Corynanthera, a new genus of Myrtaceae (Subfamily Leptospermoideae, Tribe Chamelaucieae)

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Abstract

Corynanthera flava J. W. Green gen. et sp. nov. is described and discussed. Its trisporangiate, unilocular anthers are distinctive and possibly unique. It is further characterised by the filaments produced into stipitate, terminal appendages, the stamens alternately dimorphic, the flowers zygomorphic and the inflorescence a ± terminal, spike-like raceme of yellow flowers. It is most closely related to *Micromyrtus* Benth. and is endemic in a small area 200 km north of Perth, Western Australia.

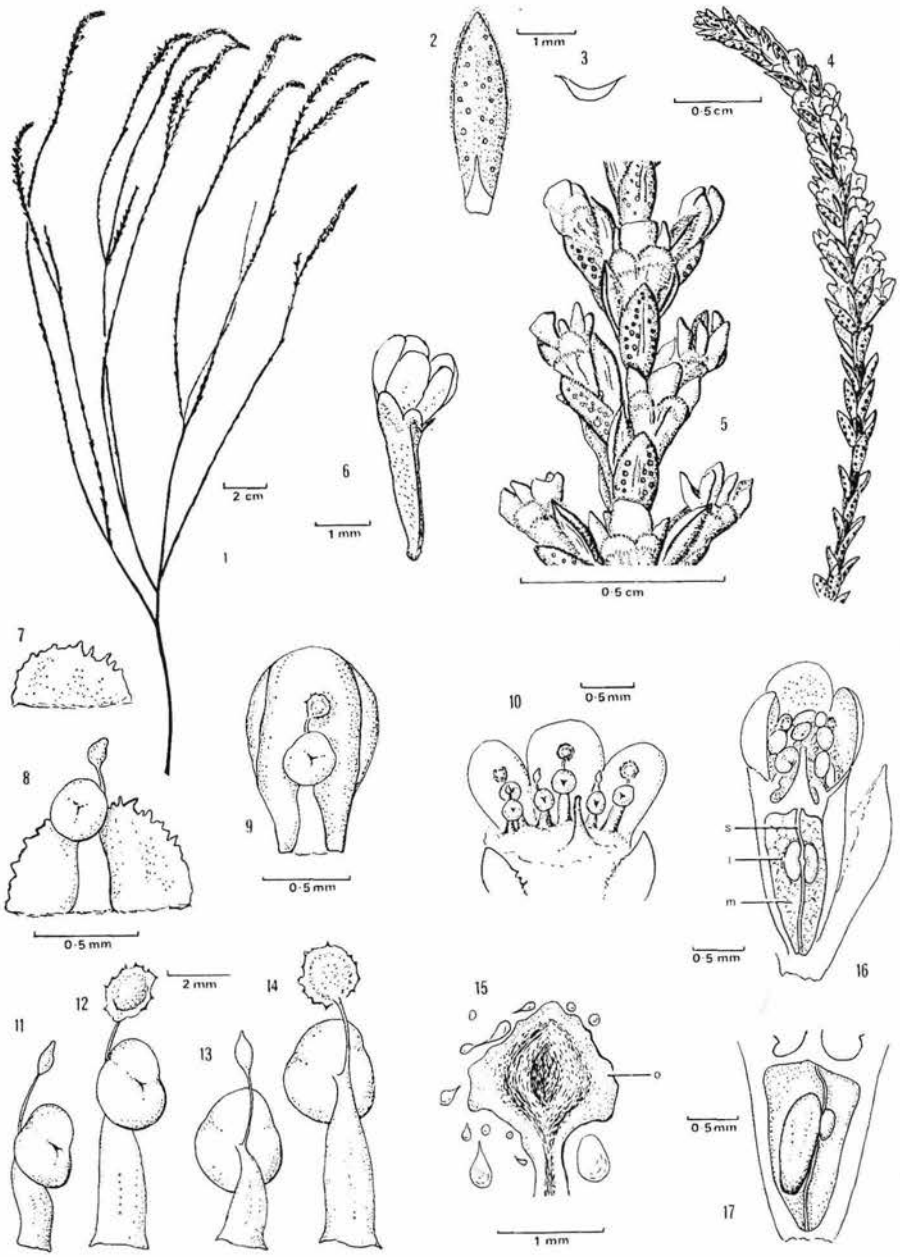
Corynanthera J. W. Green gen. nov.

