

A new species of *Artabotrys* (Annonaceae) from the southern Western Ghats, India

K.A. Sujana & R.G. Vadhyar

Botanical Survey of India, Southern Regional Centre,
TNAU Campus, Coimbatore, Tamil Nadu 641003, India
rakeshgvadhyar@gmail.com

ABSTRACT. A new species, *Artabotrys sericeus* Sujana & Vadhyar, is described from Tamil Nadu, India. The new species shows some resemblance to *Artabotrys zeylanicus* Hook.f. & Thomson, but it can be easily distinguished by the shape, size, colour and indumentum of the petals as well as the shape and texture of the monocarps. Illustrations, photographs and SEM images of the pollen grains of the new species are provided. The conservation status of the new species is also assessed.

Keywords. *Artabotrys sericeus*, endemic, Kanyakumari Wildlife Sanctuary, pollen, Tamil Nadu

Introduction

The palaeotropical genus *Artabotrys* R.Br. comprises about 110 species of woody climbing plants characterised by persistent inflorescence hooks (Chen & Eiadthong, 2020). It inhabits tropical rain forests and seasonally dry forests and is distributed mainly in tropical Africa and Asia (Chen et al., 2019; POWO, 2021). The genus belongs to the Annonaceae tribe Xylopieae (Chatrou et al., 2012).

Artabotrys is represented by nine species in India (Mitra, 1993; Turner, 2015; Prabhu et al., 2015; Ramana et al., 2016; Prabhukumar et al., 2017): *A. burmanicus* A. DC. and *A. caudatus* Wall. ex Hook.f. & Thomson occur in northeast India; *A. manoranjani* M.V.Ramana et al., *A. nicobarianus* D.Das, *A. speciosus* Kurz ex Hook.f. & Thomson and *A. suaveolens* (Blume) Blume are distributed in the Andaman & Nicobar Islands (the first three are endemic); *A. sahyadricus* Robi et al. and *A. zeylanicus* Hook.f. & Thomson occur in the Western Ghats of India (*A. sahyadricus* is endemic to Kerala); and *A. hexapetalus* (L.f.) Bhandari occurs in southern India but is widely cultivated throughout India for its fragrant flowers. Among them, *Artabotrys hexapetalus* and *A. zeylanicus* are also reported from Sri Lanka. Mathew & George (2013) described a variety, *Artabotrys zeylanicus* var. *kottavasalianus* J.Mathew & Kad.V.George from the Agasthyamala Biosphere Reserve of Kollam district; Turner (2018) provisionally synonymised it under *Artabotrys zeylanicus*.

As part of a project to document the flora of protected areas in India, the authors conducted botanical explorations in the Kanyakumari Wildlife Sanctuary of Tamil Nadu. The sanctuary is located between 8°5'–8°35'N and 77°10'–77°35'E and forms the southern part of the Agasthyamala Biosphere Reserve which is bounded to the North

by the Kalakkad-Mundanthurai Tiger Reserve, to the East by Tirunelveli District, to the South by the Kodayar and Thovalai channels, and to the West by the Neyyar Wildlife Sanctuary of Kerala state. The area gets an average annual precipitation of 1400 mm and the average monthly maximum and minimum temperatures are 30°C and 24°C. The elevation within the sanctuary ranges from 10 m to 2000 m. Kanyakumari Wildlife Sanctuary has a rich biodiversity with several microhabitats due to its exposure to a wide range of climatic conditions and its geographic location at the southernmost tip of the Indian subcontinent. A total of six major forest types have been identified with 17 sub-types (ICFRE, 2013). The sanctuary is situated in the southern Western Ghats and this region harbours 62% of the endemic plants of the Western Ghats (Singh et al., 2015).

