World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(RESEARCH ARTICLE)

Check for updates

New distributional record of mosses from Western Ghats, Karnataka, India

Vijayalakshmi C. Bhat *

Department of Botany, Poornaprajna College (Autonomous), Udupi.

World Journal of Advanced Research and Reviews, 2025, 25(03), 1486-1492

Publication history: Received on 08 February 2025; revised on 16 March 2025; accepted on 19 March 2025

Article DOI: https://doi.org/10.30574/wjarr.2025.25.3.0847

Abstract

Two species *Aulacopilum tumidulum* Thwait. & Mitt. in Mitt., *Pterobryopsis crassicaulis* (C. Muell.) Fleisch. in Hedwigia of the order Isobryales and *Glossadelphus glossoides (*Bosch & Lac.) Fleisch. of the order Hypnobryales form the new distributional record of mosses for India.

Keywords: Bryophytes; Isobryales; Hypnobryales; Mosses

1. Introduction

Mosses are a highly developed group of bryophytes, occupying a unique position between lower cryptogams and vascular cryptogams. Mosses form a natural biotic community and is of aesthetic importance to man. They are the pioneers in the formation of soil and play an important role in plant succession by forming a seedbed for higher plants. Mosses are bio-indicators of climatic change. Their abundance indicates an unpolluted environment. So far, the Western ghats and Coastal belt of Karnataka is less explored with reference to ecologically important moss plants which form the precious link between hepatics and pteridophytes in the chain of evolution. In the present study area, mosses were extensively explored during 2002-2009 for the research study and revision work was undertaken during 2020-24 with reference to new distributional occurrence of mosses. The study revealed that three species of mosses form the new distributional record to India.

In India, mosses are mainly confined to the N. E. Himalayan regions and Western Ghats. A section of Western Ghats, about 400 km, passes through the State of Karnataka.

Moss flora of Western Ghats and Coastal belt of Karnataka is under-explored and the earlier reports of occurrence of mosses is found to be lesser than its richness in the study area. In 1899, Brotherus reported 99 species of mosses belonging to 48 genera from Coorg collected by Dr. T.L.Walker. Sedgwick (1910, 1911 & 1913) compiled a list of 71 species of mosses collected by him, Maxwell, Kirtikar and Woodrow from Mahabaleshwar, Kanara, Panchagani & Purandhar in Western India and were identified by Dixon. During the first half of last century, Dixon's contribution is notable. He (1914) reported 58 species of mosses including 40 genera collected by C. E. C Fischer and others from South India and Ceylon. In 1921, he assigned Sedgwicks's collections from North Kanara into 43 species of mosses under 27 genera. Raghavan and Wadhwa (1968) reported 28 species of mosses belonging to 21 genera and 16 families from Agumbe – Hulical ranges in the Shimoga District of Karnataka State. In 1970 they had presented a key to mosses of Agumbe including two species viz. *Bryosedgwikia densa* (Hook.) Biz. P. Vard. and *Dendropogonella rufescens* (A. Schimp.) Britt. as new records for India. Nair, *et. al*. (2004) reported *Bryum tuberosum* Mohamed & Damanhuri as a new record for India from Udupi of Karnataka State.

* Corresponding author: Vijayalakshmi C. Bhat

The present intensive field study clearly defines that the three species *Aulacopilum tumidulum* Thw. & Mitt., *Pterobryopsis crassicaulis* (C. Muell.) Fleisch. and *Glossadelphus glossoides (*Bosch & Lac.) Fleisch. as the new distributional record to India.

2. Materials and methods

Floristically rich regions such as Agumbe, Bababudan Hill Range, Bisle Ghat, Castle rock, Charmadi Ghat, Kollur, Kotachadri, Narasimha Parvatha at Kigga and Tadiandamole in Western Ghats of Karnataka were given special attention for the subsequent field study of mosses.

