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## *Argostemma quarantena* (Rubiaceae, Ruboideae), a new species from southern Western Ghats, India

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**Abstract.** *Argostemma quarantena*, a new rubiaceous species from Vagamon Hills of southern Western Ghats, India is described and illustrated here. The species shows similarities with two south Indian endemics, *A. anupama* and *A. courtallense*, but differs in many qualitative attributes. The present status of genus *Argostemma* in India is briefly discussed. An artificial key for the identification of *Argostemma* in Western Ghats is also provided.

**Keywords:** Argostemmatae, Epilithic, Kottayam, Vagamon Hills.

### INTRODUCTION

*Argostemma* Wall., is a genus of small perennial herbs, widely distributed in tropical and sub-tropical Asia, except for two African species namely, *A. africanum* K.Schum. and *A. pumilum* Benn. (Sridith 1999; Sridith and Puff 2000). It is one of the four genera of the tribe Argostemmatae of subfamily Ruboideae (Rydin et al. 2009). Wallich (in Roxburgh 1824) described the genus *Argostemma* based on the species *A. sarmentosum* from the former British India. He also described three more species in the same publication, viz., *A. rostratum* & *A. verticillatum* from subtropical Himalaya and *A. pictum* from Malaya. In the ensuing years, many new species were added to the genus and presently *Argostemma* comprises 100 to 200 species (100: Mabberley 2017; 165: The Plant List 2013; 175: WCSP 2020; 220: Bremer 1989; Bremer and Manen 2000) with highest concentration in South East Asia. A dozen of new species have been added to the genus from S.E. Asia over the last 10 years (Sridith 2012; Choudhary et al. 2013; Lanorsavanh and Chantaranonthai 2016; Nuraliev et al. 2017; Quang et al. 2019; Hsu et al. 2020; Lanorsavanh et al. 2020; Van Do et al. 2020).

The species of *Argostemma* are frequently lithophytic, or occasionally epiphytic inhabiting moist to wet places with high humidity, on wet rock faces by waterfalls, or on large boulders in or along streams (Sridith and Puff 2000). Flowers of *Argostemma* are either star-shaped or bell-shaped with free stamens or stamens of which the anthers may be coherent into a cone-like structure (Sridith and Puff 2001; Sridith 2007). *Argostemma diversifolium* Ridl. and *A. separatum* Aranas, H.W.C. Hsu, & Alejandro are the only known species in the genus with free stamens in star-shaped corolla (Sridith 2007; Hsu et al. 2020).

*Argostemma* is one of the least studied rubiaceous genus in India. After Hooker (1880), no one attempted a comprehensive systematic treatment of the genus in India. Hooker included 17 species of *Argostemma* in the Flora of British India which covers the areas of present day India, Pakistan, Afghanistan, Nepal, Tibet, Bangladesh, Burma (Myanmar), Ceylon (Sri Lanka) and Malayan Peninsula, out of which 7 species were described from the present day political boundaries of India, viz., *A. courtallense* Arn., *A. humile* Benn., *A. khasianum* C.B. Clarke, *A. pumilum* Benn., *A. rostratum* Wall., *A. sarmentosum* Wall. and *A. verticillatum* Wall. Later, *A. neurocalyx* Miq., *A. tavoyanum* Wall. ex Benn. and *A. timorensis* Benn. from Andaman & Nicobar Islands and *A. Anupama* Sivar. From the Western Ghats were added to the Indian flora (Vasudeva Rao 1986; Pandey and Diwakar 2008; Sivarajan, 1984; Jayanthi et al. 2013).

