



A new species of *Hubera* (Annonaceae) from Peninsular India

RAMACHANDRAN MURALIDHARAN¹, DUVURU NARASIMHAN² & NATESAN BALACHANDRAN³

¹Department of Botany, D.G.Vaishnav College, Chennai – 600 106, Tamil Nadu, India: e-mail: botanymuralidharan@gmail.com

²Department of Botany, Madras Christian College, Chennai – 600 059, Tamil Nadu, India

³Department of Botany, Kanchi Mamunivar Centre for Post Graduate Studies, Pondicherry – 605 008, India

Introduction

Annonaceae, one of the most diverse plant families in tropical forests, comprise roughly 108 genera and 2400 species (Rainer *et al.* 2006, Chatrou *et al.* 2012). As per the current understanding, Annonaceae have four subfamilies: Anaxagoreoideae, Ambavioideae, Annonoideae and Malmeoideae (Chatrou *et al.* 2012). Phylogenetic studies on Annonaceae (Mols *et al.* 2004; Erkens *et al.* 2007; Su *et al.* 2008; Nakkuntod *et al.* 2009; Chatrou *et al.* 2012) have brought significant changes in circumscription and nomenclature of several genera due to the strict adherence to the principle of monophyly (Su *et al.* 2005, 2010; Rainer, 2007; Mols *et al.* 2008; Saunders, 2009; Chaowasku *et al.* 2011, 2012; Xue *et al.* 2012, 2014). The problematic case of the polyphyletic genus *Polyalthia* Blume *s.l.* (1830: 68) has recently been studied phylogenetically in detail and presently is fully solved; species of *Polyalthia s.l.* have been segregated into several smaller monophyletic genera, for example, *Fenerivia* Diels (1925: 355; Saunders *et al.* 2011), *Hubera* Chaowasku (2012: 46; Chaowasku *et al.* 2012), *Maasia* Mols, Keßler & Rogstad (2008: 493; Mols *et al.* 2008), *Marsypopetalum* Scheffer (1870: 342; Xue *et al.* 2011) and *Monoon* Miquel (1865: 15; Xue *et al.* 2012).

Most southern Indian species of *Polyalthia s.l.* are currently placed under *Hubera* or *Monoon*, both of which along with *Polyalthia s. str.* are members of the morphologically diverse tribe Miliuseae (Chaowasku *et al.* 2014). *Hubera* is differentiated from *Polyalthia s. str.* mainly by number of ovules and structure of pollen infractum, and it is morphologically similar to *Monoon* in position of the inflorescence and number of ovules.

Floristic studies carried out in Gingee Hills, Villupuram District, Tamil Nadu identified unique populations of one Annonaceae species occurring in several pockets scattered on the hill. The morphology of this species fits the circumscription of *Polyalthia s.l.*, e.g. presence of six subequal petals, stamens numerous with truncate connective, carpels numerous with basal or lateral ovules and fruit an aggregate of stalked berries with one to several seeds (Johnson & Murray, 1999). Study of characters highlighted and differentiated in Chaowasku *et al.* (2012) indicated that this species belongs to the recently described genus *Hubera* because of the presence of e.g. axillary inflorescences, spiniform endosperm ruminations, and uniovulate ovaries, which are principal features characterizing this genus. Although the genus is widely distributed in Paleotropics, so far only three of ca. 27 species of *Hubera* have been reported to occur on the Indian subcontinent: *H. jenkinsii* (Hooker & Thomson, 1855: 141) Chaowasku (2012: 48), *H. cerasoides* (Roxburgh, 1795: 30) Chaowasku (2012: 47) and *H. korinti* (Dunal, 1817: 133) Chaowasku (2012: 49). Comparisons with other species in the relevant literature (Dunal, 1817; Hooker & Thomson, 1872; Thwaites, 1864; Huber 1985) indicate that recognition of this species is warranted, and it is described below. In addition, morphological comparisons of the new species and three other Indian species of *Hubera* are presented (Table 1).

Taxonomy

Hubera senjiana R.Muralidharan, Naras. & N.Balach., *sp. nov.* (Figs. 1a–h, 2a–b)

Type:—INDIA. Tamil Nadu: Gingee, Villupuram District, Devathanampettai, Pakkamalai Reserve Forest, 12° 10.146' N, 79° 19.280' E, 250 m, 17 August 2008, Muralidharan & Narasimhan 7210A, (holotype MH!; isotypes, 7210 B-C, CAL!).