Frutex racemis terminalibus spiciformibus. *Folia* opposita decussata. *Flores* solitarii, axillares, zygomorphi, tubo dorsiventraliter compresso. *Stamina* 10; filamento in stipite filiformi producto glandem terminalem ferente. *Antherae* uniloculares poro uno dehiscentes, microsporangiis 3 in uno plano dispositis. *Ovarium* uniloculare. *Ovuli* 2, ad venam stylarem posticam in parte ovarii tertia collateraliter affixi.

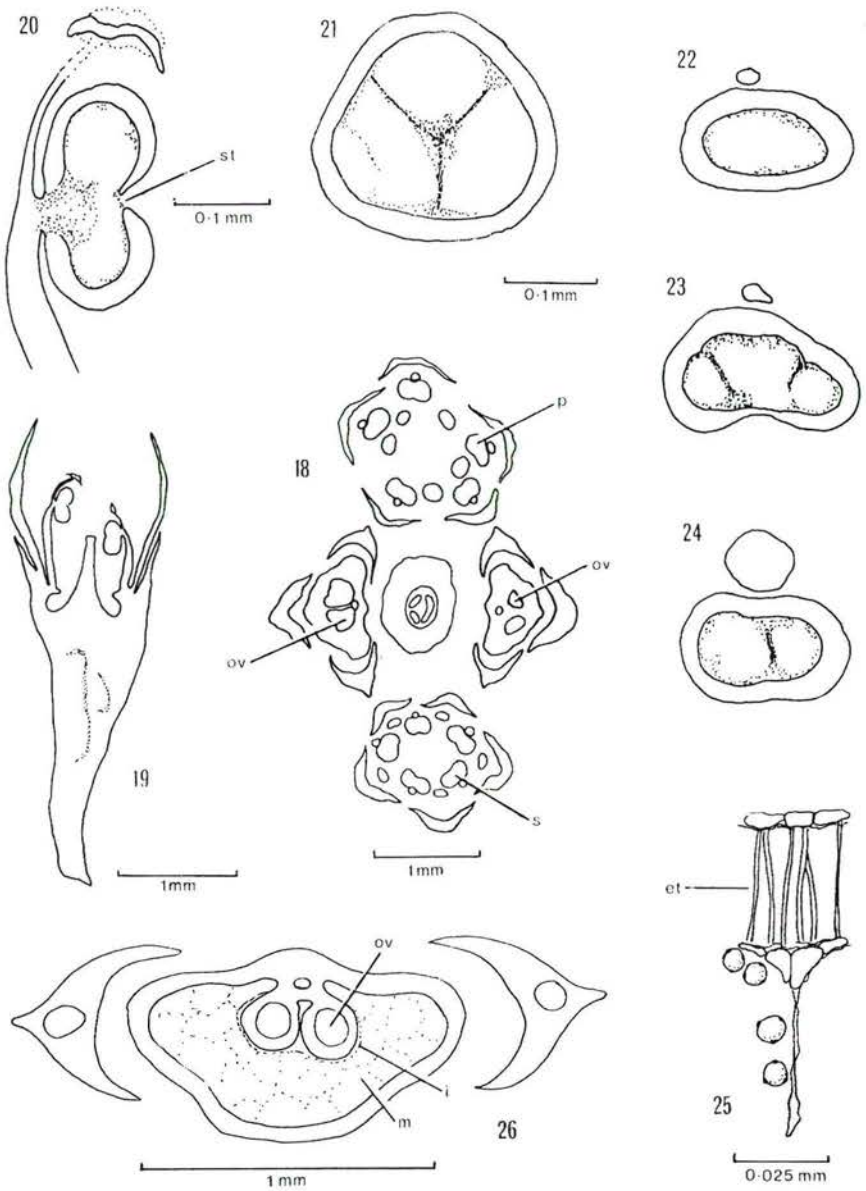
Type species: C. flava J. W. Green, the only known species. The generic name refers to the club-like appendages associated with the anthers.

