

THREE NEW RARELY COLLECTED OR ENDANGERED SPECIES OF ANNONACEAE FROM VENEZUELA

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SUMMARY

Three new species of Annonaceae from Venezuela are described here: *Crematosperma venezuelanum* Pirie, *Klarobelia subglobosa* Chatrou, and *Pseudomalmea wingfieldii* Chatrou. All three are represented by few collections (in comparison to those of other Neotropical species of Annonaceae). *Klarobelia subglobosa* and *P. wingfieldii* in particular are only known from a few individual specimens collected in areas vulnerable to habitat destruction. IUCN threat categories are assigned to these species.

Key words: Annonaceae, *Crematosperma*, *Klarobelia*, *Pseudomalmea*, Neotropics, Venezuela, threatened/endemic species.

INTRODUCTION

Klarobelia, *Pseudomalmea*, and *Crematosperma* are three Neotropical genera of the flowering plant family Annonaceae. *Klarobelia* and *Pseudomalmea* include a number of species originally assigned to the genus *Malmea*, as described by Fries in 1905. Of the 19 species originally described under *Malmea*, 12 were subsequently moved to three new genera described by Chatrou (1998) on the basis of leaf, inflorescence, and seed characters: *Klarobelia* (now including 12 recognised species), *Mosannonia* (14), and *Pseudomalmea* (3). Two new species, one of *Klarobelia* (*K. subglobosa*) and one of *Pseudomalmea* (*P. wingfieldii*), both endemic to Venezuela, are described here.

The genus *Crematosperma* was also described by Fries (1930), and phylogenetic analyses using DNA sequence data suggest that its species comprise a monophyletic group (Pirie et al., in press). 29 species of *Crematosperma* are currently recognised, although results of current systematic research suggest that the total number of distinguishable species may in fact exceed 30. A second endemic species for Venezuela, *C. venezuelanum* (the first being *C. macrocarpum*, described by Maas in Maas et al., 1986), is described here.

The number of collections available for the description of these new species was small in comparison to those known for many other Neotropical species of Annonaceae. Not all localities in the Neotropics are equally well collected or understood, and paucity of specimens does not necessarily reflect more than a lack of information with regards to the rarity or conservation status of particular taxa. However, our knowledge of both the threats present to the areas in which, in particular, *Klarobelia subglobosa*

and *Pseudomalmea wingfieldii* are found, and of the sparse distribution of individuals of these taxa in these areas, leads us to conclude that these species may with some confidence be considered as threatened. For these species the specific nature of the threat is described, and appropriate IUCN threat categories (IUCN, 2001) are assigned.

***Crematosperma venezuelanum* Pirie, *spec. nov.* — Fig. 1; Map 1**

Lamina basi cordata (raro rotundata), venis secundariis basim versus sub angulo magno e costa exeuntibus, indumento ubique nullo distinctum. — Typus: *Diaz & Niño 231* (holo U; iso NY), Venezuela, Carababo, Autonomo Mora, Watershed of Morón river, 3 May 1991.

Tree 7–10 m tall; young twigs and petioles glabrous. *Leaves*: petioles 10–20 mm long, 3–4 mm diam.; lamina narrowly elliptic, 30–53 by 9–15 cm, index 3–3.6, chartaceous to subcoriaceous, shiny, dark brown above, olive green/greyish/light to dark brown

