

LINDBERGIA SINENSIS (MÜLL. HAL.) BROTH., AN INTERESTING MOSS,
NEW TO INDIA

LINDBERGIA SINENSIS (MÜLL. HAL.) BROTH., НОВЫЙ ДЛЯ ИНДИИ
ИНТЕРЕСНЫЙ МОХ

GEETA ASTHANA¹ & CHANDRAKALA BHAGAT¹

ГИТА АСТХАНА¹, ЧАНДРАКАЛА БХАГАТ¹

Abstract

Lindbergia sinensis (Müll. Hal.) Broth., an epiphytic moss of family Leskeaceae has been identified during survey and investigation of mosses of Garhwal Hills, Uttarakhand, Western Himalaya. Earlier, this species was reported from China and Russia. This is the first report of *Lindbergia sinensis* from India which constitutes a new record for Indian Moss flora. The species is described and illustrated here with gametophytic as well as sporophytic details.

Резюме

Lindbergia sinensis (Müll. Hal.) Broth., эпифитный мох из семейства Leskeaceae найден в результате изучения флоры мхов хребта Гарвал в штате Уттаркханд в Индии, в Западных Гималаях. Этот вид был известен ранее из Китая и России. Данная находка *Lindbergia sinensis* является первой на территории Индии. Приводятся описание и иллюстрации вида, включающие признаки спорофита и гаметофита.

KEYWORDS: Bryophytes, mosses, pleurocarps, Leskeaceae, *Lindbergia sinensis*, India, new record

INTRODUCTION

The genus *Lindbergia* Kindb. is widely distributed all over the world. Vohra (1983) reported 14 species in the tropical and warm temperate regions of the world. In recently updated list, the genus is represented by 18 legitimate species (Tropicos.org. Missouri Botanical Garden 05-II-2019). In India, three species of the genus i.e. *Lindbergia duthiei* (Broth.) Broth., *Lindbergia koelzii* Williams and *Lindbergia longinervis* Card. et Dix. are reported so far from Indian subcontinent (Gangulee, 1978-1980, Vohra, 1983, Tewari & Pant, 2002, Lal, 2005, Dandotiya et al., 2011, Alam, 2013, 2015). During the survey and study of bryophyte collection from Western Himalaya, the fertile plants of *Lindbergia sinensis* (Müll. Hal.) Broth. have been discovered. It is an Asiatic species reported from China and Russia so far (Tan et al., 1995, Cao et al., 2002, Huan et al., 2002, Ignatova et al., 2010). The present report of the taxon shows extended distribution of the species in the world. With this addition of the moss species, the genus *Lindbergia* is now represented by four species in India. All of them are from western Himalaya. *Lindbergia duthiei* is known from Jammu & Kashmir, Himachal Pradesh, Uttarakhand (Tehri Garhwal & Kumaon). *Lindbergia koelzii* is known from Himachal Pradesh & Uttarakhand (Kumaon). *Lind-*

bergia longinervis is known from Uttarakhand (Kumaon) (Gangulee, 1978-1980; Vohra, 1983).

TAXONOMY

Lindbergia sinensis (Müll. Hal.) Broth., Nat. Pflanzenfam. 1(3): 993. 1907. — *Schwetschkea sinensis* Müll. Hal., Nuovo Giorn. Bot. Ital., n. ser. 3: 111. 1896.

Fig. I: 1-29.

Type Locality: China.

Plants epiphytic, yellowish green to dark green, forming mats. Main stem creeping, irregularly branched, rhizoids present in bunches, 10–25 mm long and 0.83–1.16 mm wide with leaves. Branches 4–7 mm long. Stem 0.18–0.21 mm in diameter. Cross-section of the stem 10–14 cells across diameter, cortical cells small, thick walled in 2–3 rows, 3–8 × 7–12 µm, medullary cells large, thin walled, 15–20 × 15–31 µm, central strand indistinct. Leaves densely arranged, appressed to spreading, 0.66–0.75 mm long and 0.24–0.41 mm wide, ovate to lanceolate, somewhat concave to plane, acuminate, margin entire. Costa single, strong, reaching up to 2/3–3/4 of the leaf length, with 3–4 rows of thickened cells. Apical leaf cells rhomboidal, 23–35 × 5–12 µm, middle cells near costa rounded or ovate, 11–18 × 11–16 µm, near margin quadrate-rectangular, 7–12 × 11–15 µm, basal

