

THE GENERIC POSITION OF *MYRTUS ALTERNIFOLIA* AND NOTES ON *CALYCOLPUS* (MYRTACEAE)

LESLIE R. LANDRUM

Department of Botany, Arizona State University,
Tempe, AZ 85287

ABSTRACT

Myrtus alternifolia, a species of long standing uncertain generic affinities, is transferred to *Calycolpus*. This transfer is based on characteristics of the seed coat, embryo, calyx, anthers, and vessel elements. A revised description of *Calycolpus* is provided.

RESUMEN

Myrtus alternifolia, una especie que desde hace mucho tiempo ha sido de afinidades genéricas inciertas, se transfiere a *Calycolpus*. Este cambio se basa en características de la testa de la semilla, el embrión, el cáliz, las anteras, y los elementos vasculares. Se provee una descripción revisada de *Calycolpus*.

Myrtus alternifolia Gleason was described in 1939 and placed in *Myrtus* L. because Gleason believed it to be congeneric with species of *Myrtus* (*M. myricoides* Kunth, *M. stenophylla* Oliver ex Thurn, *M. roraimensis* N. E. Brown) now considered to belong to *Ugni* Turcz. McVaugh (1969) in his revision of the Myrtaceae of the Guayana Highland, recognized that *Myrtus alternifolia* was not a species of *Ugni* and that it probably did not belong to *Myrtus*, but lacking any clear evidence of its true affinities, did not transfer it to any genus.

Myrtus, the type genus of the Myrtaceae, was once very inclusive, accommodating perhaps a quarter of the family in the early nineteenth century. Since then a progressively smaller percentage of species has been assigned to *Myrtus*. I agree with McVaugh (1968) that *Myrtus* probably does not include any American species. Scott (1979) and Byrnes (1982) have expressed the opinion that certain Australasian species belong to *Myrtus*, but if those are excluded, the genus consists of only the Mediterranean *Myrtus communis* L. *Myrtus alternifolia* differs from *M. communis* in many morphological characters, most notably in embryo structure. The two species are also geographically widely separated. Thus, extraction of *Myrtus alternifolia* from *Myrtus* is warranted.

I am now monographing American genera of the Myrtinae with hard seed coats, the group to which *Myrtus alternifolia* belongs, and have considered the following genera to be possible acceptors for *M. alternifolia*: *Calycolpus* Berg, *Mosiera* Small, *Myrteola* O. Berg, *Psidium* L., and *Ugni*. Thanks to a collection of *M. alternifolia* with

mature seeds recently made by Bruce Holst of the Missouri Botanical Garden and a survey of seed coat characters in the Myrtinae undertaken at Arizona State University (Landrum and Sharp in press), I am able to assign this species to *Calycolpus*. A description of the species and reasoning for this generic assignment are given below.

Calycolpus alternifolius (Gleason) Landrum, comb. nov.—*Myrtus alternifolia* Gleason, *Brittonia* 3:173. 1939.—TYPE: Venezuela, Bolívar, Auyan-tepui, 2200 m, *Tate 1344* (holotype, NY!).

Shrub to 2 m high, sometimes with trailing stems to 5 m long, the young growth mostly densely lanate to velutinous; hairs simple, to ca. 1.5 mm long, silvery-grey to yellowish-grey, straight or curled, spreading to ascending. Young twigs lanate, the hairs mainly persisting until the first bark falls, the older twig bark rough and cracked, light grey to blackish-grey, sometimes tinged with reddish-brown. Leaves opposite, or less often alternate, mostly separated by short internodes, elliptic, narrowly elliptic, obovate, ovate, or suborbicular, flat or revolute, 1.6–3.6 cm long, 0.6–2.5 cm wide, 1.4–3 (–4.6) times as long as wide, densely covered with hairs beneath, the upper surface tomentose in immature leaves, later glabrescent; apex acute to abruptly acuminate; base acute to rounded; petiole narrowly channeled, 1–3 mm long, 1–2 mm thick, lanate when young, losing most hairs with age; midvein impressed above, prominent below; lateral veins indistinct, or ca. 8–12 nearly straight, ascending pairs, scarcely visible, the marginal vein about equalling the laterals, about parallel to the margin; blades thickly coriaceous, drying olive-green to nearly black, lustrous above. Flowers pentamerous; peduncles 6–30 mm long, ca. 1 mm wide, solitary in the axils of leaves, uniflorous, densely lanate; bracteoles narrowly triangular to linear, 3–4 mm long, caducous at about anthesis; calyx-lobes triangular, 3–5 mm long, 1.5–3 mm wide, moderately pubescent within, lanate without; petals elliptic-obovate, 8–9 mm long, glabrous or with a ciliate margin; hypanthium lanate, obconic, 3–4 mm long; disk 2–4 mm across, tomentose; stamens 38–70, 3–5 mm long; anthers oblong, 0.8–1 mm long, with ca. 5–9 nearly equal glands in the connective; style ca. 5 mm long, glabrous to sparsely pubescent; ovary 2- to 3-locular; ovules 10–18 per locule, the placenta, a raised U-shaped pad. Fruit globose, tomentose, crowned with a persistent calyx, ca. 5–7 mm in diam.; seeds ca. 6, ca. 3 mm long, the seed coat lustrous, mostly 1 cell thick, the embryo whitish, C-shaped, the cotyledons not reflexed, accounting for less than $\frac{1}{4}$ the embryo's length.