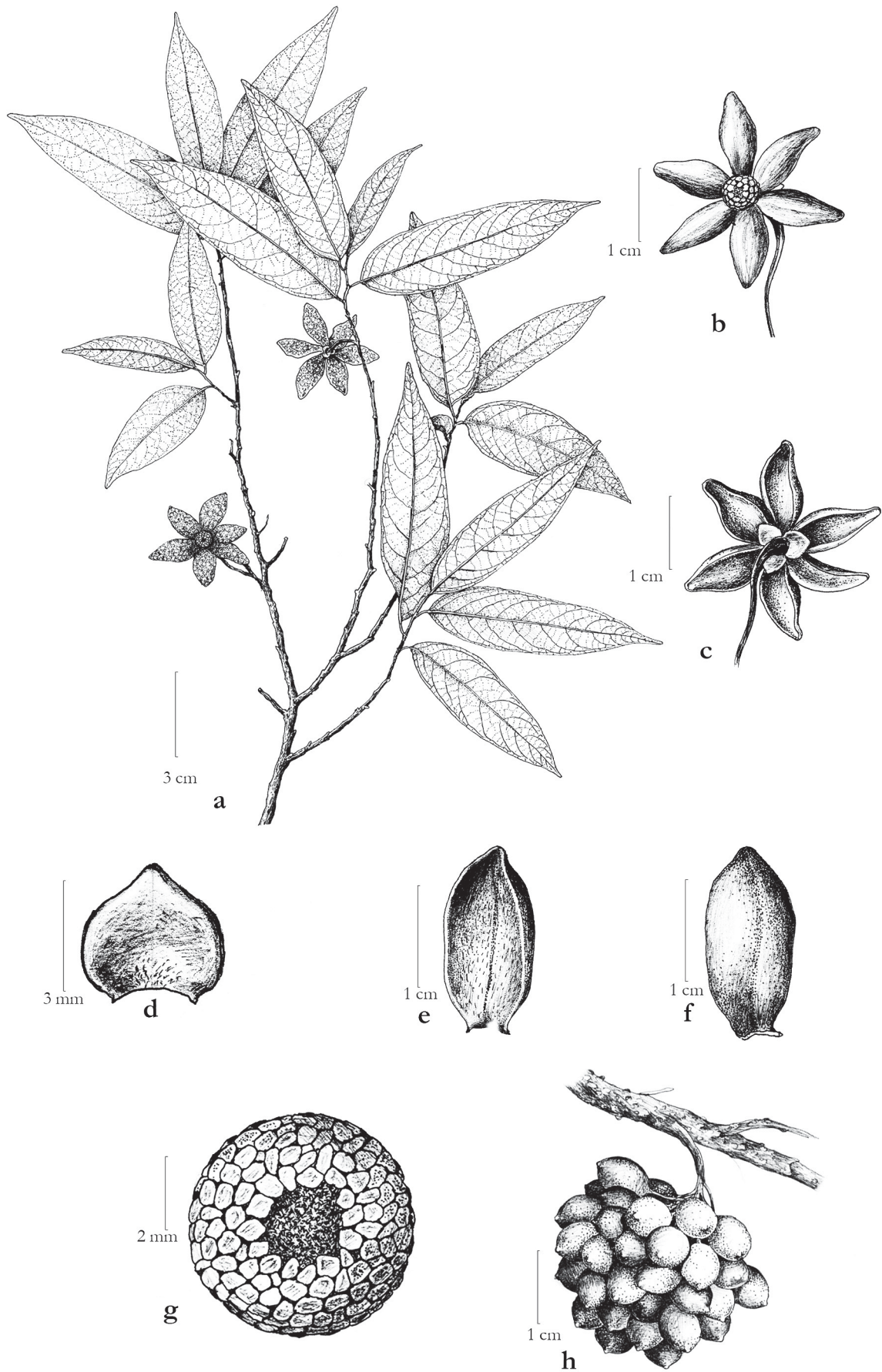


FIGURE 1. *Hubera senjiana*. **a.** Flowering twig. **b.** Front view of the flower. **c.** Back view of the flower. **d.** Sepal. **e.** Petal, inside view. **f.** Petal, outside view. **g.** Mature flower, entire thalamus with stamens and carpels. **h.** Fruiting branch.

Diagnosis: The new species differs from *Hubera jenkinsii* (Hook.f.& Thomson) Chaowasku in having usually smaller leaves and shorter petioles, more fruitlets (35–40) and a shorter and slenderer stipe (Table 1).

