of E- $\beta$ -ocimene (12%) and 2,4,6-trimethoxyisobutyrophenone (5%).

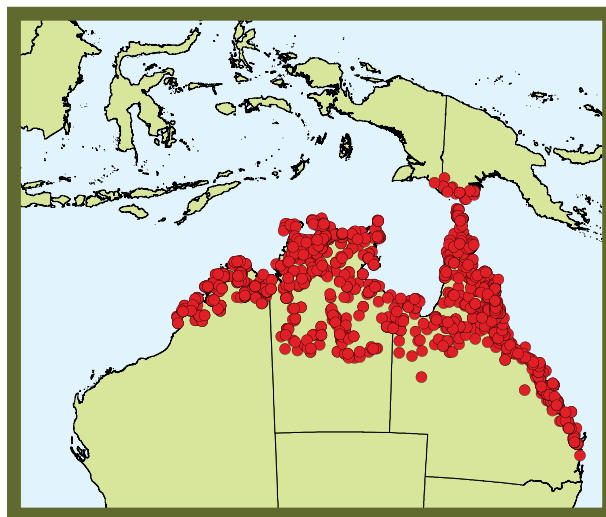
**OIL YIELD:** The oil yield (dry weight, w/w) was 1.3–2.1% for variant one, 0.4–0.7% (fresh weight, w/w) for variant two and 0.4–0.9% (dry weight, w/w) for variant three of chemotype I. For chemotype II, the oil yield (dry weight, w/w) was 4%.

**REFERENCES ON ESSENTIAL OILS:** Hellyer and Lassak 1968; Brophy and Doran 1996; Brophy 1999

**NOTES:** *Melaleuca viridiflora* can sometimes be difficult to distinguish from *M. quinquenervia*. As there is overlap in several of the key diagnostic characters (hypanthium length, petal length and inflorescence rachis pubescence), perhaps the easiest character to use is the indumentum of the young shoots. In *M. viridiflora* these have entirely appressed hairs, whereas in *M. quinquenervia* at least some of the hairs are spreading-ascending to spreading.

The species is variable, in both its morphology and ecology, and this should be comprehensively investigated using population genetics techniques and morphological/ecological studies. It may well be that the present circumscription includes several semicryptic species. As the species is a prominent, often dominant, component of the woodlands and open forests of monsoonal northern Australia, its systematics needs to be understood.

Methyl cinnamate is used in the flavouring and perfumery industries so there is a potential use for chemotype II as a 'natural' source of this compound.



## *Melaleuca williamsii* Craven



**TAXONOMY:** Three subspecies are recognised in this species: subsp. *fletcheri* Craven, subsp. *synoriensis* Craven and subsp. *williamsii*

**PUBLICATION:** *Novon* 19: 451 (2009), subsp. *fletcheri*; *Novon* 19: 452 (2009), subsp. *synoriensis*; *Novon* 16: 474 (2006), subsp. *williamsii*

**DERIVATION:** *fletcheri*, in honour of Mervyn P. Fletcher (1901–1982), a naturalist who discovered many interesting plants in the Ballandean–Stanthorpe district, Queensland, and was an advocate locally for the conservation of nature; *synoriensis*, from the Greek *synoria*, borderland, in reference to the distribution of this taxon on the edge of the Northern Tablelands of New South Wales; *williamsii*, in honour of John Beaumont Williams (1932–2005) of Armidale, New South Wales, an expert on the flora of the New England region of New South Wales, and who generously shared his extensive field knowledge

**SYNONYMS:** *Callistemon pungens* Lumley & R.D.Spencer; *Callistemon pungens* subsp. *fletcheri* (Craven) Udovicic

& R.D.Spencer; *Callistemon pungens* subsp. *synoriensis* (Craven) Udovicic & R.D.Spencer

