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Strobilanthes sripadensis, a new species of Acanthaceae from Sri Lanka

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Abstract

Strobilanthes sripadensis, a new species of Acanthaceae from Peak Wilderness Nature Reserve, Sri Lanka is described and illustrated. Both morphological and palynological evidence clearly indicate that *S. sripadensis* is a distinct species. The new species is closely related to *S. pentandra*, but differs by having short acuminate leaf apex, entire or slightly sinuate leaf margin, 5–7 pairs of lateral veins, outermost bract longer than the inner one, bract, bracteole, and calyx pubescent, white corolla with prominent dark purple lines at throat and fertile stamens 4.The full description, line drawings, photographs, and information on habitat and ecology, distribution, phenology are also provided. It is accessed to be Critically Endangered according to the IUCN Red List categories and criteria.

Keywords: taxonomy, pollen, plant morphology, wet zone

Introduction

Strobilanthes Blume (1826: 781), is one of the largest genera in the family Acanthaceae, comprising approximately 450 species (Carine & Scotland 2002, Mabberley 2017, Chen *et al*. 2020, Thomas *et al.* 2020, Patil 2021, Wood *et al.* 2021) and is widely distributed in the evergreen forests of tropical Asia (Kumar *et al.* 2020). The genus has medicinal as well as economic value and is known for its various biological activities including antioxidant properties (Isrianto 2020, Balasubramaniam *et al.* 2021).

During floral surveys of Peak Wilderness Nature Reserve on 24th and 25th December, 2018, the first and third authors found an unknown *Strobilanthes* population consisting of about 100 individuals growing in the shade along the nature trail of Palabaddala at Katukithula Ambalama. Another unknown population, consisting of about 20 individuals, was found growing in the shade along the nature trail of Eratna at Warnagala (Figure 1). Although the plants of these two populations were not flowering when first observed, the second author observed the Katukithula population, albeit reduced to about 20 individuals, flowering on 5th December, 2021. However, at that time, the Warnagala population was not flowering. The further studies indicate that it differs from all known species of *Strobilanthes* and it is a new species described and illustrated below. Morphologically, it is closely related to *S. pentandra* Wood (1995: 4), which is only known from the type location above Lebanon Estate, Madulkele, Knuckles Mountains, Sri Lanka (Figure 1).

