



## *Eriocaulon govindiana* sp. nov. (Eriocaulaceae), from southern Western Ghats, Kerala, India

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(Manuscript received 24 February 2017; accepted 20 October 2017; online published 16 November 2017)

**ABSTRACT:** A new species, *Eriocaulon govindiana* Sunil & Ratheesh, from marshy areas in the Wayanad wildlife Sanctuary, Kerala, India, is described and illustrated. It is morphologically most similar to *E. nepalense* but differs mainly in having well developed root stock, rounded and involute leaf apex, lobed limb of sheath, and usually a single hoary male petal. Information on habitat, distribution, phenology, and conservation status are provided.

**KEY WORDS:** Chedalayam, *Eriocaulon govindiana*, Eriocaulaceae, India, Wayanad wildlife Sanctuary.

### INTRODUCTION

The genus *Eriocaulon* L. (Eriocaulaceae) is distributed mainly in tropical and warm temperate regions of the world with about 485 species and 40 intra-specific taxa (Govaerts, 2014). In India the genus is represented by ca. 80 species grouped under 12 sections (Ansari & Balakrishnan, 2009). In recent years several new species have been described from different parts of India (Biju *et al.*, 2012; Swapna *et al.*, 2012; Sunil *et al.*, 2013, 2015a, 2015b; Rashmi and Krishnakumar, 2014; Manudev *et al.*, 2015).

During a floristic exploration of the Wayanad District of Kerala State in the Peninsular Indian region, the authors collected an interesting *Eriocaulon* from high altitude wetland and after critical analysis concluded that it is distinct from any hitherto known species. Therefore it is described here as new species.

### TAXONOMIC TREATMENT

*Eriocaulon govindiana* Sunil & Ratheesh sp. nov.

**Figs. 1–3**

**Type:** INDIA: Kerala, Wayanad District, Wayanad wildlife Sanctuary, Valluvadi, open marshy areas in moist deciduous forests, (11°50'36.8"N 75°78'30.2"E), 853 m, 16 September 2015, Sunil C.N. & Ratheesh Narayanan M.K. 4912 (Holotype CAL!; Isotype MH!).

*Eriocaulon govindiana* Sunil & Ratheesh resembles *E. nepalense* Prescott ex Bongard which has similar transversely elongated seed coat cells with setiform appendages that arise from the middle of transverse radial walls, deeply 3-lobed male spathe and many peduncles, but differs mainly by the presence of

rootstock, rounded and involute leaf apex, 2-3 lobed limb of sheath, 1 or 3 dissimilar male corolla lobes, two similar and flat female sepals or dissimilar 3 female sepals and glabrous female petals with hoary apex. The new species also looks like *E. richardianaum* (Fyson) Ansari & Balakr. through its well-developed rootstock and unequal female sepals with distinctly narrowed odd sepals, but is easily distinguished by the rounded and involute leaf apex, 2-3 lobed limb of sheath, black anthers and 1–3 seed coat appendages from about the middle of transverse radial walls. Diagnostic morphological characters of the three species are given in Table 1.

Acaulescent herbs. Rootstock 0.5–4 cm long. Leaves rosulate, 3–7 × 0.3–1 cm, linear-lanceolate, microscopically scabrid at margins, rounded and involute at apex, 5–9 nerved, glabrous. Peduncles 6–42 per plant, erect, 10–32 cm long, striate, glabrous. Sheath 3–5 cm long; limb 4–7 mm long, split into 2–3 oblong-acute lobes. Head 3.5–4.5 × 4–5 mm, hemispherical, black; receptacles ovoid, glabrous. Involucral bracts 1.5–2 × 1–1.6 mm, oblong-obovate, truncate at base (broadly cuneate), rounded or obtuse at apex, chartaceous, glabrous, black to pale straw coloured. Floral bracts 1.6–2.2 × 0.6–1 mm, oblanceolate or obovate-oblanceolate, acute at apex, chartaceous, glabrous or sparsely hoary abaxially towards apex. Male flowers: pedicel 0.2–0.4 mm long. Sepals 3, connate below into a 1.5–1.7 mm long spathe, deeply 3-lobed to below the middle; lobes 1–1.3 × 0.2–0.4 mm, oblanceolate, acute to acuminate at apex, glabrous towards tip, black. Corolla white; tube 0.6–1 mm long, narrowly campanulate; lobes usually 1, 0.5–1 mm long, hoary, eglandular, rarely 3, very unequal,