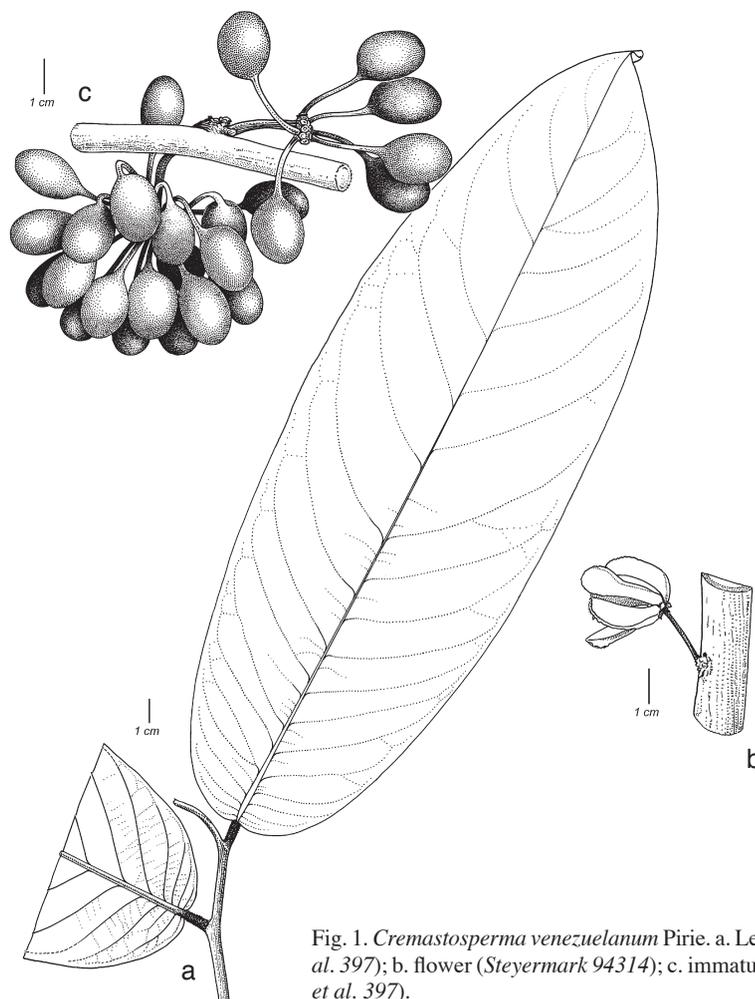
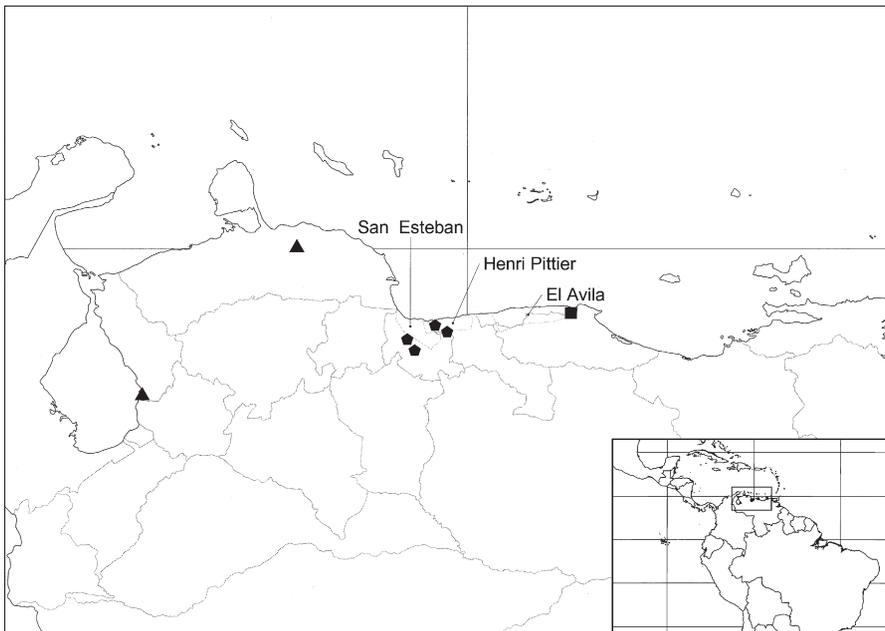


Fig. 1. *Crematosperma venezuelanum* Pirie. a. Leaves (Edwards *et al.* 397); b. flower (Steyermark 94314); c. immature fruit (Edwards *et al.* 397).

below, glabrous on both sides, base cordate (rarely rounded), apex obtuse to acute, primary vein raised over its entire length, 2.5–5 mm wide at the widest point, secondary veins 15–30, intersecondary veins occasional, distance between from 12 mm at the base to 40 mm closer to the apex, angles with primary vein from 90° at the base to 60–50° closer to the apex, rarely branching, forming more or less indistinct loops, smallest distance between loops and margin 2–3 mm; tertiary veins showing some reticulation. *Inflorescence* of single flowers clustered in groups of up to 6, produced from the main trunk or from leafless branches; short axillary shoot c. 2 by 1 mm (in flower), 3–5 by 1.5–3 mm (in fruit); pedicels c. 11 by 1 mm (in flower), 16–22 by 1.5–2 mm diam. at the base, 2–3 mm diam. at the apex (in fruit), glabrous; single lower bract, very broadly triangular, 0.5–1 mm long, obtuse, persistent, glabrous; upper bract attachment variable within central 80% of length, c. 1 by 1.5 mm, depressed triangular, obtuse, glabrous; flower buds and flowers at anthesis not seen; flowers dark brown to black in sicco, all parts glabrous; sepals free, depressed triangular, reflexed, c. 1 by 1.5 mm, acute to obtuse, persistent on less mature fruits; outer petals elliptic, c. 18 by 10 mm, inner petals narrowly elliptic, c. 21 by 6 mm; receptacle depressed ovoid; androecium c. 4 mm diam., stamens c. 60, c. 1 mm long, connective rhombic, c. 0.4 mm wide; gynoecium c. 1.8 mm diam., carpels 30–40, 0.6–0.7 mm long. *Monocarps* 20–35, black in sicco, ellipsoid, asymmetrical, 17–20 by 12–13 mm, apicule strongly excentric, glabrous; stipes 15–22 by 1.5–2 mm, glabrous; fruiting receptacle depressed ovoid, 5–12 mm diameter. *Seeds* ellipsoid, orange-brown with many shallow pits, 15–17 by 13–16 mm, raphe raised, encircling seed longitudinally, rumination spiniform.