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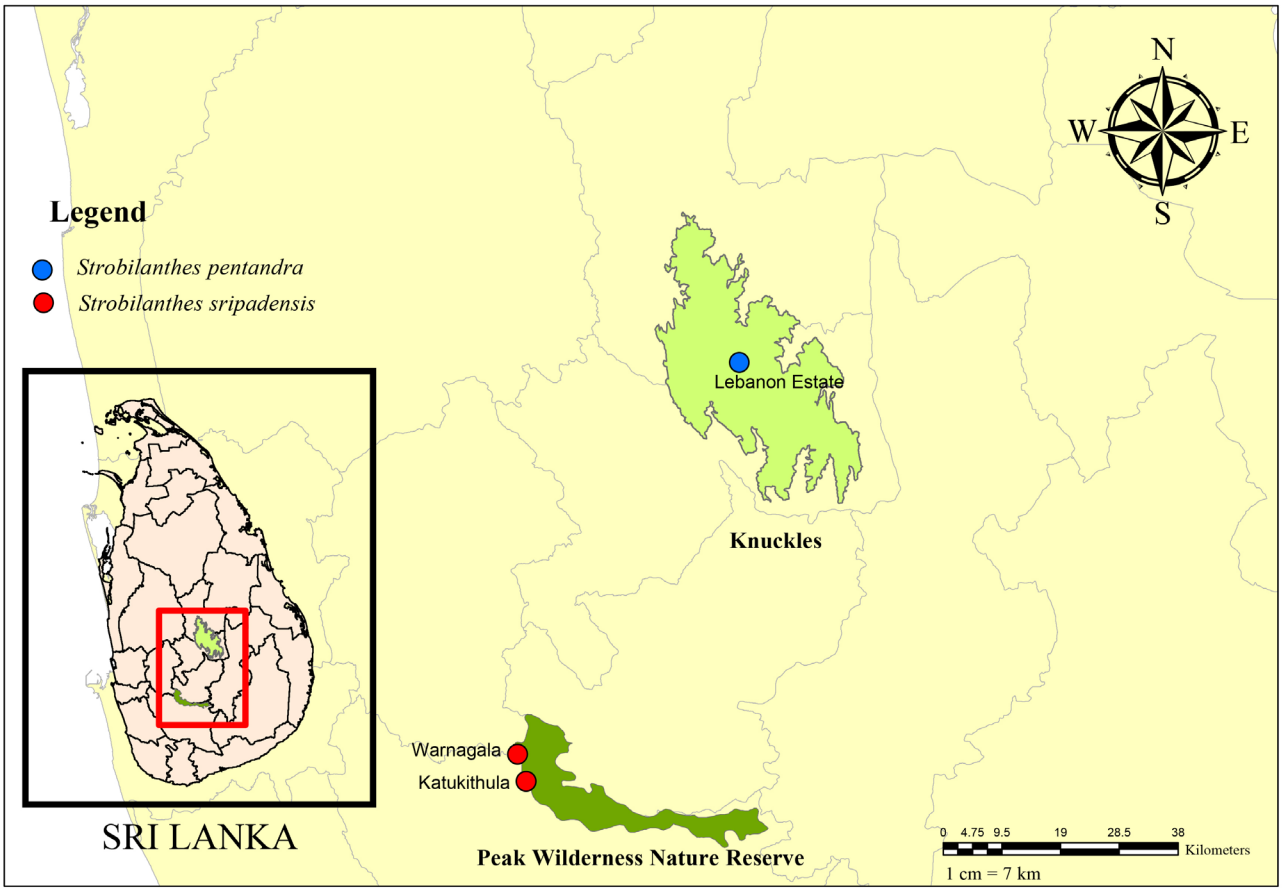

FIGURE 1. Type localities of *Strobilanthes sripadensis* and *Strobilanthes pentandra* in Sri Lanka.

Material and methods

The GPS coordinates of *Strobilanthes* population locations were recorded using a GARMIN GPS 78s and mapped using ARC GIS version 10.8.1 ESRI, 2020 (Figure 1). The species was photographed using a Nikon D850 camera with AF-S VR MICRO NIKKOR 105 mm f/2.8 G-ED and AF-S VR NIKKOR 70-200 mm f/2.8E FLED lenses. Standard methods were followed for sample collection and preservation (Alexiades 1996) and voucher specimens are deposited at the National Herbarium, Royal Botanic Gardens, Peradeniya, Sri Lanka (PDA).

Pollen morphology was also analyzed to distinguish the prospective new species from allied species. Pollen grains was extracted from a single unopened flower bud collected from the Katukithula population and acetolysed following Erdtman (1960). Then the coated samples were examined using a Hitachi SU6600 Analytical Variable Pressure FE-SEM (Scanning Electron Microscope) at Sri Lanka Institute of Nanotechnology (SLINTEC), Homagama, Sri Lanka. Images were taken representing the polar view, and exine view. The terminology and classification of pollen morphology follow Carine and Scotland (1998).

Results and discussion

Taxonomic treatment

Strobilanthes sripadensis Nilanthi, Gopallawa & Jayawardana *sp. nov.* (Figure 2 & 3)

Type:—SRI LANKA. Sabaragamuwa Province: Ratnapura District, Peak Wilderness Nature Reserve, Katukithula, 6.8038174 N & 80.4681832 E, 1130 m, 11 December 2021, *Nilanthi, Gopallawa, Jayawardana & Jayasinghe RMRN119* (holotype PDA!).