Normal taxonomic techniques were followed to collect moss specimens from various localities. Plants were scraped out from the substrata with the help of a sharp edge knife. Terrestrial species were collected with the substratum and the bulk of soil particles were removed leaving a thin film. The high canopy epiphytic species which were not easily accessible were collected from the fallen branches. Corticolous and lithophytic species when strongly attached to the substratum were collected with a portion of the bark and rock respectively.

Each collection was serially numbered, with a tag attached to each specimen. The collection number and the field characters of collected specimens were noted in the field note book on the spot. Special care was taken to note down the habit.

2.1. Species description

2.1.1. Aulacopilum tumidulum Thwait. & Mitt. in Mitt.

- Order: Isobryales
- Family: Erpodiaceae
- Genus **:** *Aulacopilum* Wils.in Lond. J. Bot. 7: 90.1848

Aulacopilum tumidulum Thwait. & Mitt. in Mitt., in J. Linn. Soc. Bot. 13: 307, 5C. 1873.; Bruehl in Rec. bot. Surv. India 13(1): 60. 1931; Chopra in Tax. Indian Moss. 266. 1975. P. 1 (A – E).

Plants green, slender, forming loose tufts. Stem prostrate, radiculose, pinnately branched. Leaves dimorphic, dorsal leaves c. 1.4 x 0.9 mm, asymmetrical, ovate; ventral leaves c. 0.8 x 0.2 mm, symmetrical, lanceolate, apex acuminate or elongated into a hair point; lamina cells up to 10.64 µm in diam, rounded, chlorophyllose, papillose, smooth; marginal cells smaller; alar cells in 3–4 series, quadrate, margin smooth. Sporophyte not seen.

Habitat: On rock.

Specimen examined: Kodagu Dist.: Bhaghamandala, 7-12-02, VCB 149 B (PPCH)., VCB 26, 12-11-2020, (PPCH)

Aulacopilum tumidulum is a rare species which has been recorded from Sri Lanka only. The present collection, therefore, from the Western Ghats of Karnataka, forms a new record for India.

2.1.2. Pterobryopsis crassicaulis (C. Muell.) Fleisch. in Hedwigia

- Order: Isobryales
- Family: Pterobryaceae
- Genus: *Pterobryopsis* Fleisch. In Hedwigia

Pterobryopsis crassicaulis (C. Muell.) Fleisch. in Hedwigia 45: 57. *l.c*, f. 1905. *Neckeracrassicaule* C. Muell., Synop. Musc. Frond. 2: 132. 1850. P. 2 (F – I).

Robust, glossy, green plants. Primary stem creeping, much branched; secondary stems c. 3 cm long, irregularly branched, densely covered with leaves. Stem leaves c. 2.5 x 0.5 mm, non-plicate, erect to spreading when moist, very concave, ovate, cucullate, abruptly subulate at apex, margin entire; branch leaves c. 2.8 x 0.5 mm, concave, ovate, abruptly subentire; nerve single, red, ceasing at c. 2/3 of leaf; cells 38 x 7.6 µm, narrow, elongate, firm-walled; cells at base 46 x 8 µm, larger and broader; alar cells 19 x 11.4 µm, quadrate to irregularly rectangular, reddish-brown. Sporophyte not seen.

Habitat: Epiphyte.

Specimens examined: Chikmagalur Dist.: Kigga, 10-11-03, VCB 696 (PPCH). 20-11-2020, VCB122, Kodagu Dist.: Abbifalls, 8-12-02, VCB 167 A (PPCH).25-10-2022, VCB 136 (PPCH)

Very rare, found growing at higher elevations of Western Ghats in Chikmagalur and Kodagu Districts. This species is so far reported only from Sri Lanka, Indonesia and Philippines. The present collection forms the first record of its occurrence in India.

2.1.3. Glossadelphus glossoides (Bosch & Lac.) Fleisch

- Order: Hypnobryales
- Family: Sematophyllaceae
- Genus: *Glossadelphus* Fleisch. in Musci Fl. Buitenz. 4: 1351. 1923.

