

RUBIACEAE

TAXONOMIC NOTES ON *SERICANTHE ANDONGENSIS* AND A NEW COMBINATION AND STATUS IN *SERICANTHE* FROM LIMPOPO, SOUTH AFRICA

Rubiaceae Juss. is one of the five largest families of flowering plants with over 13 000 species (Bremer 2009) and belongs in the order Gentianales Juss. ex Bercht. & J.Presl (APG III 2009; Reveal 2012b). Members of Rubiaceae can be recognized in the vegetative state by their opposite, sometimes whorled, entire leaves and interpetiolar stipules with axillary colleters. The flowers are usually bisexual or sometimes unisexual or

functionally unisexual and polysymmetric, often with a narrow corolla tube and spreading lobes; the ovary is inferior in most species, with a nectary or disc on top, except in members of tribe Gaertnereae in subfamily Rubioideae, which have a secondarily superior ovary (Jansen *et al.* 1996), and the fruit is baccate, drupaceous, or capsular (Stevens 2001–[accessed December 2011]). There is strong molecular support for three subfamilies:

Cinchonoideae Raf., Dialypetalanthoideae Reveal [replacing Ixoroideae Raf. (Reveal 2012a)] and Rubioideae Bremek. ex Verdc. (Bremer & Eriksson 2009).

The African genus *Sericanthe* Robbr. belongs in subfamily Dialypetalanthoideae—tribe Coffeae DC. (Robbrecht & Puff 1986; Retief & Leistner 2000). Currently tribe Coffeae includes the southern African genera *Coffea* L., *Sericanthe* Robbr., *Tricalysia* A.Rich. ex DC., and the reinstated genus *Empogona* Hook.f. (Bridson 2003; Davis *et al.* 2007; Tosh *et al.* 2009). The tribe is characterized by very short stipules that are connate and apiculate; axillary inflorescences paired at nodes; relatively small flowers; distinctly 2-lobed styles with divergent arms; small, few-seeded, fleshy fruits; and seeds with a deep ventral groove (Retief & Leistner 2000; Tosh *et al.* 2009).

Tricalysia was more than 40 years ago considered as a very broadly circumscribed genus. Hallé (1970) recognized that several species were misplaced in *Tricalysia* and removed them to the new genus *Neorosea* N.Hallé. Detailed revisionary work by Robbrecht (1978), however, showed that one of these species, *N. jasminiflora* (Klotzsch) N.Hallé (= *Tricalysia jasminiflora* (Klotzsch) Benth. & Hook.f. ex Hiern), was in fact a *Tricalysia*. Unfortunately this species was the one Hallé has chosen as the type of *Neorosea*, and *Neorosea* therefore became a synonym of *Tricalysia*, while the remaining species were left without a generic name. Robbrecht (1978) rectified this by publishing the new name *Sericanthe*. Subsequently *Tricalysia* subgenus *Empogona* (Hook.f.) Robbr. (1979) was raised to genus level, defined by the very short calyx tube with well-developed lobes, corolla mostly bearded in the throat, and anthers with conspicuously apical appendages (Tosh *et al.* 2009). The genus *Tricalysia*, as currently defined, is one of the largest genera of Rubiaceae in Africa and occurs in continental Africa (\pm 95 spp.), Madagascar (12 spp.) and the Comoros (1 sp.) (Tosh *et al.* 2009).

Sericanthe comprises 21 named species, confined to Sub-Saharan Africa (Klopper *et al.* 2006), with four recently described from Lower Guinea (Sonke *et al.* 2012). *Sericanthe* is distinguished from *Tricalysia* and *Empogona* by the presence of linear bacterial leaf galls or nodules (Van Oevelen *et al.* 2001), wing-shaped collectors, pollen with a verrucate sexine (in contrast to reticulate sexine in all other members of Coffeae), 7- to 9-merous flowers (4- to 7-merous flowers in *Tricalysia* and *Empogona*), and basifixed anthers (medifixed in *Tricalysia* and *Empogona*) with enlarged connectives (Tosh *et al.* 2009). The seeds of *Sericanthe* can also be distinguished by a \pm elliptic to circular hilar scar, \pm half the size of the seed, while *Tricalysia* has a shallow hilar groove (Bridson 2003) and *Empogona* a hilar excavation (Bridson 2003: 468, as subgen. *Empogona*). In *Sericanthe* the seed coat is smooth and shiny when preserved in liquid but slightly striate when dry (Robbrecht 1978; Bridson 2003: tab. 98, B2 and Figure 2D), whereas the seed surface of *Tricalysia* and *Empogona* are reported to be reticulate or pusticulate (Retief & Leistner 2000; Bridson 2003).

