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*Lepidagathis decumbens*  
N. Dhatchan. & S. Soosairaj, sp. nov. (Acanthaceae),  
a new species from Tamil Nadu, India

Narayanasamy DHATCHANAMOORTHY,  
Chinnasamy KARTHIKEYAN,  
Prakasam RAJA,  
Sebastian SOOSAIRAJ &  
Natesan BALACHANDRAN

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# *Lepidagathis decumbens* N. Dhatchan. & S. Soosairaj, sp. nov. (Acanthaceae), a new species from Tamil Nadu, India

**Narayanasamy DHATCHANAMOORTHY**

National Herbarium of Medicinal Plants and Repository of Raw Drug, Trans Disciplinary University (TDU), Foundation for Revitalisation of Health Traditions (FRLHT), # 74/2, Jarakabande Kaval, Yelahanka, Bangalore – 560 064 (India)

**Chinnasamy KARTHIKEYAN**

Department of Botany, Presidency College, Chennai, Tamil Nadu – 600 005 (India)

**Prakasam RAJA**

Department of Botany, J.J. College of Arts and Science, Pudukkottai, Tamil Nadu – 622 422 (India)

**Sebastian SOOSAIRAJ**

Department of Botany, St. Joseph's College, Tiruchirappalli, Tamil Nadu – 620 002 (India)

**Natesan BALACHANDRAN**

Ecology Department, French Institute of Pondicherry, Puducherry – 605 001 (India)  
[balachandran.n@ifpindia.org](mailto:balachandran.n@ifpindia.org) (corresponding author)

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## ABSTRACT

*Lepidagathis decumbens* N. Dhatchan. & S. Soosairaj, sp. nov. is described and illustrated here from Eastern Ghats of Tamil Nadu, Southern India. This new species is closely allied to *L. diffusa* C.B. Clarke but differs by erect and decumbent habit, short internodes, long unilateral spikes, glandular sericeous floral parts, and ovoid seeds. Photographs of habit, spikes and flowers, pollen grains, seed SEM are provided, in addition leaf and stem anatomy are compared between the new and allied species and key of *Lepidagathis* Willd. in Tamil Nadu for easy identification is also provided.

## RÉSUMÉ

*Lepidagathis decumbens* N. Dhatchan. & S. Soosairaj, sp. nov. (Acanthaceae), une espèce nouvelle du Tamil Nadu, Inde.

*Lepidagathis decumbens* N. Dhatchan. & S. Soosairaj, sp. nov., croissant dans les Ghâts orientaux du Tamil Nadu (Inde du Sud), est décrit et illustré ici. Cette nouvelle espèce est très proche de *L. diffusa* C.B. Clarke, mais en diffère par son port dressé et décombant, des entrenœuds courts, de longs épis unilatéraux, des pièces florales glanduleuses et soyeuses, ainsi que des graines ovoïdes. Des photographies illustrant le port, les épis et les fleurs, les grains de pollen et les graines (MEB) sont fournies. En outre, l'anatomie des feuilles et des tiges est comparée pour les deux espèces alliées et une clé d'identification facile des *Lepidagathis* Willd. du Tamil Nadu est proposée.

## KEY WORDS

Acanthaceae,  
*Lepidagathis*,  
Dharmapuri district,  
Eastern Ghats,  
endemic,  
South India,  
Morphoanatomy.

## MOTS CLÉS

Acanthaceae,  
*Lepidagathis*,  
district de Dharmapuri,  
Ghâts orientaux,  
endémique,  
Inde du Sud,  
morphoanatomie.

INTRODUCTION

Family Acanthaceae Juss. is pantropical in distribution but also found in temperate regions (Kameyama 2008). Worldwide, it comprises of 206 genera and 3947 species (POWO 2022; The Plant List 2013). In India, Clarke (1885) recorded 49 genera, 504 species and 127 varieties whereas Karthikeyan *et al.* (2009) reported 47 genera, 475 species and 118 varieties. The genus *Lepidagathis* Willd. is traditionally placed in tribe Barlerieae (Bentham 1876; Lindau 1895; Kameyama 2008), based on molecular studies, pollen morphology, corolla aestivation and morphological characters, Scotland & Vollesen (2000) placed *Lepidagathis* in subtribe Barleriinae of the tribe Ruellieae. At present, there are 147 species of *Lepidagathis* and 18 varieties represented from the tropics and subtropics (POWO 2022). In India 23 species and eight varieties occur (Karthikeyan *et al.* 2009), among them 17 species are endemic to peninsular India (Nayar *et al.* 2014), of which 12 species and one variety occur in Tamil Nadu (Henry *et al.* 1987). Recently *Lepidagathis benojiana* Jithin & Josep (2017), *L. shrinangii* Natekar, Kambale & Chandore (Natekar *et al.* 2019), *L. sabui* Chandore, Borude, Madhav & S.R. Yadav (Chandore *et al.* 2020) were described, whereas *L. clavata* Dalzell (Kolte *et al.* 2016) and *L. diffusa* C.B. Clarke (Dhatchanamoorthy *et al.* 2017) were rediscovered after a century.