In the Western Ghats, the genus is represented by four species, namely, *A. anupama*, *A. courtallense*, *A. rostratum* and *A. verticillatum* (Nayar et al. 2014). Deb and Basu (1990) reduced *A. anupama* and *A. tavoyanum* as synonyms to *A. courtallense*. Later, Sridith (1999) reinstated the status of *A. tavoyanum* and Sivarajan and Pradeep (1993) did the same for *A. anupama*. Thus, the genus *Argostemma* in India is presently represented by 11 species, chiefly distributed in North East India and Western Ghats. During a floristic exploration in the Vagamon Hills in southern Western Ghats, India, the authors encountered an interesting species of *Argostemma*, notable due to its densely hairy, strongly anisophyllous leaves and much short, congested umbels. Detailed study of the literature (Hooker 1880; Gamble 1921; Ridley 1923 and 1927; Bremer 1989; Sridith 1999; Chen et al. 2011) and comparison of type specimens of Indian species in major herbaria in India (CAL, CALI, MH) and abroad (BM, K, etc.) revealed that the unknown taxon is morphologically similar to *A. anupama* and *A. courtallense*, but shows distinct differences as shown in table 1. Hence, it is described and illustrated here as a new species from India.

***Argostemma quarantena*** Balan & Robi, **sp. nov.** (Figures 1 and 2)

Type: INDIA, Kerala, Kottayam district, Vagamon Hills, ± 1000 m, 12 July 2020, *A.J.Robi & Anoop P.B. 15561* (holotype, MH!; isotypes, MBGH!, MH!).

#### Diagnosis

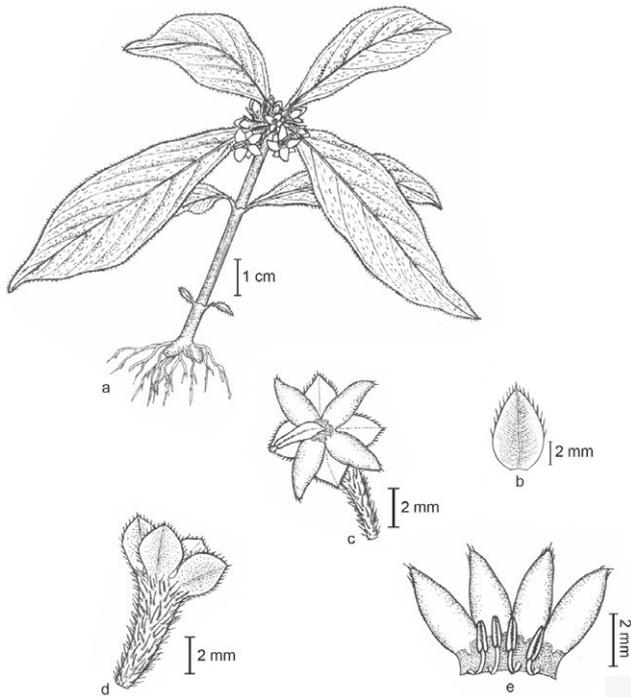
The new species is closely similar to *A. anupama*, but differs in its stem (suberect, terete stem vs erect, quadrangular stem), stipules (1.5–2.0 mm long, deltate stipules vs c. 1 mm long, ovate stipules), leaves (obovate-oblancoolate, densely strigose lamina with 6–10 pairs veins vs ovate-lanceolate, scabrous lamina with 4–6 pairs veins), length and form of umbel (c. 1.5 cm long, congested umbel vs 2.5–3.5 cm long, lax umbel), pedicels (2–3 mm long, stout, hirsute pedicels vs 8–10 mm, slender, pubescent pedicels), calyx lobes (2.5 mm long vs 4.0 mm long), corolla lobes (4.5 mm long, triangular vs 5.5–6.0 mm long, lanceolate) and anther filaments (not twisted vs twisted). It also shows similarities with *A. courtallense*, but differs mainly by its stipules (1.5–2.0 mm long, deltate stipules vs 7–8 mm long, ovate stipules), shape and indumentum of leaves (anisophyllous leaves with obovate-oblancoolate and densely strigose lamina vs isophyllous leaves with ovate-orbicular and sparsely pubescent lamina), number of lateral veins (6–10 pairs vs 4–7 pairs lateral veins), umbel (c. 2 cm long, congested umbel vs 4–8 cm long, lax umbel), corolla lobes (4–4.5 mm long vs 7–8 mm long) and anthers (ca 1.5 mm long, white anthers vs ca 3 mm long, yellow anthers). (Table 1).