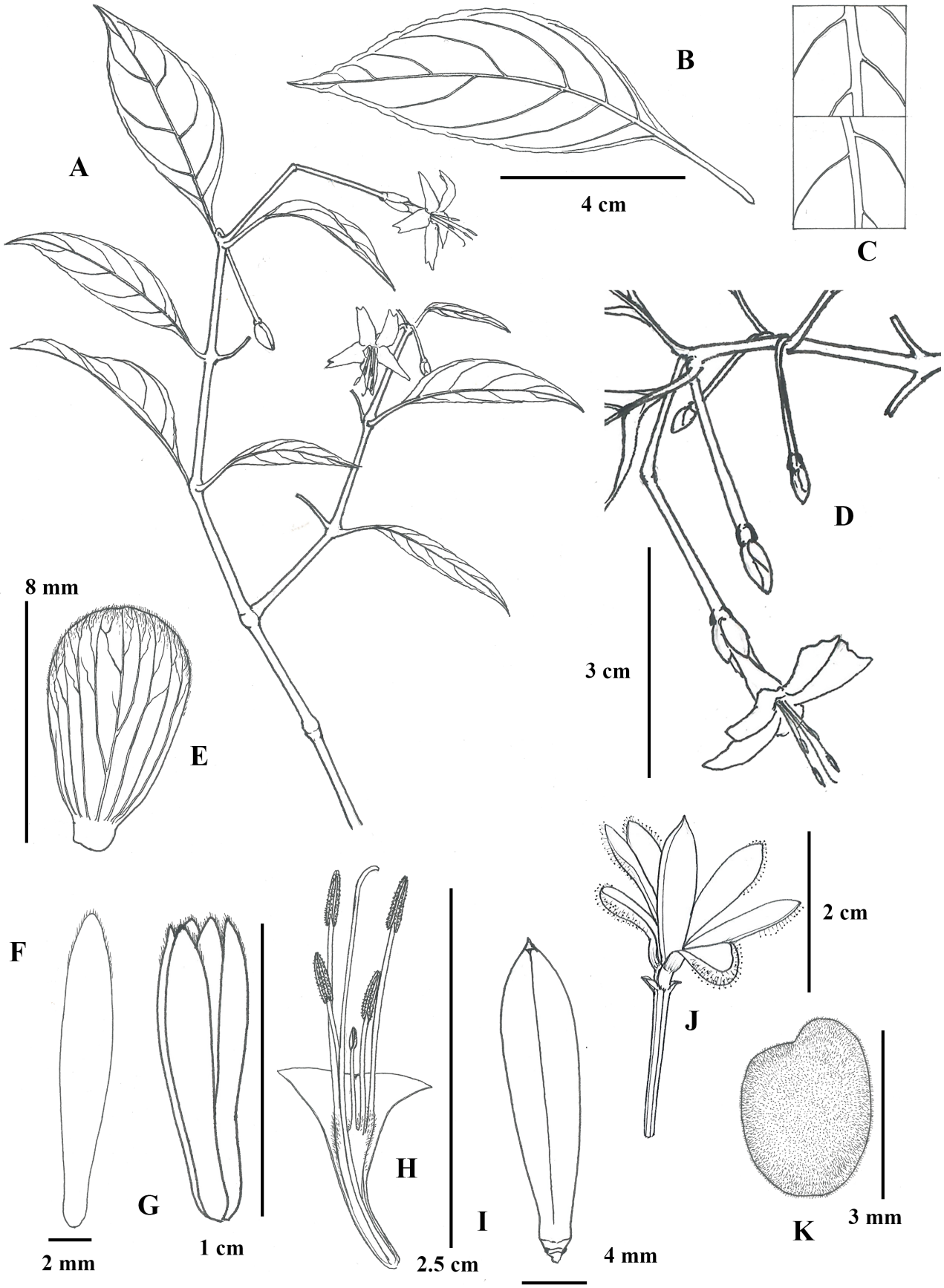

FIGURE 2. *Strobilanthes sripadensis*. A. Flowering branch; B. Leaf; C. Close up of the leaf surfaces adaxial and abaxial; D. Inflorescence; E. Bract; F. Bracteole; G. Calyx; H. Corolla split open showing stamens and anthers; I. Capsule; J. Glandular hairs on bracts at fruiting. K. Seed (Drawn by Rukmal Ratnayake based on the holotype).