MATERIAL AND METHODS

On our regular field visit to the sacred groves of Dharmapuri district, Eastern Ghats of Tamil Nadu, Southern India between 2013 and 2015, for the doctoral degree of the second author, an interesting *Lepidagathis* specimen was collected from dry, red gravelly, barren soil at Thippampatti village. After critical literature screening (Beddome 1868-1874; Clarke 1885; Gamble 1924; Cooke 1958; Karthikeyan *et al.* 2009) and the study of herbarium materials deposited at BSI, CAL, K, MH and RHT we concluded that it is hitherto undescribed species. Detailed descriptions and illustrations (Fig. 1) of the new species; diagnostic key characters (Table 1) and field pictures (Fig. 2) between the new and allied species, as well as key to *Lepidagathis* growing in Tamil Nadu were provided for (only ten species, because *L. pungens* and *L. subarmata* were synonymised under *L. barberi* and *L. cristata* respectively) easy understanding.

Anatomical comparisons were made *viz.* cross section (CS) of midribs and stems, epidermal peels of leaves (Fig. 3; Table 2) and SEM images of seeds (Fig. 4) between the two species. For which fresh leaf, mature flower buds, stem and seed samples of the new species were collected from the study site, as well as for *L. diffusa* from the type locality (Dhatchanamoorthy *et al.* 2017) and those were fixed in FAA. Freehand sections were taken, stained with safranin and TBO and mounted with glycerine following Jeffrey (1917). Leaf epidermis was peeled manually to observe the stomata and types of hair. The anatomical pictures were captured using an Olympus CX33 light microscope and their differentiating features described using the terminology of Metcalfe & Chalk (1983). Mature, dry seeds of both species were collected from the field and SEM (EVO-18 model, CAREL ZEISS) images was taken at St. Joseph College, Tiruchirappalli to examine the differences of size, shape and in the length of hydrophilic hairs. Acetolysed (Erdtman 1952) pollen grains (Fig. 5) were also studied and their distinguished characters are tabulated (Table 1). A distribution map is also provided: <http://u.osmfr.org/m/822677/>

TAXONOMIC TREATMENT

Family ACANTHACEAE Juss.  
Genus *Lepidagathis* Willd.

*Lepidagathis decumbens*

N. Dhatchan. & S. Soosairaj, sp. nov.  
(Fig. 1; Table 1).

*Lepidagathis decumbens* sp. nov. resembles *L. diffusa* C.B. Clarke, but differs in having erect and decumbent habit, short internodes, long unilateral spikes, multicelled glandular hairs, sericeous floral parts and ovate-suborbicular seeds (Table 1).

TYPE MATERIAL. — **India.** Tamil Nadu, Dharmapuri district, Thippampatti village, 12°14'53.304"N, 78°16'31.980"E, alt. c. 358 m, 25.X.2013, N. Dhatchanamoorthy 1295 (holo-, HIFP! • iso-, RHT!).

ETYMOLOGY. — The species epithet “*decumbens*” describes the erect and geniculate habit of the plant.

DISTRIBUTION. — *Lepidagathis decumbens* sp. nov. is endemic to Dharmapuri district of Tamil Nadu, South India.

PHENOLOGY. — Flowering and fruiting from October to January.

TABLE 1. — Distinct characters of *Lepidagathis diffusa* C.B. Clarke and *L. decumbens* N. Dhatchan. & S. Soosairaj, sp. nov.