**Table 1:** Morphological difference between *Eriocaulon govindiana*, *E. nepalense* and *E. richardianum*.

Character	<i>Eriocaulon nepalense</i>	<i>E. govindiana</i>	<i>E. richardianum</i>
Root stock	Absent	Present, 0.5–4 cm long	Present, ca. 1.5 cm long
Leaves	Up to 10 cm long, margins smooth, sub-acuminate to obtuse at apex	3–7 cm long, scabrid at margins, rounded and involute at apex	Up to 25 cm long, margins smooth, sub-acute or obtuse at apex
Limb of sheath	Entire, obtuse	Split into 2–3 acute lobes	Entire, acute
Involucral bracts	Obovate-cuneate, entire or lacerate, ca. 2 mm long	Oblong-obovate, rounded to obtuse at apex, 1.5–2 mm long	Oblong or oblanceolate, sub-acute at apex, 3–4 mm long
Male spathe	Ca. 1.5 mm long, deeply 3-lobed with obtuse lobes, hoary towards tip	1.5–1.7 mm long, deeply 3-lobed, with acute to acuminate lobes, glabrous towards the tip	Ca. 1.25 mm long, shallowly 3-lobed with obtuse lobes, hoary at apex
Male petals	3, minute, sub-equal, glabrous, eglandular	Usually 1, 0.5–1 mm long, hoary, eglandular; rarely 3, very unequal, lateral ones minute, eglandular, odd one 0.5–1 mm long	3, sub-equal, sparsely hoary with a black gland
Anthers	Black	Black	Dark brown
Female sepals	3, similar, conduplicate, minutely keeled, hoary towards apex	2 equal or 3 unequal with middle one smaller and narrower, flat, glabrous towards apex	3, unequal, the two lateral ones oblanceolate, conduplicate, keeled, barbate along keels and margins
Female petals	Pilose, not hoary	Not pilose, sparsely hoary at apex	Ciliate along margins and barbate at apex
Seed appendages	1–4 from about the middle of transverse radial walls so that they appear to be in vertical rows on the surface of seeds, setiform with truncate apex	1–3 from about the middle of transverse radial walls so that they appear to be in vertical rows on the surface of seeds, setiform with truncate apex	5–6 from the transverse radial walls which appear to be in transverse rings on the surface of seeds, setiform with dilated apex

lateral ones minute, eglandular, odd one 0.5–1 mm long. Stamens 6; filaments 0.4–0.6 mm long, hyaline; anthers black. Female flowers: pedicel minute, ca. 0.2 mm long. Sepals 2 or 3, free, 1.4–2 × 0.2–0.3 mm, linear or linear-oblanceolate, acute to acuminate at apex, flat, glabrous towards apex, black; the middle one often smaller and narrower or altogether lacking. Petals 3, equal, 1–1.3 × ca. 0.2 mm, oblanceolate or linear-oblanceolate, obtuse or acute at apex, hyaline, sparsely hoary at apex, eglandular. Stipitate between sepals and petals. Ovary sessile, 0.3–0.45 mm long, ovoid, trigonous, style 0.4–0.5 mm long; stigmas 3, 0.4–0.5 mm long, minutely papillose. Seeds 0.65–0.9 × 0.4–0.55 mm, ellipsoid, obtuse, yellow; cells of seed coat transversely elongated, aligned in vertical rows; appendages 1–3 from about the middle of transverse radial wall so that they appear to be in vertical rows on the surface of seeds, setiform, truncate at apex.

**Flowering & Fruiting:** September – January.

**Habitat and ecology:** The species has a restricted distribution in swampy open areas in the moist deciduous forests of Wayanad wildlife Sanctuary, Wayanad District, Kerala, India. The plant grows in association with *Eriocaulon longicuspis* Hook.f., *Rotala rotundifolia* (Buch. Ham. Roxb.) Koehne, *Ludwigia peruviana* (L.) H. Hara, *Limnophila rugosa* (Heyne ex Roth.) Merrill, *Ischaemum* sp., *Fimbristylis salbundia* (Nees) Kunth. and *Impatiens* sp.

**Etymology:** The epithet is proposed in honour of Late Prof. P.V. Govindankutty, former Professor of Botany, Payyanur College, Kannur, Kerala, India.