Bacterial leaf galls, or nodules, occur in only three genera of Rubiaceae, namely in *Psychotria* (tribe Psy-

chotrieae of subfamily Rubioideae), *Pavetta* (tribe Pavetteae of subfamily Dialypetalanthoideae) and *Sericanthe* (Van Oevelen *et al.* 2001), however the nodules of *Pavetta* and *Psychotria* are usually punctate to ellipsoid, rarely only shortly linear. These galls house endosymbiotic bacteria. The bacterial partners are strictly host specific and have been identified in *Pavetta*, *Psychotria*, and recently also in *Sericanthe andongensis* (Hiern) Robbr. as *Candidatus Burkholderia andongensis* and in *S. petiti* (N.Hallé) Robbr. as *Candidatus Burkholderia petiti* (Lemaire *et al.* 2011).

The only species of *Sericanthe* from South Africa was formerly referred to *Sericanthe andongensis* (Hiern) Robbr. var. *andongensis* (Robbrecht 1978; Coates Palgrave 2002; Retief 2003, 2006; Klopper *et al.* 2006), following Robbrecht (1978, 1988) who recognized two varieties of *S. andongensis*, namely var. *andongensis* and var. *mollis* Robbr. These two varieties grow more or less sympatrically and differ in hairiness on their leaf undersurfaces (var. *andongensis* with scattered hairs and var. *mollis* velutinous) and their leaf apices (var. *andongensis* always has acuminate apices and var. *mollis* has rounded, obtuse to acute or occasionally subacuminate leaf apices). In her treatment of *Sericanthe* in *Flora zambesiaca*, Bridson (2003) redefined Robbrecht's (1978, 1988) concept of var. *andongensis* and var. *mollis* for the plants occurring south of the Zambezi River. The varieties of subsp. *andongensis* grow \pm sympatrically to the north of the Zambezi River but are geographically separated to the south. In Bridson's opinion there are five distinct taxa in Zimbabwe and South Africa: the non-montane element is treated as subsp. *engleri*, which is confined to the granite outcrops and serpentine hills of the Matobos, southwestern Zimbabwe, while the montane specimens have been grouped with other doubtfully named specimens as three provisional species (see *Sericanthe* sp. A, sp. B, and sp. C). Bridson (2003: 512) continued: '*Tricalysia legatii* Hutch., from South Africa, has not been included as a synonym of *Sericanthe andongensis* var. *andongensis* because, in my opinion, it is both taxonomically and geographically discrete'. She goes on to provide a few morphological differences between the South African taxon, *Tricalysia legatii* and *S. andongensis* subsp. *engleri* (K.Krause) Bridson, the geographically nearest taxon. *Tricalysia legatii* differs from *S. andongensis* subsp. *engleri* in its \pm glabrous, often obovate leaves (subsp. *engleri* has pubescent stems and leaves), and calyx limbs 6–9 mm long with an apiculum 1–3 mm long (limb 4–6 mm long with apiculum 1–2 mm long in subsp. *engleri*).

In Bridson's (2003) opinion, *Sericanthe andongensis* subsp. *andongensis* var. *andongensis* is considered to be confined to Angola, Democratic Republic of Congo (DRC), and north of the Zambezi River in Malawi, Mozambique, Tanzania, and Zambia. Neither *S. andongensis* subsp. *andongensis* var. *mollis* nor *S. andongensis* subsp. *engleri* occur in the *Flora of southern Africa* region according to Bridson (2003), and our own investigation of tropical and southern African material of this genus supports this opinion. Therefore *S. andongensis* var. *andongensis* is a misapplied name for South African material, leaving the South African taxon unplaced.

Besides the distinct geographical separation between *S. andongensis* subsp. *andongensis* (including both varieties), subsp. *engleri* and *Tricalysia legatii*, leaf characters such as hairiness, size, apex, and petiole length, can be used to separate these entities. However, there is great variation in the hairiness of leaves, a character that might correlate with the different stages of development of the leaves, since most plants are deciduous, with the flowers appearing before the leaves. Differences in hairiness of the leaves are not always a distinctive distinguishing character to separate these entities. On the South African specimens of *S. andongensis* at Kew, Robbrecht has frequently annotated the specimens 'tending towards *mollis*' (i.e. var. *mollis* Robbr.) (Burrows, pers. comm.). Although some South African plants do seem to be pubescent when young, it would seem not sufficiently so for Robbrecht to unequivocally place them in var. *mollis*.

