

Journal of Threatened Taxa | www.threatenedtaxa.org | 26 November 2016 | 8(13): 9562–9567

ISSN 0974-7907 (Online)
ISSN 0974-7893 (Print)

OPEN ACCESS



Dipcadi krishnadevarayae (Asparagaceae), a new plant species from Andhra Pradesh, India

Boyina Ravi Prasad Rao [1], Kothareddy Prasad [2], Dasari Veeranjaneyulu [3], Mudavath Chennakesavulu Naik [4], Sugali Salamma [5] & Angajala Narayanaswamy [6]

[1,3,4,5,6] Biodiversity Conservation Division, Department of Botany, Sri Krishnadevaraya University, Anantapuramu, Andhra Pradesh 515003, India
[2] Botanical Survey of India, Deccan Regional Centre, Plot No. 366/1, Attapur, Hyderguda (P.O), Inner Ring Road, Hyderabad, Telangana 500048, India
[1] biodiversityravi@gmail.com (corresponding author), [2] prasad.orchids@gmail.com, [3] hanveerobu@gmail.com, [4] chenna.lilly@gmail.com, [5] sshailajapr.001@gmail.com, [6] swamybcd@gmail.com

Abstract: *Dipcadi krishnadevarayae* B.R.P.Rao (Asparagaceae), a new species from the Sri Krishnadevaraya University campus, Anantapuramu of Andhra Pradesh, India, is described and illustrated. The novel species is distinct from all other species of Dipcadi in having distinctly 6-lobed stigma and shows close affinity to *D. serotinum* (L.) Medik. and *D. montanum* (Dalzell) Baker. It differs from both allies in having a combination of up to 50cm long linear leaves, 85cm long 16–24 flowered scapes, greenish-yellow flowers, dark green band outside the outer tepals, distinctly 6-lobed stigma and up to 10 seeds in each locule.

Keywords: Asparagaceae, India, new species, Ornithogaleae, Scillodeae.

The genus, *Dipcadi* Medik. belongs to the family Asparagaceae and is distributed in southern, eastern and northern Africa, Socotra, Madagascar, Europe, Middle East and Indian subcontinent comprising 41 species, three varietis and one hybrid (The Plant List 2013; Govaerts et al. 2016). In recent works, *Dipcadi* with the type *Dipcadi serotinum* (L.) Medik. is treated under the tribe Ornithogaleae, subfamily Scilloideae and family Asparagaceae (Stevens 2001 onwards; APG IV 2016). Alternatively, it is also considered under a monophyletic subfamily Ornithogalideae under the family Hyacinthaceae (Manning et al. 2009; Martinez-Azorin 2011). Deb & Dasgupta (1981) reported nine species and three varieties of *Dipcadi* from India. Karthikeyan et al. (1989) recorded nine species and two varieties from India. Later, one new species: *D. goaense* (Prabhugaonkar et al. 2010) was added to the Indian list making the total to 10 species; of which except *D. serotinum* (L.) Medik., *D. erythraeum* Webb & Berthel, all others are endemic to India. *Dipcadi* is distributed in India from the Himalaya to peninsular India. While working on the flora of Sri Krishnadevaraya University Campus, Anantapuramu, Andhra Pradesh, India, during 2010–2015, we could locate interesting specimens of *Dipcadi*. After a critical examination of these specimens and other collections from two different localities in Anantapuramu District it is revealed that combination of characters of scape length (c. 85cm), raceme length stigma nature (distinctly 6-lobed) and number of seeds

DOI: http://dx.doi.org/10.11609/jott.3039.8.13.9562-9567

Editor: Pankaj Kumar, Kadoorie Farm and Botanic Garden (KFBG), New Territories, Hong Kong. **Date of publication:** 26 November 2016 (online & print)

Manuscript details: Ms # 3039 | Received 09 September 2016 | Final received 06 November 2016 | Finally accepted 09 November 2016

Citation: Rao, B.R.P., K. Prasad, D. Veeranjaneyulu, M.C. Naik, S. Salamma & A. Narayanaswamy (2016). *Dipcadi krishnadevarayae* (Asparagaceae), a new plant species from Andhra Pradesh, India. *Journal of Threatened Taxa* 8(13): 9562–9567; http://dx.doi.org/10.11609/jott.3039.8.13.9562-9567

Copyright: © Rao et al. 2016. Creative Commons Attribution 4.0 International License. JoTT allows unrestricted use of this article in any medium, reproduction and distribution by providing adequate credit to the authors and the source of publication.