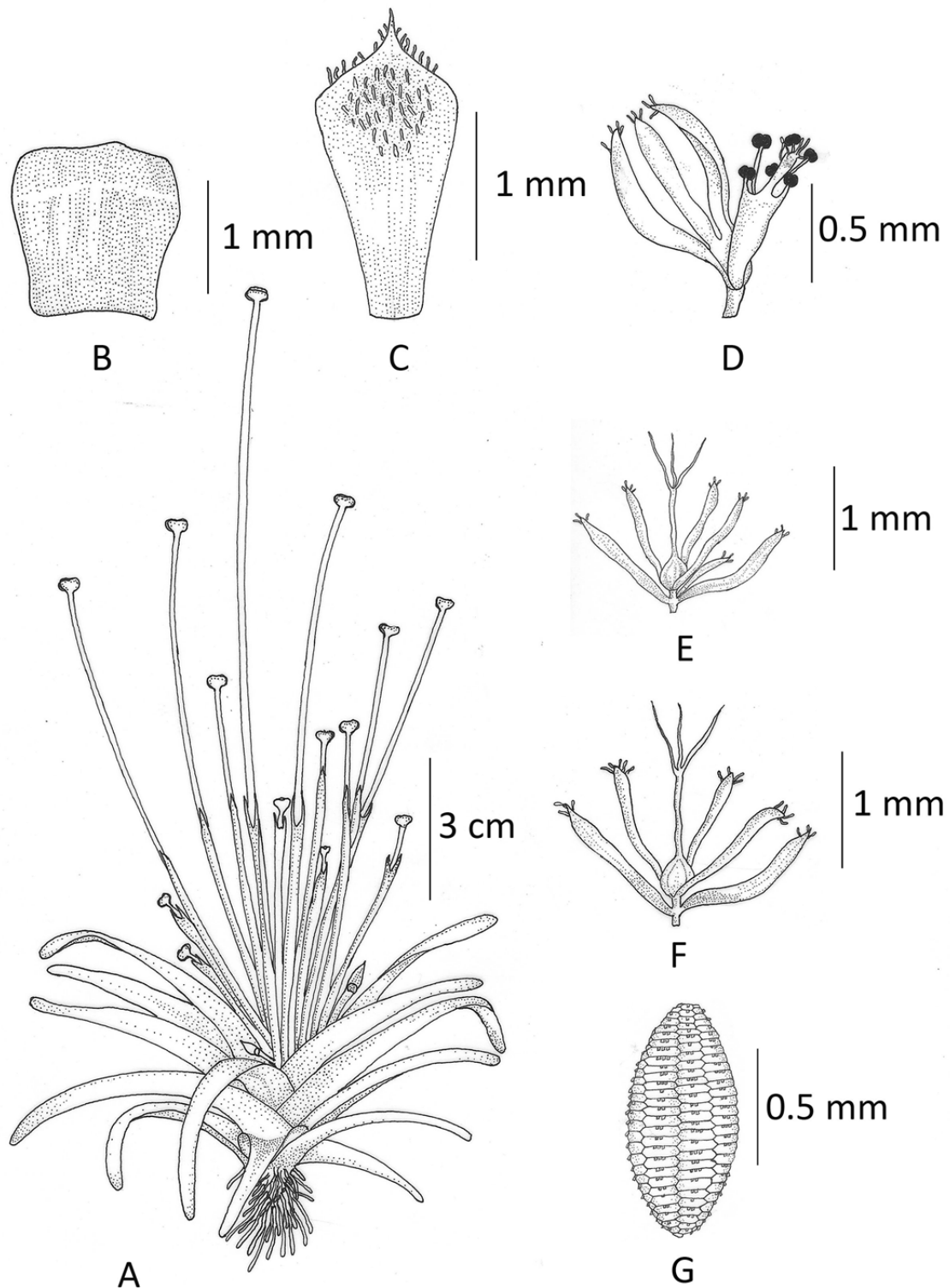
**Conservation status:** Populations of the new species are fragmented, seen in swampy open areas of moist deciduous forests at ca. 800 m elevations and

represented by a few scattered mature individuals in two localities of Wayanad wildlife Sanctuary. In both localities there were only less than 50 individuals restricted to an area of 1 km<sup>2</sup>. The population at Valluvady is adjacent to human habitation and prone to grazing. The population at Chedalayam is adjacent to the State highway. Increased anthropogenic pressure in the form of non-timber forest products collection; tourism, widening and clearing of road sides worsen the situation. Further field explorations are essential to have a thorough knowledge on range of distribution and assessment of status of the species; and hence as per IUCN categories and criteria (IUCN 2012) it is herein categorized as ‘Data Deficient’ (DD).

**Paratype:** INDIA, Kerala, Wayanad District, Wayanad wildlife Sanctuary, Chedalayam, moist deciduous forests, 850m, 23 November 2016, Sunil C.N. & Ratheesh Narayanan M.K. 5612 (SNM College Herbarium, Maliankara, Ernakulam).