¹ – Department of Botany, University of Lucknow, Lucknow-226007, India; E-mails: drgasthana@yahoo.com (Corresponding author); chandrakalabhagat1992@gmail.com

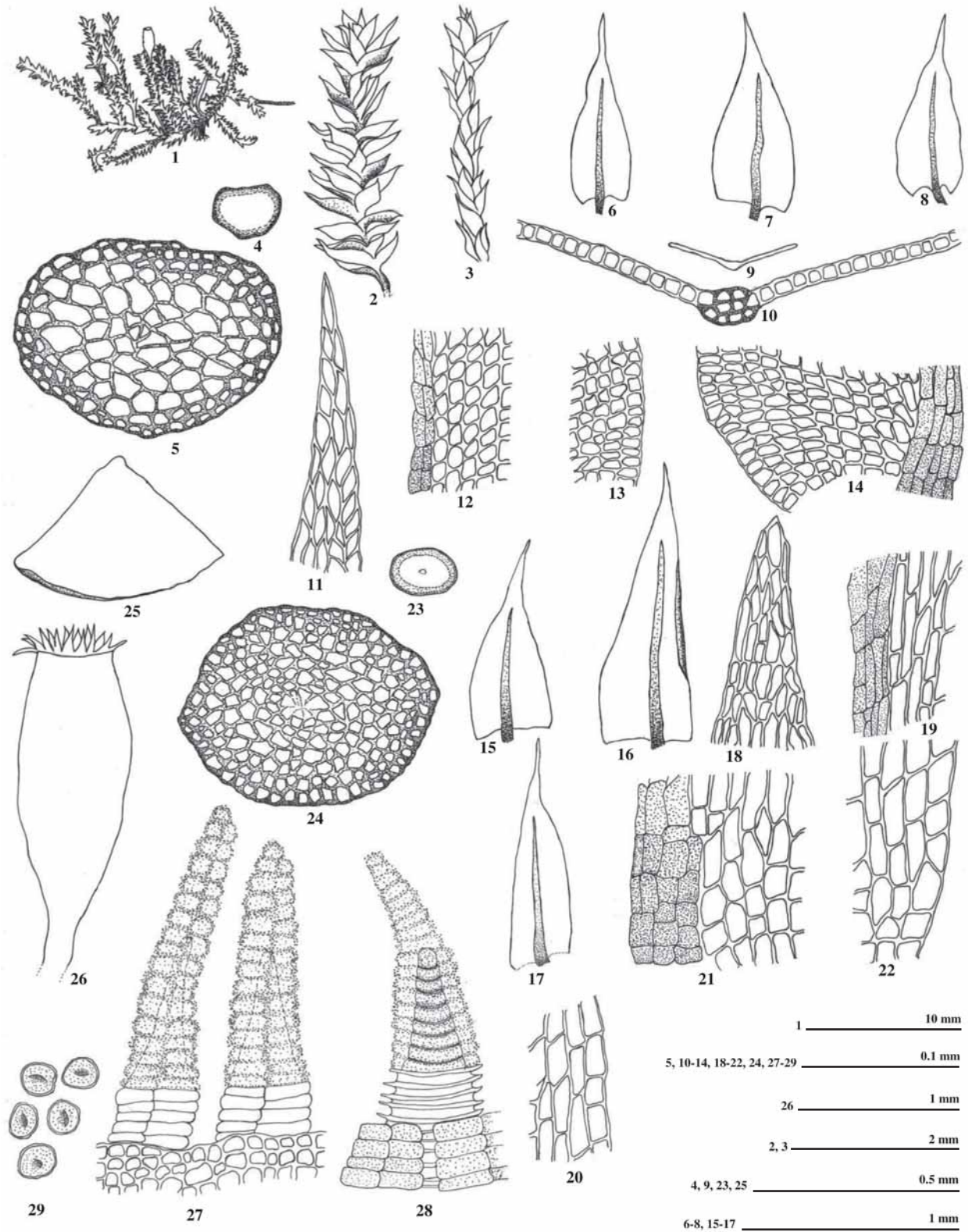


Fig. 1. *Lindbergia sinensis* (Müll. Hal.) Broth. 1. Habit of plant (Wet). 2. A portion of plant enlarged (Wet). 3. A portion of plant enlarged (Dry). 4. Cross-section of stem (Diagrammatic). 5. Cross-section of stem (Cellular). 6-8. Leaves. 9,10. Cross-sections of leaf showing costa. 11. Apical leaf cells. 12. Median leaf cells near costa. 13. Median leaf cells near margin. 14. Basal leaf cells. 15-17. Perichaetial leaves. 18. Apical perichaetial leaf cells. 19. Median perichaetial leaf cells near costa. 20. Median perichaetial leaf cells near margin. 21. Basal perichaetial leaf cells near costa. 22. Basal perichaetial leaf cells near margin. 23. Cross-section of seta (Diagrammatic). 24. Cross-section of seta (Cellular). 25. Operculum. 26. Capsule. 27. Exostome (Outer view). 28. Exostome (Inner view) & Endostome. 29. Spores. All figures drawn from LWU 22472/12.

Table 1. A comparison of *Lindbergia sinensis* and *L. duthiei*.

	Russian Plants (Ignatova <i>et al.</i> , 2010)	Indian Plants (LWU 22472/12)	<i>L. duthiei</i> (Vohra 1983)
Habitat	Epiphytic	Epiphytic	Epiphytic
Plants	Dark green or brownish green	Yellowish green to dark green	—
Stem	1–3 cm long, Irregularly or almost pinnately branched; branches 2–5 mm long	10–25 mm long and 0.83–1.16 mm wide with leaves, irregularly branched; branches 4–7 mm long	Stem up to 3 cm long; branches 5–7 mm long
Leaves	Weakly concave to plain, ovate-lanceolate, acuminate, 0.9–1.3×0.4–0.7 mm, margin entire	Slightly concave to plain, ovate-lanceolate, acuminate, 0.66–0.75×0.24–0.41 mm, margin entire	Concave, broadly ovate, gradually acuminate, 1×0.5 mm, margin entire.
Costa	Ending at 2/3–3/4 the leaf length	Reaching up to 2/3–3/4 the leaf length	Ending at 2/3 the leaf length