In a recent floristic survey in the sanctuary, an enigmatic *Artabotrys* species was collected. Detailed morphological examination and consultation of the relevant literature (Hooker & Thomson, 1855, 1872; King, 1894; Sinclair, 1955; Huber, 1985; Mitra, 1993; Mohanan, 2000; Turner, 2012; Turner & Utteridge, 2015; Turner, 2016; Turner, 2018) and available herbarium specimens, including digital images, from BSI, CAL, CMPR, E, K, KFRI, L, MH and P, led to the conclusion that the species is undescribed. Its morphological characters are compared with the morphologically similar species *Artabotrys zeylanicus* distributed in South India and Sri Lanka and is described and illustrated below. The description of the new species is based on an examination of dried specimens unless otherwise stated.

Taxonomy

Artabotrys sericeus Sujana & Vadhyar, **sp. nov.**

Similar to *Artabotrys zeylanicus* in having thickly coriaceous leaves, broadly ovate sepals, and (nearly) sessile monocarps with apiculate apices, but differs by smaller leaves with acute apices (9–10 × 3.5–4 cm vs 10–15 × 4–9 cm and acuminate at apex in *Artabotrys zeylanicus*), shorter flowering pedicels (7–8 mm vs 10–13 mm), lower length/width ratio of petals (outer 2.8–3.0 vs 4.7–5.0; inner 3.6–5.0 vs 5.8–7.0), and thickness of petals in vivo (outer c. 1700 vs c. 1300 µm; inner c. 1850 vs c. 1200 µm). The petal apex also differs: acute in *Artabotrys sericeus* but acuminate in *A. zeylanicus*. In *Artabotrys sericeus*, the outer petal blades are ovate and the inner petal blades are oblong-elliptic whereas in *A. zeylanicus*, the blades of the outer and inner petals are lanceolate. The inner petals of the anthetic flowers of *Artabotrys sericeus* are highly reflexed (virtually perpendicular to the claw) whereas the inner petals of *A. zeylanicus* are only slightly reflexed during anthesis. The apex of the anther connective in *Artabotrys sericeus* is convex (vs truncate). The monocarps of *A. sericeus* are glabrous, subobovoid to globose, and mucronate at apex (vs strigose, obovoid and bluntly beaked). – TYPE: India, Tamil Nadu, Kanyakumari District, Kanyakumari Wildlife Sanctuary, Swamikuchimalai, 770 m, 8°24'44.7"N 77°27'10.8"E, 24 February 2020, *K.A. Sujana & R.G. Vadhyar 144557* (holotype MH [MH00226937]; isotype CAL). (Fig. 1–3)