Map 1. Distribution of *Crematosperma venezuelanum* Pirie (◆), *Klarobelia subglobosa* Chatrou (■), and *Pseudomalmea wingfieldii* Chatrou (▲). Nearby national parks are indicated.

Distribution — Only known from four collections from the states of Aragua and Carabobo in Venezuela.

Habitat & Ecology — Growing in the understorey of primary, moist, evergreen forest at elevations between 350 and 1100 m. Fruiting specimens have been collected in the months of April and May, one flowering specimen in August.

Note — *Crematosperma venezuelanum* is best distinguished from other species of *Crematosperma* by its distinctive acute to obtuse leaf apex (as opposed to acuminate in other species). The combination of its distinctive cordate (rarely rounded) leaf base, the large angles of the secondary with the primary veins near the base of the leaves and the lack of indument on any parts is also unique. Only one other species of *Crematosperma* has been collected in Venezuela; *C. macrocarpum* Maas, which has larger monocarps with shorter, thicker stipules.

Paratypes:

VENEZUELA. **Aragua:** Henri Pittier National Park, 1 April 1990 (fr), *Edwards et al.* 397 (NY); National Park; Dos Riitos, 19 May 1943 (fr), *Killip et al.* 37752 (NY, S). **Carabobo:** San Gián river, 5–6 km S of Borburata, 7 Aug. 1965 (fl), *Steyermark* 94314 (NY, US).

Klarobelia subglobosa Chatrou, *spec. nov.* — Fig. 2a; Map 1

A speciebus ceteris huius generis differt monocarpiis subglobosis — Typus: *Meier & Llamozas* 3685 (holo U [2 sheets]; iso VEN), Venezuela, Distrito Federal, National Park 'El Avila', Fila Jabillar, alt. 500 m, 16–19 April 1993.

Tree of unknown height; young twigs and lower side of petioles, primary vein and basal part of lower side of leaf blade rather densely covered with brownish, appressed hairs 0.2–0.4 mm long. Petiole 4–6 by 1–2 mm. *Lamina* 6–10 by 2.5–4.5 cm, length/width ratio 2.2–2.8, chartaceous to subcoriaceous, (narrowly) elliptic, base shortly attenuate, apex acute (or gradually acuminate), olive-green to brown on both sides, shiny on both sides, glabrous above, secondary veins 6–8 per side, distance between secondary veins 9–18 mm, angles with primary vein 45–60°, loop-forming at acute to right angles, distance between loops and leaf margin 2–3 mm. *Inflorescences* on older branches (only observed in fruiting stage), short shoot 20–45 by 3–4 mm, sparsely covered with brownish, appressed hairs 0.2–0.4 mm long, leaves on short shoot 7 by 2.5 cm, caducous, pedicels 17–19 by 4 mm basally to 5–6 mm apically. *Flowers* unknown. *Fruit* of 10–12 monocarps, light brown in sicco, subglobose, 18–24 by 16–21 mm, glabrous, verrucose, stipules 30–46 by 1–2.5 mm, glabrous, verrucose, fruiting receptacle transversely ellipsoid, 9–13 mm diam., 6–7 mm high, glabrous. *Seeds* subglobose, 17–23 by 15–20 mm, reddish brown, shallowly transversely striate, raphe impressed, slightly sinuous.

Distribution — Only known from the type locality, in El Avila National Park, in the surroundings of Caracas, at an elevation of 500 m.

Habitat & Ecology — In semi-deciduous forest on the north-eastern side of the Venezuelan central coastal mountain range, of which the El Avila National Park is part.