Characters	<i>Lepidagathis diffusa</i> C.B. Clarke	<i>Lepidagathis decumbens</i> sp. nov.
Habit	Prostrate	Erect or decumbent
Stem	Leaf scars indistinct, internodes long, up to 3 cm	Leaf scars prominent, internodes short, up to 1 cm
Leaf	Elliptic-lanceolate, nerves prominent at both surfaces, grooved along the lateral nerves on the adaxial surface	Linear-oblong to lanceolate, nerves prominent at abaxial surface and indistinct on adaxial surface
Inflorescence	Spikes sometimes aggregated at base, globose-ovoid, up to 2 cm long	Spikes not aggregated at base, oblong, 3-6 cm long
Calyx	7 × 3 mm, anterior sepals united ¼ of the way	9 × 4 mm, anterior sepals united ½ of the way
Pollen	Size 34.66 × 23.60 µm, exine thick c. 4.14 µm	Size 41.81 × 28.22 µm, exine thin c. 3.52 µm.
Capsule	6 × 2 mm	6 × 4 mm
Seeds	Oblong, 3 × 1.5 mm	Ovoid-suborbicular, 3.5 × 3 mm

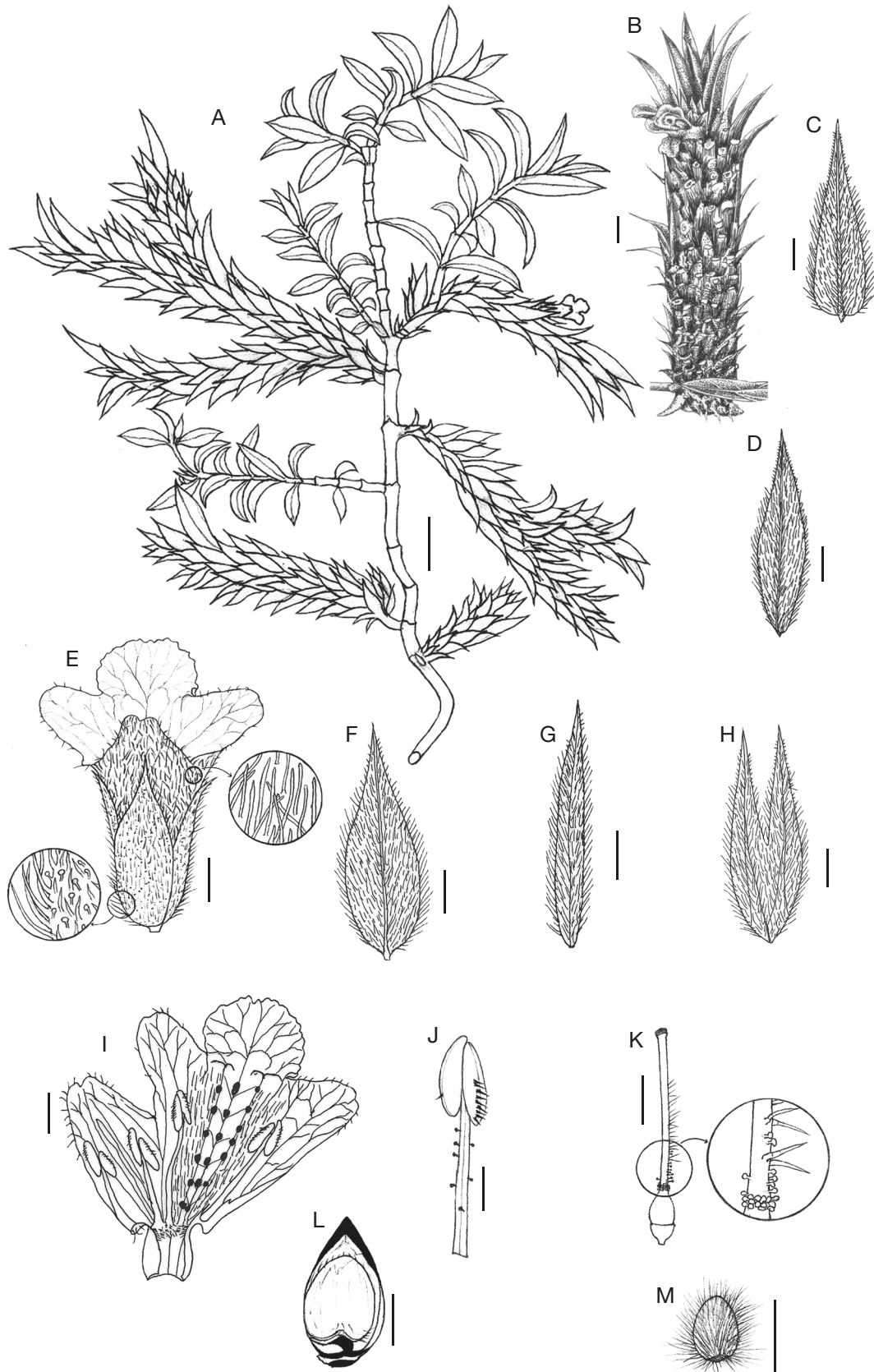


FIG. 1. — *Lepidagathis decumbens* N. Dhatchan. & S. Soosairaj, sp. nov. (drawing by P. Raja): **A**, flowering branch; **B**, inflorescence; **C**, bract; **D**, bracteole; **E**, flower; **F**, posterior sepal; **G**, lateral sepal; **H**, anterior sepals; **I**, corolla split open; **J**, stamen; **K**, pistil; **L**, capsule; **M**, seed. Scale bars: A, B, 1 cm; C, D, F-H, 5 mm; E, I, K, L, 2 mm; J, 1 mm; M, 3 mm.



FIG. 2. — **A-D**, *Lepidagathis diffusa* C.B.Clarke; **E-H**, *L. decumbens* N. Dhatchan. & S. Soosairaj, sp. nov.: **A, E**, habit; **B, F**, inflorescence; **C, G**, flower; **D, H**, seed.