Glossadelphus glossoides (Bosch & Lac.) Fleische in Musci Fl. Buitenz. 4: 1358. 1923; Bruehl in Rec. bot. Surv. India 13(1): 108. 1931; Gangulee in Moss. East. India & Adj. Reg. 8: 1929, f. 989. 1980. *Hypnum glossoides* Bosch & Lac. in Bryol. Jav. 2: 146, 243. 1866.P.3 (A – F).

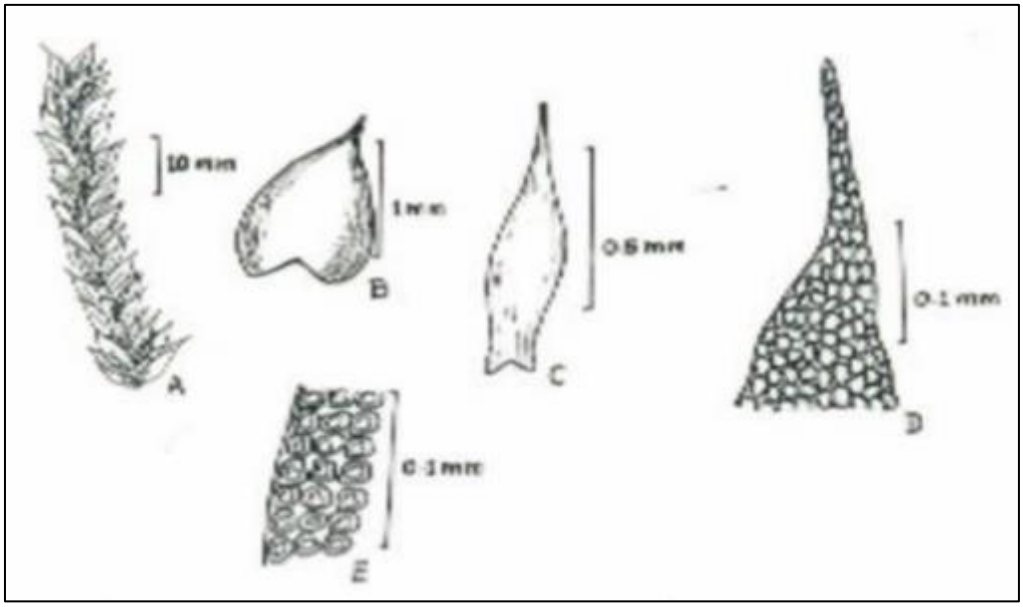
Delicate, yellow-green, somewhat glossy plants forming mats. Primary stem creeping, c. 5 cm long, with pinnate branches; branches short. Stem leaves narrower, pointed; branch leaves c. 0.6 x 0.3 mm, patent when dry, laxly spreading on moist, ovate-oblong with rounded tip, margin sharply dentate; nerve double, short; leaf cells c. 19 x 4 µm, narrow rhomboid, papillae at cell tips; basal cells smooth; extreme basal cells c. 17 x 9 µm, sub rectangular to hyaline. Seta c. 2 cm long, erect, arcuate at top. Capsule horizontal, ovate-cylindrical, curved. Peristome normal, double, c. 0.3 mm high, cilia usually two, short. Operculum conic-apiculate. Spores c. 10–12 µm in diam. smooth.

Habitat: Growing on rocks.

Specimen examined: Shimoga Dist.: Kotachadri, 18-10-03, VCB 367 (PPCH). Kotachadri, 16-8-2020, VCB 18 (PPCH)