**DESCRIPTION:** *Shrub* 1–6 m tall; bark hard, flaking. *Branchlets* glabrescent, with long sericeous-pubescent hairs overlying a layer of short pubescent or lanuginose hairs, or sericeous or pubescent. *Leaves* alternate, 18–68 mm long, 3–14 mm wide, 3–10 times as long as wide, short- or long-petiolate; blade glabrescent, sericeous (often approaching lanuginose in the proximal region of the blade) or pubescent, narrowly obovate, narrowly elliptic, very narrowly obovate, elliptic or obovate, in transverse section transversely linear, sublunate, obsubllunate or ‘bird-winged’, the base attenuate (sometimes very narrowly so) or very narrowly cuneate, the apex acuminate, narrowly acute or very shortly acuminate, the veins pinnate or longitudinal-pinnate (occasionally leaves have up to 5 longitudinal veins), 8–20 pinnate veins, *oil glands* dense or moderately dense, distinct, scattered. *Inflorescences* spicate, pseudoterminal and sometimes also upper axillary, with 10–65 monads, 25–45 mm wide. *Hypanthium* hairy or glabrescent, 3.1–5.1 mm long. *Calyx lobes* abaxially hairy or glabrescent, 1–2.1 mm long, scarious in a marginal band 0.5–0.9 mm wide or scarious throughout. *Petals* deciduous, 2.1–5.8 mm long. *Stamens* 25–66 per flower; filaments deep red, purplish, white or mauve-pink, 6.5–19 mm long; anthers red, purple or maroon. *Style* 12–24 mm long. *Ovules* c. 100–200 per locule. *Fruit* 3.9–6.6 mm long, the calyx lobes deciduous; cotyledons obvolvate, planoconvex or concavoconvex.

**NATURAL OCCURRENCE:** subsp. *fletcheri*: Queensland: the Stanthorpe district. subsp. *synoriensis*: New South Wales: the Gibraltar Range – Point Lookout district. subsp. *williamsii*: New South Wales: the Northern Tablelands region.

**ECOLOGY:** subsp. *fletcheri*: Recorded as occurring in riparian woodland/shrubland, and in crevices of small granite outcrops. subsp. *synoriensis*: Recorded as occurring in scrub and heath on extensive trachyte outcrops, creek bed in dry sclerophyll forest, and wet heathy flats on granite. subsp. *williamsii*: Recorded as occurring in scrub patches along a gully, creek bed and banks in dry sclerophyll forest, dry heath on sandy soil, on sand, and shallow rocky soil.

**FLOWERING TIME:** subsp. *fletcheri*: Recorded as flowering in November. subsp. *synoriensis*: Recorded as flowering in November and December. subsp. *williamsii*: Recorded as flowering in November and December.

**ESSENTIAL OILS:** subsp. *fletcheri*: The leaf oil of this subspecies was dominated by monoterpenes. The principal component was 1,8-cineole (69.9%). This was accompanied

by lesser amounts of limonene (7.3%),  $\alpha$ -terpineol (6.5%), linalool (4.3%),  $\alpha$ -pinene (1.9%) and terpinen-4-ol (1.0%). Sesquiterpenes were not plentiful, making up less than 5% of the oil, with globulol, caryophyllene oxide (both 0.2%) and spathulenol (0.1%) being the major members. E- and Z-methyl cinnamate (both 0.1% or less) were also present. **subsp. synoriensis:** The leaf oil from this subspecies was dominated by monoterpenes. The principal component was 1,8-cineole (74.8%). This was accompanied by lesser amounts of  $\alpha$ -pinene (3.2%), limonene (7.0%) and  $\alpha$ -terpineol (5.0%). Sesquiterpenes contributed less than 3% to the oil, with the main members being globulol (0.5%), viridiflorol (0.3%) and spathulenol (0.3%). **subsp. williamsii:** This subspecies produced a monoterpenoid oil. The principal component was 1,8-cineole (67–74%) and there were lesser amounts of  $\alpha$ -pinene (6–8%), limonene (5–7%) and  $\alpha$ -terpineol (6–8%). No other monoterpene of the oil was greater than 0.5%. The principal sesquiterpene was spathulenol (1–2%) and no other sesquiterpene contributed more than 0.5% of the total oil.