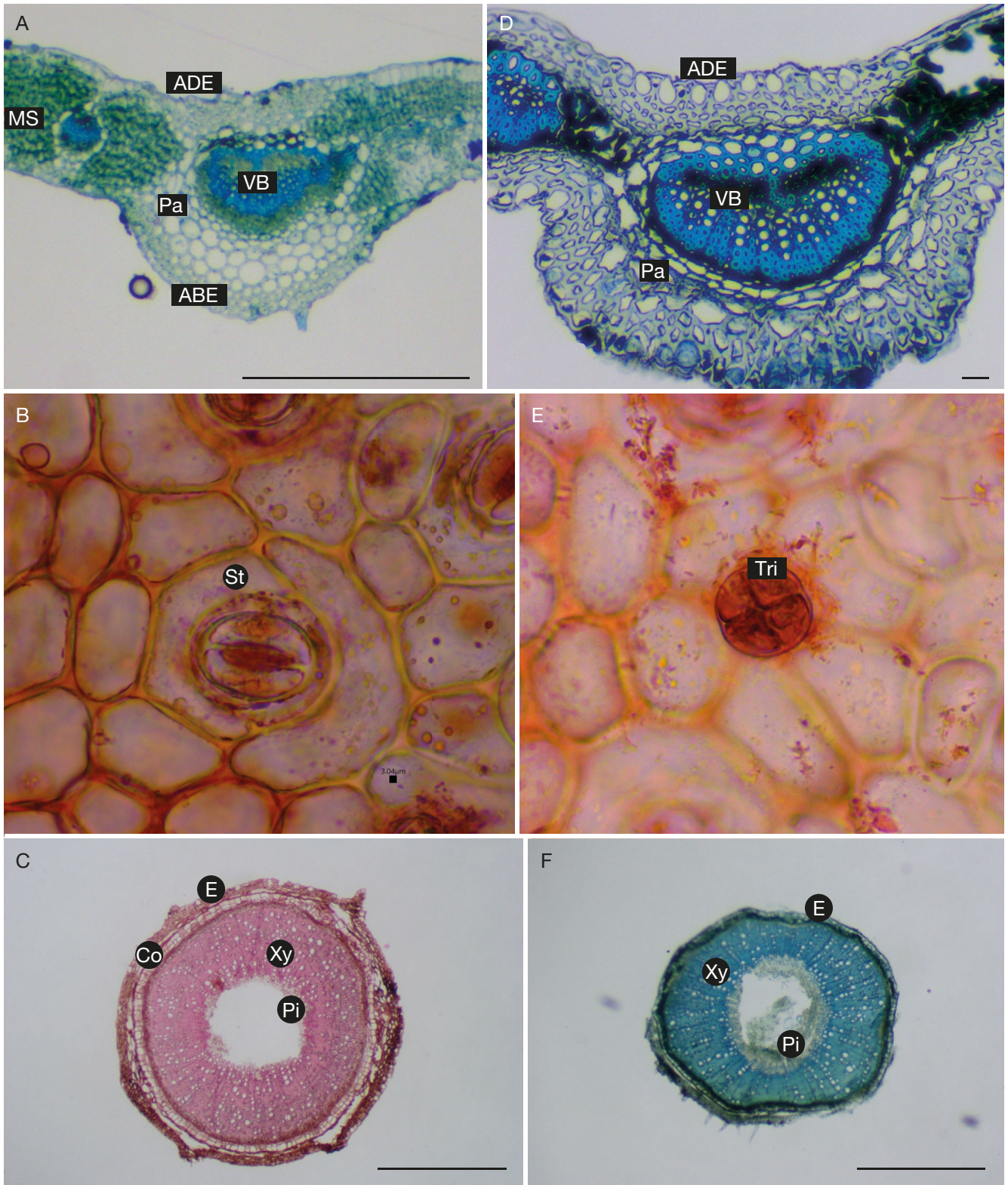


FIG. 3. — Anatomical comparisons: **A-C**, *Lepidagathis diffusa* C.B.Clarke: **A**, CS of midrib; **B**, stomata; **C**, CS of stem; **D-F**, *L. decumbens* N. Dhatchan. & S. Soosairaj, sp. nov.: **D**, CS of midrib; **E**, four lobed glandular hair; **F**, CS of stem. Abbreviations: **ADE**, adaxial epidermis; **ABE**, abaxial epidermis; **Co**, cortex; **E**, epidermis; **MS**, mesophyll; **Pa**, parenchyma; **Pi**, pith; **St**, stomata; **Tri**, trichome; **VB**, vascular bundle; **Xy**, xylem. Scale bars: A, C, F, 175  $\mu$ m; D, 28  $\mu$ m.

ECOLOGY. — Dry, red, barren and gravel mixed soils at an elevation of 300-400 m a.s.l. Associated with *Andrographis serpyllifolia* (Vahl) Wight, *Aristida hystrix* L.f., *Corbichonia decumbens* (Forssk.) Exell, *Cyanotis tuberosa* (Roxb.) Schult. &

Schult.f., *Indigofera cordifolia* Roth, *I. linnaei* Ali, *Mollugo stricta* L. *Oldenlandia umbellata* L., *Oropetium thomaeum* (L.f.) Trin., *Senna italica* Mill. and *Tribulus subramanyamii* P.Singh, G.S.Giri & V.Singh.

TABLE 2. — Comparison of anatomical characters from the CS of leaf midrib and stem of *Lepidagathis diffusa* C.B. Clarke and *L. decumbens* N. Dhatchan. & S. Soosairaj, sp. nov.

Characters	<i>Lepidagathis diffusa</i> C.B. Clarke	<i>Lepidagathis decumbens</i> sp. nov.
