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ISSN 2319-3077 Online/Electronic

ISSN 0970-4973 Print

UGC Approved Journal No. 62923

MCI Validated Journal

Index Copernicus International Value

IC Value of Journal 82.43 Poland, Europe (2016)

Journal Impact Factor: 4.275

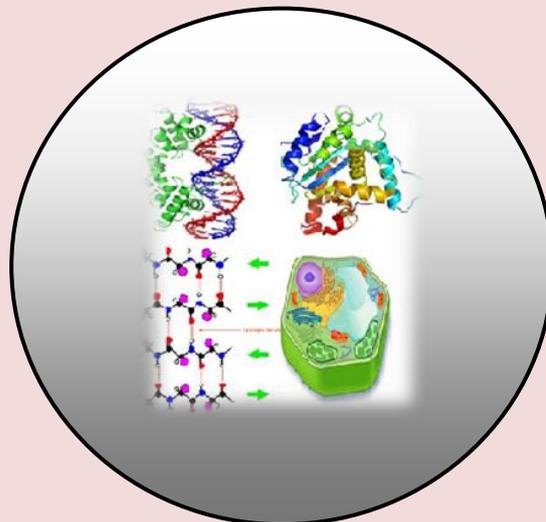
Global Impact factor of Journal: 0.876

Scientific Journals Impact Factor: 3.285

InfoBase Impact Factor: 3.66

J. Biol. Chem. Research

Volume 36 (1) 2019 Part D, Pages No. 158-161



Journal of Biological and Chemical Research

An International Peer Reviewed / Referred Journal of Life Sciences and Chemistry

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RESEARCH PAPER

Received: 12/04/2019

Revised: 24/06/2019

Accepted: 25/06/2019

On the Occurrence of *Gentiana cephalodes* (Gentianaceae) in Garhwal Himalaya, India

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ABSTRACT

Gentiana cephalodes (Gentianaceae) has been collected in a recent botanical visit to Adhwani forest in Pauri district of Garhwal Himalaya, India. The species is known to occur in Western Himalaya of India, besides its distribution also claimed in Nepal and Bhutan. The taxonomy of the species, its distribution in the Himalayan region has been discussed in the present communication.

Keywords: *Gentiana cephalodes*, Occurrence, Adhwani forest, Garhwal Himalaya and Endangered.

INTRODUCTION

Adhwani forest located at an altitudinal range of 1700–2200 m in Pauri district of Garhwal Himalaya, India, lies between 30°06'1"–30°06'7" N and 78°72'3"–78°72'6" E. It is situated 17 km southeast to district headquarters Pauri and is dominated by *Pinus roxburghii* Sarg., *Quercus oblongata* D. Don and *Rhododendron arboreum* Sm. An interesting species of *Gentiana* L. has been collected from the Adhwani pine forest in a recent botanical trip to the area, which after critical morphological examination and literature survey (Agarwal and Bhattacharyya, 1982; Garg, 1987; Omer and Qaiser, 1993; Ho and Pringle, 1995; Ho and Liu, 2001; Gupta *et al.*, 2012, Shabir *et al.*, 2017, 2018a) was identified as *Gentiana cephalodes* Edgew. The species is closely allied to *Gentiana capitata* Buch.-Ham. ex D. Don and belongs to section *Chondrophyllae* Bunge. In present state of our knowledge, the species is endemic to the Himalayan region and is rare in distribution in India, Nepal and Bhutan.

Gentiana belonging to the family Gentianaceae has a sub-cosmopolitan distribution across the globe and is widely distributed in the northern Hemisphere showing its maximum concentration in the Himalayan region both in number of species as well as in diversity (Ho and Pringle, 1995; Ho and Liu 2001; Struwe and Albert, 2002). The genus consists of *ca.* 362 species under 15 sections, among them *Chondrophyllae* is the largest and most diverse section (Ho and Liu, 2001; Mabberley, 2008). In India, the genus is represented by *ca.* 68 species, chiefly distributed in the Himalayan region (Shabir *et al.*, 2018b).

TAXONOMIC TREATMENT

Gentiana cephalodes Edgew., Linn. Soc. London 4: 637. 1845. Agrawal and Bhattacharya, J. Econ. Tax. Bot. 3: 995–1000. 1982. Garg, Gent. NW. Him. 104–105, 1987 (Figure 1 and 2).

Type: India, Western Himalaya, Banasar, 1525 m, 1844, M.P. Edgeworth *s.n.* (holo – K *n.v.*, image!).