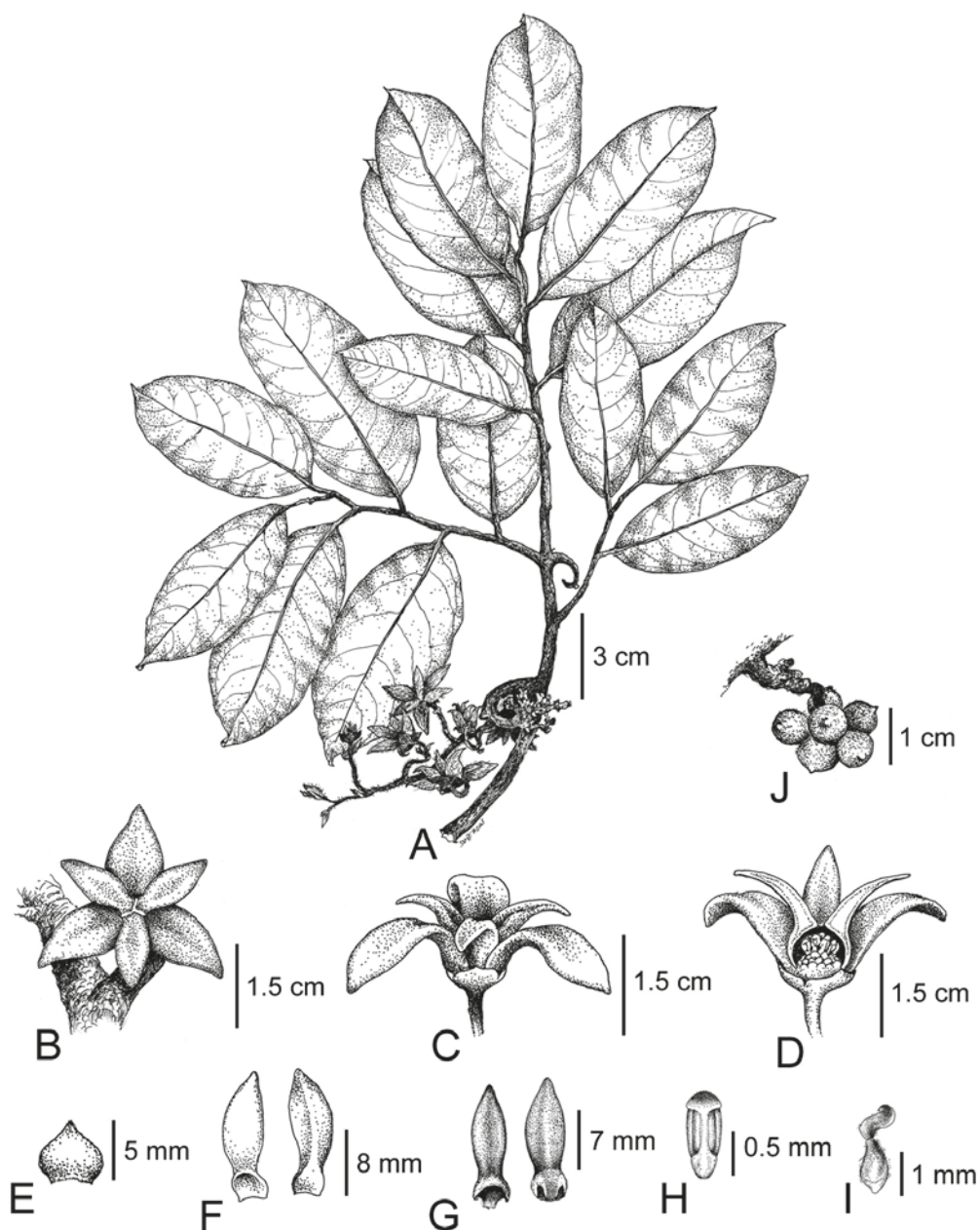


Fig. 1. *Artabotrys sericeus* Sujana & Vadhyar. **A.** Flowering branch. **B.** Apical view of flower. **C.** Lateral view of flower. **D.** Longitudinal section of flower showing torus with carpels and stamens. **E.** Abaxial view of sepal. **F.** Abaxial and adaxial view of an outer petal. **G.** Abaxial and adaxial view of an inner petal. **H.** Stamen. **I.** Carpel. **J.** Immature monocarps. A, J from the holotype; B–I from fresh material. Drawn by A.T. Durgadas.