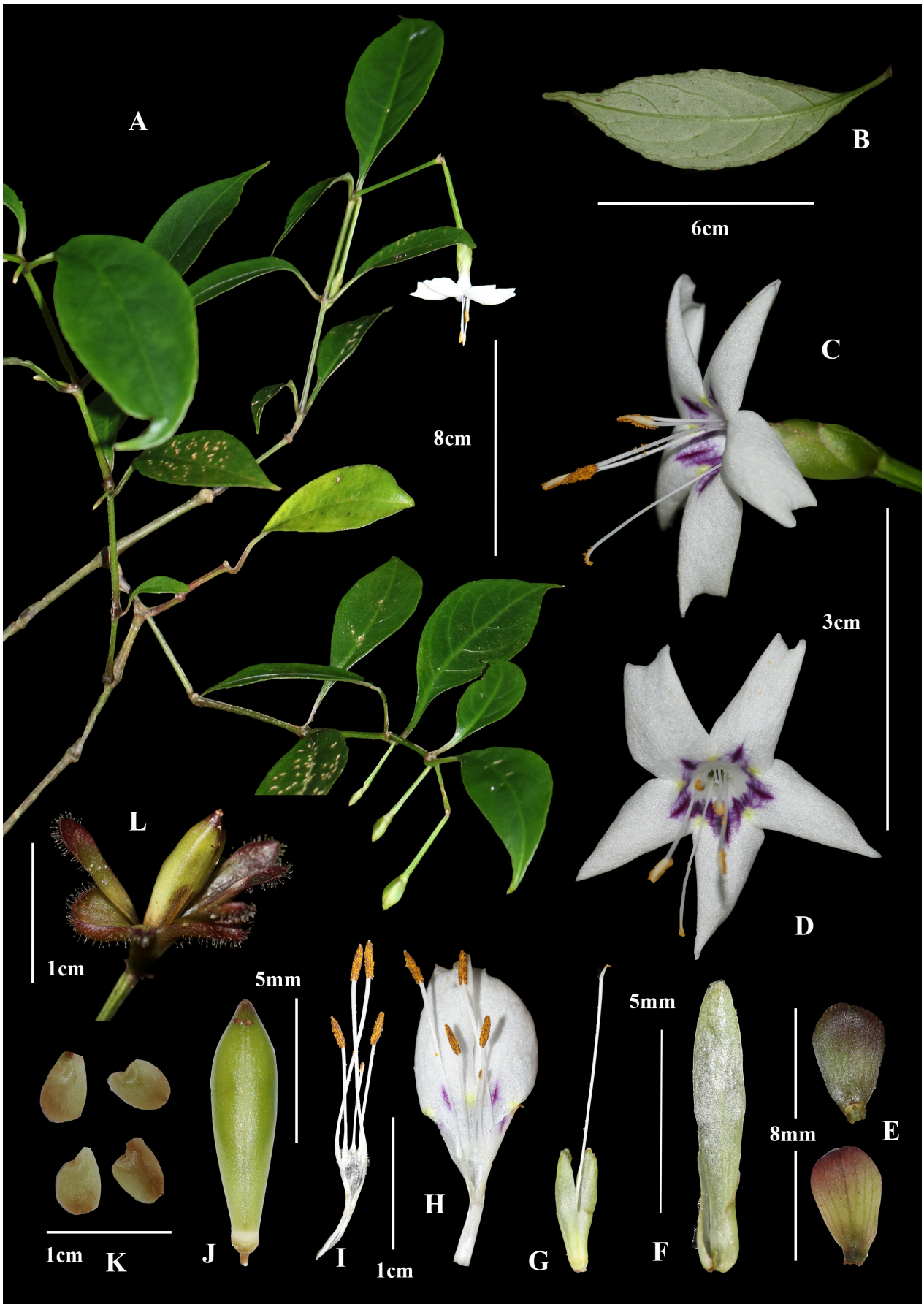

FIGURE 3. *Strobilanthes sripadensis*. A. Flowering branch; B. Abaxial surface of a leaf; C. Inflorescence; D. Front view of the corolla; E. Bracts (adaxial and abaxial); F. Bracteole; G. Calyx and Style; H. Corolla opened showing stamens and anthers; I. Stamens; J. Capsule; K. Seeds; L. Glandular hairs at fruiting.

