

Kalanchoe dineshii (Crassulaceae), a new species from southern Western Ghats, India

Syam Radh SASI¹, Santhosh NAMPHY^{2*}

^{1,2}Department of Botany, University of Calicut, Malappuram, Kerala 673635, India

*Correspondence: santhoshnamphy2019@gmail.com

¹<http://orcid.org/0000-0002-5697-6972>

²<http://orcid.org/0000-0001-5744-7522>

Abstract. A new species of *Kalanchoe* (Crassulaceae), *K. dineshii* Syam Radh & Nampy, is described and illustrated. The new species occurs in the Mathikettan Shola National Park in southern Western Ghats, Kerala, India, and it is only known from the Idukki district. It is morphologically most similar to *K. bhidei*, but distinguished from the latter by its small stature (30–40 cm high), obovate to obovate sessile leaves adnate to stem in the basal 1/4th, and widely ovate calyx lobes. Information is also given on the distribution, habitat, phenology, and conservation status of the new taxon.

Keywords. Idukki district, Mathikettan Shola National Park, Western Ghats, taxonomy.

Resumen. Se describe e ilustra una nueva especie de *Kalanchoe* (Crassulaceae), *K. dineshii* Syam Radh & Nampy. La nueva especie se encuentra en el Parque Nacional Mathikettan Shola, en el sur de los Ghats occidentales, Kerala, India, y solo se conoce del distrito de Idukki. Es similar en su morfología a *K. bhidei*, pero puede distinguirse de ésta por su menor tamaño (30–40 cm de altura), hojas sésiles, de obovadas a obovadas, adnatas al tallo en 1/4 de su longitud, y lóbulos del cáliz anchamente ovados. Se aporta también información sobre la distribución, hábitat, fenología y estatus de conservación de este nuevo taxón.

Palabras clave. Distrito de Idukki, Ghats occidentales, Parque Nacional Mathikettan Shola, taxonomía.

How to cite this article: Sasi S.R., Nampy S. 2022. *Kalanchoe dineshii* (Crassulaceae), a new species from southern Western Ghats, India. *Anales del Jardín Botánico de Madrid* 79: e127. <https://doi.org/10.3989/ajbm.2591>

Title in Spanish: *Kalanchoe dineshii* (Crassulaceae), una nueva especie del sur de los Ghats occidentales, India.

Associate Editor: José María Cardiel. Received: 26 February 2022; accepted: 21 July 2022; published online: 25 January 2023.

INTRODUCTION

Kalanchoe Adans. (Crassulaceae) sensu lato includes about 150 species worldwide, with its centre of diversity in Madagascar (Smith & Figueiredo 2018, 2019). *Kalanchoe* is the fourth species-rich genus in Crassulaceae after *Sedum* L. (463 spp.), *Crassula* L. (205 spp.), and *Echeveria* DC. (197 spp.) (POWO 2022).

Hamet (1907) treated *Kalanchoe*, *Bulbophyllum* Thouars, and *Kitchingia* Baker as a single genus, while Boiteau (1947) proposed to divide *Kalanchoe* into three sections: *Kalanchoe* sect. *Eukalanchoe*, *K.* sect. *Kitchingia* (Baker) Boiteau, and *K.* sect. *Bryophyllum* (Salisb.) Boiteau. POWO (2022) included 160 species in *Kalanchoe*, with its native range in tropical and subtropical Old World. The most recent species level treatment of *Kalanchoe* was published by Descoings (2003, 2006) who provided an infrageneric classification for *Kalanchoe*, recognizing three subgenera: *Kalanchoe* subgen. *Kalanchoe*, *K.* subgen. *Bulbophyllum* (Salisb.) Koorders, and *K.* subgen. *Calophygia* Descoings. Smith & Figueiredo (2018) also recognized three subgenera, but replacing the subgen. *Calophygia* by *K.* subgen. *Kitchingia* (Baker) Gideon F.Sm. & Figueiredo.