**OIL YIELD:** **subsp. fletcheri:** The oil yield (fresh weight, w/w) was 0.1%. **subsp. synoriensis:** The oil yield (dry weight, w/w) was 1.0%. **subsp. williamsii:** The oil yield (fresh weight, w/w) was 0.3%.

**REFERENCE ON ESSENTIAL OILS:** Brophy et al. 1998, as *Callistemon pungens*

**NOTES:** The three subspecies have been distinguished as follows: **subsp. fletcheri:** Longest stamens up to 19 mm long (range 9–19 mm); inflorescences 30–45 mm wide; calyx lobes with the scarious band 0.8–0.9 mm wide; staminal filaments mauve or pink. **subsp. synoriensis:** Longest stamens up to 11 mm long (range 6.5–11 mm); inflorescences 25–30 mm wide. **subsp. williamsii:** Longest stamens up to 19 mm long (range 9–19 mm); inflorescences 30–45 mm wide; calyx lobes with the scarious band 0.5–0.6 mm wide; staminal filaments red, crimson or purple.



## *Melaleuca wilsonii* F.Muell.



**PUBLICATION:** *Fragmenta phytographiae Australiae* 2: 124, t. XV (1861)

**DERIVATION:** *wilsonii*, in honour of Charles Wilson (florist c. 1860), who evidently had some role in this species becoming known to his friend, Ferdinand Mueller, the botanist who named the species

**DESCRIPTION:** *Shrub* 0.5–2.5 m tall. *Branchlets* glabrescent, cobwebbed-lanuginulose, often matted. *Leaves* decussate, 7.5–15 mm long, 1–2 mm wide, 5–9 times as long as wide, subsessile; blade glabrescent, cobwebbed-lanuginulose, often matted, very narrowly elliptic to very narrowly ovate or subulate, in transverse section sublunate, shallowly lunate or lunate, the base narrowly cuneate to cuneate or parallel (blade width equals petiole width), the apex acuminate, narrowly acute or acute, the veins longitudinal, 3, *oil glands* moderately dense, obscure (but distinguishable), more or less in rows. *Inflorescences* capitate, lateral, with 1–6 monads, up to 25 mm wide.

*Hypanthium* glabrescent or hairy, 2–2.5 mm long. *Calyx lobes* abaxially glabrescent, 1.8–3 mm long, scarious in a marginal band 0.2–0.5 mm wide. *Petals* deciduous, 2.8–3.3 mm long. *Stamens* 6–15 per bundle; filaments pink or purplish-pink (once recorded as purplish-pink to almost white), 9–12 mm long, the bundle claw 5–7 mm long, 0.4–0.6 times as long as the filaments. *Style* 8–15 mm long. *Ovules* 45–60 per locule. *Fruit* 2.5–3.5 mm long, with sepaline teeth (these variably developed, the proximal c. 1/4 to 3/4 may become woody with the remainder weathering away, and the teeth may become more or less immersed in the hypanthium wall); cotyledons flattened planoconvex.

**NATURAL OCCURRENCE:** South Australia, Victoria: from south-eastern South Australia eastwards to western and central Victoria.