Leaf cells	Smooth, sometimes with one very small, hardly visible simple papilla per cell on dorsal or both surfaces	Smooth, papillae not seen	Smooth
Seta	Red, smooth, 5–7 mm long	Brown, erect, smooth, 4–7 mm long	Slender, reddish up to 7 mm long
Capsule	Ovate, symmetrical, 1.0–1.1 mm long, red brown, narrowed to the mouth	Ovate-elongated, 1.5–1.7 mm long and 0.68–0.76 mm wide, brown	Up to 2×0.75 mm, brownish
Operculum	Conic with short obtuse beak	Brown, conical, 0.33–0.38 mm long and 0.48–0.55 mm wide, obtuse at apex.	Lid deep red.
Peristome	Double	Double	—
Exostome	220 µm long, whitish, finely papillose on outer surface, dorsal trabeculae moderately high	Exostome well developed, 196–235×39–47 µm in size, obtuse at apex, light yellow-brown and finely papillose except at base	Peristome teeth 162 µm long
Endostome	Endostome basal membrane 1/4 of exostome length, white, finely papillose, segments absent	Endostome hyaline, finely papillose, fragile, rudimentary	—
Spores	20–25 µm, reddish brown, finely papillose	19–24 µm, yellowish brown, finely papillose	21–25 µm, smooth.

cells ovate to rectangular, 11–20 × 7–12 µm, thickened at corners, cells smooth, papillae not seen. Sporophytes present on short lateral branches. Perichaetial leaves 0.99–1.16 mm long and 0.33–0.41 mm wide, erect, ovate to elongated, acuminate, margin entire, costate, cells smooth. Seta brown, erect, smooth, 4–7 mm long. Capsules brown, erect, ovate-elongated, 1.5–1.7 mm long and 0.68–0.76 mm wide. Operculum conical, 0.33–0.38 mm long and 0.48–0.55 mm wide, with obtuse apex. Peristome double. Exostome well developed, 196–235 × 39–47 µm in size, obtuse at apex, light yellowish brown and finely papillose except at base. Endostome hyaline, finely papillose, fragile, rudimentary. Spores small, yellowish brown, 19–24 µm in diameter, finely papillose.