Clarke (1878) reported six species of *Kalanchoe* in the *Flora of British India*, while Singh & al. (2011) included nine species from India. Gamble (1919) recorded six species in *Flora of Presidency of Madras*, which include two endemic species: *K. olivacea* Dalzell and *K. bhidei* T.Cooke, which were not discussed by Clarke (1878). Nandikar & al. (2019) provided a detailed analysis of the above species, including their typification. Scientific surveys between 2014 and 2018, as a part of documenting the flowering plant diversity of Mathikettan Shola National Park, resulted in collecting a few specimens of *Kalanchoe*. Detailed studies in consultation with type/protologue of the related species and relevant literature (Wight 1846; Cooke 1903; Hamet 1907; Gamble 1919; Boiteau 1947; Gandhi 1976; Srinivasan 1983; Deshpande & Sharma 1984; Rao 1984; Sharma & al. 1984; Godbole & Das 2000; Descoings 2003, 2006; Chernetskyy 2011; Singh & al. 2011; Sasidharan 2012; Chorghé & al. 2017; Smith & Figueiredo 2018, 2019; Nandikar & al. 2019) revealed that the collected specimens represent a hitherto undescribed species, which is established here as new to science.

MATERIALS AND METHODS

More than 20 specimens that represented a new taxon were collected from four adjoining populations in Mathikettan Shola National Park. The flowers were pickled in 4% formalin and 70% ethanol for further study. The herbarium specimens were prepared by conventional methods (Bridson & Forman 1991). The description was prepared after examining all available specimens of the new taxon. The specimens of related taxa in CALI herbarium, and digital images of types of other *Kalanchoe* species at K and P herbaria were also examined. The conservation status of the new species was assessed as per IUCN Red List Categories and Criteria (IUCN 2022). Photographs of habitat and habit were taken with an α

A55 DSLR camera (Sony, Japan) and floral details with a Stemi 508 stereo microscope (Zeiss, Germany) outfitted with an Axiocam 105 color camera (Zeiss). Illustrations were drawn by camera lucida attached to a Stemi 508 stereomicroscope.

RESULT AND DISCUSSION

Taxonomic treatment

Kalanchoe dineshii Syam Radh & Nampy, **sp. nov.** Type: India, Kerala: Idukki district, Mathikettan Shola National Park, Near Aduvizhunthankudi, c. 1590 m, 22 Nov. 2014, S.S. Radh & S. Nampy 137816 (holotype: CALI!; isotype CAL!). Figs. 1 & 2.