Diagnosis:—The new species resembles *S. pentandra*, but differs by having leaf apex short acuminate (vs. acute), margin entire or slightly sinuate (vs. serrulate), lateral veins 5–7 pairs (vs. 4–5), outermost bract longer than the inner one (vs. outermost smaller than the inner), bract, bracteole, and calyx pubescent (vs. glabrous), corolla white with prominent dark purple lines at throat (vs. pale violet), fertile stamens 4 (vs. fertile stamens 5).

Description:—Subshrub, slender, up to 50 cm high. Stems terete, glabrous, woody, slightly swollen at node, transverse ridges not prominent. Leaves opposite, unequal in each pair; petioles 1.4–2.5 cm long, glabrous; blades oblong to elliptical, 6.2–10.5 × 2.1–3.6 cm, base cuneate, margin entire or slightly sinuate, apex obtusely short acuminate, adaxially dark green, glabrous with numerous cystoliths, abaxially paler green, glabrescent, venation camptodromous, lateral veins 5–7 pairs, prominent on both surfaces, tertiary veins inconspicuous. Inflorescences of bracteate heads, terminal or axillary opposite pairs on short leafy branchlets; heads oblong, few-flowered, 1.3–5.1 × 1.1–1.9 cm, glabrous; peduncles 1.8–4.7 cm long; flowers sessile; rachis glabrescent. Bracts broadly oblong, 0.5–1.0 × 0.2–0.6 cm, apex obtuse, slightly concave, the outermost ones longer than the inner ones, pubescent on adaxial surface and margin towards the apex, then densely glandular pubescent on mature capsule. Bracteoles linear-oblong, 7.9–9.1 × 1.9–2.0 mm, apex obtuse, pubescent along margin towards the apex, then glandular-pubescent. Calyx five-lobed to about half of the length; lobes linear, 8.9–9.0 × 1.9–3.0 mm, apex acute, margin pubescent towards the apex, then densely glandular-pubescent when fruiting, persistent. Corolla 1.4–1.5 cm long, white with prominent dark purple lines at throat, outside glabrous, inside glabrous except at the place of the insertion of the stamens, tube very narrowly cylindrical for 1.3–1.4 cm, then abruptly inflated and campanulate, flower diameter 2.1–2.3 cm, lobes obovate, 10–13 × 4–8 mm, spreading. Stamens 4, exserted, didynamous; filaments glabrous except for a few hairs at the base, shorter pair 12.9–13.1 mm long, longer pair 18.2–19.0 mm long; anthers bithecous, subsagittate, dorsifixed near to the base, anthers yellow brown. Staminode 1. Ovary two locular, oblong-elliptic, 2.5–3.0 mm long; style exserted, slightly curved, 1.7–2.0 cm long, glabrous; stigma unlobed. Capsule 8–9 mm long, 2–3 mm wide, narrowly oblong-ellipsoid, glabrous, 4-seeded. Seeds, ca. 1.5 mm broad softly pubescent.

Pollen Morphology:—Pollen grains of *S. sripadensis* (Figure 4) are spheroidal, 47–56 × 2.7–2.9 µm, 3-colporate, equatorial. Carine and Scotland (1998) observed the pollen morphology of 25 *Strobilanthes* species from Sri Lanka. They recognized 13 ellipsoid pollen types and 12 spheroidal pollen types for Sri Lankan *Strobilanthes* species. Pollen morphological characters showed a great variability among Sri Lankan *Strobilanthes* species.