Notes — *Klarobelia subglobosa* is only known from the type collection. Despite extensive explorations, reflected in Steyermark & Huber (1978) and Meier (1998),

only a single specimen of this new species has been collected. In Meier (1998), *K. subglobosa* has been listed as *Malmea diclina*. According to the label, the specimen has been collected from a fallen, dried tree.

Despite the poor material, *K. subglobosa* can easily be distinguished from other species in the genus by its subglobose monocarps. The species is most similar to *K. stipitata*, an endemic of the Osa Peninsula, Costa Rica, with which it shares the presence of non-reduced leaves on the short shoot subtending the inflorescence. The short shoot in all other species of *Klarobelia* is provided with bracts. Leaves of *K. stipitata* are 10.5–16.5 cm long and narrowly elliptic, whereas leaves of *K. subglobosa* are 6–10 cm long and usually elliptic. Furthermore, monocarps of *K. stipitata* are broadly ellipsoid, rarely subglobose, and typically dry black, instead of light brown as in *K. subglobosa*.

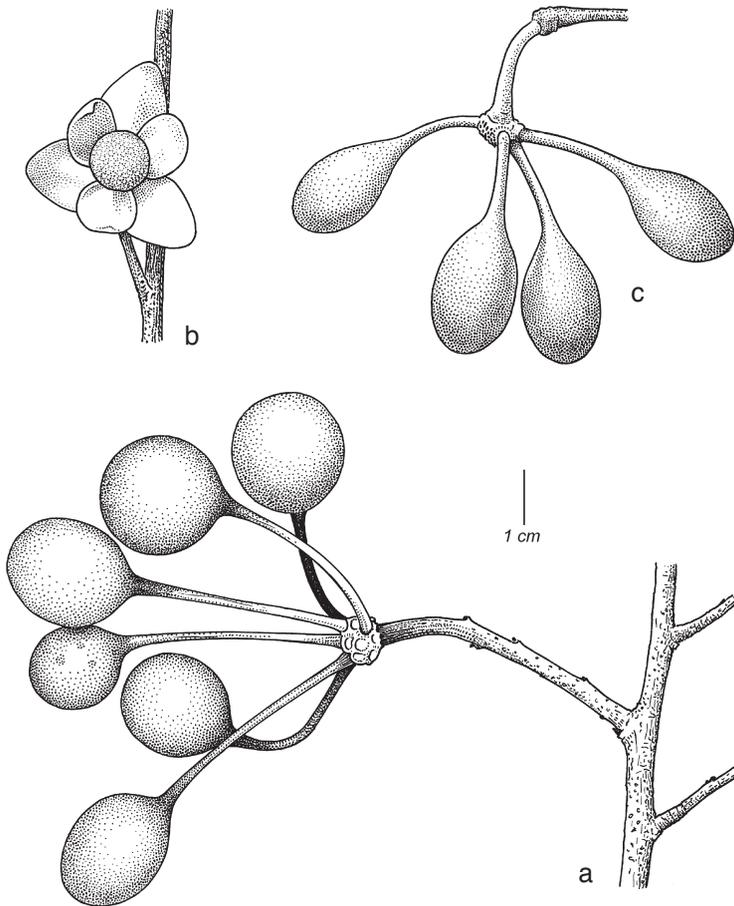


Fig. 2. a. *Klarobelia subglobosa* Chatrou. Immature fruit (Meier & Llamozas 3685). — b, c. *Pseudomalmea wingfieldii* Chatrou. b. Flower before anthesis; c. immature fruit (Pendry & Wingfield 1034).

Conservation — El Avila is vulnerable: there is a risk that the various threats it faces will increasingly threaten its biodiversity (ParksWatch; www.parkswatch.org).

Assessing the conservation status of *K. subglobosa*, we judge this species to be critically endangered under the following criterion for this threat category (IUCN, 2001): Criterion D, population size estimated to number fewer than 50 mature individuals. *Klarobelia subglobosa* might classify as critically endangered under other IUCN criteria as well. However, as these criteria involve changes over time (e.g. of population size, area of occupancy, number of mature individuals), they are impossible to assess given the fact that only one herbarium specimen of this taxon has ever been collected.

Pseudomalmea wingfieldii Chatrou, *spec. nov.* — Fig. 2b, c; Map 1

A speciebus ceteris huius generis differt pedicello supra articulationem ebracteato, praeterea stipite brevioris notabilis. — Typus: *Pendry & Wingfield 1034* (holo U [2 sheets]; iso E, VEN), Venezuela, Falcón, Los Tablones, 4 km downstream from Las Dos Bocas, alt. 100 m, 16 November 2000.