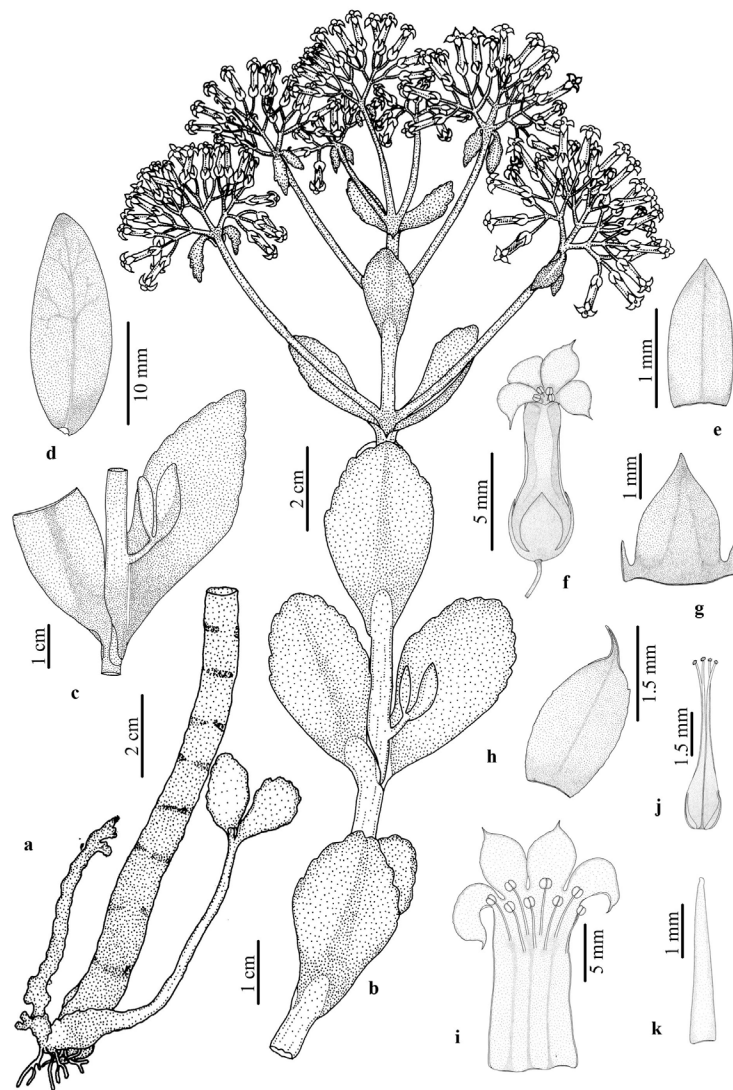


Fig. 1. *Kalanchoe dineshii* Syam Radh & Nampy, sp. nov.: **a**, stem basally showing leaf scars and new shoots; **b**, flowering twig; **c**, leaves adnate to stem in the basal $\frac{1}{4}$ th; **d**, involucre bract; **e**, floral bract; **f**, flower; **g**, calyx lobe; **h**, corolla lobe showing a caudate apex; **i**, corolla cut opened; **j**, gynoecium; **k**, nectar scale [from: S. Syam Radh & S. Nampy 137816; illustration: S. Syam Radh].