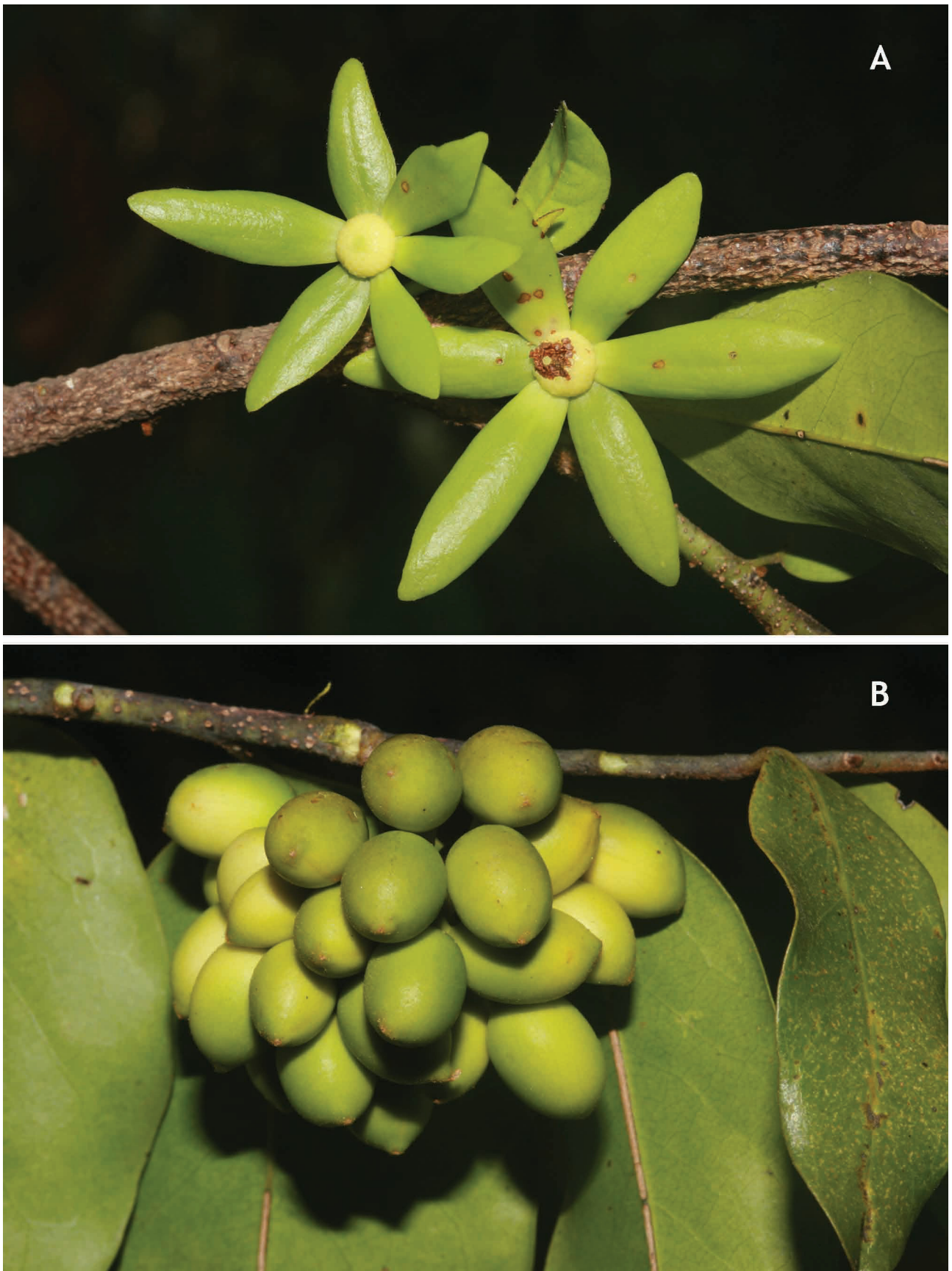


FIGURE 2. a. *Hubera senjiana*, flower. b. *Hubera senjiana*, fruitlets.