We accept Bridson's opinion that *Tricalysia legatii* is a distinct taxon on account of the differences mentioned above, but the differences between it and the other subspecies and varieties of *S. andongensis* are not sufficient enough to elevate this taxon to species level. The purpose of this paper is therefore to provide a subspecific classification and combination in order to accommodate the South African taxon and to provide a key to the current accepted subspecies and varieties of *S. andongensis*. The three unnamed, undescribed entities of Bridson (2003), namely the montane element of *S. andongensis* from Zimbabwe (sp. A, sp. B, sp. C), are not dealt with in this paper.

All specimens cited are studied from herbarium specimens housed in PRE. The most important type specimens were seen on websites which are cited below. Acronyms for herbaria are listed in Holmgren *et al.* (1990).

TAXONOMY

Key to subspecies and varieties of *Sericanthe andongensis* (modified from Bridson 2003)

- 1a Mature stems usually not gnarled, with nodes and lateral twigs widely spaced; leaves monomorphic or \pm dimorphic, usually > 50 mm (up to 113 mm) long; leaf lamina narrowly elliptic to broadly ovate, occasionally obovate; petiole 5–10 mm long; Angola, DRC, Tanzania, Malawi, Mozambique, Zambia (subsp. *andongensis*):
 - 2a Leaves with only few scattered hairs below; leaf apex mainly acuminate subsp. *andongensis* var. *andongensis*
 - 2b Leaves velutinous below; leaf apex usually rounded, obtuse to acute, very occasionally a few leaves with sub-acuminate apices subsp. *andongensis* var. *mollis*
- 1b Mature stems often gnarled, with nodes and lateral twigs closely spaced; leaves clearly to markedly dimorphic, usually < 50 mm long (sometimes young leaves up to 70 mm long); leaf lamina variously obovate, oblanceolate, broadly elliptic to oblong; petiole up to 5 mm long; Zimbabwe, South Africa:
 - 3a Leaves softly pubescent below or occasionally with few scattered hairs; leaf lamina rarely obovate; calyx limb 4–6 mm long; southwestern Zimbabwe subsp. *engleri*
 - 3b Leaves glabrescent below; leaf lamina often obovate; calyx limb 6–9 mm long; South Africa: Limpopo subsp. *legatii*

Sericanthe andongensis (Hiern) Robbr. in Bulletin du Jardin Botanique de l'État à Bruxelles 48: 31 (1978).

Neorosa andongensis (Hiern) N.Hallé: 270 (1970). Type: Angola, Cuanza Norte, Pungo Andongo, on the Calemba islands in the river Cuanza, *Welwitsch 3133* (LISU, holo.—Aluka image!; BM—Aluka image!, K—Aluka image!, LISC—ACTD image!, iso.).

Sericanthe andongensis subsp. *andongensis* var. *mollis* Robbr. in Bulletin du Jardin Botanique de l'État à Bruxelles 48: 35 (1978). Type: DRC, without precise locality, *Quarré 1437* (BR, holo.—Aluka image!; SRGH—Aluka image!, iso.).

Sericanthe andongensis subsp. *engleri* (K.Krause) Bridson in Flora Zambesiaca 5: 514 (2003). Type: Zimbabwe, Matobo Dist., Kora Kora [Korakora] Stream near Absent Farm, *Plowes 1474* [BR, neotype—Aluka image!, chosen by Robbrecht (1978); MO—digital image!, P—digital image!, SRGH, isoneo.].

Sericanthe andongensis subsp. *legatii* (Hutch.) Jordaan & H.M.Steyn, stat. nov. *Tricalysia legatii* Hutch., A botanist in southern Africa: 306 (1946). Type: South Africa, [Limpopo Province], Soutpansberg [Zoutpansberg], between Louis Trichardt and Farm Geluk, September 1908, *Legat 23* (K, holo.—Aluka image!, PRE, photo!).

Sericanthe andongensis subsp. *andongensis* var. *andongensis* sensu Robbr.: 31 (1978), pro parte, as to specimens cited from South Africa.