## ACKNOWLEDGEMENTS

The authors are grateful towards Dr J.F. Veldkamp, Leiden, for a critical review of the manuscript. The encouragements provided by the Manager and Head of the Department of Botany, Sree Narayana Mangalam College, Maliankara, Kerala, India and the President and Principal of the Payyanur College, Payyanur, Kerala, India are acknowledged. The various help rendered by Mr K.T. Satheesh, M.S. Swaminathan Research Foundation and officials of Kerala Forest Department are thankfully remembered.



**Fig. 1.** *Eriocaulon govindiana* Sunil & Ratheesh. **A.** Habit; **B.** Involucral bract; **C.** Floral bract; **D.** Male flower; **E.** Female flower with three sepals; **F.** Female flowers with two sepals; **G.** Seed.

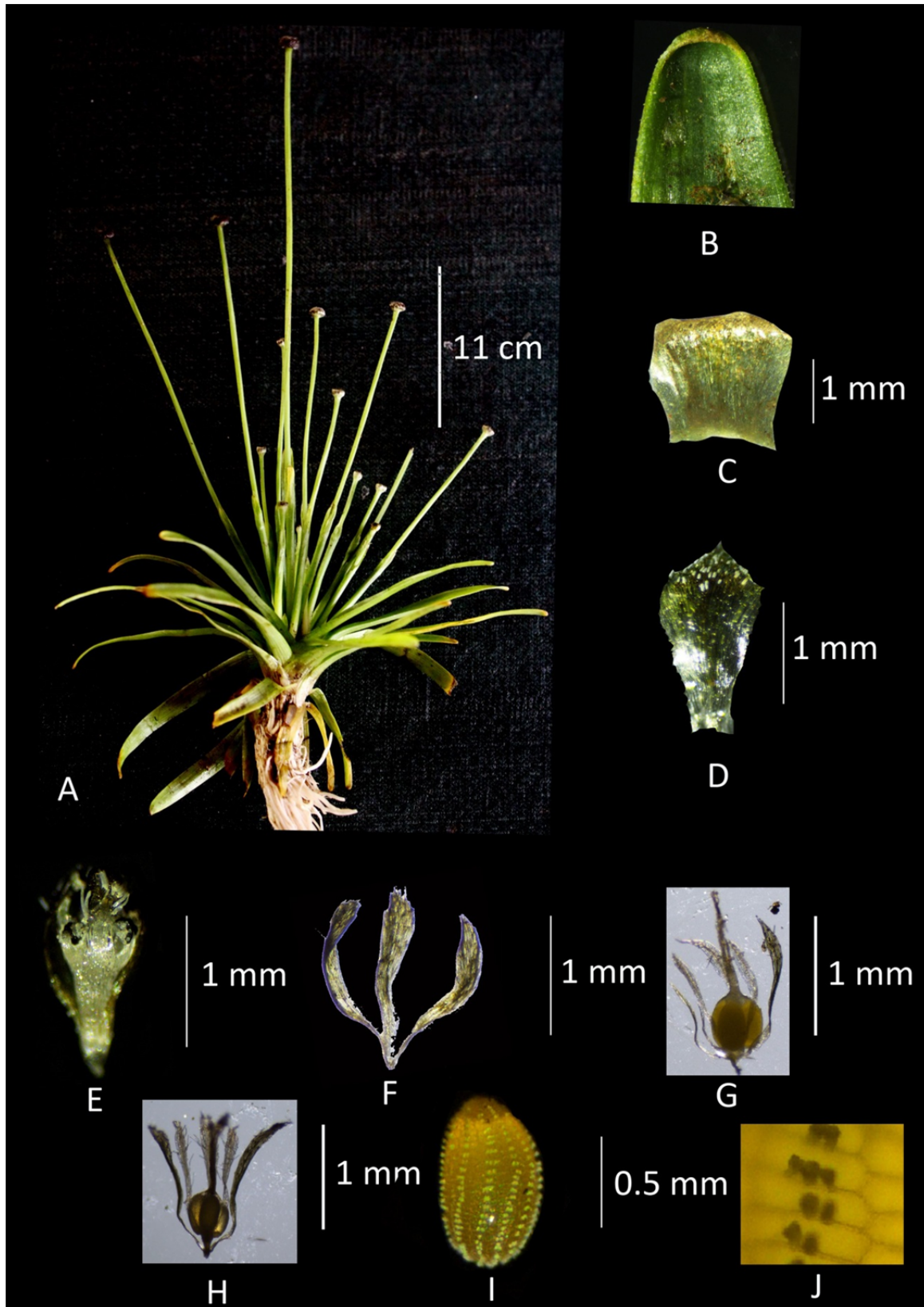
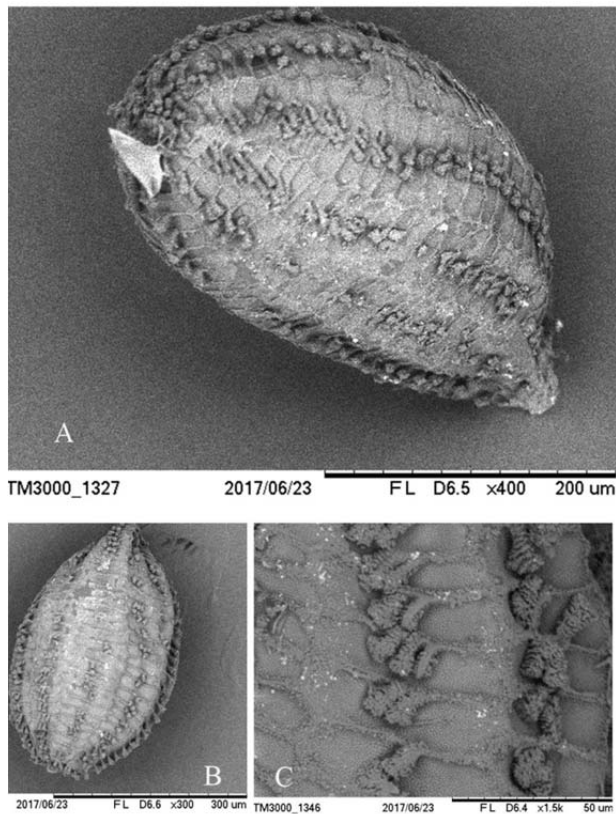