Trees, ca. 5 m high, bark develops even on young branchlets, blackish–grey, apical bud covered by rusty brown tomentum. Leaves elliptic–oblong, 6.5–13.5 × 2.0–4.0 cm, oblique or rounded at base, undulate, acute to acuminate at apex; shiny above; midrib raised below, grooved above; pubescent on margins of midrib on the lower side of leaf; lateral veins ca. 5 pairs; domatia absent; petiole ca. 5 mm long; pubescent. Cymes axillary, 1–2-flowered, inflorescences on young and old, leafless branches, pendulous; flowers ca. 3.5 cm across, pale yellowish green in vivo; pedicel slender, ca. 7 mm long; puberulous. Peduncle bract 1, ovate, ca. 1 mm long; rusty pubescent on the outer side. Sepals 3, ovate to sub orbicular, ca. 3–4 mm long and recurved at margin, rounded at apex, hirsute outside, glabrous inside. Petals 6; outer 3, elliptic-ovate, 1.5–2.0 × 0.7–1.0 cm, entire at margin, acute–obtuse at apex, puberulous on the outer side; inner 3, elliptic–oblong, 1.4–2.2 × 0.5–1.0 cm, entire at margin, obtuse at apex, yellow tinged at base in vivo; puberulous on the outer side; faintly nerved in the middle. Stamens many, pale yellow in vivo; filaments ca. 1 mm long; hirsute; connectives polygonal, flat at top, ca. 1 mm across; anthers oblong, ca. 1.2 × 1.0 mm. Carpels ca. 50, oblong, each ca. 2 × 1 mm long, hirsute on ovary; ovule 1, basal, style indistinct; stigma capitate. Torus slightly raised, hairy. Fruitlets 20–30, densely packed, ellipsoid, 5 × 3 mm; pointed at apex; glabrous; stipe slender, ca. 5 mm long; fruiting pedicel slender, ca. 1 cm long; fruitlets red in vivo when ripe; seed 1, 2 × 1 mm, ellipsoid, brown in vivo; endosperm ruminations spiniform.

Flowering & Fruiting:—August–March

Local Name:—*Kothukala* (Tamil)

Etymology:—The species is named for the type locality, namely *Senji* (Gingee).

Distribution and Ecology:—Endemic to Gingee hills, Villupuram District, Tamil Nadu, India. It is rare, growing in dry rocky soils along forest fringes associated with *Phyllanthus polyphyllus*, *Stenosiphonium russellianum* and *Justicia beddomei*, at an elevation of 200–300 m.

Other specimens examined:—INDIA. Tamil Nadu: Gingee, Villupuram District, Devathanampettai, Pakkamalai Reserve Forest, 12° 10.146' N, 79° 19.280' E, 250 m, 23 March 2012, *Muralidharan & Narasimhan 7674*. Gingee, Villupuram District, Devathanampettai, Pakkamalai Reserve Forest, 12°10.146' N, 79°19.280' E, 250 m, 2 October 2013, *Balachandran 12801*.

Notes:—*Hubera senjiana* is morphologically most similar to *H. jenkinsii*, a northeastern Indian species, than it is to *H. cerasoides* or *H. korintii*, which are widely distributed in southern India.

TABLE 1. Comparison of *H. senjiana* with *H. jenkinsii*, *H. cerasoides* and *H. korintii*.

Characters	<i>Hubera senjiana</i>	<i>Hubera jenkinsii</i> *	<i>Hubera cerasoides</i> *	<i>Hubera korintii</i> *
Tree height	ca. 5m	ca. 15m	3–15m	3–5m
Leaf	6.5–13.5 × 2.0–4.0 cm	10.0–17.0 × 3.0–7.0 cm	8.0–18.0 × 2.5–4.0 cm	5.0–15.0 × 3.0–6.0 cm
Length of petiole	ca. 5 mm	5–12 mm	3–5 mm	3–5 mm
Length of flowering pedicel	ca. 0.7 cm	1.0–2.0 cm	1.5–3.0 cm	2–3 cm
Number of fruitlets	35–40	10	20	10
Length of fruiting pedicel	Slender, ca. 1.0 cm	Woody, ca. 2.0 cm	Woody, 1.0–1.5 cm	Slender ca. 0.7 cm

*Data from Mitra, D (1993).

Acknowledgements

We thank Forest Department, Tamil Nadu, for permission to study plant diversity in Pakkamalai Reserve Forest. We thank P. Venu, Scientist F, Botanical Survey of India, Kolkata for permission to refer CNH, and we thank G.V.S. Murthy, Head of Office, Botanical Survey of India, Southern Regional Centre, Coimbatore for permission to refer MH. We are thankful to Tanawat Chaowasku, Scientist, Naturalis Biodiversity Center, The Netherlands, for examining the photographs, diagrams and images of herbarium specimens. We also express our gratitude to him for critically going through the manuscript and for his valuable suggestions. We record our thanks to Ian M. Turner, Research Associate, Herbarium, Royal Botanic Gardens, Kew, for his opinion on the identity. We thank G. Gnanasekaran, Botanical Assistant, BSI, Southern Regional Centre, Coimbatore and K. Karthigeyan Scientist 'C', BSI, Kolkata for their kind assistance. We are thankful to Sheeba J. Irwin, Research Associate, Department of Botany, Madras Christian College, Tambaram for photo plates and Leslie Lawrence, Assistant Professor of Botany, Madras Christian College,

Tambaram for photographing the specimens. We are also thankful to A. T. Durgadas, Artist, BSI, Coimbatore, for the fine illustration.