Habitat. Plants grow epiphytically on tree bark.

Distribution in the World. China & Russia (Tan *et*

al., 1995, Cao *et al.*, 2002, Huan *et al.*, 2002, Ignatova *et al.*, 2010).

Distribution in India. Garhwal hill in Uttarakhand, Western Himalaya (new record for India).

Specimen examined: Western Himalaya, Uttarakhand, Garhwal hill, Chamoli, Khanotinala, alt. ca. 1678 m, Lat. 30° 31' 70N, Lon. 79° 31' 70E, G. Asthana & party, 05-X-2012, 22472/12 (LWU).

DISCUSSION

Lindbergia sinensis resembles *Lindbergia duthiei* in their overall morphology, especially in the presence of smooth leaf cells, but differs in having smaller, ovate to lanceolate leaves, while leaves are broadly ovate in *Lindbergia duthiei*. Central conducting strand is indistinct in *L. sinensis*, while well developed in *L. duthiei* (Fig. 1:5, Vohra, 1983 Fig. 18:n). Perichaetial leaves are

small, with smooth and entire margin in *L. sinensis* (Fig. 1: 15-17), while they are large, with dentitions at the apical portion in *L. duthiei* (Vohra, 1983 Fig. 18: i). Besides, the spores are finely papillose (Fig. 1: 29) in the former species and smooth in the latter one (see Vohra, 1983 Fig. 18: m).

Ignatova *et al.* (2010) have revised the genus *Lindbergia* in Russia and remarked, "Material of *L. duthiei* studied in H-BR does not show any substantial differences from *L. sinensis*, except for slightly larger plants. They quite likely belong to the same species, which is however better to proof genetically before their formal synonymization". With this remark, they included *L. duthiei* in *L. sinensis* with (?) mark (Ignatova *et al.*, 2010: p. 103,105). At present juncture *L. duthiei* is considered to be a valid species until unless it is formally synonymised with *L. sinensis*. However, the Indian population of *Lindbergia* collected from Uttarakhand has been critically investigated, compared and identified as *L. sinensis* (Table 1).

ACKNOWLEDGEMENTS

Council of Scientific & Industrial Research (CSIR-UGC), New Delhi is greatly acknowledged for financial assistance.

LITERATURE CITED

- ALAM, A. 2013. Moss flora of Western Himalayas, India – An updated checklist. – *Archive for Bryology* **168**: 1–28.
- ALAM, A. 2015. *Moss Flora of India: An Updated Summary of Taxa*. – *Grin Academic Publishing*, Germany. 183 pp.
- CAO, T., S. JUN & G. CHIEN. 2002. Leskeaceae. – In: *Moss Flora of China, English Version*, Vol. 6, Beijing, New York and St.-Louis, Science Press and Missouri Botanical Garden: 99–130.
- DANDOTIYA, D., H. GOVINDPYARI, S. SUMAN, & P.L. UNIYAL. 2011. Checklist of the bryophytes of India. – *Archive for Bryology* **88**: 1–126.
- GANGULEE, H.C. 1978-80. Mosses of Eastern India and adjacent regions. – Calcutta, India. 2145 pp.
- HUAN, W.Y., G. CHIEN & B.C. TAN. 2002. The bryophytes of Gansu Province, China: a new annotated checklist. – *Arctoa* **11**: 11–22.
- IGNATOVA, E.A., M.S. IGNATOV & I.A. MILYUTINA. 2010. A revision of the genus *Lindbergia* (Leskeaceae, Bryophyta) in Russia. – *Arctoa* **19**: 97–116.
- LAL, J. 2005. A checklist of Indian Mosses. – *Bishen Singh Mahendra Pal Singh, Dehra Dun, India*. 164 pp.
- TAN, B.C., J.C. ZAHO, & R.L. HU. 1995. An updated checklist of mosses of Xinjiang, China. – *Arctoa*. **4**: 1–14.
- TEWARI, S.D. & G. PANT. 2002. Bryophytes of Kumaun Himalaya. – *Bishen Singh Mahendra Pal Singh, Dehra Dun, India*. 240 pp.
- VOHRA, J.N. 1983. Records of The Botanical Survey of India, Hypnobryales suborder Leskeineae (Musci) of the Himalayas. – *Botanical Survey of India*. XXIII. 336 pp.