Tree to 15 m tall, bark smooth and dark grey. Young twigs and lower side of petioles and primary vein glabrous to sparsely covered with brownish, appressed hairs 0.1–0.2 mm long. Petiole 3–5 by 1–2 mm. *Lamina* 6–14 by 2.5–5 cm, length/width ratio 1.9–3.2, chartaceous, (narrowly) elliptic, sometimes (narrowly) obovate, often falcate, base cuneate to acute, rarely attenuate, apex gradually acuminate (or acute), olive-green and often shiny on both sides, glabrous above, glabrous to sparsely covered with brownish, appressed hairs 0.1–0.2 mm long below, secondary veins 6–10 per side, distance between secondary veins 10–18 mm, angles with primary vein 45–60°, rarely loop-forming and diminishing towards leaf margin, intersecondaries present, tertiary venation conspicuous and reticulate. *Inflorescences* rhipidiate, on leafy twigs or on older branches, single-flowered at any point in time; indument: short shoot, pedicels, and outer side of bracts rather densely covered with (yellowish) brown, (erect to) appressed hairs 0.2–0.4 mm long, less densely in fruiting stage; short shoot 2–8 by 1.5–2 mm, 3 mm diam. when fruiting, leaves on short shoot 5 by 3–3.5 cm, caducous, bracts on short shoot 2 by 2 mm, flowering pedicels 15–23 by 1 mm basally to 1.5 mm apically, fruiting pedicels to 29 by 2 mm basally to 3 mm apically. *Flowers* bisexual, petals patent during most of flower development, inner three petals curving over floral centre before anthesis. Flower colour pale yellow at anthesis (in vivo), cinnamon (in sicco). Sepals free, transversely ovate, 2 by 3 mm, ciliate, outer side densely covered with yellowish brown, appressed hairs 0.2 mm long, inner side glabrous. Petals obovate (to elliptic), fleshy and rigid. Outer petals 11–20 by 7–14 mm, on both sides densely covered with yellowish brown, appressed to erect, often curly, hairs 0.1 mm. Inner petals 8–20 by 6–15 mm, concave at base, outer side rather densely hairy (same hairs as outer petals), inner side glabrous to sparsely hairy, papillate. Stamens 100–150, 1.4–1.6 mm long, thecae 0.8–1 mm long, extrorse, prolonged connective discoid, papillose, glabrous. Carpels c. 200, ovaries 1–1.2 mm long, several-ribbed, totally covered with yellowish brown, appressed hairs 0.1–0.2 mm, stigmas 0.3–0.5 mm long, papillose, densely covered with hairs ≤ 0.05 mm long. Flowering receptacle transverse elliptic, flat on top, 2–3 mm high, 5–6 mm diam., staminate portion glabrous, carpellate portion densely hairy. *Fruit* of 4–6 monocarps, red at maturity (in vivo), (reddish) brown in sicco,

with red pulp at maturity (in vivo), ellipsoid, 21–35 by 12–21 mm, (sub)glabrous, verrucose, stipes 17–30 by 1–2 mm, (sub)glabrous, verrucose, fruiting receptacle transversely ellipsoid, 7–10 mm diam., 4–5 mm high, densely hairy. *Seeds* ellipsoid, 19–33 by 10–19 mm, reddish brown, shallowly transversely striate, raphe slightly raised, verrucose and rugose, 1 mm wide.

Distribution — Only known from two individuals: the tree from which *Tejera s.n.* was collected (the Venezuelan state of Zulia), and an individual from which all remaining collections were gathered (Wingfield, pers. comm.), in the state of Falcón, Venezuela. Elevation 100 m.

Habitat & Ecology — Semideciduous, riverine forest.

Notes — Of *Pseudomalmea wingfieldii* only bisexual flowers have been observed. The other two species of *Pseudomalmea*, *P. boyacana* and *P. declina*, are androdioecious. Androdioecy in Annonaceae is correlated with a higher number of carpels compared to the number of stamens in bisexual flowers, e.g. in *Klarobelia*, *Pseudomalmea* (Chatrou, 1998), *Anonidium* (Le Thomas, 1969), and *Greenwayodendron* (Verdcourt, 1969). A carpel-stamen ratio comparable to *Pseudomalmea boyacana* and *P. declina* is observed in *P. wingfieldii*. It is therefore expected that the latter should also be androdioecious.