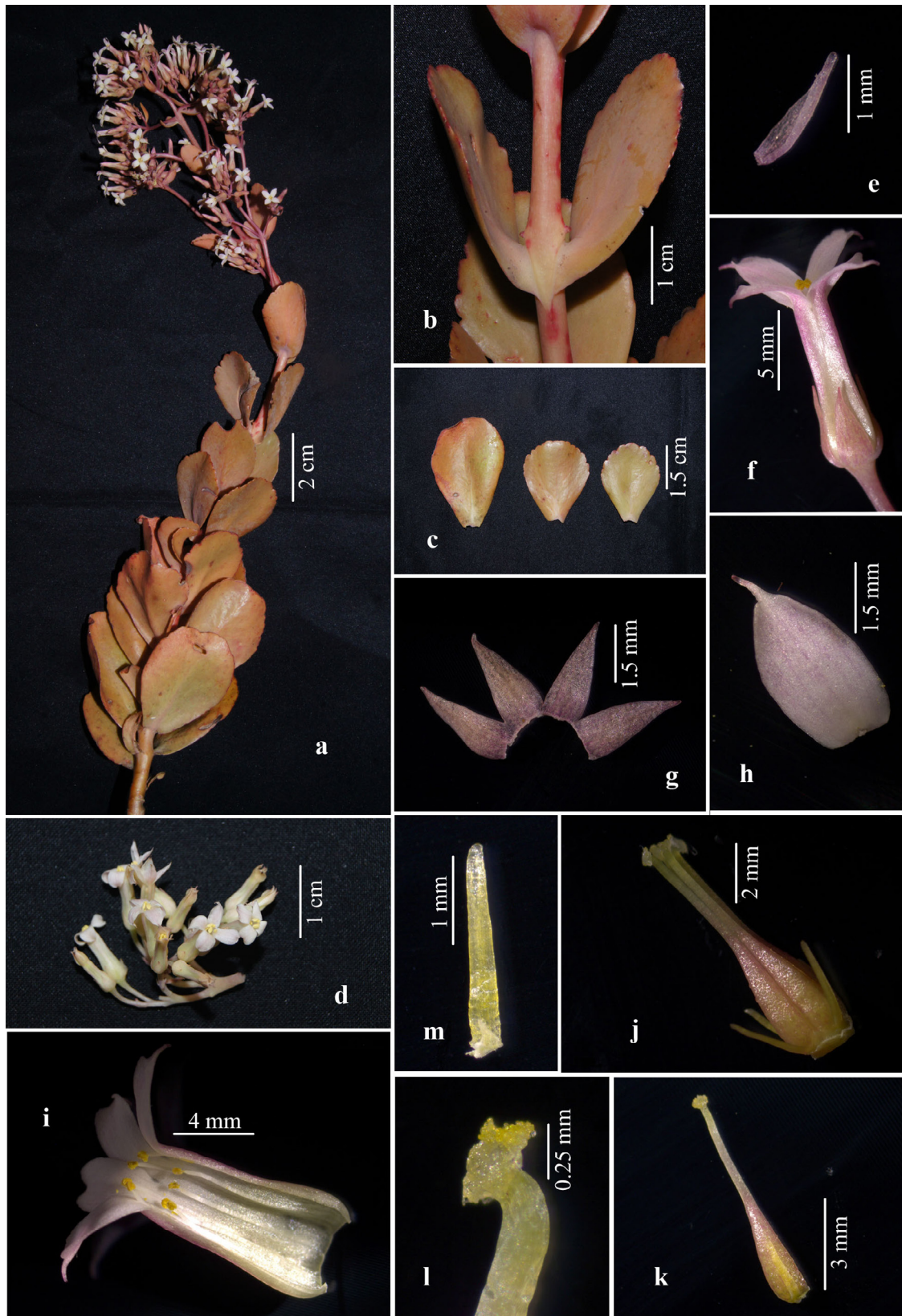


Fig. 2. *Kalanchoe dineshii* Syam Radh & Nampy, sp. nov.: **a**, flowering branch; **b** & **c**, leaves adnate to stem in the basal $\frac{1}{4}$ th and the undulate to incised margins distally; **d**, branch of the inflorescence; **e**, bract; **f**, flower; **g**, calyx split opened; **h**, corolla lobe showing the caudate apex; **i**, corolla cut opened; **j**, gynoecium showing the nectar scales at the base; **k**, carpel; **l**, stigma; **m**, nectar scale [from: S. Syam Radh & S. Nampy 137816; photos: S. Syam Radh].

Diagnosis.—*Kalanchoe dineshii* is morphologically close to *K. bhidei* but can be easily distinguished from the latter by its smaller size (up to 40 vs. up to 100 cm tall in *K. bhidei*), sessile obovate to obovate leaves (vs. petiolate ovate to elliptic or oblanceolate), smaller bracts (1.5 vs. 5 mm long), and widely ovate calyx lobes (vs. narrowly ovate or trigonous).

Description.—Erect to decumbent, perennial, succulent herbs, 30–40 cm tall, glabrous, reddish white throughout. Stems woody at base, glabrous, with prominent leaf scars on lower part. Leaves sessile, basal 1/4th adnate to the stem; lamina obovate to obovate, 3–4.5 × 2–2.5 cm, obtuse to rounded at apex, both surfaces glabrous, margins undulate to incised at distal half, entire at basal half; veins pinnate-netted, lateral veins obscure. Inflorescences terminal, trichotomous corymbs, not spreading; peduncles 6–8 cm long, glabrous; involucre bracts leafy, obovate, 2.5–3 × 1.5–2 cm, margins incised, reddish white; pedicels 3–5 mm long, glabrous. Bracts lanceolate, 1.5 × 0.5 mm, glabrous. Flowers hermaphrodite, 9–13 × 4–6 mm, glabrous, closely packed. Calyx lobes 4, basally fused, widely ovate, pale green, 2–3 × 1.5–2 mm, glabrous, persistent in fruit. Corolla tube 4-angular, bulged at base, 8–1 × 2 mm, fleshy, glabrous; lobes 4, 3–5 × 2–3 mm, widely ovate, wavy at margins, caudate at apex, pinkish-white, glabrous. Stamens 8, outer whorl arising from the base of corolla lobes and inner whorl from the middle of corolla tube; filaments unequal, 1–2 mm long, glabrous, white; anthers 0.75 × 0.75 mm, elliptic, basifixed, yellow, dehiscing longitudinally. Nectar scales 4, subulate, adnate to each carpel, 2.5–3 mm long, glabrous. Carpels 4, bottle shaped, free; ovary 3 × 1 mm, glabrous; ovules numerous; style 3–5 mm long, cylindrical, glabrous; stigma capitate. Follicles 6 × 3 mm, glabrous; seeds many.

Phenology.—*Kalanchoe dineshii* was collected with flowers and fruits during November to January.

Distribution and habitat.—The new species is only known from four adjoining populations in the type locality, Mathikettan Shola National Park in Idukki district of Kerala; on rocks in grasslands, between 1550–1600 m elevation. It is associated, among other species, with *Cyanotis arachnoidea* C.B. Clarke (Commelinaceae), *Tripogon bromoides* Roth ex Roem. & Schult. (Poaceae).

Provisional conservation status.—The total area of Mathikettan Shola National Park is 12.81 km². The area was earlier exposed to severe anthropogenic activities, which caused serious habitat destruction. However, considering the unique nature of the shola forests and its importance as an elephant corridor, the area was declared as a National Park in 2003. The new taxon was collected in one location in the park from four adjoining populations. The lack of number of locations precludes estimation of Extent of Occurrence. The Area of Occupancy is below 10 km² and the number of mature individuals recorded was 20. There are cardamom and coffee plantations adjoining to the National Park, where human activities are frequent. Since the area belongs to a national park, current threats are minimal. Despite this, the species is provisionally classified here as Critically Endangered (CR, D), based on restricted populations and number of mature individuals.