Funding: University Grants Commission, New Delhi.

Conflict of Interest: The authors declare no competing interests.

Acknowledgement: First author is grateful to University Grants Commission (UGC), New Delhi for awarding BSR-One Time Grant (2016-17) and also thank Prof. M. Janarathanam, Department of Botany, Goa University for his guidance. Dr. K. Prasad acknowledges SERB-DST, New Delhi and Dr. S. Salamma for UGC, New Delhi for Post-Doctoral fellowships. Mr. Chennakesavulu Naik thank Department of Biotechnology (BT/Env/BC/01/2010) for Senior Research Fellowship. Thanks are also due to Mr. Anil Kumar, Mr. A. Sreenath, Mr. Uma Sankar and Mr. Anjaneyulu for their help in field work.



Image 1. *Dipcadi krishnadevarayae* sp. nov.
A & B - Species habitat (© B. Ravi Prasad Rao, M. Chennakesavulu Naik and M. Anil Kumar)

per locule (5–10) were not found in any other known species of *Dipcadi* and hence warrants new species status. Among the Indian species, this new species is allied to D. *serotinum* (L.) Medik. and *D. montanum* (Dalzell) Baker, but differ in the characters as given in Table 1.

Taxonomic treatment

***Dipcadi krishnadevarayae* B.R.P.Rao sp. nov.**

Specimen examined

Type: 47481 (Holotype: SKU; Isotype: will be deposited in CAL), Sri Krishnadevaraya University Campus, Anantapuramu District, Andhra Pradesh, India, 14^{0}36'44.2"N & 77^{0}38'42.5"E, 370m, 25.viii.2012, coll. B.R.P. Rao & M. Chennakesavulu Naik (Images 1–5).

Paratypes: 41639 (SKU), India, Andhra Pradesh: Anantapuramu District, Sri Krishnadevaraya University campus, 14^{0}36'44.2"N & 77^{0}38'42.5"E, 370m, 25.viii.2012, coll. B.R.P. Rao & M. Chennakesavulu Naik; 45317 (SKU), Tadimarri, 14^{0}33'45.41"N & 77^{0}52'15.51"E, 376m, 30.viii.2012, coll. B.R.P. Rao, A. Narayanaswamy & D. Veeranjaneyulu; 3km from Garladinne Village on Penakacharla Road, 51138 & 51275 (SKU), 14^{0}49'00.29"N & 77^{0}34'18.13"E, 347–367 m, 6.vii.2016, coll. S. Salamma & A. Sreenath (Image 5).

Diagnosis

The novel species is distinct from all other species of Dipcadi in having a distinctly 6-lobed stigma and allied to *D. serotinum* and *D. montanum*. It differs from both the latter species in having a combination of up to 50cm long linear leaves, 85cm long 16–24 flowered scapes, greenish-yellow flowers, a dark green band outside the outer tepals, a distinctly 6- lobed stigma and up to 10 seeds in each locule.