Etymology:—This specific epithet "*sripadensis*" refers to the type locality of this species where the term "Sri Pada" means "holy footprint" in Sinhala and comes from an indentation at the top of the mountain of the same name which is believed by Buddhists to be the foot print of lord "Gauthama Buddha". This mountain, which is revered by Sri Lanka's four main religions, is located within the Peak Wilderness Nature Reserve in close proximity to the type locality.

Phenology:—Flowering in December and fruiting in February.

Distribution and Habitat:—The new species is currently known only from Katukithula and Warnagla in Peak Wilderness Nature Reserve (Figure 1). It grows in the wet zone, in the transitional gradient between lowland rainforest and sub-montane forest at an elevation of 1130 m. This species inhabits areas along the nature trail appearing to prefer well-shaded areas of higher forest cover. Associated species are *Syzygium alubo* Kosterm (1981: 34), *Garcinia echinocarpa* Thwaites (1854: 71) and *Aporosa fusiformis* Thwaites (1861: 288).

Additional specimens examined (paratypes):—SRI LANKA. RATNAPURA DISTRICT: Peak Wilderness Nature Reserve, Katukithula, 6.8038174 N & 80.4681832 E, 1130 m, 11 December 2021, *Nilanthi, Gopallawa, Jayawardana & Jayasinghe BGAPK001* (PDA); same locality, same date, *Nilanthi, Gopallawa, Jayawardana & Jayasinghe BGAPK002* (PDA); same locality, same date, *Nilanthi, Gopallawa, Jayawardana & Jayasinghe BGAPK003* (PDA).

Conservation status:—About 20 individuals were observed at, Katukithula with the extent of occurrence ca. 0.25 km^2. and about 25 individuals were observed at Warnagala with the extent of occurrence ca. 0.25 km^2 This newly described species may be facing the threat of extinction in the wild due to the low number of plants representing the entire known populations and its limited distribution. Between 2018 and 2021, it is shown that Katukithula population has a significant decline, with a loss of approximately 80% of the population. Furthermore, due to its presence along the edge of a path, there is a threat to this population from road clearing and weeding. Therefore, this new species is assigned to the category 'Critically Endangered' (CR) in accordance with the International Union for Conservation of Nature guidelines (IUCN, 2019). Further field investigations are required to determine if other populations of *S. sripadensis* are present.

Note:—A detailed comparison between the new species and *S. pentandra* is given in Table 1.