#### Description

Epilithic, perennial herb, 3–7 cm tall; attached to the substrate with dense, much-branched matted roots. Tuber 4–5 × 3–4 mm, ovoid. Stem suberect, unbranched, terete, 1.5–4 cm long, glabrous, succulent. Stipule deltate, 1.5–2 × 1.5–2 mm, hairy along margins, deciduous. Leaves opposite, 2–3 pairs, upper 4 pseudoverticillate, strongly anisophyllous, mostly subfalcate; petiole 3–4 mm long, hairy; large leaf blade narrowly obovate-oblancoolate or elliptic, 5–9 × 1.2–2.5 cm, small leaf blade ovate-elliptic, 1.5–4.5 × 0.6–1.5 cm, membranous, acute to shortly acuminate at apex, cuneate at base, inequilateral, densely strigose above, so below along the veins; venation brochidodromous, veins 6–10 pairs, raised below. Inflorescence solitary, terminal, 6 to 10-flowered, much congested, pedunculate umbel; peduncle 0.5–1.3 cm long, much shorter than leaf, unbranched, glabrous. Flowers 4-merous, actinomorphic; bracts 4–6, of unequal size, fused basally and forming a cup-like involucre, each bract ovate, 4–5



**Figure 1.** (a) *Argostemma courtallense*. (b) *A. rostratum*. (c) *A. verticillatum*. (d, e) *A. quarantena* sp. nov., Habitat. (f, g) Habit. (h) Inflorescence. (i) Tuber. (j) Stipule. (k) Calyx with pistil. (l) Corolla and stamens. (m) Seeds.



**Figure 2.** *Argostemma quarantena*. sp. nov. (a) Habit. (b) Bract. (c) Flower. (d) Calyx. (e) Split opened corolla. Drawn by Anoop P. Balan.

× 4–5 mm, acute at apex, hairy along margins, green; pedicels 2–3 mm long, stout, dilated above, densely hirsute. Calyx campanulate, tube short, densely hirsute; lobes 4, ovate, 2.5 × 2.5 mm, acute at apex, hairy along margins, spreading, enlarged in fruit, venation inconspicuous. Corolla white with green blotches at base of the tube, star-shaped; corolla tube 0.6–0.8 mm long; corolla lobes triangular-lanceolate, 4–4.5 × 2–2.5 mm, spreading, with a tuft of hairs at back towards apex. Stamens 4, filaments free, inserted at the base of the corolla tube, ca 1.5 mm long, bent at the middle, white; anthers connivent in a cone around the stigma, oblong, as long as filament, opening by apical pores, white. Ovary inferior, 2-locular, many-ovuled; style slightly exerted from the stamens, ca 3 mm long, stout, glabrous; stigma clavate. Fruit capsular, opening by an apical operculum, subglobose, 3–4 × 3–4 mm, densely hairy, crowned by persistent calyx. Seeds many, 0.3–0.4 × 0.2–0.3 mm, angled and minutely tuberculate, pale brown.

#### Etymology

The specific epithet *quarantena* indicates the outbreak of COVID-19 corona virus across the world in 2020. The term *quarantena* was used in 14<sup>th</sup>–15<sup>th</sup> century Venetian language for a forty-day isolation period. The