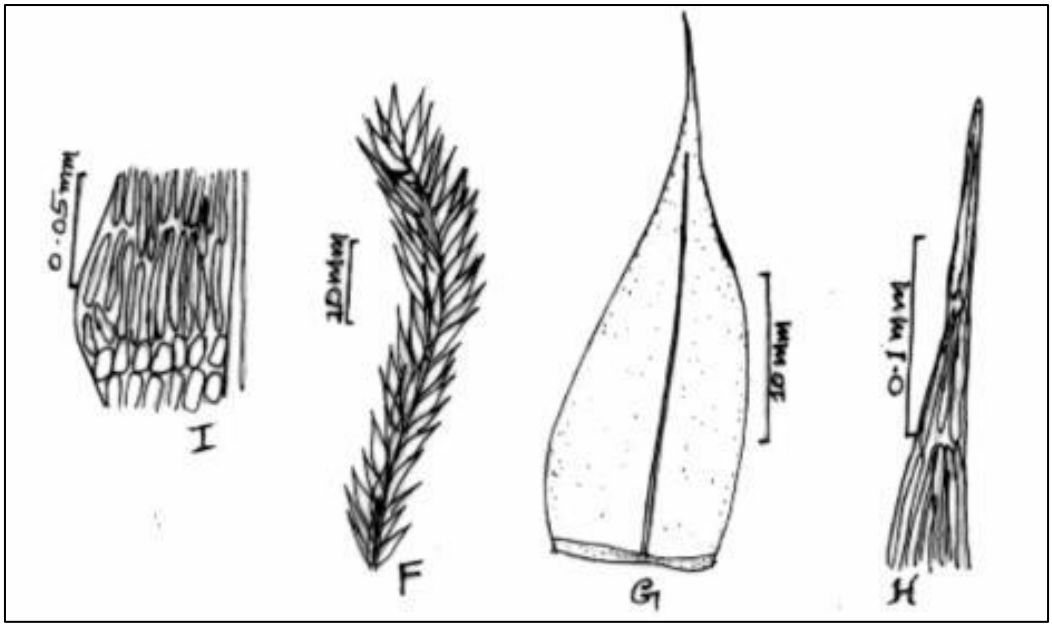
Not common. This species has not been recorded from India till now. So it forms a new distributional record to India.

3. Illustrations



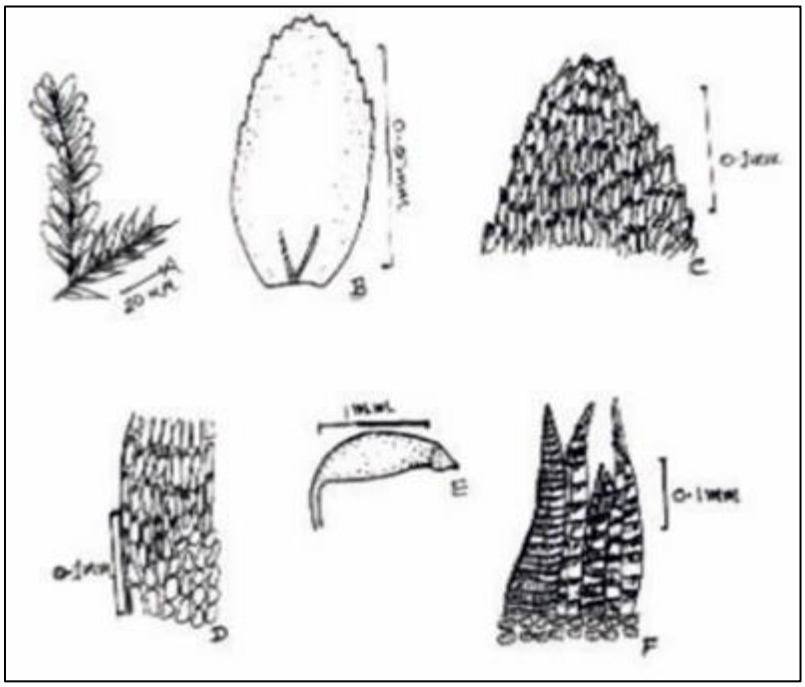
Aulacopilum tumidulum **:** A, habit; B, dorsal leaf; C, ventral leaf; D, leaf apex; E, leaf base

Figure 1 *Aulacopilum tumidulum* Thwait. & Mitt. in Mitt.