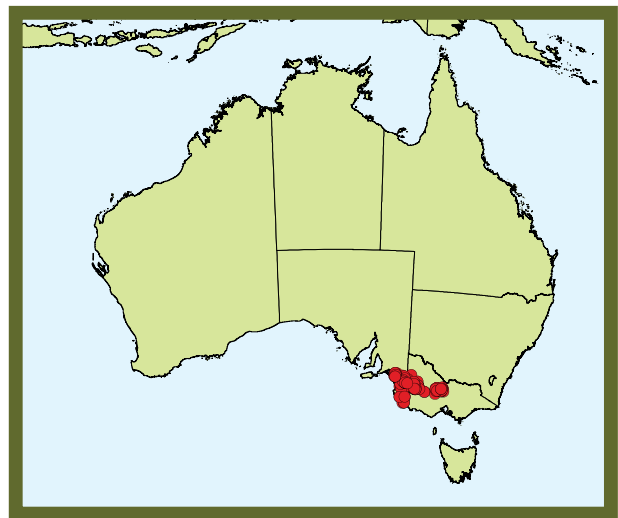
**ECOLOGY:** Recorded as occurring in open scrubland, eucalypt forest, mallee heath, on sand over clay, wet areas, loam, and gravelly clay.

**FLOWERING TIME:** Recorded as flowering in April, and from October to December.

**ESSENTIAL OILS:** The leaf oil of this species was dominated by monoterpenes. The principal monoterpene was 1,8-cineole (48–70%). It was accompanied by lesser amounts of  $\alpha$ -pinene (5–10%), limonene (5–8%) and  $\alpha$ -terpineol (3–5%). The principal sesquiterpenes encountered were globulol (0.9–5.0%), viridiflorol (0.3–2.0%), spathulenol (0.9–5.0%) and T-murolol (0.3–2.0%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.1–0.3%.

**NOTES:** This very ornamental shrub is commonly cultivated in temperate south-eastern Australia and can cope well with dry conditions.



## Melaleuca wimmerensis (Marriott & G.W.Carr) Craven



**PUBLICATION:** *Novon* 19: 453 (2009)

**DERIVATION:** *wimmerensis*, from the locality Wimmera, a region in Victoria

**SYNONYM:** *Callistemon wimmerensis* Marriott & G.W.Carr

**DESCRIPTION:** *Shrub or tree* to c. 10 m tall; bark fibrous, grey-brown. *Branchlets* glabrescent, densely tomentose-sericeous. *Leaves* alternate, (12–)30–50(–62) mm long, 2–8 mm wide, short-petiolate; blade glabrescent, sericeous, narrowly obovate or narrowly elliptic, the apex acute, the veins pinnate, *oil glands* dense, distinct abaxially, obscure adaxially. *Inflorescences* spicate, pseudoterminal, with c. 12–50 monads, 32–35 mm wide. *Hypanthium* glabrous, 2–3.3 mm long. *Calyx lobes* abaxially glabrous (the margin ciliate), 1.7–2.5 mm long, scarious at the margin.

*Petals* deciduous, 4–5 mm long. *Stamens* 52–56 per flower; filaments pink, 11.5–13.5 mm long; anthers yellow. *Style* 13.5–14 mm long. *Fruit* 3.2–5 mm long.

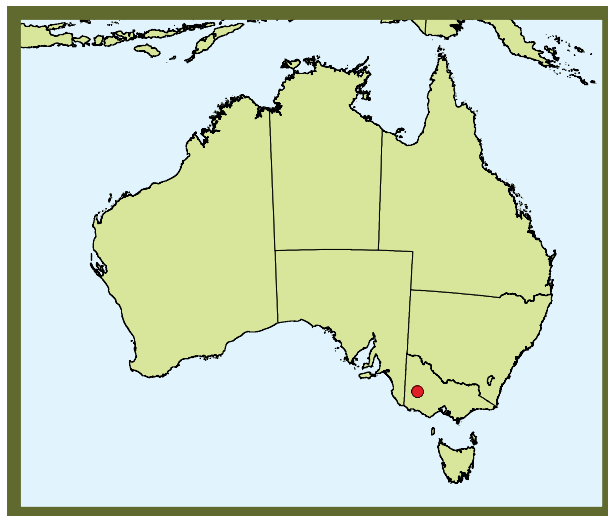
**NATURAL OCCURRENCE:** Victoria: the MacKenzie River in the Wimmera district.