**Table 1.** Comparison of *Argostemma quarantena* sp. nov. with *A. anupama* and *A. courtallense*.

Attributes	<i>A. quarantena</i>	<i>A. anupama</i>	<i>A. courtallense</i>
Stem	Suberect, terete, glabrous, 3–7 cm tall.	Erect, quadrangular, puberulous, 2–6 cm tall.	Erect, terete, pubescent, 8–20 cm tall.
Stipule	Deltate, 1.5–2 × 1.5–2 mm.	Ovate, c. 1 × 0.5 mm, minute	Ovate, 7–8 × 1–2 mm.
Leaves	2–3 pairs, strongly anisophyllous; lamina narrowly obovate-oblancoate or elliptic, 1.5–10 × 0.6–2.5 cm, cuneate and unequal at base, acute to shortly acuminate at apex, densely strigose on both surfaces, pale grey-glaucous below.	2–3 pairs, anisophyllous; lamina ovate-lanceolate, 2–9 × 1–1.8 cm, cuneate and unequal at base, acute at apex, scabrous on both surfaces, white-glaucous below.	2-pairs, isophyllous; lamina ovate-orbicular, 8–12 × 5–8 cm, subacute or rounded and equal at base, acute at apex, sparsely pubescent on both surfaces, white-glaucous below.
Petiole	3–4 mm long.	5–6 mm long	0–2 cm long.
Venation	6–10 pairs.	4–6 pairs	4–7 pairs.
Bract	4–6, ovate, 4–5 × 4–5 mm.	4–5, ovate, 3–4 × 1.5–2.5 mm.	4, ovate, 4.0 × 2.5 mm.
Inflorescence	6–10 flowered, much congested; peduncle 0.5–1.3 cm long.	6–8 flowered, lax; peduncle 2.0–3.5 cm long.	3–many flowered, lax; peduncle 3–6 cm long.
Pedicel	2–3 mm long, stout, densely hirsute.	8–10 mm long, slender, pubescent.	8–10 mm long, slender, pubescent.
Flower	4-merous.	4-5-merous	4-merous.
Calyx	Lobes 4, ovate, 2.5 × 2.5 mm, with rounded sinuses.	Lobes 4–5, ovate, 4 × 3 mm, with rounded sinuses	Lobes 4, ovate, 3 × 2 mm, with acute sinuses.
Corolla	Lobes 4, triangular lanceolate, 4–4.5 × 2–2.5 mm	Lobes 4–5, elliptic-lanceolate, 5.5–6 × 2–2.5 mm.	Lobes 4, ovate, 7–8 × 2–2.5 mm.
Stamens	4, filaments ca 1.5 mm long, free, bent at middle; anthers white, oblong, ca 1.5 mm long.	4–5, filaments ca 2 mm long, free, twisted; anthers white, oblong, ca 2 mm long.	4, filaments 3 mm long, free, bent at middle; anthers yellow, lanceolate, ca 3 mm long.

new species was described during the 2020 quarantine period imposed to curb the spread of the COVID-19 virus. This species is a dedication to the lakhs of people including eminent botanists and scientists who have lost their lives due to the COVID-19 virus in the year 2020.

*Phenology*

July to September

*Distribution and ecology*

*Argostemma quarantena* is known only from its type locality at Vagamon Hills, South India. Vagamon hills are traversed by numerous perennial fast flowing streams which originated from evergreen forest patches and pseudosholas at 1000–1400 m elevations asl. This species is thriving on boulders beside such streams and shaded areas, growing with mosses and ferns.

*Conservation status*

*Argostemma quarantena* is so far known only from the type locality, Vagamon Hills of Western Ghats, with an extent of occurrence estimated to be less than 10 km<sup>2</sup>. The authors located 5 groups of fewer than 100 plants along the streams. *Argostemma spp.* are normally found in wet, shady, undisturbed habitats and are very sensitive to microclimatic changes (Sridith & Puff, 2000). The type locality of *A. quarantena* is outside of protected forest areas and is under threat due to habitat loss as a result of human encroachment. Extensive field surveys are needed to assign appropriate threatened category of IUCN (2012), therefore it is classified as Data Deficient (DD) according to IUCN standards.

*Paratype*

**INDIA:** Kerala, Kottayam district, Vagamon Hills, ± 1000 m, 30 July 2020, *Anoop P.B. & A.J.Robi & 15562* (MBGH!, MH!).

*Key to the identification of Argostemma in the Western Ghats*

- 1a. Umbels branched; flowers 5-merous ..... 2
- 1b. Umbels unbranched; flowers 4-merous (except *A. anupama*) ..... 3
- 2a. Leaves 2 pairs; peduncle much shorter than the leaves ..... *A. verticillatum*
- 2b. Leaves 3 pairs; peduncle as long as the leaves *A. rostratum*
- 3a. Leaves 2–3 pairs, anisophyllous; anthers white ..... 4

- 3b. Leaves 2 pairs, isophyllous; anthers yellow *A. courtallense*
- 4a. Stem terete; lamina densely strigose with 6–10 pairs veins; pedicels <5 mm long ..... *A. quarantena*
- 4b. Stem quadrangular; lamina scabrous with 4–6 pairs veins; pedicels >8 mm long ..... *A. anupama*

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