References

- Blume, C.L. (1830) *Flora Javae* (Annonaceae). Frank, Brussels, 108 pp.
- Chatrou, L.W., Pirie, M.D., Erkens, R.H.J., Couvreur, T.L.P., Neubig, K.M., Abbott, J.R., Mols, J.B., Maas, J.W., Saunders, R.M.K. & Chase, M.W. (2012) A new subfamilial and tribal classification of the pantropical flowering plant family Annonaceae informed by molecular phylogenetics. *Botanical Journal of the Linnean Society* 169: 5–40.
<http://dx.doi.org/10.1111/j.1095-8339.2012.01235.x>
- Chaowasku, T., Zijlstra, G. & Chatrou, L.W. (2011) Proposal to conserve the name *Meiogyne* against *Fitzalania* (Annonaceae) *Taxon* 60: 1522–1523.
- Chaowasku, T., Johnson, D.M., Van der Ham, R.W.J.M. & Chatrou, L.W. (2012) Characterization of *Hubera* (Annonaceae), a new genus segregated from *Polyalthia* and allied to *Miliusa*. *Phytotaxa* 69: 33–56.
- Chaowasku, T., Thomas, D.C., Van der Ham, R.W.J.M., Smets E.F., Mols, J.B. & Chatrou, L.W. (2014) A plastid DNA phylogeny of tribe Miliuseae: insights into relationships and character evolution in one of the most recalcitrant major clades of Annonaceae. *American Journal of Botany* 101: 691–709.
<http://dx.doi.org/10.3732/ajb.1300403>
- Diels, L. (1925) Revisio Anonacearum Madagascariensium. *Notizblatt des Botanischen Gartens und Museums zu Berlin-Dahlem* 9 : 334–357
<http://dx.doi.org/10.2307/3994385>
- Dunal, M.F. (1817) *Monographie de la famille des Anonacées*. Treuttel & Würtz, Paris, 144 pp.
- Erkens, R.H.J., Chatrou, L.W., Koek-Noorman, J., Maas, J.W. & Maas, P.J.M. (2007) Classification of a large and widespread genus of Neotropical trees, *Guatteria* (Annonaceae) and its three satellite genera *Guatterietta*, *Guatterioopsis* and *Heteropetalum*. *Taxon* 56: 757–774.
<http://dx.doi.org/10.2307/25065859>
- Hooker, J.D. & Thomson, T. (1855) *Flora Indica*, 1. Pamplin, London, 285 pp.
<http://dx.doi.org/10.5962/bhl.title.50109>
- Huber, H. (1985) In : Dassanayake, M.D. (Ed.) *A revised handbook to the Flora of Ceylon*. Oxford & IBH, New Delhi. 5: 31–42.
- Johnson, D.M. & Murray, N.A. (1999) Four new species of *Polyalthia* (Annonaceae) from Borneo and their relationship to *Polyalthia insignis*. *Contributions from the University of Michigan Herbarium* 22: 95–104.
- Miquel, F.A.W. (1865) Annonaceae Archipelagi Indici. *Annales Musei Botanici Lugduno-Batavi* 2 : 1–45.
- Mitra, D. (1993) *Polyalthia* (Annonaceae) In: Sharma, B.D., Balakrishnan, N.P., Rao, R.R. & Hajra, P.K. (Eds.) *Flora of India* 1. pp. 268–278.
- Mols, J.B., Co, D.L.V., Gravendeel, B., Chatrou, L.W., Pirie, M.D., Van der Ham, R.W.J.M., Van Marle, E.J & Keßler, P.J.A. (2004) Morphological character evolution in the miliusoid clade (Annonaceae). In: Mols, J.B. (Ed.) *From Miliusa to Miliuseae to miliusoid: identifying clades in Asian Annonaceae*. Ph.D. Thesis, Leiden University, The Netherlands, pp. 37–75.
- Mols, J.B., Keßler, P.J.A., Rogstad, S.H. & Saunders, R.M.K. (2008) Reassignment of six *Polyalthia* species to the new genus *Maasia* (Annonaceae): molecular and morphological congruence. *Systematic Botany* 33: 490–494.
<http://dx.doi.org/10.1600/036364408785679752>
- Nakkuntod, M., Su, Y.C.F., Seelanan, T. & Saunders, R.M.K. (2009) Molecular phylogenetic and morphological evidence for the congeneric status of *Goniothalamus* and *Richella* (Annonaceae). *Taxon* 58: 127–132.
- Rainer, H. & Chatrou, L.W. (2006) *AnnonBase: World species list of Annonaceae* – version 1.1, 12 Oct 2006. Available from: <http://www.sp.2000.org> (accessed 4 December 2011).
- Rainer, H. (2007) Monographic studies in the genus *Annona* L. (Annonaceae) : inclusion of the genus *Rollinia* A.St.-Hil. *Annalen des Naturhistorischen Museums in Wien. Serie B. Botanik und Zoologie* 193: 191–205.
- Roxburgh, W. (1795) *Plants of the coast of Coromandel*. 1. Bulmer, London, 68 pp.
- Saunders, R.M.K. (2009) Proposal to conserve the name *Goniothalamus* against *Richella* (Annonaceae). *Taxon* 58: 302–303.
- Saunders, R.M.K., Su, Y.C.F. & Xue, B. (2011) Phylogenetic affinities of *Polyalthia* species (Annonaceae) with columellar-sulcate pollen: enlarging the Madagascan endemic genus *Fenerivia*. *Taxon* 60: 1407–1416.
- Saunders, R.M.K. & Wang, J. (2011) Five new nomenclatural combinations in *Dasymaschalon* and *Goniothalamus* (Annonaceae). *Nordic Journal of Botany* 29: 674–676.