<b>Leaves</b>		
Cuticle	Thick	Thin
Epidermis	Thick walled cells, variable in size and shape	Thin walled cells, (almost) uniform in size and shape
Hairs	Simple non-glandular	Four lobed glandular and simple non-glandular
Cystoliths	Present on both surfaces	Present on abaxial surface
Stomata type	Anisocytic and diacytic	Diacytic
Midrib	Parenchyma cells 3-layered	Parenchyma cells 5-layered
Vascular bundles	Surrounded by 2-layered sclerenchyma cells	Surrounded by 3-layered sclerenchyma cells
<b>Stem</b>		
Medullary rays	Uniseriate	Uni and biseriate
Intra-xylary Phloem	Absent	Present
Pith parenchyma	Thick walled with tannin	Thin walled
Acicular crystals	Present	Absent

CONSERVATION STATUS. — This species occurs in an area of only about one hectare which lies between the segments of Eastern Ghats. The population has about 50 mature individuals, there is a possibility that the species may occur in nearby areas with similar ecological niches. However, these habitats are yet to be explored. The species is currently categorized as ‘Data Deficient’ following IUCN (2020) criteria and categories.

ADDITIONAL SPECIMEN EXAMINED. — **India.** Tamil Nadu, Dharmapuri district, Thippampatti village, 12°14'53.304"N, 78°16'31.980"E, 30.XI.2015, N. Dhatchanamoorthy, P. Raja & S. Soosairaj 2125 (SJC).