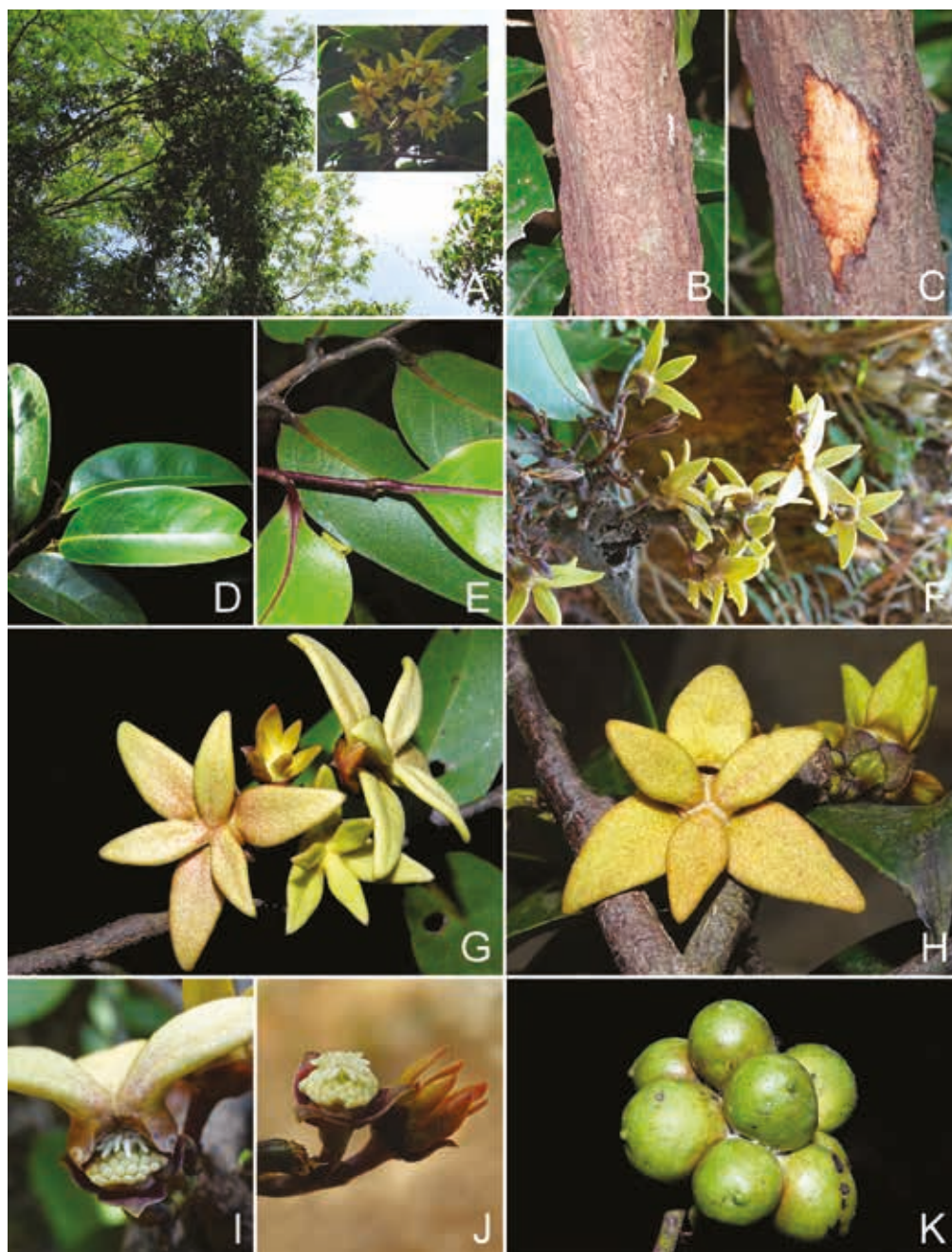


Fig. 2. *Artabotrys sericeus* Sujana & Vadhyar. **A.** Habit. Inset: Cluster of flowers. **B.** Bark. **C.** A slash showing inner bark. **D.** Leaves (adaxial view). **E.** Leaves (abaxial view). **F, G.** Inflorescences with many flowers. **H.** Mature flower with basal apertures partially exposed. **I, J.** Torus showing stamens and carpels. **K.** Monocarps. (Photos: K.A. Sujana)