Pterobryopsis crassicaulis: F, habit; G, leaf; H, leaf apex; I, leaf base

Figure 2 *Pterobryopsis crassicaulis* (C. Muell.) Fleisch.



Glossadelphus glossoides: A, habit; B, leaf; C, leaf apex; D, leaf base; E, capsule; F, peristome teeth

Figure 3 Glossadelphus glossoides (Bosch & Lac.) Fleische

Compliance with ethical standards

Acknowledgments

I profusely thank Forest Department of Karnataka for permitting field studies.

I am grateful to the authorities of Central National Herbarium, Botanical Survey of India for giving permission to consult the herbarium and library. I thank my institution for providing me research facilities.

References

[1] Blatter, E. 1929. Mosses of Bombay Presidency, the High Wavy Mountain and Mt. Abu. *J. Bomay nat. Hist. Soc.* 33: 869 – 879.

[2] Brotherus, V. F. 1898. Contributions to the Bryological Flora of the North Western Himalayas. *Acta. Soc. Sci. fenn.* 24(2): 1 – 46.

[3] Brotherus, V. F. 1899. Contributions to the Bryological Flora of Southern India. Report on a collection of Mosses made by Dr. J. L. Walker in Coorg. *Rec. Bot. Surv. India.* 1(12): 311 – 329.

[4] Brotherus, V. F. 1901 – 1909. Musci. In: Engler, A. & K. Prantl (eds.), *Die Naturlichen Pfanzen familien* I(3): 277 – 1246.

[5] Brotherus, V. F. 1924. Musci. In: Engler, A. & K. Prantl (eds.), *Die Naturlichen Pflanzenfamilien* ed. 2. Band X. Leipzig.

[6] Brotherus, V. F. 1925. Musci. In: Engler, A. & K. Prantl (eds.), *Die Naturlichen Pflanzen familien* ed. 2. Band XI. Leipzig.

[7] Brotherus, V. F. 1928. Contributions a la flore bryologique de cachmire. *Annls. bryol*. 1: 28 – 48.

[8] Bruehl, P. 1931. A census of Indian Mosses. *Rec. Bot. Surv. India* 13(1): 1 – 135 & (2): 1 – 152.

[9] Bruehl, P. & N. Sarkar. 1929. The mosses of Bengal. *J. Dep. Sci. Calcutta Univ*. 10: 1 - 12.

[10] Chopra, R. N. & V. Kanta. 1966. Some mosses from Delhi, India. Bryologist 69(4): 509 – 510.

[11] Chopra, R. S. 1975. *Taxonomy of Indian Mosses*. Botanical Monograph No. 10. CSIR, New Delhi.

[12] Chopra, R. S., B. K. Abrol & M. S. Banga. 1956. A preliminary list of the Mosses of the Mussoorie Region. *Res. Bull. Panjab. Univ. Sci.* No. 85: 21 – 30.

[13] Chopra, R. S. & S. S. Kumar. 1981. Mosses of the Western Himalayas and adjacent Plains. *Annles Crypt. et Phytopath*. Vol. 5. pp. 140. The Cronica Botanica Co., New Delhi.

[14] Dabhade, G. T. 1966a. Some interesting Mosses of India. *Proc. Of the Autumn School in Botany Mahableshwar*, pp. 91 – 97.

[15] Dabhade, G. T. 1969. Mosses of Mahabaleshwar. M. V. M. *Patrika* 4(2): 94 – 104.

[16] Dabhade, G. T. 1998. *Mosses of Khandala & Mahabaleshwar in the Western Ghats (India).* A. S. Dalvi, Thane.

[17] Daniels, A. E. D. & P. Daniel. 2003. Addition to the bryoflora of Peninsular India. *Indian J. For.* 26: 389 – 396.

[18] Deb, D. C. 1955. Mosses of Manipur. *Bull. bot. Soc. Bengal* 9: 81 – 83.