Shrub with small, estipulate, decussate leaves. *Inflorescence* a terminal or sub-terminal spike-like raceme. *Flowers* solitary, in the axils of the upper leaves, subtended by two persistent bracteoles, zygomorphic; *floral tube* dorsiventrally compressed, the free part inclined towards the axis; *sepals* 5, the anterior 2 larger and the posterior smaller than the other 2; *petals* 5, exceeding the sepals. *Stamens* 5 + 5, in two scarcely distinguishable whorls, the outer, antepetalous stamens with the filament produced into a filiform stipe bearing a large, irregularly-shaped or ± globular appendage above the anther; the inner, antesepalous stamens with a shorter filament and a smaller, ellipsoidal, appendage level with the outer anthers. *Anthers* versatile, subglobular (somewhat dorsiventally compressed), uniplanar, trisporangiate, unilocular, with one microsporangium above and two below, introrse, dehiscing by a central pore. *Ovary* inferior, the wall consisting of a thin, fibrous, glandular, outer layer, a broad ± aerenchymatous middle zone and a fragile, membranous inner layer; locule 1, small, in the upper half or third. *Placenta* lateral within the ovary, attached to the stylar vein which passes just inside the outer layer on the posterior side. *Ovules* 2, ellipsoidal, collaterally attached above the middle. Aerenchyma and membrane breaking down, presumably after fertilization, their place apparently eventually becoming occupied by the single seed. *Seed* not seen mature.

Within the Chamelaucieae, which are distinguished by a unilocular ovary with a single placenta and indehiscent, dry fruit with 1–2 seeds (Bentham 1867), *Corynanthera* falls into a small group of genera containing *Thryptomene* and *Micromyrtus*, most species of which have 5 or 10 free stamens, regularly opposite sepals or petals, without staminodia. *Corynanthera*, while sharing these characteristics with *Thryptomene* and *Micromyrtus*, is distinguished from both genera by its trisporangiate, unilocular anthers, the associated, dimorphic appendages and the spike-like inflorescence of closely-appressed, yellow flowers.



Figures 1–17. *Corynanthera flava.* 1, Habit, upper half of one branch; 2–3 Leaf, lower view and T.S.; 4–5, Inflorescence; 6, Flower, lateral view showing compressed floral tube; 7–8, sepals; 9, Petal; 10, Androecium, showing dimorphic stamens *in situ*; 11–14, Stamens, 11 & 13 antesepalous, 12 & 14 antepetalous; 15, Gland showing irregular fringe with outer layer of oil-secreting cells (o); 16, Ovary showing stylar vein (s), inner wall layer (i) and middle layer (m); 17, Developing seed (1–10, 16–17 from *A. Chapman*, 18 miles W of Winchester; 11–15 fresh material from the same area).



Figures 18–26. *Corynanthera flava.* 18, T.S. Inflorescence, showing central axis, antepetalous anthers (p) (upper), antesepalous anthers (s) (lower), floral tube at two levels of ovules (ov) (left and right); 19, Flower, L.S. showing antepetalous stamen (left), antesepalous stamen (right) and developing seed; 20, Antepetalous anther and gland, L.S. showing stomium (st) after dehiscence; 21–25, Anther—21, tangential L.S. showing three microsporangia—22, T.S. upper sporangium—23, T.S. above stomium showing three sporangia—24, T.S. below stomium showing two sporangia—25, T.S. showing fibrous-banded endothecium (et), junction of two sporangia and pollen grains; 26, Floral tube and bracteoles, T.S. showing ovary, including ovules (ov), inner wall layer (i) and middle layer (m) (all from *Green* 4917).

Corynanthera flava J. W. Green sp. nov.—Figures 1–27.

Frutex gracilis, erectus, 30–175 cm altus. *Folia* angustoelliptica, 1·5–4 mm longa. *Inflorescentia* 2–7 cm longa. *Bracteolae* persistentes. *Flores* sessiles, 2·5–3 mm longi. *Tubum florale* leviter costatum. *Sepala* semicircularia inaequalia, 0·25–0·5 mm longa, 1 mm lata. *Petala* late-elliptica, 1·5 mm longa, flava. *Stamina* exteriora ± 1 mm longa, stipite 0·3 mm longo in glande irregulariter globulosa terminanti; interiora breviora glande parviore ellipsoidea. *Stylus* 0·5 mm longus.