Bracts (in *Pendry & Wingfield 1034*) as well as non-reduced leaves (in *Wingfield 8668, 15289*) have been found on the short shoot subtending the inflorescence in *P. wingfieldii*. The occurrence of bracts on the short shoot is a feature not observed in the remaining two species of *Pseudomalmea*. In *Wingfield 15289* a lateral inflorescence, only observed in a very young stage, originates from the axil of a non-reduced leaf. The occurrence of such a paracladium has not been observed before in *Pseudomalmea*, but is known e.g. from species in the Neotropical genus *Unonopsis* (L. Westra, pers. comm.). The absence of a bract on the part of pedicel above the articulation is a remarkable feature of *P. wingfieldii*. Chatrou (1998) used this as one of the characters to distinguish *Pseudomalmea* from *Klarobelia*. In every other respect, however, *P. wingfieldii* evidently belongs to *Pseudomalmea*, most notably because of the clear, reticulate venation, the inflorescences on a short, axillary shoot, the spreading of the petals during flower development, and the seeds with lamellate, four-parted ruminations and a raised, straight raphe.

Etymology — *Pseudomalmea wingfieldii* is named after Dr. Robert Wingfield, founder and curator of herbarium CORO (Instituto Tecnológico Alfonso Gamero, Coro), the herbarium for the Venezuelan state of Falcón.

Conservation — Only two individuals of *P. wingfieldii* have ever been encountered. The individual in the state of Falcón grows by the river Ricoa, and is under immediate threat due to planned infrastructural works (Wingfield, pers. comm.). Under the same IUCN (2001) criterion as applied to *Klarobelia subglobosa*, we assess *P. wingfieldii* to be critically endangered. Similar to *K. subglobosa*, more criteria for critically endangered species might apply to *P. wingfieldii*, but this cannot be evaluated due to the limited number of collections and known individuals.

Paratypes:

VENEZUELA. **Zulia:** Dept. of Bolívar, La Barua, hacienda La Concha, *Tejera s.n.* (VEN). **Falcón:** Río Ricoa, 4 km E of Las Dos Bocas, 35 km ESE of Coro, 100 m, *Wingfield 7940* (CORO, U), *ibidem*, *Wingfield 8668* (CORO, U), *ibidem*, *Wingfield & Hernández 15289* (CORO, U).

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REFERENCES

- Chatrou, L.W. 1998. Changing Genera: Systematic studies in Neotropical and West African Annonaceae. PhD Thesis. Utrecht University, the Netherlands.
- Fries, R.E. 1905. Studien in der Riedel'schen Anonaceen-Sammlung. Ark. Bot. 5, 4: 1–24.
- Fries, R.E. 1930. Revision der Arten einiger Anonaceen-Gattungen I. Acta Horti Berg. 10: 1–128.
- IUCN. 2001. The IUCN red list of threatened species, 2001 categories and criteria, version 3.1. IUCN, Gland, Switzerland.
- Le Thomas, A. 1969. Annonacées. In: A. Aubréville (ed.), Flore du Gabon 16. Muséum National d'Histoire Naturelle, Paris.
- Maas, P.J.M., E.C.H. van Heusden, J. Koek-Noorman, A.K. van Setten & L.Y.Th. Westra. 1986. Studies in Annonaceae. VII. New species from the Neotropics and miscellaneous notes. Proc. Kon. Ned. Akad. Wetensch., Ser. C 89: 249–278.
- Meier, W. 1998. Flora und Vegetation des Avila-National parks (Venezuela/Küstenkordillere). Dissertationes Botanicae 296. Cramer, Berlin/Stuttgart.
- Pirie, M.D., L.W. Chatrou, R.H.J. Erkens, J.W. Maas, T. van der Niet, J.B. Mols & J.E. Richardson. In press. Phylogeny reconstruction and molecular dating in four Neotropical genera of Annonaceae: the effect of taxon sampling in age estimations. In: F.T. Bakker, L.W. Chatrou, B. Gravendeel & P.B. Pelsner (eds.), Plant species-level systematics: new perspectives on pattern and process. Regnum Veg. 143. Koeltz Scientific Books & IAPT, Vienna.
- Steyermark, J.A. & O. Huber. 1978. Flora del Avila. INCAFO, Madrid.
- Verdcourt, B. 1969. The status of the genus *Polyalthia* Blume (Annonaceae) in Africa. *Adansonia*, n.s. 9: 87–94.