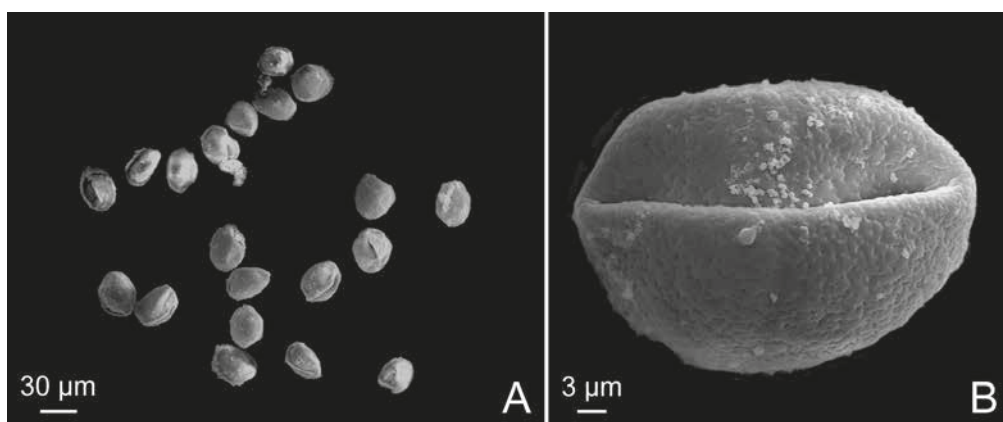


Fig. 3. SEM images of pollen grains of *Artabotrys sericeus* Sujana & Vadhyar.

Robust liana, 20–25 m tall, orthotropic branches terete, stout. Bark surface cracked, greyish-brown with greenish blotches; inner bark pale orange. Juvenile twigs reddish brown in vivo, lenticellate, drying dark brown, irregularly cracked, subglabrous. **Leaves** thick-coriaceous, drying grey above with brown midrib, grey-brown beneath with dark brown main nerves, glabrous; blade oblong-elliptic, $9\text{--}10 \times 3.5\text{--}4$ cm, cuneate at base, acute to shortly acuminate at apex, glossy, often minutely pustulate; secondary veins 9–12 pairs, brochidodromous, arching forward and looping within margin adaxially, visible on both surfaces, raised; tertiary venation visible abaxially, obscure adaxially, reticulate; petiole 3–6 mm long, 2–3 mm in diam., drying black, canaliculate, glabrous. **Inflorescence** 1–4-flowered in young hooks, flattened, sparsely pubescent, lenticellate, old laterally compressed hooks bearing many fascicles, each with 10–15 flowers; bracts lanceolate, $2.8\text{--}3 \times 1.8\text{--}2$ mm, brown pubescent abaxially, more or less glabrous adaxially. **Flower** bud ovoid, c. 4×3 mm, villous; pedicels 7–8 mm long, c. 1 mm across, sparsely pubescent, brownish red, drying black, longitudinally wrinkled, often pustulate; torus flat. **Sepals** 3, free, valvate, broadly ovate, $3\text{--}4 \times 3\text{--}4$ mm, acute at apex, reflexed, coriaceous, brownish red in vivo, drying black, sparsely sericeous abaxially, subglabrous along the margins, glabrous adaxially. **Petals** 6, free, valvate, citrine with red tinges at maturity in vivo, drying pale brown. **Outer petals** 3, 2–2.3 cm long in vivo with little external distinction between blades and claws; blades c. $1000\text{ }\mu\text{m}$ thick, 1.2–1.4 cm long, 0.4–0.5 cm wide, length/width ratio 2.8–3.0, ovate, obtuse to acute at apex, villous sericeous both abaxially and adaxially; claws $1.5\text{--}2 \times 2.5\text{--}3$ mm, broadly ovate, densely sericeous abaxially, glabrous adaxially, reddish brown inside in vivo. **Inner petals** 3, 1.9–2.1 cm long in vivo with externally distinct blades and claws; blades c. $900\text{ }\mu\text{m}$ thick, 1.0–1.1 cm long, 0.2–0.3 cm wide, length/width ratio 3.6–5.0, oblong-elliptic, villous sericeous both abaxially and adaxially; claws $2.5\text{--}3 \times 1.5\text{--}2$ mm, rhomboid, densely brown sericeous abaxially, glabrous adaxially. **Stamens** 70–75, 0.9–1.0 mm long, oblong, apex of connective convex. **Pollen grains**