[19] Dixon, H. N. 1909a. Mosses from Western India. *J. Bombay nat. Hist. Soc* 19: 536 – 537.

[20] Dixon, H. N. 1909b. Mosses from Western India. *J. Bot., Lond*. 47: 157 – 164.

[21] Dixon, H. N. 1914. Report on the mosses of the Abor expedition 1911 – 12, and report on the mosses collected by Mr. C. E. C. Fischer and others from South India, Ceylon. *Rec. Bot. Surv. India* 6(3): 55 – 73; 75 – 89.

[22] Dixon, H. N. 1921. On a collection of mosses from Kanara District. *J. Indian Bot*. 174 – 188.

[23] Dixon, H. N. 1922. Some new genera of mosses. *J. Bot., Lond*. 60: 101 – 110.

[24] Dixon, H. N. 1925. Mosses from the Mt. Everest expedition, 1924. *J. Bot., Lond.* 63: 221

[25] Dixon, H. N. 1931. New genera of Asiatic mosses. *J. Bot., Lond.* 69: 1 – 7.

[26] Dixon, H. N. 1932. Classification of mosses. In: Verdoorn, *Manual of Bryology*, pp. 397 - 412.

[27] Dixon, H. N. 1937. Mosses collected in Assam. *J. Bombay nat. Hist. Soc.*39: 769 – 795.

[28] Dixon, H. N. 1942. Some new species of Acrocarpous Mosses from North-West Himalayan Flora. *150th Anniv. Vol. R. bot. Gdn., Calcutta.* Pp. 173 – 182.

[29] Dixon, H. N. & R. L. Badhwar. 1938. Some new North-West Himalayan Mosses. *Rec. Bot. Surv. India* 12(2): 163 – 173.

[30] Dixon, H. N. & Potier De La Varde. R. 1927. Contribution a la flore bryologique de l'Inde meridionales. *Archs Bot. Bull. mens.* 1(8-9): 161 – 184.

[31] Dixon, H. N. & Potier De La Varde. R. 1928. Musci Novi Indici. *Annls Cryptog. exot.* 1: 37 – 47.

[32] Dixon, H. N. & Potier De La Varde. R. 1930. Nouvelle contribution a la flore bryologique de l'Inde. *Annls Cryptog. exot.*3: 168 – 193.

[33] Easa, P. S. 2003. *Biodiversity documentation for Kerala, Part IV: Bryophytes*. KFRI Handbook No. 17. Kerala Forest Research Institute, Peechi.

[34] Ellis, L. T. 1992b. Towards a moss flora of Southern India. *Bryobrothera* 1: 133 – 136.

[35] Foreau, G. 1930 – 1931. Notes on Bryological Geography for the Presidency of Madras. *J. Madras Univ*. 2: 238 – 250. 1930; 3: 118 – 126. 1931.

[36] Foreau, G. 1961. The moss flora of the Palni hills. *J. Bomby nat. Hist. Soc.* 58: 13 – 47.

[37] Foreau, G. 1964. Some South Indian mosses. *J. Bomby nat. Hist. Soc.*61: 223 – 226.

[38] Gangulee, H. C. 1985. *Handbook of Indian Mosses.* Amerind Publishing Co., New Delhi.

[39] Harvey, W. H. & J. D. Hooker. 1840. Musci Indici. *J. Bot. (Hooker) & Kew Garden Misc.* 2: 1 – 21.

[40] Madhusoodanan, P. V. & M. C. Nair. 2004. Pleurocarpous mosses of Eravikulam National Park, Kerala I. *J. Econ. Taxon. Bot.* 28: 338 – 346.

[41] Nair, M. C. & P. V. Madhusoodanan. 2001. Contribution to the bryophyte flora of Eravikulam National Park, Kerala. *J. Econ. Taxon. Bot.* 25: 569 – 574.

[42] Nair, M. C. & P. V. Madhusoodanan. 2002. Studies on the bryophyte flora of Kerala (South India) – an introduction. *J. Econ. Taxon. Bot.* 26: 697 – 708.