<http://dx.doi.org/10.1111/j.1756-1051.2011.01293>.

- Scheffer, R.H.C.C. (1870) *Observationes Phytographicae. Pars II. Natuurkundig Tijdschrift voor Nederlandsch-Indië* 31: 338–375.
- Su, Y.C.F., Mols, J.B., Takeuchi, W., Keßler, P.J.A. & Saunders, R.M.K. (2005) Reassessing the generic status of *Petalolophus* (Annonaceae) : evidence for the evolution of a distinct sapromyophilous lineage within *Pseuduvaria*. *Systematic Botany* 30: 494–502.
<http://dx.doi.org/10.1600/0363644054782189>
- Su, Y.C.F., Smith, G.J.D. & Saunders, R.M.K. (2008) Phylogeny of the basal angiosperm genus *Pseuduvaria* (Annonaceae) inferred from five chloroplast DNA regions, with interpretation of morphological character evolution. *Molecular Phylogenetics and Evolution* 48: 188–206.
<http://dx.doi.org/10.1016/j.ympev.2008.03.028>
- Su, Y.C.F., Chaowasku, T. & Saunders, R.M.K. (2010) An extended phylogeny of *Pseuduvaria* (Annonaceae) with descriptions of three new species and a reassessment of the generic status of *Oreomitra*. *Systematic Botany* 35: 30–39.
<http://dx.doi.org/10.1600/036364410790862533>.
- Thwaites, G.H.K. (1864) *Enumeratio plantarum Zeylaniae: An enumeration of Ceylon plants*, 5. Dulau, London.
- Xue, B., Su, Y.C.F., Mols, J.B., Keßler, P.J.A. & Saunders, R.M.K. (2011) Further fragmentation of the polyphyletic genus *Polyalthia* (Annonaceae): molecular phylogenetic support for a broader delimitation of *Marsyopetalum*. *Systematics and Biodiversity* 9: 17–26.
<http://dx.doi.org/10.1080/14772000.2010.542497>
- Xue, B., Su, Y.C.F., Thomas, D.C. & Saunders, R.M.K. (2012) Pruning the polyphyletic genus *Polyalthia* (Annonaceae) and resurrecting the genus *Monoon*. *Taxon* 61: 1021–1039.
- Xue, B., D.C. Thomas, Chaowasku, T., Johnson, D.M. & Saunders, R.M.K. (2014) Molecular phylogenetic support for the taxonomic merger of *Fitzalania* and *Meiogyne* (Annonaceae) : New nomenclatural combinations under the conserved name *Meiogyne*. *Systematic Botany* 39: 396–404.
<http://dx.doi.org/10.1600/036364414X680825>