in monads, ellipsoidal with a single furrow, diam. $36.98 \pm 3.19 \mu\text{m}$, inaperturate; exine ornamentation rugulate-foveolate. **Carpels** 18–20; ovary c. 1.2 mm long, cylindrical, sparsely pubescent; stigma c. 1 mm long, ellipsoidal, glabrous. Fruiting pedicel c. $8 \times 4 \text{ mm}$, glabrous, brownish black when dry, longitudinally striate. **Monocarps** 8–12 per fruit, subobovoid to globose, slightly compressed laterally, $2\text{--}2.5 \times 1.7\text{--}2 \text{ cm}$ in vivo, sparsely pubescent, glabrous, mucronate at apex, dull black when dry, sessile; pericarp c. $1200 \mu\text{m}$ thick in vivo. **Seeds** 2, ellipsoidal, flattened on one face, c. $11 \times 8 \times 3 \text{ mm}$, greyish brown when dry, longitudinally grooved.

Distribution and ecology. The species is so far known only from Kanyakumari Wildlife Sanctuary, Tamil Nadu, South India. It grows in tropical semi-evergreen forests and tropical moist deciduous forests at an altitudinal range between 500 m and 900 m. The major associate species noted are *Albizia amara* (Roxb.) Boivin, *Aporosa indoacuminata* Chakrab. & N.P.Balakr., *Archidendron bigeminum* (L.) I.C.Nielsen, *Erycibe paniculata* Roxb., *Machilus glaucescens* (Nees) Wight, *Olea dioica* Roxb., *Premna tomentosa* Willd. and *Xanthophyllum arnottianum* Wight.

Phenology. Flowering from January to March and fruiting from February to August.

Etymology. The specific epithet ‘sericeus’ refers to the densely sericeous petals.

Provisional IUCN conservation assessment. *Artabotrys sericeus* is currently only known from the type locality. During the course of the study, two populations were observed comprising eight flowering individuals and 22 saplings at the margins of tropical semi-evergreen forests, altogether occupying less than 2 km^2 . Its habitat is severely fragmented inside the sanctuary and major anthropogenic threats to the populations observed during the study period are plantation activities and clearing of trekking paths inside the forest. The species has therefore been assessed against the criteria as described in IUCN Standards and Petitions Committee (2019) as Critically Endangered (CRB1ab(iii), B2ab(iii), C2(a), D).

Additional specimen examined. INDIA: **Tamil Nadu:** Kanyakumari District, Kanyakumari Wildlife Sanctuary, Swamikuchimalai, 534 m, $8^{\circ}24'23.5''\text{N}$ $77^{\circ}26'31.2''\text{E}$, 5 Feb 2019, *Sujana & Vadhyar 144652* (MH).

Notes. The new species shows similarities to *Artabotrys zeylanicus* although note that some morphological characters of *A. zeylanicus* have been inaccurately described in the previous literature. The monocarps of *Artabotrys zeylanicus* are obovoid and not ovoid, and the anther connective is truncate and not triangular (cf. descriptions in King (1894) and Prabhukumar et al. (2017)). This clarification is important to facilitate comparison between *Artabotrys sericeus* and *A. zeylanicus* (Fig. 4).