ANALYSIS OF RELATIONSHIPS

The characters of the following structures have been taken into account in my attempt to assign a generic position to *Myrtus alter-*

nifolia: 1) seed coat (surface; and outer seed coat thickness and prevalent cell shape in the outer seed coat); 2) embryo (cotyledon to hypocotyl ratio and cotyledons reflexed or not); 3) calyx-lobes (number and fusion); 4) anthers (shape, glandularity, and size in relation to the filament); and 5) vessel elements (with or without scalariform perforation plates).

Seed coat. In *Psidium* the seed coats a) are not lustrous but dull, b) have an external layer of pulpy tissue, c) have outer seed coats normally over 8 cells thick, and d) have outer seed coats in which the prevalent cell shape is elongate (Landrum and Sharp in press). *Myrtus alternifolia*, *Calycolpus*, *Mosiera*, *Myrteola*, and *Ugni* all differ in having seed coats that a) are lustrous, b) normally lack an external layer of pulpy tissue, c) have outer seed coats usually 1 to 4 cells thick, and d) have outer seed coats in which the prevalent cell shape is more or less isodiametric to oblong. These characters of the seed coat are the most useful in circumscribing *Psidium* and exclude *M. alternifolia* from the genus.

Embryo. The cotyledons of *Myrteola* and *Ugni* are about as long as the hypocotyl and are not reflexed. In the other genera and *Myrtus alternifolia* they are shorter than the hypocotyl; in *Psidium* and in some species of *Mosiera* and *Calycolpus* the cotyledons are reflexed. In *Myrtus alternifolia* they are not reflexed. Based on embryo structure then, *M. alternifolia* might belong to *Mosiera* or *Calycolpus*.

Calyx-lobes. *Mosiera* has 4 calyx-lobes, *Myrteola* has 4 or 5, and the rest of the genera and *Myrtus alternifolia* normally have 5. Thus, calyx-lobe number indicates that *Myrtus alternifolia* does not belong to *Mosiera*, but might belong to any of the other genera. Usually there is notable fusion of the calyx-lobes beyond the ovary's summit in *Psidium*, and there is often such fusion in *Calycolpus*. In *Myrtus alternifolia* and the other genera here considered, fusion is lacking. This character indicates that *Myrtus alternifolia* probably does not belong to *Psidium*.

Anthers. Anthers of most species of American Myrtaceae (including *Mosiera* and *Myrteola*) are subglobose and have no gland or a prominent terminal gland. In *Myrtus alternifolia*, *Calycolpus*, *Ugni*, and some species of *Psidium* the anthers are more or less elongate and have a few to several glands in the connective. In *Ugni* the mature filament is 1 to 3 times as long as the anther. In other species in this group the mature filament is more than 3 times as long as the anther. Thus, anther glandularity and proportional size indicate that *Myrtus alternifolia* should probably not be placed in *Mosiera*, *Myrteola*, or *Ugni*.

Vessel elements. In *Ugni* and *Myrteola* vessels have (or mostly have) scalariform perforation plates (Schmid and Baas 1984). *Myrtus*

alternifolia does not have scalariform perforation plates. One species of *Mosiera* (cited as *Psidium longipes* [O. Berg] McVaugh) and *Psidium pubifolium* Burret studied by Schmid and Baas were found to have simple perforation plates. The condition of other species of *Mosiera*, *Psidium*, and *Calycolpus* is not known to me. This character indicates that *Myrtus alternifolia* is not a member of *Ugni* nor *Myrteola*.

In summary *Psidium* is eliminated as a possible acceptor for *Myrtus alternifolia* because of seed coat characteristics. Elimination of *Ugni* and *Myrteola* seems warranted because of characters of the anthers, embryo, and vessel elements. *Myrtus alternifolia* would be out of place in *Mosiera* because of the glandularity of the anthers and calyx-lobe number. *Calycolpus* is not eliminated by any characteristic considered and the addition of *Myrtus alternifolia* does not add greatly to its variability.

Moreover, *Myrtus alternifolia* has leaves that are thickly coriaceous, and although the venation is faint, it can be seen to consist of several nearly straight lateral veins that connect with a discrete marginal vein. This is the common leaf type in *Calycolpus*.

Another factor that favors placing *Myrtus alternifolia* in *Calycolpus* is that it grows on the mountain peaks (tepui) of the Guayana highlands, the area in which *Calycolpus* is most diverse. *Mosiera*, perhaps the second most suitable acceptor for *Myrtus alternifolia*, is a Caribbean and Central American genus.