**ECOLOGY:** Recorded as occurring in riparian shrubby woodland and swampy woodland on streambanks and terraces, and on brown silty alluvium.

**FLOWERING TIME:** Recorded as flowering from October to December.

**ESSENTIAL OILS:** The leaf oil of this species was dominated by monoterpenes. The principal component was 1,8-cineole (66–74%). This was accompanied by lesser amounts of  $\alpha$ -pinene (9–17%), limonene (5–9%) and  $\alpha$ -terpineol (3–5%). Sesquiterpenes were not plentiful in this oil, with the main components being globulol (0.2%), spathulenol (0.2–0.4%) and viridiflorol (0.1%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.3%.





## *Melaleuca wonganensis* Craven

**PUBLICATION:** in Craven & Lepschi, *Australian Systematic Botany* 12: 915 (1999)

**DERIVATION:** *wonganensis*, from the locality Wongan Hills, Western Australia

**DESCRIPTION:** *Shrub* 1–1.4 m tall. *Branchlets* glabrescent, pubescent. *Leaves* alternate, 7.5–20 mm long, 0.8–1.4 mm wide, 4.5–18 times as long as wide, subsessile to short-petiolate; blade glabrescent, pubescent, often dimorphic with a distinct layer of short hairs overtopped by a sparser layer of much longer hairs, linear, linear-obovate or rarely very narrowly obovate, in transverse section depressed obovate or transversely semielliptic, the base narrowly cuneate or parallel (blade width equals petiole width), the apex obtuse to rounded, the veins longitudinal, 3, *oil glands* moderately dense, distinct to obscure, scattered. *Inflorescences* capitate, pseudoterminal and sometimes also upper axillary, with 2–5 triads, up to 25 mm wide. *Hypanthium* hairy, 2–2.5 mm long. *Calyx lobes* abaxially hairy, 1–2 mm long, scarious throughout. *Petals* caducous, 1.5–3 mm long. *Stamens* 7–10 per bundle; filaments purple or deep mauve, 7–13 mm long, the bundle claw 2.7–5.7 mm long, 0.3–0.6 times as long as the filaments. *Style* 10–11.5 mm long. *Ovules* c. 15–20 per locule. *Infructescences* peg-fruited. *Fruit* 3–4.5 mm long, the calyx lobes weathering away; cotyledons subobovulate (almost planoconvex) to obovulate. **NATURAL OCCURRENCE:** Western Australia: the Wongan Hills district.

**ECOLOGY:** Recorded as occurring in dense scrub, shrubland, heath, open scrubland, on sand, clayey sand with lateritic pebbles, and sand over granite and laterite.

**FLOWERING TIME:** Recorded as flowering in September and October.

**ESSENTIAL OILS:** The leaf oil of this species contained a majority of monoterpenes, though there were significant amounts of sesquiterpenes. The principal monoterpenes were 1,8-cineole (26–47%),  $\alpha$ -pinene (4–12%) and  $\alpha$ -terpineol (0.5–7.0%). These were accompanied by lesser amounts of  $\beta$ -pinene (0.7–4.0%), limonene (1–3%) and terpinen-4-ol (0.8–2.0%). The main sesquiterpenes encountered in the oil were globulol (6–12%), viridiflorol (5–10%), spathulenol (4–8%), bicyclogermacrene (4–9%) and  $\alpha$ -,  $\beta$ - and  $\gamma$ -eudesmol (each <3%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.5–0.6%.