Etymology.—The epithet ‘dineshii’ honours Dr. Dinesh Raj (Assistant Professor, Department of Botany & Biotechnology, Bishop Moore College, Mavelikkara), who introduced the first author to the field of angiosperm taxonomy.

Notes.—Apart from sexual reproduction, some *Kalanchoe* species show pronounced asexual reproductive strategies

Table 1. Comparison of *Kalanchoe dineshii* with morphologically allied *K. bhidei* and *K. olivacea* (the characters for *K. bhidei* and *K. olivacea* were taken from Nandikar & al. 2019).

Characters	<i>K. dineshii</i>	<i>K. bhidei</i>	<i>K. olivacea</i>
Height (cm)	30–40	30–100	15–63
Leaves	Obovate to obovate, 3–4.5 × 2–2.5 cm, margins undulate to incised at distal half, entire at basal half	Ovate to elliptic or oblanceolate, 2–12 × 2–5 cm, margins crenate, distal leaves dentate to entire	Ovate to lanceolate or oblanceolate, 1–10 × 0.5–4 cm, margins usually crenate, distal leaves crenate to dentate to entire
Petioles	Absent	Subsessile	Subsessile
Inflorescence	Not spreading	Widely spreading	Not spreading
Bracts	1.5 mm long, glabrous	ca. 5 mm long, glabrous	c. 2 mm long, glandular hairy
Pedicels	3–5 mm long, glabrous	3–7 mm long, glabrous	5–7–(10) mm long, glandular hairy
Calyx lobes	Widely ovate, 2–3 mm long, glabrous	Narrowly ovate or trigonous, c. 4 mm long, glabrous	Lanceolate, 4.7–6.4 mm long, densely glandular hairy
Corolla	Tube glabrous; lobes widely ovate, apex caudate, glabrous	Tube glabrous; lobes white, narrowly ovate to lanceolate, apex acute to acuminate, glabrous	Tube glandular hairy out, lobes white, lanceolate, apex acuminate to caudate, densely to sparsely glandular hairy out
Anthers	Elliptic	Ellipsoid	Ellipsoid
Nectar scale	Subulate	Linear to ensiform	Linear

(Smith & al. 2022), but this feature is not found in *K. dineshii*. Several populations of this new species were observed continuously in the natural habitat for three years and it was showed that the diagnostic characters remain unchanged. *Kalanchoe dineshii* appears to be most closely related to *K. bhidei* and *K. olivacea* (Table 1).

Additional specimens studied.—INDIA. Kerala: Idukki district, Mathikettan Shola National Park, Choondal, ± 1550 m, 4 Nov. 2015, S.S. Radh & K.M. Manudev 145081 (CALI); way to Perattakkalam, ± 1590 m, 4 Jan. 2017, S.S. Radh & D. Francis 151529 (CALI); way to Sivanpara check post, ± 1600 m, 3 Dec. 2018, S.S. Radh & T.K. Sree-kutty 151789 (CALI).

ACKNOWLEDGEMENTS

Authors are thankful to the Head of the Department of Botany, University of Calicut, for facilities; the Curators and staffs of K and P for the virtual images of type specimens and CALI for permitting to consult the specimens; Principal Chief Conservator of Forests (Wildlife) & Chief Wildlife Warden (Kerala), Range officer (Munnar Wildlife Division) and Forester (MSNP) for providing permission to explore the Park; Forest guard and watchers (MSNP) for helping collections. SRS is thankful to the University Grant commission for Rajiv Gandhi National Fellowship (No. 17.1/2014-15/RGNF-2014-15-SC-KER-63372/ (SA-III/Website) dated, 28-Feb-2015) and SN is thankful to KSCSTE for financial assistance (Council (P) Order No. 126/2016/KSCSTE).