Perennial, bulbous, scapigerous herbs. Plants erect, c. 85cm high (including scape). Bulbs ovoid or globose, 4–4.5 × 2–3.5 cm, white, glabrous, with many unbranched fibrous roots from base; outer tunics of bulb membranous, scarious; inner layers fleshy. Leaves all basal, 2–4 per bulb with sheathing base, emerge along with scape, linear, clavate, 16–20-veined, green, 25–50 × 0.4–1.2 cm, acute at apex, entire at margins; sheaths broader and white, glabrous; leaves fleshy when fresh and become membranous in herbarium specimens. Inflorescence racemose, secund with patent flowers. Scapes erect, slender, 30–85 cm long, cylindrical and glossy in fresh specimens, terete or strongly furrowed in dry specimens; racemes 20–40 cm long, compact in young stage, become lax on maturity, 18–24 flowered. Flowers oblong-obovate in bud condition, 1–1.3 × 0.9 cm, green when young, greenish-yellow at maturity, glossy, with dark green band on outside of the outer tepals; pedicels 4–5 mm long, c. 1mm thick, stout. Bract 1, longer than the pedicel, membranous, scarious, ovate, 6–12 × 2–6 mm, acuminate-caudate at apex, base with hyaline entire margins and 5–10 conspicuous nerves, persistent; bracteoles absent. Perianth in two whorls, 3+3, spreading, subequal, obscurely veined. Outer tepals, 8–13 mm long, longer than the inner ones; tube united one to two thirds, campanulate, 3–7 mm long; lobes narrowly oblong or oblong-obovate, 5–6 × 2–4 mm, acute and tubercled at apex, hooded or curved outwards to almost half of the length. Inner tepals connivent; tube more than two-thirds, c. 11mm long; lobes deltoid, 3–3.2 × 2–2.5 mm, acute and tubercled at apex and reflexed. Stamens 6, inserted at throat of tube; filaments adherent along perianth throughout tube protruding at tip; anthers 2.5–3 × 1–1.2 mm, linear-oblong, versatile, dorsifixed, introrse, dehiscing longitudinally; pollen oblong; stipe c. 1mm long. Ovary



Image 2. *Dipcadi krishnadevarayae* sp. nov.
A - Habit; B - Bulb; C - flowers side and top view; D - Fresh Capsules; E - Matured Capsules open with seeds.
(© B. Ravi Prasad Rao & M. Chennakesavulu Naik).

superior, sessile, oblong-obovate, 4–5 × 1.5–2 mm; style cylindric, 4–5 mm long; stigma simple in young flowers, 3-lobed at maturity and each lobe further bilobed. Capsules trigonous, deeply 3-lobed, quadrate in outline, deeply sulcate, subglobose to obovoid, 1–1.2 × 1 cm, narrowed at base, as broad as long, truncate