Fig. 2. *Eriocaulon govindiana* Sunil & Ratheesh. A. Habit; B. Leaf apex; C. Involucral bract; D. Floral bract; E. Male flower showing large odd petal; F. Male sepal; G. Female flower with three sepals; H. Female flowers with two sepals; I. Seed; J. A portion of seed enlarged showing cells and appendages.



**Fig. 3.** Scanning electron micrographs of *Eriocaulon govindiana* seed. **A. & B.** Entire view of seed coat; **C.** A portion enlarged showing transversely elongated cells with appendages.

## LITERATURE CITED

- Ansari, R. and N.P. Balakrishnan** 2009. The Family Eriocaulaceae in India. Revised edition. Bishen Singh Mahendra Pal Singh: Dehra Dun.
- Biju, P., Subrahmanya Prasad, K, P. Ajith Kumar, , Jomy Augustien, , K. R. Raveendran and V. Ansari.** 2012. *Eriocaulon cheemenianum* (Eriocaulaceae), a new species from Kerala, India. *Int. J. Pl. Anim. Environ. Sci.* **2(4)**: 176-179.
- Govaerts, R.** 2014. World checklist of Eriocaulaceae. Royal Botanic Gardens, Kew. [cited 2016 Dec. 11]. Available from: <http://apps.kew.org/wcsp/>.
- IUCN** 2012. IUCN red list categories and criteria, ver. 3.1. IUCN Species Survival Commission.
- Manudev, K.M., A.J. Robi, and S. Nampy.** 2015. *Eriocaulon biappendiculatum*, a new species of Eriocaulaceae from the southern Western Ghats, India. *Edinb. J. Bot.* **72(2)**: 219-223.
- Rashmi, K. and Krishnakumar, G.** 2014 . *Eriocaulon gopalakrishnanum* sp. nov. (Eriocaulaceae) from the Western Ghats, India. *Nord. J. Bot.* **32**: 146-149.
- Sunil, C.N., M.K. Ratheesh Narayanan, M.K. Nandakumar, K.A. Sujana, P.J. Jayesh, N. Anil Kumar.** 2013. *Eriocaulon kannurensis* (Eriocaulaceae), a new species from Kerala, India. *Int. J. Pl. Anim. Environ. Sci.* **3(2)**: 116-120.
- Sunil, C.N., M.K. Ratheesh Narayanan, M. Sivadasan, , A.H. Alfarhan, and V. Abdul Jaleel,** 2015a. *Eriocaulon vandaanamense* sp. nov. (Eriocaulaceae) from Kerala, India. *Nordic J. Bot.* **33(2)**: 155-158.
- Sunil C.N. and V.V. Naveen Kumar.** 2015b. A new species of Eriocaulon (Eriocaulaceae) from Western Ghats, India, *Webbia* **70(2)**: 211-215.
- Swapna, M.M., K.P. Rajesh, C.N. Manju and R. Prakash Kumar** 2012. *Eriocaulon madayiparensis* (Eriocaulaceae) a new species from the foot hills of the Western Ghats of India. *Phytokeys* **10**: 19-23.