Type: 34.6 km W of Winchester, Western Australia, *J. W. Green* 4918, 6 Dec. 1978 (holo: PERTH; iso: CANB, K, PERTH).

Slender, erect *shrub*, few-stemmed near the base, spreading above, 30–175 cm high, leaves usually confined to the upper branches, the branch endings sometimes decurved. *Leaves* sessile, narrow-elliptic, concave above, convex

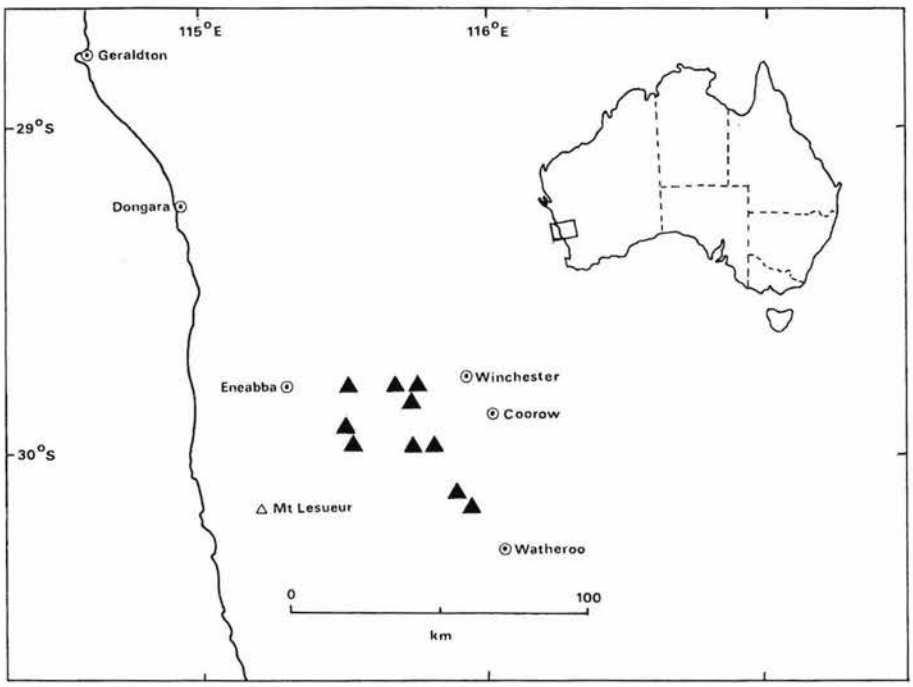


Figure 27. Distribution of *Corynanthera flava*.

or ± keeled below, 1.5–4 mm long, usually appressed, imbricate on the younger branches, margins minutely ciliolate or sometimes entire, oil-glands several to many, large and prominent. *Inflorescence* 2–7 cm long. *Bracteoles* conduplicate, keeled, as long as the floral tube at maturity, yellowish and petaloid except for the broad, scarious, ciliate margins. *Flowers* sessile, 2.5–3 mm long. *Floral tube* narrowly triangular in anterior view, with five faint, longitudinal ribs opposite the sepals, the surface somewhat rough from the presence of numerous small, pale yellow oil glands. Anterior *sepals* erect, semicircular, 0.5 mm long and 1 mm broad, yellowish-petaloid to scarious near the ciliolate to faintly denticulate margins; posterior sepal somewhat spreading, about half as long as the anterior; lateral sepals erect, intermediate in length. *Petals* broadly elliptic, 1.5 mm long, lamina yellow, slightly hooded, claw brown. Outer (antepetalous) *stamens* 0.8–1 mm long; inner (antesepalous) stamens about 2/3 as long. *Filaments* broadly compressed-terete,

yellow. *Anthers* reddish-purple, 0.3 mm diameter. Filamentous continuation of the filament 0.3 mm long, curved over the anther, yellow. *Style* 0.5 mm long, the stigma at maturity level with the inner anthers.