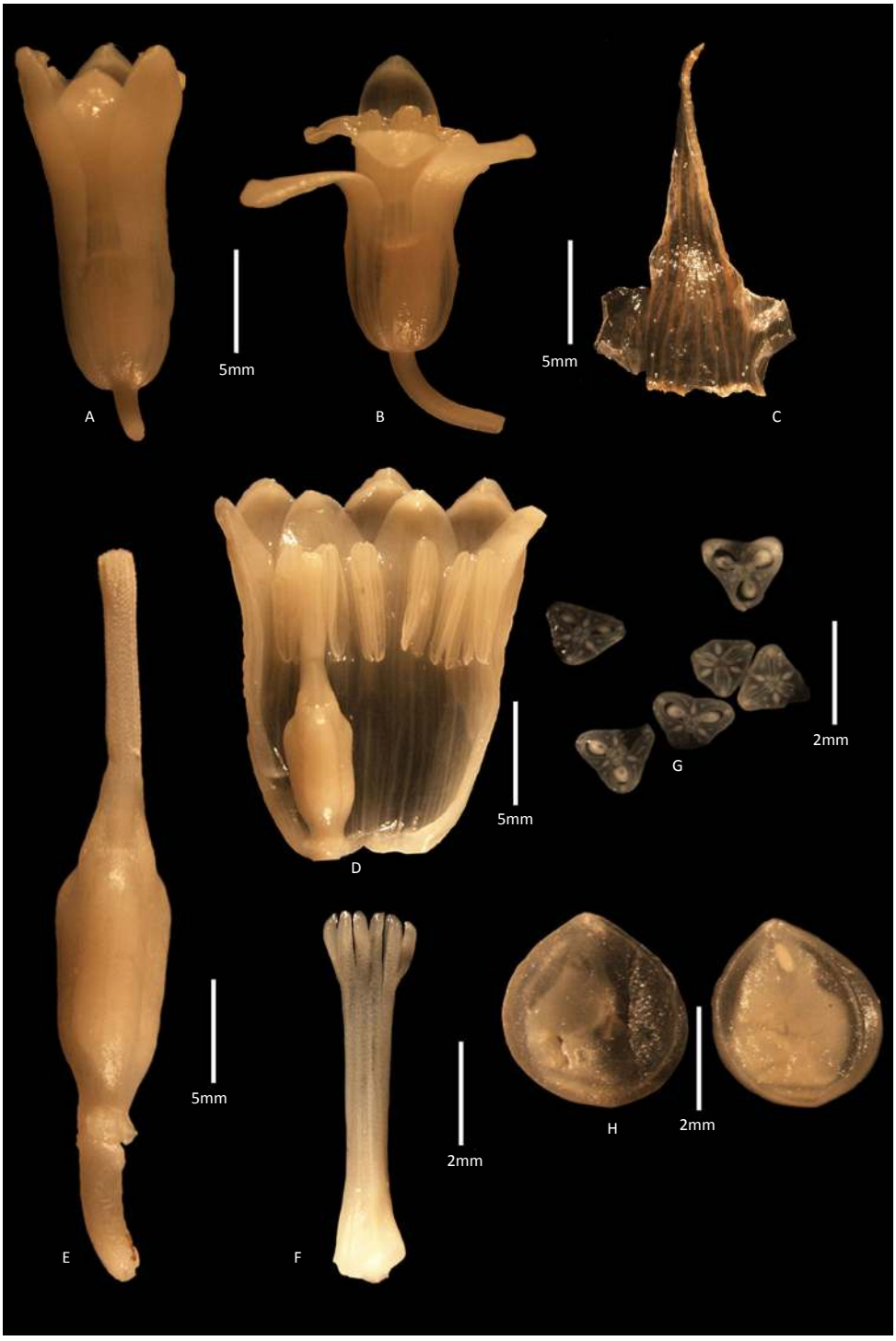


Image 3. *Dipcadi krishnadevarayae* sp. nov.
A & B - Flowers; C - Bract; D - Spilt open flowers; E - Ovary; F - Style and Stigma magnified; G - Ovary T.S; H - Seeds.
(© B. Ravi Prasad Rao & K. Prasad).

at apex, stipitate, loculicidally dehiscent; pericarp thin, brittle; dry perianth reflexed. Seeds 5–10 in each locule, uniseriate, horizontally stacked, compressed or polygonal, subdiscoid, rarely ellipsoid, 3–5 × 2–5 mm, with shallow depressions, margins thickened, brownish-black, glossy.

Table 1. Comparison of the morphological characters of *Dipcadi krishnadevarayae*, *D. serotinum* and *D. montanum*

Characters	*D. krishnadevarayae*	*D. serotinum*	*D. montanum*
Bulbs	4–4.5 × 2–3.5 cm	2–3.5 × 1.5-3 cm	1.2–2.0 × 1–1.5 cm
Leaves per bulb	3–4 20–50 × 0.4–1.2 cm	2–4 18–34 × 0.2–0.5 cm	3–8 15–20 × 0.2 cm
Scape	30–85 cm long,	20–70 cm long	18–25 cm long
Raceme	20–40 cm long 10–24 flowered	10–12 cm long 10–16 flowered	5–15 cm long 7–15 flowered
Tepals colour	Greenish-yellow	White-pale pink	Greenish-white
Bracts	6–12 × 2–6 mm	8–12 × 4–5 mm	5–10 × 3–4 mm
Ovary	sessile or subsessile	Sessile-stipitate	stipitate
Stigma	distinctly 6-lobed	3-lobed	3-lobed
Capsules	as long as broad	as long as broad	broader than the long,
Seeds per locule	5–10	6–8	3–5

Phenology

June–August. Remains dormant with the underground bulb.