Semi-deciduous or deciduous shrub or tree up to 5 m tall, usually much smaller, young twigs densely hairy with spreading hairs, becoming glabrescent with age, older stems covered with dark brown, flaking bark. Stems straight, with conspicuous, closely spaced nodes, knobbly due to leaf scars and stipule remains. Stipule lobes sheathing at least at base, truncate to triangular, 1.5–2.5 mm long, each bearing an awn, 1–2(–3) mm long, with silky hairs on outside and colleters inside. Leaves opposite, papery to \pm leathery, slightly glossy above, pubescent or glabrescent below, occasionally with insect galls (\pm rounded to ovoid hairy excrescences), lamina obovate, oblanceolate to elliptic, markedly dimorphic, (20–)25–50(–70) \times (10–)15–25(–45) mm, apex obtuse to acute, base cuneate or sometimes somewhat rounded, midrib hairy on both sides, prominent below, lateral veins in 3–4(–6) main pairs, prominently raised below, tertiary reticulate venation obscure to conspicuous; domatia inconspicuous or occasionally as conspicuous hairy tufts; bacterial galls linear, usually situated along basal half of midrib; petiole 1–3(–5) mm long, pubescent. Flowers 8(9)-merous, solitary, axillary, white, sweetly scented, usually before new leaves appear, subsessile; bract and bracteoles, cupular, 1–3 mm long, each with 2 unequal pairs of awns. Calyx limb 4–6(–8) mm long, closed in bud, with an apiculum 1–2 mm long, splitting into 2 or 3 lobes at anthesis, thin in texture and often translucent, silky hairy outside. Corolla salver-shaped, tube 7–13 mm long, silky hairy outside except at base; lobes 7–12 mm long and slightly twisted, \pm truncate with acuminate tip but acumen not central in mature lobes. Stamens arising at throat, filaments up to 1 mm long, glabrous, anthers 4–6 mm long, exerted. Ovary 2-locular, ovules 2 per locule, style glabrous, 2-lobed, reaching or slightly exceeding anthers.

Fruit a spherical drupe, \pm 10 mm diam., orange or red, crowned by persistent calyx. *Seeds* either 1 per chamber and hemispherical or 2 per chamber and quadriform, \pm 3–4 mm in diam., dark brown, striate. Figures 1 & 2.

Etymology: *Sericanthe* is derived from the Greek words *serikos* = silk and *anthos* = flower, referring to the silky hair-coat of the flower parts (Glen 2004). The specific epithet honours Charles Edward Legat (1876–



FIGURE 1.—*Sericanthe andongensis* subsp. *legatii*: A, flowering twig; B, stipule; C, flower. A–C, from Galpin 9557 (PRE). Scale bar: 10 mm. Artist: Marietjie Steyn.