Selected specimens (all PERTH): 35 miles (56 km) W of Winchester, *C. Chapman*, 14 Nov. 1975; 25 km W of Winchester, *J. W. Green* 4917, 6 Dec. 1978; 30 km WSW of Winchester, *J. W. Green* 4920, 6 Dec. 1978; 43 km SW of Winchester, *J. W. Green* 4919, 6 Dec. 1978; 39 miles (62 km) W of Coorow, *C. Chapman*, 15 Jan. 1967; Within 24 miles (38 km) W of Coorow, *C. Chapman*, 4 Jan. 1976; N end of Watheroo National Park, *J. S. Beard* 7880, 18 Sept. 1976; E boundary of Watheroo National Park, *R. D. Royce* 9721, 7 Oct. 1971.

Conservation Status: Density ranges from sparse to locally abundant. Populations occur in three National Parks. Because of the very small area of occurrence, however, and because the species has already proved attractive to the cut flower trade, it should be protected from commercial exploitation in the wild. Efforts are being made to bring it into cultivation.

Distribution: an elliptical area some 70 km long, extending from Tathra National Park to Watheroo National Park, about 200 km north of Perth, Western Australia (Figure 27).

Habitat: heaths and shrublands where it is frequently associated with *Xylomelum angustifolium*, *Eucalyptus todtiana* and *Eucalyptus eudesmoides* on pale, grey-brown, somewhat loamy sands over laterite. Annotated voucher specimens of the associated species are deposited in the Western Australian Herbarium (PERTH).

Flowering period: September to February.

Discussion

The anther of *Corynanthera* may be described, using the terminology of Green (1980), as trisporangiate and unilocular (Figures 20–25). This is in sharp contrast with the remainder of the Myrtaceae which are only known to have tetrasporangiate anthers (Davis 1966), apparently always bilocular. The sporangia are uniplanar, as described by Prakash (1969) in *Darwinia micropetala*.

Two of the above characteristics of *Corynanthera* appear to be unique in the angiosperms. No record has been found in the literature of a trisporangiate anther. Eames (1961, p.114) noted that anthers with more than four sporangia were uncommon or rare, except in forked or branched stamens, and that the larger number was nearly always eight, even this sometimes resulting from connation. He regarded a smaller number, "nearly always two", as representing a reduction from the basic four, giving several examples of bisporangiate families and genera. The only example given of any other reduced number was *Arceuthobium* (Viscaceae) which has a single sporangium "with some trace of a second". It seems reasonable to speculate that the apparently trisporangiate anther of *Corynanthera* may be tetrasporangiate in origin, the appendage having arisen from a fourth, sterile sporangium.

Another apparently unique feature of *Corynanthera* is the single, porate, posterior stomium (Figures 8–9, 11–12, 20), through which pass the contents of the three microsporangia (Figure 21) at anthesis. Thus the remaining vestiges of three microsporangial compartments are here interpreted as comprising a single loculus (Green 1980). Further embryological study may reveal the pore to be morphologically terminal, which would be unusual in the angiosperms but not unique.

Also of considerable interest is the stipitate appendage which arises as a continuation of the filament beyond the point of attachment of the anther (Figures 11–15, 19–20). Appendages of the connective (a term somewhat difficult to apply to the unusual structure of *Corynanthera*) occur sporadically through the angiosperms (Kerner & Oliver 1902), a fringed structure having been found, for example, in a single species of *Conostylis* (Haemodoraceae), *C. aurea* (Green 1961). In many cases such appendages have been interpreted as staminal nectaries (Fahn 1952, 1974) but the structure in *Corynanthera*, at least in the antepetalous stamens, appears to be an oil gland, judging by immiscible droplets which were extruded by gently squashing an aqueous, microscopic whole mount (Figure 15). While many members of the Myrtaceae possess an enlarged gland on the connective, only in *Verticordia* is this greatly enlarged into what might be termed an appendage; according to Bentham (1867), seven species have variously thickened, often concave appendages. The most extreme is probably *V. grandiflora*, in which the "two long horn-like points" project well above the anther in a manner somewhat reminiscent of *Corynanthera*.