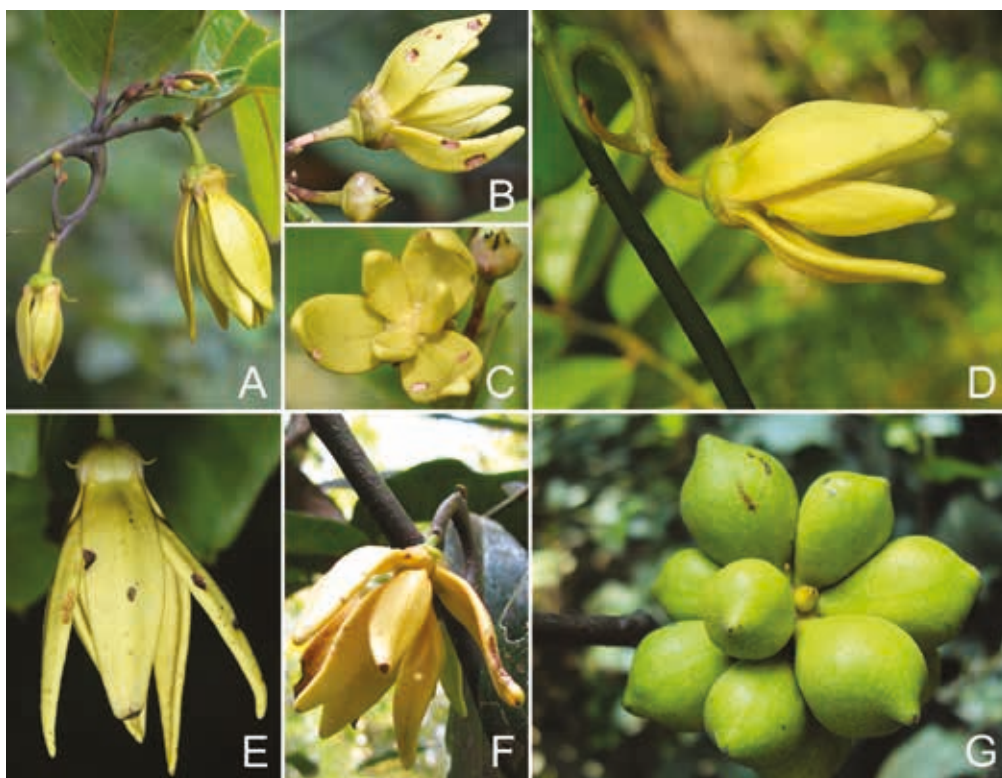


Fig. 4. *Artabotrys zeylanicus* Hook.f. & Thomson. **A–F.** Flowers. **G.** Monocarps. (Photos: A, N. Arun Kumar; B, C, P. Murugan; D, G, V.R. Vinayaraj; E, K.A. Sujana; F, V.C. Balakrishnan)

ACKNOWLEDGMENTS. The authors express their sincere thanks to the Director of the Botanical Survey of India (BSI) and the Head of the Office of the Southern Regional Centre of the BSI for providing facilities for this study. Mr A.T. Durgadas produced excellent drawings. The authors are indebted to Mr V. Ramesh for making the photo plates, Mr C. Vijayakumar and Mr Immanuel S. Jonathan for excellent field assistance, Dr Boopathy Ayyanar for technical support of SEM studies and Dr G. Valsaladevi, Kerala University for her critical comments on the nature of the pollen grains. They are also grateful to the Tamil Nadu Forest Department for permission to carry out fieldwork and to the District Forest Officer of the Kanyakumari Forest division, for support and logistics.

References

- Chatrou, L.W., Pirie, M.D., Erkens, R.H.J., Couvreur, T.L.P., Neubig, K.M., Abbott, J.R., Mols, J.B., Mass, 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. *Bot. J. Linn. Soc.* 169: 5–40.