RECHARACTERIZATION OF *CALYCOLPUS*

Until now *Calycolpus* has been thought to be morphologically a rather uniform group, recognized by characteristics of the inflorescence (flowers usually borne in pairs on short axillary shoots), calyx ("open in bud and flower, with 5 broad and often flaring lobes"), and ovary (4- to 5-locular) (McVaugh 1968). Recent studies of *Calycolpus* indicate that none of these characteristics is as consistent as was previously thought and that seed coat and embryo characters indicate a somewhat more inclusive group than was accepted by McVaugh. In addition to *Myrtus alternifolia*, I would also include in *Calycolpus*, *Psidiopsis moritziana* Berg, which McVaugh (1956) placed in *Psidium*.

Even without *Myrtus alternifolia* and *Psidiopsis moritziana* there has been no particular characteristic found in all species of *Calycolpus* that is not also found in other genera. *Calycolpus*, at least at present, must be defined by a set of characters: seed coats lustrous, with no pulpy covering, the outer seed coat 1–4 cells thick with the prevalent cell shape more or less isodiametric; cotyledons shorter than the hypocotyl, reflexed or not; calyx-lobes normally 5, fused

or not beyond the ovary's summit; anthers elongate, with a few to several glands in the connective, about $\frac{1}{3}$ to $\frac{1}{10}$ as long as the filament; vessel elements with simple perforation plates. The following is an updated description of *Calycolpus* based on studies of the following species: *C. alternifolius*, *C. calophyllus* (Kunth) O. Berg, *C. cochleatus*, *C. goetheanus* (DC.) Berg, *C. legrandii* Mattos, *C. moritzianus* (O. Berg) Burret, *C. revolutus* (Schauer) O. Berg, *C. roraimensis* Steyerf., *C. surinamensis* McVaugh, and *C. warszewiczianus* O. Berg.

CALYCOLPUS O. Berg, *Linnaea* 27:378. 1856. Lectotype species: *C. goetheanus* (DC.) O. Berg. Designated by Riley (1926).

Shrubs or trees up to 10(-15) m high. Hairs whitish or yellowish, unicellular, simple or dibrachiate, up to ca. 1.5 mm long. Leaves persistent, coriaceous, the venation brochidodromous, with several pairs of nearly straight lateral veins that are united by a marginal vein that parallels the leaf margin. Inflorescence a solitary axillary flower or a very short axillary bracteate shoot with 1-3 decussate pairs of flowers. Flowers pentamerous (sometimes tetramerous in one population of *C. cochleatus*); calyx-lobes often flared, often with an apical appendage, the calyx fused beyond the ovary's summit and tearing between the lobes at anthesis or the calyx-lobes free; petals slightly fleshy, white or tinged with red, often drying brown; bracteoles usually small, about triangular, caducous at about anthesis or in *C. legrandii* leafy and persistent; stamens 35-270, folded centerward or more or less erect in the bud; anthers somewhat to markedly elongate, with about 4 to 40 glands; ovary 2- to 6-locular, the locular wall sometimes glandular; ovules 8-32(-ca. 80 in *C. moritzianus*), the placenta a U-shaped pad or mound of tissue or an essentially round peltate structure. Fruit subglobose; seeds few to numerous, about reniform, the seed coat hard, lustrous, the external wall 1-4 cells thick, the surface cells rounded to elongate, the central portion of the seed sometimes soft; embryo oily, whitish, C-shaped, the cotyledons reflexed or straight, less than $\frac{1}{4}$ the length of the embryo.

ACKNOWLEDGMENTS

Special thanks go to Bruce Holst who sought out a specimen of *Calycolpus alternifolius* with mature seeds on the Auyan-tepui in Bolívar, Venezuela. I am also grateful to the curators of the following herbaria for allowing me to include their collections in my studies of *Calycolpus*: A, ASU, CAS, GH, MICH, MO, NY, UC, and US. Bruce Holst, David Keil, Rudolph Schmid, and Al Gentry offered helpful suggestions as to how this paper could be improved.

LITERATURE CITED

BYRNES, N. 1982. The genus *Myrtus* or *Austromyrtus* in Australia? *Austral. Syst. Bot. Newslett.* 31:10-11.

- LANDRUM, L. R. and W. P. SHARP. 1989. Seed coat characters of some American Myrtinae (Myrtaceae): *Psidium* and related genera. Syst. Bot. 14 (in press).
- MCVAUGH, R. 1956. Tropical American Myrtaceae. Notes on generic concepts and descriptions of previously unrecognized species. Field Mus. Nat. Hist., Bot. Ser. 29(3):145-228.
- . 1968. The genera of American Myrtaceae—an interim report. Taxon 17: 354-418.
- . 1969. Myrtaceae. In The Botany of the Guayana Highland—Pt. 8. Mem. New York Bot. Gard. 18(2):55-286.
- RILEY, L. A. M. 1926. Revision of the genus *Calycolpus*. Kew Bull. 1926:145-154.
- SCHMID, R. and P. BAAS. 1984. The occurrence of scalariform perforation plates and helical vessel wall thickenings in wood of Myrtaceae. Int. Assoc. Wood Anat. Bull. 5(3):197-215.
- SCOTT, A. J. 1979. New species and combinations in Myrtaceae from Malesia and Australia. Kew Bull. 33:511-515.

(Received 21 Jun 1988; revision accepted 25 Oct 1988.)