The dimorphic nature of the stipitate appendage of *Corynanthera* is also noteworthy, the appendage of the antepetalous, larger stamens being irregularly globular and that of the antesepalous, smaller stamens much smaller, ellipsoidal and discrete in shape, lacking the ragged irregular fringe of the others (Figures 11–14). This characteristic appears to have no parallel, especially as the antesepalous stamens appear equally fertile and are in no sense like staminodia.

The ovary of *Corynanthera* closely resembles that of a group of species of *Micromyrtus* having 10 stamens and two ovules, suggesting a very close relationship. Upon dissection, the ovules may sometimes be found enclosed within a fragile membrane which is here interpreted as the innermost layer of the ovary wall (Figures 16, 26). Outside this membrane (when present) occurs a broad layer of aerenchyma consisting of a convoluted network of narrow, thin-walled, parenchymatous cells with large intercellular spaces (Figures 16, 26). This middle zone has scarcely been mentioned in taxonomic descriptions, possibly because of its fragile nature and eventual disappearance in many specimens. An apparently identical structure has been described and illustrated in *Thryptomene elliottii* by Black (1952, Figure 859–16). Alternatively, this layer may be what Esau (1965) calls *stigmatoid tissue* (also known as conducting tissue) which facilitates the progress of the pollen tube through the ovary. This explanation, however, would negate the present interpretation of the aerenchyma as being outside the ovary loculus.

The hard, outer wall of the floral tube doubtless consists of the outer carpellary layer and the tube formed from either the fused calyx and corolla or an upgrowth of the receptacle but developmental studies in other genera have not provided the means of identifying the separate contributions made by each of these tissues. Pending an elucidation of this matter it is probably best to use a neutral term when describing the combined structure.

At odds with the above interpretation of the ovary is the concept of a "filiform placenta extending from the base to the top of the cavity" in *Micromyrtus* (Bentham 1867), which appears to have arisen from his examination of flowers in which the aerenchymatous layer has broken down. This "filiform placenta" is probably the fused ventral bundles of a single carpel, contributing to the vasculature of both the ovary and the style (Figures 16–17), the placenta being very short, within the innermost ovary wall layer. In describing *Thryptomene*, Bentham (1967) referred to "the cavity usually small near the top of the calyx-tube" (consistent with my interpretation of *Corynanthera* and related species of *Micromyrtus*) but then went on to say "or rarely the cavity occupies the greater part of the tube", a situation which can

certainly be found in some flowers, including those of *Corynanthera*, (Figure 17), but seems more plausibly explained as a post-fertilization stage of floral development resulting from partial breakdown of the ovary wall.

Evidence that the spongy aerenchyma may sometimes persist in older flowers or fruits is contained in the original description of *Micromyrtus sulphurea*, in which Fitzgerald (1904) noted "fruiting calyx somewhat spongy within."

Acknowledgments

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References

BENTHAM, G. (1867). "Flora Australiensis" v. 3 (Reeve: London.)

BLACK, J. M. (1952). "Flora of South Australia.", 2nd ed. Pt. 3 (Govt. Printer: Adelaide.)

DAVIS, G. L. (1966). "Systematic Embryology of the Angiosperms." (Wiley: New York.)

EAMES, A. J. (1961). "Morphology of the Angiosperms." (McGraw-Hill: New York.)

ESAU, K. (1965). "Plant Anatomy." (Wiley: New York.)

FAHN, A. (1952). On the structure of floral nectaries. Bot. Gaz. 113: 464–70.

FAHN, A. (1974). "Plant Anatomy". (Pergamon: Oxford.)

FITZGERALD, W. V. (1904). Additions to the West Australian flora. J. W. Austral. Nat. Hist. Soc. 2(1): 3–36.

GREEN, J. W. (1961). The genus *Conostylis* R.Br. II. Taxonomy. Proc. Linn. Soc. N.S. Wales 85: 334–373.

GREEN, J. W. (1980). A revised terminology for the spore-containing parts of anthers New Phytol. 84 (in press).

KERNER VON MARILAUN, A. & OLIVER, F. W. (1902). "The Natural History of Plants." 2 vols. (Blackie: London.)

PRAKASH, N. (1969). Reproductive development in two species of *Darwinia* Rudge (Myrtaceae). Austral. J. Bot. 17: 215–27.