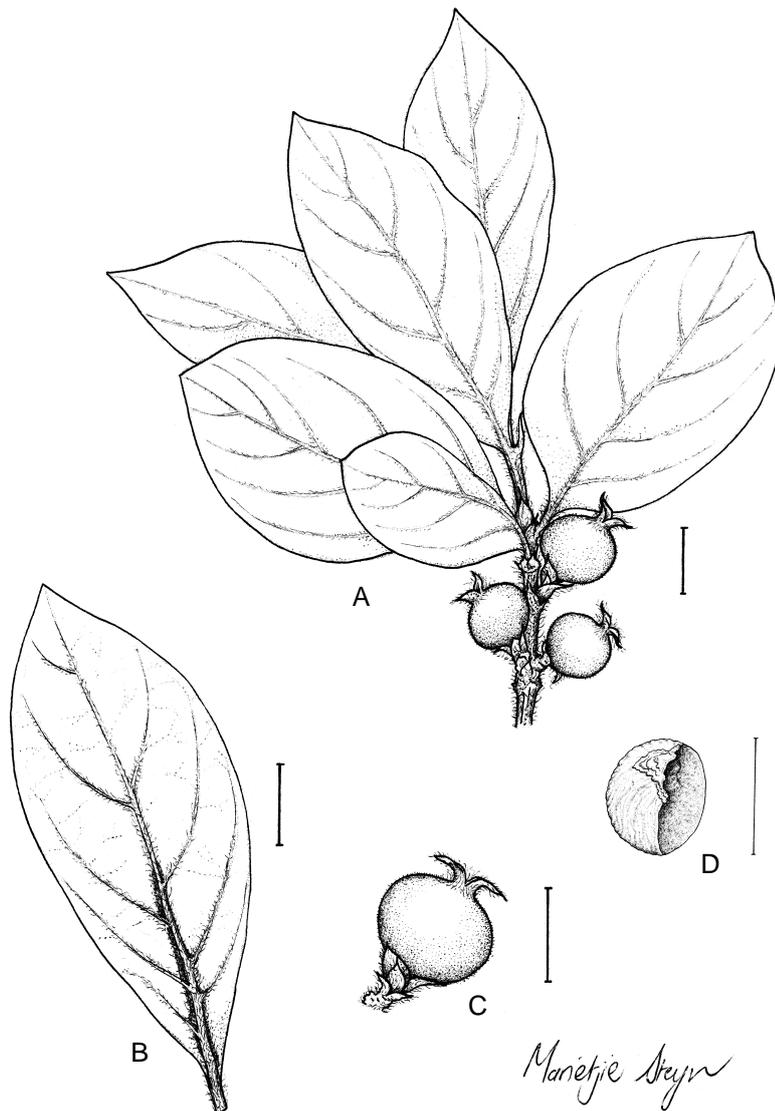


FIGURE 2.—*Sericanthe andongensis* subsp. *legatii*: A, fruiting twig; B, leaf with bacterial galls along midrib; C, fruit; D, half-spherical seed with striate coat. A, C, & D, from *Stalmans 1466* (PRE); B, from *McMurtry 10271* (PRE). Scale bar: 10 mm. Artist: Marietjie Steyn.

1966), who was born in Scotland and came to South Africa in 1898 as a forester in the Cape Forestry Department. He was later transferred to the former Transvaal where he was Chief Conservator and Chief Conservator of Forests for South Africa from 1913 to 1931, after which he returned to England (Glen & Germishuizen 2010). Legat collected the type material in the Soutpansberg, near Louis Trichardt in 1908, from which Hutchinson in 1946 described the species. *Sericanthe* belongs to the same tribe as *Coffea*, namely tribe Coffeae, and occurs in the northern parts of the Limpopo Province, hence the common name Venda-coffee or silky-coffee as in Van Wyk *et al.* (2011) under *Tricalysia legatii*.

Diagnostic characters: *Sericanthe andongensis* subsp. *legatii* differs from subsp. *andongensis*, occurring from Angola to Tanzania, and subsp. *engleri* from the Matopos in Zimbabwe in having longer calyx limbs, usually longer than 6 mm. For more differences see key.

Distribution and habitat: *Sericanthe andongensis* subsp. *legatii* is confined to the Soutpansberg, Blouberg, and Wolkberg regions of Limpopo (Figure 3), thus endemic to the Soutpansberg and Wolkberg Centres of Endemism (Van Wyk & Smith 2001). It is recorded to

grow in bushveld, open woodland, or forest margins on mountain or hill slopes, and rocky outcrops, often on quartzite or sandstone.

Selected specimens

LIMPOPO.—**2229** (Waterpoort): Zoutpansberg Dist., Farm Budworth, (–BB), Aug. 1958, *Mogg 28281*; Zoutpansberg Dist., Goro, (–CD), Jul. 1996, *Barker 3*; Louis Trichardt, Mountain Inn, (–DD), May 1966, *Theron 1489*. **2230** (Messina): Louis Trichardt Dist., ± 15 km ENE of Louis Trichardt on the Witvlag road, Farm Studholme, (–CC), Apr. 1997, *Burgoyne 6181*; SE of Nwanedi Reserve, N of Gundani Village, just W of the *Brachystegia spiciformis* forest, (–DA), Mar. 2002, *McMurtry 10271*; Venda, Tshaulu Mission, Mutanzhela, (–DC), April 1980, *Van Wyk 3812*. **2328** (Baltimore): Polokwane [Pietersburg] Dist., Blouberg, Farm Leipsig, (–BB), Apr. 1961, *Strey & Schlieben 8470*. **2329** (Pietersburg): Polokwane [Pietersburg] Dist., eastern foothills of Blauwberg, (–AA), May 1953, *Codd 7937*; Zoutpansberg Dist., Farm ‘Llewellyn’ 35 LS, hill opposite house, (–AB), Jul. 1981, *Venter 6196*; Hanglip, near Louis Trichardt, (–BB), Dec. 1945, *Gerstner 5760*. **2330** (Tzaneen): near Louis Trichardt, Entabeni Forest Station, (–AA), Sept. 1929, *Galpin 9557*; Spelonken Dist.; Tshakhuma, (–AB), Nov. 1931, *Oberrmeyer TRV30580*; Daviesville, Setali Mission, (–AC), May 1945, *Gerstner 5484*; Letaba Dist., Modjadji’s Reserve, near Duiwelskloof, (–CB), Apr. 1937, *Krige 104*. **2430** (Pilgrim’s Rest): Lekgalameetse Nature Reserve, Haffenden Heights, (–AA), Jan. 1978, *Stalmans 1466*; Letaba Dist., Farm Cyprus, (–AB), Nov. 1960, *Renny 139*.