## Melaleuca xerophila Barlow



**PUBLICATION:** in Barlow & Cowley, *Australian Systematic Botany* 1: 122, fig. 9e–f (1988)

**DERIVATION:** *xerophila*, from the Greek *xeros*, dry, and *phileo*, to love, in reference to the occurrence of the species in the arid zone

**DESCRIPTION:** *Shrub or tree* 2–5 m tall; bark fibrous, grey to blackish. *Branchlets* glabrescent, lanuginulose-puberulous with puberulous and lanuginulose hairs also. *Leaves* alternate, 1.8–5.2 mm long, 0.9–1.5 mm wide, 2–5 times as long as wide, subsessile to short-petiolate; blade glabrescent, lanuginulose-puberulous with lanuginulose and puberulous hairs also, very narrowly elliptic, narrowly elliptic or suboblong, in transverse section transversely elliptic to subcircular, the base cuneate to narrowly cuneate or rounded, the apex obtusely shortly acuminate, acuminate or obtuse, the veins longitudinal, 3, *oil glands* moderately dense, obscure, in rows. *Inflorescences* spicate or capitate, pseudoterminal, with 1–9 monads (rarely a triad may

occur). *Hypanthium* glabrous, 1.6–2.2 mm long. *Calyx lobes* abaxially glabrous, 0.5–1 mm long, scarious in a marginal band 0.15–0.2 mm wide. *Petals* deciduous, 1.8–2.5 mm long. *Stamens* 15–22 per bundle; filaments white, 4–5.2 mm long, the bundle claw 1.2–1.7 mm long, 0.2–0.4 times as long as the filaments. *Style* 4.7–7 mm long. *Ovules* 30–50 per locule. *Fruit* 2–3.5 mm long, the calyx lobes weathering away or rarely the extreme proximal portion of the lobes may become woody and persist as a low ring around the hypanthium rim; cotyledons planoconvex. **NATURAL OCCURRENCE:** Western Australia, South Australia: from the Roy Hill district south to the Leonora–Laverton district in Western Australia, and in central South Australia.

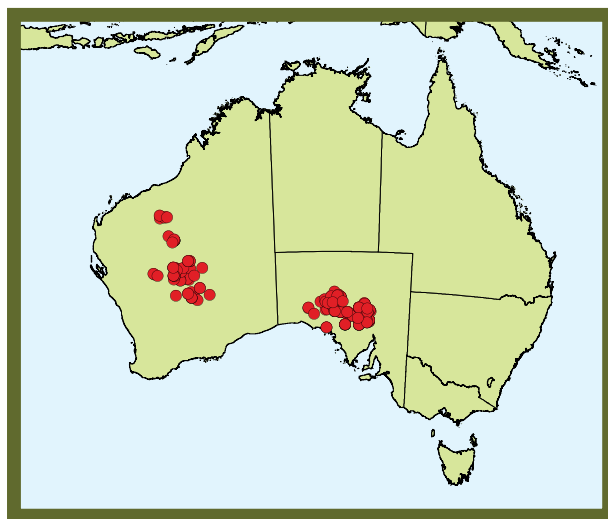
**ECOLOGY:** Recorded as occurring on the margin of salt lakes, in chenopod steppe, above samphire, deep sandy creek channel, open tall shrubland with annual understorey on faint drainage line, eucalypt woodland in flood plain near dry creek bed, on red-brown loam, calcrete, kopi dune, and a stony outcrop.

**FLOWERING TIME:** Recorded as flowering from August to December.

**ESSENTIAL OILS:** The leaf oil of this species was dominated by monoterpenes. The principal component was 1,8-cineole (77.8%) and this was accompanied by lesser amounts of  $\alpha$ -pinene (5.0%), limonene (9.1%), myrcene (1.3%) and  $\alpha$ -terpineol (0.7%). Sesquiterpenes were rare, with the major components being spathulenol (0.4%), globulol and viridiflorol (both 0.1%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.1%.

**NOTES:** This arid zone species may have potential for use in land rehabilitation etc. in very dry climates. It may be tolerant of different soil types as the ecological notes above indicate it occurs on a diverse range of substrates.