- Chen, J. & Eiadthong, W. (2020). New species and new records of *Artabotrys* (Annonaceae) from peninsular Thailand. *PhytoKeys* 151: 67–81.
- Chen, J., Thomas, D.C. & Saunders, R.M.K. (2019). Geographic range and habitat reconstructions shed light on palaeotropical intercontinental disjunction and regional diversification patterns in *Artabotrys* (Annonaceae). *J. Biogeogr.* 46: 2690–2705.
- Hooker, J.D. & Thomson, T. (1855). Annonaceae. In: *Flora Indica: Being a Systematic Account of the Plants of British India*, pp. 86–153. London: Pamplin.
- Hooker, J.D. & Thomson, T. (1872). Annonaceae. In: Hooker, J.D. (ed.) *The Flora of British India*, vol. 1, pp. 45–94. London: Reeve & Co.
- Huber, H. (1985). Annonaceae. In: Dassanayake, M.D. & Fosberg, F.R. (eds) *A Revised Handbook to the Flora of Ceylon*, vol. 5, pp. 1–75. Rotterdam: A.A. Bakema.
- ICFRE (2013). *Forest Types of India Revisited*. Dehradun: Indian Council of Forestry Research and Education.
- IUCN Standards and Petitions Committee (2019). *Guidelines for Using the IUCN Red List Categories and Criteria*. Version 14. Prepared by the Standards and Petitions Committee. Available from <http://iucnredlist.org/documents/RedListGuidelines.pdf>.
- King, G. (1893). The Annonaceae of British India. *Ann. Roy. Bot. Gard. (Calcutta)* 4: 1–169.
- Mathew, J. & George, K.V. (2013). *Artabotrys zeylanicus* var. *kottavasaliyana* (Annonaceae): A new variety from southern Western Ghats. *Int. J. Pl. Anim. Environm. Sci.* 3(4): 153–155.
- Mitra, D. (1993). Annonaceae. In: Sharma, B.D., Balakrishnan, N.P., Rao, R.R. & Hajra, P.K. (eds) *Flora of India*, vol. 1, pp. 202–307. Kolkata: Botanical Survey of India.
- Mohanan, M. (2000). Annonaceae. In: Daniel, P. (ed.) *Flora of Kerala*, vol. 1, pp. 131–175. Coimbatore: Botanical Survey of India.
- POWO (2021). *Plants of the World Online*. Facilitated by the Royal Botanic Gardens, Kew. <http://plantsoftheworldonline.org/>. Accessed 24 Mar. 2021.
- Prabhu, S., Sathiyaseelan, R., Aron, S. & Murugan, C. (2015). A review of the genus *Artabotrys* R.Br. (Annonaceae) from Andaman and Nicobar Islands, with a new record for India. *Indian J. Forest.* 38(2): 159–164.
- Prabhukumar, K.M., Robi, A.J., Hareesh, V.S., Dantas, K.J., Sujanalal, P. & Indira, B. (2017). *Artabotrys sahyadricus* (Annonaceae), a new species from Western Ghats of India. *Webbia* 72(1): 117–120.
- Ramana, M.V., Swamy, J. & Chandramohan, K. (2016). *Artabotrys manoranjani* sp. nov. (Annonaceae) from the Andaman Islands, India. *Nordic J. Bot.* 34: 413–415.
- Sinclair, J. (1955). A revision of the Malayan Annonaceae. *Gard. Bull. Singapore* 14: 149–516.
- Singh, P., Karthigeyan, K., Lakshminarasimhan, P. & Dash, S.S. (2015). *Endemic Vascular Plants of India*. Kolkata: Botanical Survey of India.
- Turner, I.M. (2012). Annonaceae of Borneo: a review of the climbing species. *Gard. Bull. Singapore* 64: 371–479.
- Turner, I.M. (2015). A conspectus of Indo-Burmese Annonaceae. *Nordic J. Bot.* 33: 257–299.
- Turner, I.M. (2016). Notes on the Annonaceae of the Malay Peninsula. *Gard. Bull. Singapore* 68: 65–69.
- Turner, I.M. (2018). Annonaceae of the Asia-Pacific region: names, types and distributions. *Gard. Bull. Singapore* 70: 409–744.
- Turner, I.M. & Utteridge, T.M.A. (2015). *Artabotrys byrsophyllus* and *A. tipuliferus* spp. nov. (Annonaceae) from Peninsular Malaysia and Thailand. *Nordic J. Bot.* 33(5): 562–566.