[43] Nair, M. C. & P. V. Madhusoodanan. 2006. A preliminary checklist of Bryophytes of Vellarimala in the Western Ghats of Kerala. *Indian J. For*estry 29: 191 – 196.

[44] Nair, M. C., K. P. Rajesh & P. V. Madhusoodanan. 2005. *Bryophytes of Wayanad in Western Ghats.* Malabar Natural History Society, Calicut.

[45] Narayan, B., P. V. Karunakaran & D. K. Singh. 2001. Contribution to the Bryoflora of Great Himalayan National Park, Kullu, Himachal Pradesh – I. *Indian J. For*estry 24: 265 – 278.

[46] Noguch, A. 1958. A small collection of mosses from southern India. *Kumamoto J. Sci.* Ser. B, Sect. 2, 4: 1 – 4.

[47] Ochi, H. 1956. Supplement to the north-western Himalayan Mosses. *Bryologist* 59: 213 –216.

[48] Ochi, H. 1964. Notes on Asiatic moss flora II. Mosses of the family Bryaceae and Bartramiaceae collected by the members of the Univ. Tokyo Bot. Exped. to Eastern India 1960. *J. Jap. Bot*. 39: 49 – 55.

[49] Raghavan, R. S. & B. M. Wadhwa. 1968. Mosses of Agumbe – Hulical ranges, Shimoga District (Western Ghats). *Bull. Bot. Surv. India* 10: 344 – 347.\

[50] Raghavan, R. S. & B. M. Wadhwa. 1970. Mosses of Agumbe (Shimoga District, Mysore State) II. Key to species and new records for India. *M. V. M. Patrika* 5: 28 – 35.

[51] Sedgewick, L. J. 1910. A first list of mosses from western India. *J. Bombay nat. Hist. Soc.* 19: 938 – 942.

[52] Sedgewick, L. J. 1911. A second list of mosses from western India. *J. Bombay nat. Hist.Soc.* 20: 1043 – 1045.

[53] Sedgewick, L. J. 1913. A third list of mosses from western India. *J. Bombay nat. Hist. Soc.* 22: 370 – 371.

[54] Srinivasan, C. 1974. *Mosses of South India*. Annamalai University, Annamalai Nagar.

[55] Srinivasan, K. S. 1968. An ecological and distributional resume of the liverworts and mosses of India. *Bull. Bot. Surv. India* 10: 377 – 380.

[56] Srivastava, J. P. 1966. Mosses of Kumaon. 1. *Proc. nat. Acad. Sci*. *Sect, B*, 36: 385 – 396.

[57] Vohra, J. N. 1969a. A contribution to the moss flora of Western Himalayas I. *Bull. Bot. Surv. India* 11: 41 – 50.

[58] Vohra, J. N. 1970. A contribution to the moss flora of Western Himalayas II. Bull. Bot. Surv. India 12: 97.

[59] Vohra, J. N. 1981b. 250 mosses collected from Mullaperiyar and its catchment area in Idukki dist. of Kerala. *B.S.I. news letter* 7(1): 2.

[60] Vohra, J. N., K. N. Roychoudhary, K. N. Gosh, R. K. Kar, B. D. Singh & R. K. Singh. 1982. Observations on the Cryptogamic flora of Silent Valley. In. *Botanical Studies on Silent Valley*, Special Bulletin, Botanical Survey of India, Howrah, pp. 1 – 40.

[61] Wadhwa, B. M. & J. N. Vohra. 1965. On a collection of bryophytes made by the Indian Cho Oyu Expedition, 1958. *J. Bombay nat. Hist.* Soc. 62: 259 – 265.

[62] Wijk Vander, R., W. D. Margadent & P. A. Florschut. 1964. *Index Muscorum*. Vol. III.Utrechet

[63] Wijk Vander, R., W. D. Margadent & P. A. Florschut. 1967. *Index Muscorum*. Vol. IV.Utrechet