## *Melaleuca zeteticorum* Craven & Lepschi



**PUBLICATION:** in Craven, Lepschi, Broadhurst & Byrne, *Australian Systematic Botany* 17: 269 (2004)

**DERIVATION:** *zeteticorum*, from the Greek *zetetikos*, disposed to search, in honour of these persons who for their enjoyment explore natural vegetation communities to become familiar with their constituent species

**DESCRIPTION:** *Shrub* to 2.5 m tall; bark hard and fibrous, or papery and peeling. *Branchlets* glabrescent or hairy, pubescent, sericeous-pubescent or sericeous.

*Leaves* spreading-ascending, 10–29 mm long, 0.9–1.5 mm wide, 10–24 times as long as wide, petiole 0.5–1.7 mm long; blade glabrescent or hairy, sericeous-pubescent or sericeous, rarely glossy, linear, linear-obovate or linear-elliptic, in transverse section transversely narrowly elliptic, subcircular or transversely narrowly suboblong, in lateral view straight or sometimes recurved, the base very narrowly cuneate or narrowly cuneate, the apex narrowly acuminate, aristate or narrowly acute, *oil glands* scattered.

*Inflorescences* capitate, 7–13 mm wide with 5–13 triads. *Hypanthium* 0.8–1.2 mm long, 0.9–1.4 mm wide.

*Calyx lobes* 5 or sometimes as few as 3, free or connate, abaxially hairy, 0.2–0.3 mm long. *Petals* caducous, subcircular to circular, or very broadly ovate, 0.9–1.1 mm long, oil glands elliptic to circular. *Stamens* 3–6 per bundle, the filaments bright yellow, pale yellow, lemon-yellow or whitish, 2.7–4 mm long, the bundle claw 0.9–2 mm long, 0.25–0.5 times as long as the filaments. *Style* 3.6–5.1 mm long. *Ovules* 15–26 per locule. *Infructescences* longer than wide or rarely as wide as long, 5.2–8.3 mm wide, the constituent fruits closely packed and not retaining a

significant separate identity (the fruiting hypanthia closely packed for their full length). Seeds 0.4–0.9 mm long, the cotyledons planoconvex.

**NATURAL OCCURRENCE:** Western Australia: from the Dowerin–Cunderdin–Beacon district eastwards to the Coolgardie–Norseman district.

**ECOLOGY:** Recorded as occurring in tall eucalypt woodland, *Eucalyptus–Acacia–Casuarina–spinifex* community, open low woodland, open mallee woodland, *Frankenia–samphire–Lycium* community, tall shrubland, open *Melaleuca thyoides* shrubland, on red sandy clay loam over granite, red sandy loam, greyish-white (saline?) sand in river channel, pale orange brown sandy loam, red loam over quartz, coarse granitic sand, yellow sand, whitish gypsum sand at edge of salt lake, reddish brown sandy clay loam on raised margin of salt lake, and saline grey sand.

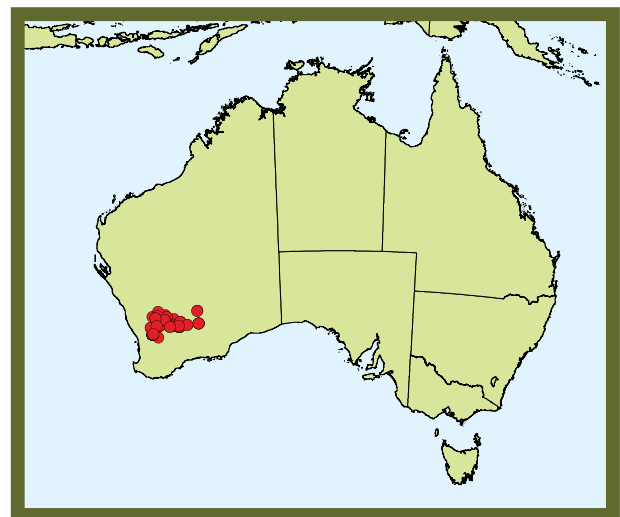
**FLOWERING TIME:** Recorded as flowering in October and November.