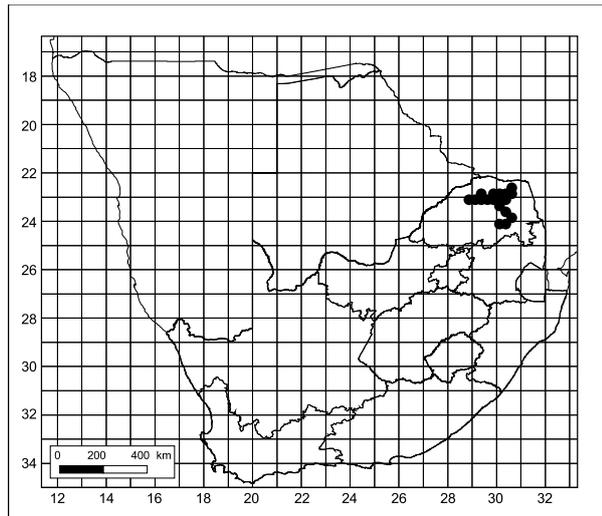


FIGURE 3.—Known distribution of *Sericanthe andongensis* subsp. *legatii*.

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REFERENCES

- ANGIOSPERM PHYLOGENY GROUP [A.P.G.] 2009. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG III. *Botanical Journal of the Linnean Society* 161: 105–121.
- BREMER, B. 2009. A review of molecular phylogenetic studies of Rubiaceae. *Annals of the Missouri Botanic Garden* 96: 4–26.
- BREMER, B. & ERIKSSON, T. 2009. Time Tree of Rubiaceae: phylogeny and dating the family, subfamilies, and tribes. *International Journal of Plant Science* 170:766–793.
- BRIDSON, D.M. 2003. Rubiaceae. *Sericanthe*. In G.V. Pope, *Flora zambesiaca* 5, 3: 505–516. Royal Botanic Gardens, Kew.
- COATES PALGRAVE, M. 2002. *Keith Coates Palgrave' Trees of southern Africa*, edn 3. Struik Publishers, Cape Town.
- DAVIS, A.P., CHESTER, M., MAURIN, O. & FAY, M.F. 2007. Searching for the relatives of *Coffea* (Rubiaceae, Ixoroideae): the circumscription and phylogeny of Coffeae based on plastid sequence data and morphology. *American Journal of Botany* 94: 313–329.
- GLEN, H. 2004. *Sappi, what's in a name?* Jacana, Johannesburg.
- GLEN, H.F. & GERMISHUIZEN, G. 2010. Botanical exploration of southern Africa, edn. 2. *Strelitzia* 26. South African National Biodiversity Institute, Pretoria.
- HALLÉ, N. 1970. Rubiacées, *Neorosea*. In *Flore du Gabon* 17,2: 268–277.
- HOLMGREN, P.K., HOLMGREN, N.H. & BARNETT, L. C. (eds). 1990. *Index Herbariorum. Part 1: The Herbaria of the World*, edn 8. New York Botanical Garden, New York.
- HUTCHINSON, J. 1946. *A botanist in southern Africa*. Gawthorn, London.
- JANSEN, S., ROBBRECHT, E., BEECKMAN, H. & SMETS, E. 1996. *Gaertnera* and *Pagamea*: genera within the Psychotrieae or constituting the tribe Gaertnerae? A wood anatomical and palynological approach. *Botanica Acta* 109: 466–476.
- KLOPPER, R. R., CHATELAIN, C., BÄNNINGER, V., HABASHI, C., STEYN, H.M., DE WET, B.C., ARNOLD, T.H., GAUTIER, L., SMITH, G.F. & SPICHIGER, R. 2006. Checklist of the flowering plants of sub-Saharan Africa. An index of accepted names and synonyms. *South African Botanical Diversity Network Report* no. 42. SABONET, Pretoria.
- LEMAIRE, B., ROBBRECHT, E., VAN WYK, A.E., VAN OEVELEN, S., VERSTRATE, B., PRINSEN, E., SMETS, E. & DESSEIN, S. 2011. Identification, origin, and evolution of leaf nodulating symbionts of *Sericanthe* (Rubiaceae). *The Journal of Microbiology* 49: 935–941.
- RETIEF, E. 2003. Rubiaceae. In G. Germishuizen & N.L. Meyer, *Plants of southern Africa: an annotated checklist. Strelitzia* 14: 825–841. National Botanical Institute, Pretoria.
- RETIEF, E. 2006. Rubiaceae. In G. Germishuizen, N.L. Meyer, Y. Steenkamp & M. Keith, *A checklist of South African plants. Southern African Botanical Diversity Network Report* No. 41: 740–754. SABONET, Pretoria.