**DESCRIPTION**

Erect-decumbent herb, perennial, with woody rootstock; branches up to 30 cm long, stem terete, young branches purplish, scabrid-glabrescent; internodes up to 1 cm long. Leaves opposite, linear-oblong to lanceolate, 0.8-2.5 × 0.3-0.5 cm, sessile, attenuate at base, entire at margins, apex curved and spiny; lateral nerves 3-5, prominent at abaxial surface, indistinct on adaxial surface, scabrous hairy on both sides, leaf scars prominent. Inflorescence axillary, spike unilateral, 3-6 × 1-1.5 cm. Bracts lanceolate, 1.2 × 0.3 cm, truncate at base, acute-acuminate at apex, spiny, outer surface glandular sericeous, inner surface sericeous, margin with long hispid hairs in lower 2/3, scabridulous at apex, midnerve prominent. Bracteoles lanceolate, 10 × 2.8 mm, acute-acuminate, glandular sericeous, midnerve prominent, laterals actinodromous, spiny at apex. Calyx 5 lobed, 8.5-9 mm long, minutely mucronate-spiny at apex, outer surface glandular sericeous, inner surface sericeous; posterior sepal broader, lanceolate, 8.5 × 3.5 mm, acute-acuminate; anterior sepals 2, connate up to middle, lanceolate, 8.5 × 1.5 mm; lateral sepals 2, linear, 8.5 × 1.2 mm, smaller than the others. Corolla white, c. 1.4 cm long, 1 cm across, hispid on outer surface except at base; sparsely hispid inside, purple with yellow spots along the ribs, lobes 5, glabrous inside, upper 2 lobes connate, obtuse, emarginate, lower 3 lobes, median broader than the lateral, obtuse, emarginate, margins sinuate, lateral lobes obtuse. Stamens 4, didynamous, dorsifixed, filament 2-3.5 mm long, sparsely glandular; anthers ovoid-oblong, c. 2 mm long, bearded, pollen 3-colporate, 41.81-48.85 ×

28.22-32.26 µm, exine thin, c. 3.52 µm, reticulate. Disk annular; ovary ovoid, c. 1.2 × 1 mm, glabrous; 2-locular; ovules 2 in each cell; style slender, 6 mm long, hispid-glandular at base; stigma slightly bifid, glabrous. Capsules shorter than calyx, ovate-oblong, c. 6 × 4 mm, glabrous. Seeds 2, ovoid-suborbicular, c. 3.5 × 3 mm, densely short mucilaginous hairy.

**TAXONOMIC NOTES**

The distinguished characters between the species were compared (Table 1) with their images (Fig. 2). *Lepidagathis diffusa* is a prostrate herb, with up to 3 cm long internodes, leaf nerves prominent on both surfaces, spike dense, ovoid-oblong at upper axils, and the seeds are oblong with long mucilaginous hairs whereas the new species is erect-decumbent herb, with up to 1 cm short internodes, leaves linear-oblong and nerves indistinct on adaxial surface, spike oblong (unilateral) up to 6 cm long at leaf scar axils, floral parts glandular sericeous, and the seeds are ovoid-suborbicular with short mucilaginous hairs (Fig. 1).

Anatomically, leaves of *Lepidagathis diffusa* have simple and non-glandular hairs, cystoliths on both surfaces, anisocytic and diacytic types of stomata. The cross section (CS) of stem shows vascular bundles (VB) surrounded by 2 layers of sclerenchyma cells, uniseriate medullary rays, absence of intra-xylary phloem and presence of acicular crystals at pith. Anatomy of *L. decumbens* leaves shows simple and four lobed glandular foliage hairs, cystoliths occur only on abaxial surface, epidermal peel has only diacytic type of stomata. The CS of stem shows VB surrounded by 3 layers of sclerenchyma cells, uni- and biseriate medullary rays, presence of intra-xylary phloem, and absence of acicular crystals (Fig. 3; Table 2) at pith. The SEM images of seeds from the two species clearly represented the difference in size and shape, particularly the base of seeds and the length of hydrophilic hairs (Fig. 4). In all, clear differences in morphology, anatomy, reproductive features and SEM images are strongly evidenced to confirm this *Lepidagathis* was new and named as *L. decumbens*.