REFERENCES

- Boiteau P. 1947. Les plantes grasses de Madagascar. *Cactus* 12: 5–10.
- Bridson D.M. & Forman L. 1991. *The Herbarium Handbook*. Royal Botanic Gardens, Kew.
- Chernetsky M. 2011. Problems in nomenclature and systematics in the subfamily Kalanchoideae (Crassulaceae) over the years. *Acta Agrobotanica* 64: 67–74.
- Chorghé A.R., Rasingam L., Prasanna P.V. & Sankara Rao M. 2017. Three new additions to the flora of Eastern Ghats. *Nelumbo* 59: 66–70.
- Clarke C.B. 1878. *Kalanchoe*. In Hooker J.D. (ed.) *Flora of British India* vol. 2. L. Reeve & Co., London. pp. 414–416.
- Cooke T. 1903. *Flora of the Presidency of Bombay* vol. 1. Taylor and Francis, London.
- Descoings B. 2003. *Kalanchoe*. In Eggl U. (ed.) *Illustrated handbook of succulent plants: Crassulaceae*. Springer-Verlag, Berlin, Heidelberg New York.
- Descoings B. 2006. Le genre *Kalanchoe* structure et définition. *Journal de Botanique de la Société Botanique de France* 33: 3–28.
- Deshpande S. & Sharma B.D. 1984. A note of the topotypic occurrence of *Kalanchoe bhidei* Cooke (Crassulaceae) after eight decades. *Bulletin of Botanical Survey of India* 26 (3–4): 238–239.
- Gamble J.S. 1919. Crassulaceae. *The Flora of Presidency of Madras* vol. 1. Adlard and Son Ltd., London.
- Gandhi K.N. 1976. *Kalanchoe*. In Saldanha C.J. & Nicolson D.H. (eds.). *Flora of Hassan district, Karnataka, India*. Amerind Publishing Co. Pvt. Ltd., New Delhi. pp. 207–10.
- Godbole A. & Das S.K. 2000. Crassulaceae. In Singh N.P. & Karthikeyan S. (eds.), *Flora of Maharashtra* vol. 1. Botanical Survey of India, Kolkata.
- Hamet R. 1907. Monographie du genre *Kalanchoe*. *Bulletin de l'HerbierBoissier* Sér. 2, 7: 869–900.
- IUCN 2022. Guidelines for using the IUCN Red list Categories and Criteria. Version 15. Prepared by the Standards and Petitions Subcommittee of the IUCN Species Survival Commission. <https://www.iucnredlist.org/resources/redlistguidelines> [accessed: 20 Jun. 2022].
- Nandikar M.D., Rohini A., Shinde & Noltie H.J. 2019. Taxonomy and typification of *Kalanchoe olivacea* and *K. bhidei* (Crassulaceae). *Rheedea* 29: 197–208.
- POWO 2022. Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. Published on the Internet; <http://www.plantsoftheworldonline.org/> [accessed: 20 Jun. 2022].
- Rao R.R. 1984. Crassulaceae In Saldanha C.J. (ed.), *Flora of Karnataka* vol.1. Oxford & IBH Publishing Co., New Delhi.
- Sasidharan N. 2012. *Flowering Plants of Kerala*, version 2. Kerala Forest Research Institute, Peechi.
- Sharma B.D., Singh N.P., Raghavan R.S. & Deshpande U.R. 1984. *Flora of Karnataka. Analysis. Flora of India Series*. Botanical Survey of India, Kolkata.
- Singh N.B., Bhattacharyya U.C. & Uniyal B.P. 2011. *Crassulaceae of India*. Bishen Singh Mahendrapal Singh, Dehradun.
- Smith G.F. & Figueiredo E. 2018. The infrageneric classification and nomenclature of *Kalanchoe* Adans. (Crassulaceae), with special reference to the southern African species. *Bradleya* 36: 162–172.
- Smith G.F. & Figueiredo E. 2019. A new status and combination in a Madagascan *Kalanchoe*, *K. beauverdii* var. *juelii* (Crassulaceae subfam. Kalanchooideae). *Phytotaxa* 414: 119–120.
- Smith G.F., Shtein R., Klein D.-P., Parihar B., Almeida A., Rodewald S., Kadereit G. 2022. Sexual and asexual reproduction in *Kalanchoe* (Crassulaceae): A review of known and newly recorded strategies. *Haseltonia* 28: 2–20.
- Srinivasan S.R. 1983. Crassulaceae. In Nair N.C. & Henry A.N. (eds.), *Flora of Tamil Nadu, India: Analysis* vol.1. Botanical Survey of India. Coimbatore.
- Wight R. 1846. Crassulaceae. *Icones Plantarum Indiae Orientalis* vol. 3. J.B. Pharoah, Madras, t. 1158.