Ecology

This species is found in lateritic gravely soils in open places among grass at an elevation range of 300–400 m. Common associates are *Heteropogon contortus* (L.) P. Beauv. ex Roem. & Schult., *Chrysopogon fulvus* (Spreng.) Choiv. *Cleome viscosa* L. and *Kohautia aspera* (B. Heyne ex Roth) Bremek.

Distribution

Presently known only from three localities in Anantapuramu District, India: the type locality, Sri Krishnadevaraya University campus, Anantapuramu, Andhra Pradesh; edges of cultivated fields, 3km from Garladinne Village towards Penakacharla and Tadimarri Village, located 22 and 45 km from Anantapuramu Town.

Etymology

This new species is named after Sri Krishnadevaraya, Emperor of Vijayanagara Dynasty (collection sites and the type locality falls in this region) who was known for his significant contribution in conserving natural resources 400 years ago.

Conservation status

About 500 plants were found in the type locality. About 50 plants were seen at the edges of the cultivated fields, 3km from Garladinne Village and 50 plants near Tadimarri Village. Since an assumption that the species might be distributed elsewhere in Anantapuram District and its surroundings in allied habitats, and more explorations are required to determine its full range of distribution as well as population, the species is categorized as Data Deficient.

Notes

Perusal of literature revealed that of all the species of *Dipcadi*, only *D. glaucum* have indistinctly 6-lobed stigmatic apex (Obermeyer 1964), and all other species have either unlobed, disctinctly or indistinctly 3-lobed stigmatic apex. It is interesting to note that Robert Wight's collection of *Dipcadi serotinum* from Peninsular India have 14 seeds per locule (Deb & Desgupta 1976).

References

APG IV (2016). An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV. *Botanical Journal of the Linnean Society* 181: 1–20; http://dx.doi.org/10.1111/boj.12385

Deb, D.B. & S. Dasgupta (1981). *Liliaceae*: *Tribe-Scilleae*. *Fascicles of Flora of India,* Fascicle 7. Botanical Survey of India, Calcutta, 23pp.

Govaerts, R., B.J.M. Zonneveld & S.A. Zona (2016). *World Checklist of Asparagaceae*. Facilitated by the Royal Botanic Gardens, Kew. Published on the Internet: http://apps.kew.org/wcsp/qsearch.do Retrieved 30 August 2016.

Karthikeyan, S., S.K. Jain, M.P. Nayar & M. Sanjappa (1989). *Florae Indicae Enumeratio; Monocotyledonae*. Botanical Survey of India, Calcutta, 435pp.

Manning, J.C., F. Forest, D.S. Devey, M.F. Fay & P. Goldblatt (2009). A molecular phylogeny and a revised classification of Ornithogaloideae (Hyacinthaceae) based on an analysis of four plastid DNA regions. *Taxon* 58: 77–107.

Martínez-Azorin, M, M.B. Crespo, A. Juan & M.F. Fay (2011). Molecular phylogenetics of subfamily Ornithogaloideae (Hyacinthaceae) based on nuclear and plastid DNA regions, including a new taxonomic arrangement. *Annals of Botany* 107: 1–37; http://dx.doi.org/10.1093/aob/mcq207

Obermeyer, A.A. (1964). The South African species of Dipcadi. *Bothalia* 8: 117–137.

Prabhugaonkar, A., U.S. Yadav & M.K. Janarthanam (2009). *Dipcadi goaense* (Hyacinthaceae), a new species from the foothills of the Western Ghats, India. *Kew Bulletin* 64: 743–746.

Stevens P. F. (2001 onwards). Angiosperm phylogeny website. Available at http://www.mobot.org/MOBOT/research/APweb/. Retrieved 22-10-16.

The Plant List (2013). Version 1.0. Published on the Internet; http://www.theplantlist.org/ (accessed 1st October, 2016).



Image 4. Herbarium image of *Dipcadi krishnadevarayae* sp. nov.



Image 5. Herbarium image of *Dipcadi krishnadevarayae* sp. nov.