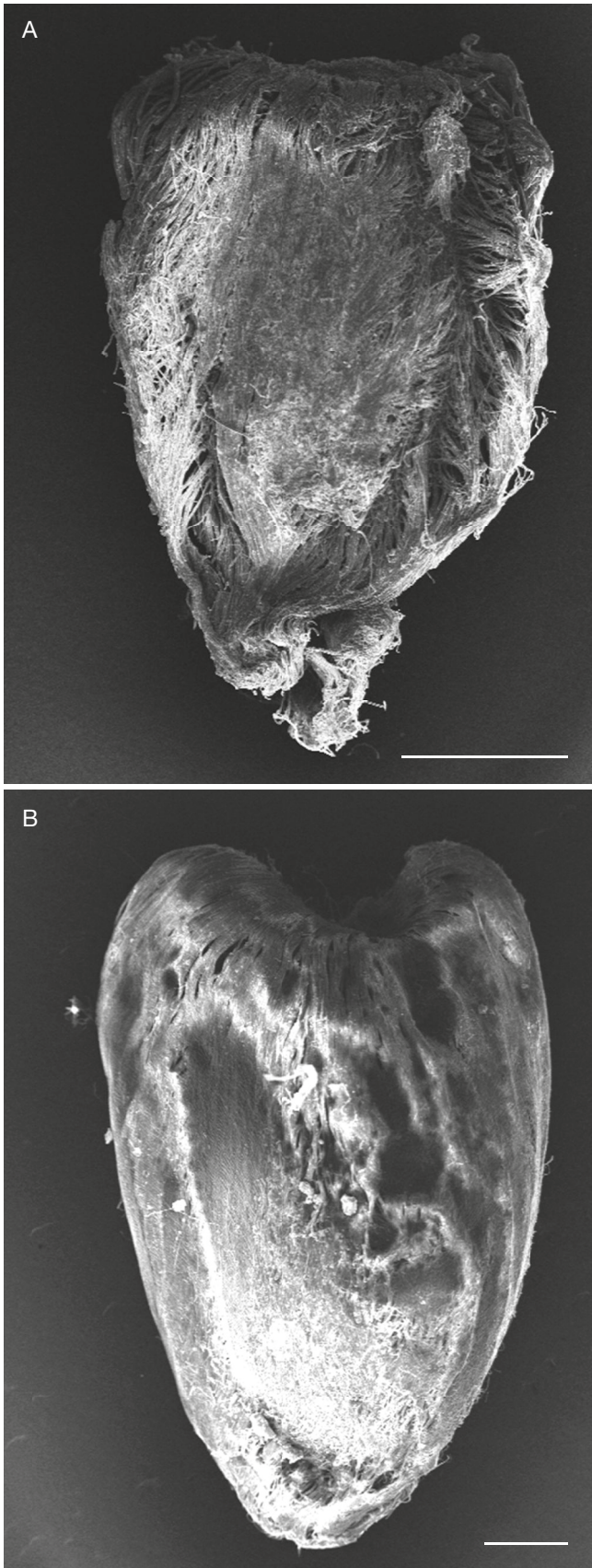


FIG. 4. — SEM images of seeds of: **A**, *Lepidagathis diffusa* C.B. Clarke with long hydrophilic hairs; **B**, *L. decumbens* N. Dhatchan. & S. Soosairaj, sp. nov. with short hairs. Scale bars: A, 1 mm; B, 300  $\mu$ m.