**ESSENTIAL OILS:** The leaf oil of this species was dominated by monoterpenes. The principal component was 1,8-cineole (63–68%). This was accompanied by lesser amounts of  $\alpha$ -pinene (3–11%), limonene (0.8–5.0%), terpinen-4-ol (1–3%) and  $\alpha$ -terpineol (7–9%). Sesquiterpenes did not contribute much to the oil, with the major components being elemol (0.4–4%),  $\gamma$ -eudesmol (0.6–3.0%),  $\alpha$ -eudesmol (0.6–2.0%) and  $\beta$ -eudesmol (0.8–3.0%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 1.5–2.5%.

**REFERENCE ON ESSENTIAL OILS:** Brophy et al. 2006b

**NOTES:** This member of the broombush group may have potential for growing on semi-saline soils in subarid regions. It certainly is potentially suited as an ornamental shrub in such areas.



## Melaleuca zonalis Craven



**PUBLICATION:** in Craven & Lepschi, *Australian Systematic Botany* 12: 916 (1999)

**DERIVATION:** *zonalis*, from the Greek *zone*, belt, girdle, and refers to the apparently common occurrence of this species on the lateritic belt of the Gairdner Range in Western Australia

**DESCRIPTION:** *Shrub* 0.3–1 m tall. *Branchlets* glabrescent, pubescent to rarely puberulous. *Leaves* alternate, 8.5–30.5 mm long, 2.2–6 mm wide, 2.2–7.5 times as long as wide, subsessile to short-petiolate; blade glabrescent, pubescent to sericeous-pubescent, with some scattered shortly pubescent to puberulous hairs also, narrowly obovate, very narrowly obovate or narrowly elliptic, in transverse section transversely linear, the base narrowly cuneate to cuneate, the apex obtusely shortly acuminate,

acuminate or acute to obtuse, the veins longitudinal, 3, *oil glands* moderately dense, distinct to obscure, scattered to more or less in rows. *Inflorescences* capitate or spicate, pseudoterminal and sometimes also upper axillary, with 5–14 triads, up to 28 mm wide. *Hypanthium* hairy, 1.2–1.8 mm long. *Calyx lobes* abaxially glabrous, 1–1.5 mm long, scarious throughout or rarely scarious in a marginal band 0.2–0.4 mm wide. *Petals* deciduous, 2–3.5 mm long. *Stamens* 8–13 per bundle; filaments yellow, very pale lemon-white or cream, ageing to red, pinkish or salmon, 8–10.5 mm long, the bundle claw 3–5 mm long, 0.3–0.5 times as long as the filaments. *Style* 10–13 mm long. *Ovules* 15–25 per locule. *Infructescences* peg-fruited (occasionally approaching globose). *Fruit* 3–6.5 mm long, the calyx lobes weathering away; cotyledons obvolvate.

**NATURAL OCCURRENCE:** Western Australia: the Eneabba – Gairdner Range district.

**ECOLOGY:** Recorded as occurring in low heathland with mallee, low open heathland, mallee shrubland, tall shrubland, and on sand over laterite.

**FLOWERING TIME:** Recorded as flowering from October to December.

**ESSENTIAL OILS:** The leaf oil of this species contained both mono- and sesquiterpenes. The principal monoterpenes were  $\alpha$ -pinene (17.9%), 1,8-cineole (21.8%) and linalool (17.2%). These were accompanied by lesser amounts of  $\beta$ -pinene (5.2%), limonene (2.5%) and  $\alpha$ -terpineol (3.6%). The principal sesquiterpenes in the oil were globulol (5.7%), viridiflorol (3.2%), spathulenol (5%) and cubeban-11-ol (1.5%).

**OIL YIELD:** The oil yield (fresh weight, w/w) was 0.1%.