- RETIEF, E. & LEISTNER, O.A. 2000. Rubiaceae. In O.A. Leistner (ed.), *Seed plants of southern Africa: families and genera. Strelitzia* 10: 476–495. National Botanical Institute, Pretoria.
- REVEAL, J.L. 2012a. Newly required infrafamilial names mandated by changes in the *Code of Nomenclature for Algae, Fungi, and Plants. Phytoneuron* 2012-33: 1–32.
- REVEAL, J.L. 2012b. An outline of a classification scheme for extant flowering plants. *Phytoneuron* 2012-37: 1–221.
- ROBBRECHT, E. 1978. *Sericanthe*, a new African genus of Rubiaceae (Coffeae). *Bulletin du Jardin Botanique de l'État à Bruxelles* 48: 3–78.
- ROBBRECHT, E. 1979. The African genus *Tricalysia* A.Rich. (Rubiaceae-Coffeae). I. A revision of the species of subgenus *Empogona*. *Bulletin du Jardin Botanique de l'État à Bruxelles* 49: 239–360.
- ROBBRECHT, E. 1988. Rubiaceae. *Sericanthe*. In R.M. Polhill, *Flora of tropical East Africa, Rubiaceae*, Part 2: 566–569. Balkema, Rotterdam.
- ROBBRECHT, E. & PUFF, C. 1986. A survey of the Gardenieae and related tribes (Rubiaceae). *Botanische Jahrbücher* 108: 63–137.
- SONKE, B., TAEDOUMG, H. & ROBBRECHT, E. 2012. A reconsideration of the Lower Guinean species of *Sericanthe* (Rubiaceae, Coffeae), with four new species from Cameroon and Gabon. *Botanical Journal of the Linnean Society* 169: 530–554.
- STEVENS, P. F. (2001 onwards). Angiosperm Phylogeny Website. Version 9, June 2008. <http://www.mobot.org/MOBOT/research/APweb/> (accessed December 2011).
- TOSH, J., DAVIS, A.P., DESSEIN, S., DE BLOCK, P., HUYSMANS, S., FAY, M.F., SMETS, E. & ROBBRECHT, E. 2009. Phylogeny of *Tricalysia* (Rubiaceae) and its relationships with allied genera based on plastid DNA data: resurrection of the genus *Empogona*. *Annals of the Missouri Botanical Garden* 96: 194–213.
- VAN OEVELEN, S., PRINSEN, E., DE WACHTER, R. & ROBBRECHT, E. 2001. The taxonomic value of bacterial symbiont identification in African *Psychotria* (Rubiaceae). *Systematic Geography and Plants* 71: 557–563.
- VAN WYK, A.E. & SMITH, G.F. 2001. *Regions of floristic endemism in southern Africa*. Umdaus, Pretoria.
- VAN WYK, A.E., VAN DEN BERG, E., COATES PALGRAVE, M. & JORDAAN, M. 2011. *Dictionary of names for southern African trees*. Briza Publishers, Pretoria.
- Websites accessed:
 ALUKA LIBRARY: <http://plants.jstor.org/> [accessed January 2012].
 ANGIOSPERM PHYLOGENY WEBSITE (APweb): www.mobot.org/MOBOT/Research/APweb/ [accessed February 2012].
 ARQUIVO CIENTIFICO TROPICAL DIGITAL REPOSITORY (ACTD): <http://actd.iict.pt/> [accessed June 2012].
 PARIS HERBARIUM: <http://coldb.mnhn.fr/> [accessed June 2012].
 TROPICOS: <http://www.tropicos.org/> [accessed June 2012].

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