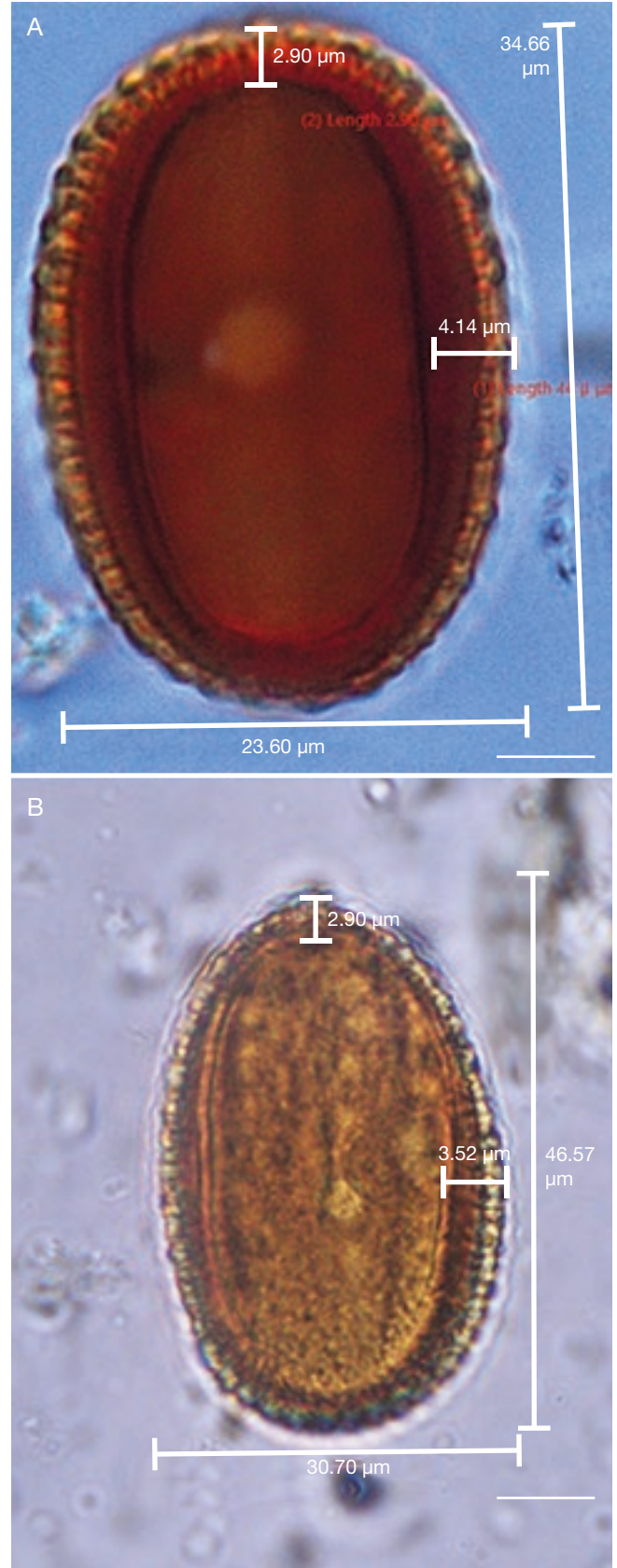


FIG. 5. — Acetolysed pollen images of: **A**, *Lepidagathis diffusa* C.B. Clarke with thick exine; **B**, *L. decumbens* N. Dhatchan. & S. Soosairaj, sp. nov. with thin exine. Scale bars: 5  $\mu$ m.

KEY TO THE GENUS *LEPIDAGATHIS* WILLD. FROM TAMIL NADU

1. Prostrate-decumbent herb, capsule 2-seeded ..... 2  
— Erect subshrub, capsule 4-seeded ..... 8
2. Leaf margin or apex spinous tipped ..... 3  
Leaf margin entire or toothed, apex mucronate ..... 4
3. Leaves lanceolate, margin entire, one spine only at apex ..... *L. spinosa* Wight ex Nees  
— Leaves ovate-oblong, margin and apex spinous tipped ..... *L. barberi* Gamble
4. Spike aggregated only at lower nodes ..... 5  
— Spike at axils of leafy and leafless stem ..... 7
5. Leaves > 3 cm long, lateral nerves 5-7 pairs ..... *L. hamiltoniana* Wall.  
— Leaves < 3 cm long, lateral nerves 3-5 pairs ..... 6
6. Leaves scabrous along the nerves beneath, margin ciliate ..... *L. mitis* Dalzell  
— Leaves glabrous on both sides, margin entire to toothed ..... *L. cristata* Willd.
7. Spike globose-ovoid, internodes long to 3 cm ..... *L. diffusa* C.B. Clarke  
— Spike elongate and unilateral, internodes short to 1 cm ..... *L. decumbens* N. Dhatchan. & S. Soosairaj, sp. nov.
8. Bract and calyx lobes single nerved, bract margin hyaline ..... *L. hyalina* Nees  
— Bract and calyx lobes 3-7 nerved, bract scarious or coriaceous ..... 9
9. Bract scarious, lower calyx lobes 3-ribbed, upper 7-ribbed ..... *L. scariosa* Nees  
— Bract coriaceous, calyx lobes 3-ribbed ..... 10
10. Flowers in soft, condensed spike, leaves crenate-serrate ..... *L. fasciculata* (Retz.) Nees  
— Flowers in elongate spike, villous, leaves entire or undulate ..... *L. cuspidata* Nees

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