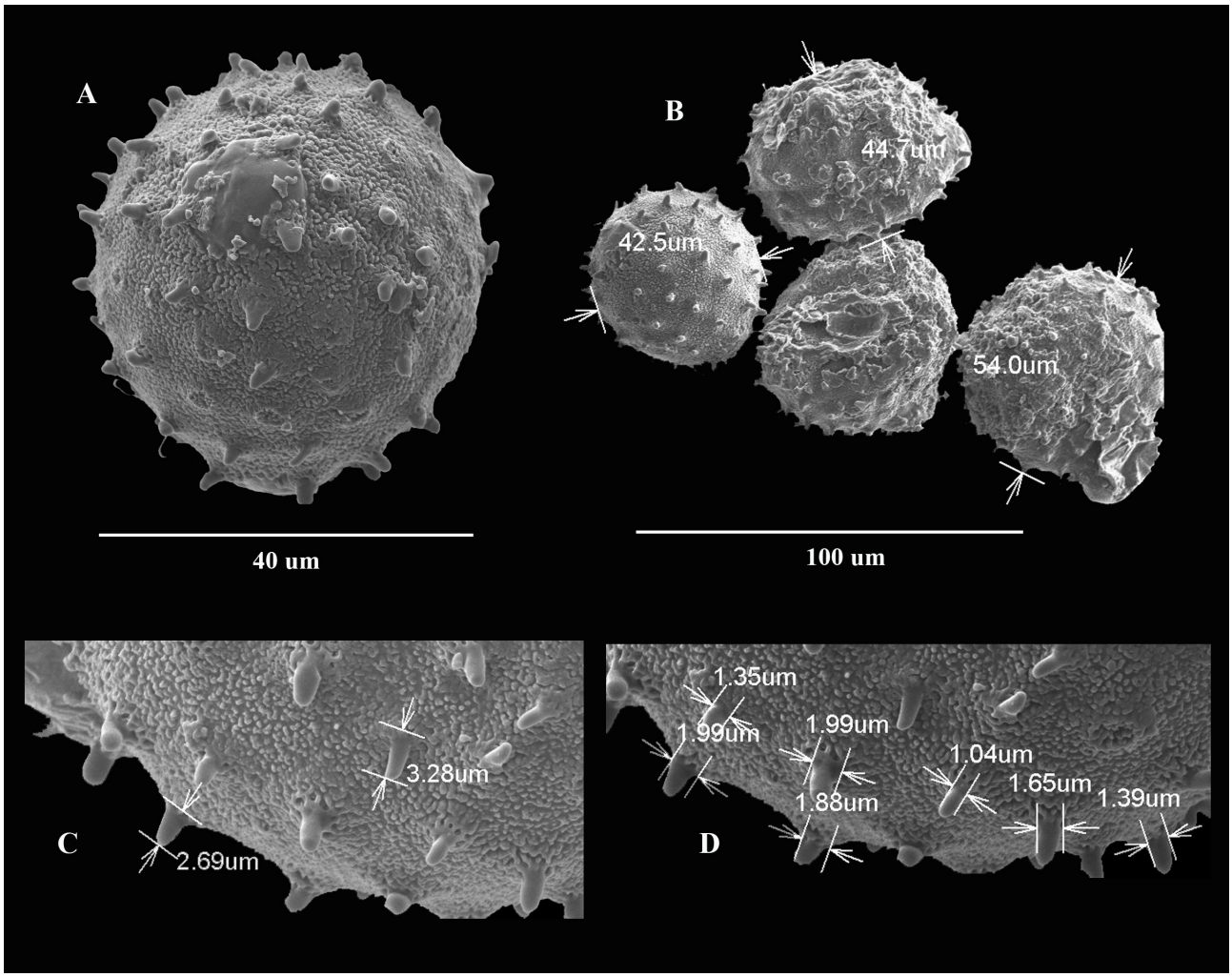

FIGURE 4. Pollen grains of *Strobilanthes sripadensis* A, B: Polar view. C: Spines (spine height marked). D: Spines (spine width marked).

TABLE 1. Morphological comparison between *S. sripadensis* and *S. pentandra*.

Characters	***S. sripadensis***	***S. pentandra*** †
Leaf	6.2–10.5 × 2.1–3.6 cm	2.5–6.5 × 1.5–2.7 cm
Leaf shape	oblong-elliptical	oblong-elliptical
Leaf apex	short acuminate	acute
Leaf margin	entire or slightly sinuate	serrulate
Leaf blade	5–7 pairs	4–5 pairs
Petiole	1.4–2.5 cm long	1.0–2.5 cm long
Inflorescence	bracteate heads	dense bracteate heads
	1.3–5.1 ×1.1–1.9 cm	1.0–5.0 × 1.2–1.8 cm
Bract	broadly oblong, outermost longer than the inner	broadly oblong, outermost smaller than the inner
	0.5–1.0 × 0.2–0.6 cm	1.2–1.7 × 0.6–1.2 cm
Bracteole	7.9–9.1 × 1.9–2.0 mm	8–10 × 1–2 mm
	pubescent along margin towards the apex	glabrous
Calyx	5–6 mm	5–6 mm
	softly pubescent along margin towards the apex	glabrous
Corolla colour	white with prominent dark purple lines at throat	pale violet
Corolla length	1.4–1.5 cm	2.9–3.3 cm
Corolla width	2.1–2.3 cm	1.0–1.5 cm
Stamens	one sterile, 4 fertile	5 fertile
Capsule	8–9 mm × 2–3 mm	12–13 × 3–4 mm

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