Annual herb, 4.5–8.0 cm high. Stem quadrangular, striate, scabrous on angles, unbranched, basal leaves absent; cauline leaves twisted, quadriferous, lower leaves petiolate, in dimorphic series (larger and smaller), larger leaves 4.0–8.0 × 2.5–4.8 mm, broadly elliptic, apex acuminate to acute, margin cartilaginous, scabrous; petiolate, petiole 1.0–2.5 mm long; smaller leaves 2.0–4.0 × 1.0–4.0 mm, cordate to elliptic, apex acute, margin scabrous, petiole 0.5–1.8 mm long. Upper leaves quadriferous, more or less equal or monomorphic series, 6.0–12 × 5.0–9.0 mm, elliptic, apex apiculate, margin membranous, mid-vein keeled abaxially. Inflorescence terminal, capitate, clustered. Calyx 4.0–4.5 mm long; tube membranous, 3.0–3.5 mm long; lobes 1.3–2.0 × 0.7–1.0 mm, ovate, lanceolate, apex apiculate. Corolla 5.0–6.0 mm long; tube 4.0–4.2 mm long; lobes 0.9–1.1 × 0.7–0.8 mm, ovate-oblong, apex mucronate; plicae 0.55–0.65 × 0.53–0.63 mm, ovate, apex acute, margin 2-3 dentate, serrulate. Stamens inserted from the base of the corolla tube; filament 2.0–2.2 mm long; anther 0.35–0.42 × c. 0.2 mm. stigma bifid, lobes coiled to orbicular, style linear, ovary obovate. Capsule 4.0–5.0 mm long, gynophores 0.6–1.0 mm, apex truncate, winged along the suture. Seeds 0.28–0.32 × c. 0.20 mm, elliptic, sub-orbicular; seed coat, reticulate, honeycomb shaped.

Flowering and fruiting: June to October.

Distribution: India, Western Himalaya (Himachal Pradesh and Uttarakhand), Nepal, Bhutan, endemic to Himalaya.

Habitat & Ecology: Pine forest slopes, generally in sunny places, rare in shady areas, at 1710–1780 m. Surrounded by many small herbs (*Bidens pilosa* L., *Bupleurum gracillimum* Klotzsch, *Cynoglossum lanceolatum* Forssk., *Geranium nepalense* Sweet, *Polygala tatarinowii* Regal, *Shuteria involucrate* (Wall.) Wright & Arn., and *Smithia ciliate* Royle) and shrubs (*Asparagus adscendens* Roxb., *Berberis aristata* DC., *Berberis asiatica* Roxb. ex DC., *Cotoneaster microphyllus* Wall ex. Lindl., *Rubus ellipticus* Sm.).

Conservation status: *Gentiana cephalodes* has been collected from four different localities in the Indian Western Himalaya so far. The Area of Occupancy (AOO) is less than 50 km² and Extent of Occurrence (EOO) of 3061 km². A population consisting of hundreds of mature individuals of the species has been recently observed in Adhwani forest, but considering its severely fragmented distribution at less than five locations and a confined AOO and EOO, the species is regionally assessed as Endangered (ER) according to the IUCN rule [B1ab(i,iii,iv) + 2ab(ii,iii,iv) (IUCN var. 3.1. 2012)].

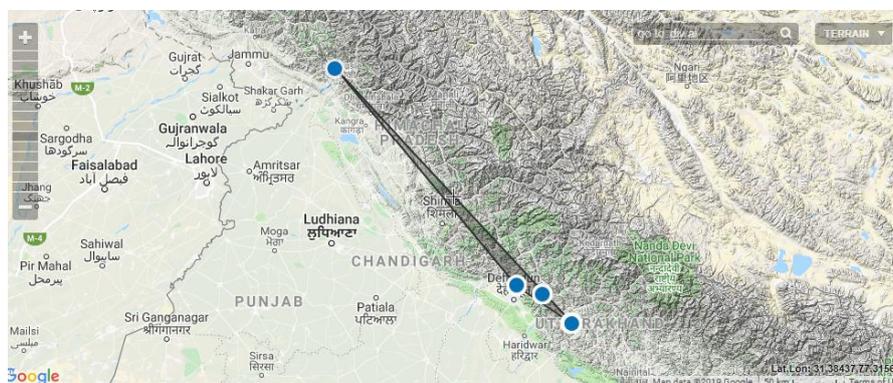


Figure 1. Extent of Occurrence (EOO) of *Gentiana cephalodes* in India.

Specimens examined: 499 (DD), India, Chamba, Dalhousie, 1880, coll. *s. leg.*; 113/9 (DD), Tehri, above Silkara, 1520–1828 m. 04-ix-1887, Mussoorie, Blucher's hills, South tede, 20-ix-1899, coll. J and D (DD), *s.loc.* coll. Royle; 383 (DD), Mussoorie, 1920 m, 15-iv-1948, coll. R.L. Fleming; 462 (DD), coll. J.F. Duthie; 4208 (DD), Garhwal, Open Places near Labah, 1520–1828 m, 21-ix-1983, coll. J.F. Duthie; *s.n.* (DD), Adhwani Forest, 1710 m, 30-ix-2018, N. Singh and A.S. Bagri; 308860 (LWG).

DISCUSSION

Gentiana cephalodes was first described by Edgeworth (1845) from Garhwal Himalaya, Uttarakhand. The species is characterized by a naked stem, lower leaves petiolate, broadly elliptic to ovate-elliptic, arranged in quadriferous series.



Figure 2. *Gentiana cephalodes* Edgew. (A) Habit, (B) Flower.



Figure 3. *Gentiana cephalodes* Edgew. (A) Calyx, (B) Corolla, (C) Capsule, (D) Seeds.

In the present state of our knowledge, the species is known to occur from three different localities (Mussoorie, Adhwani Forest, Tehri) in Uttarakhand Himalaya and from one locality (Dalhousie) in Himachal Pradesh. In the current scenario, the species has a rare occurrence in Uttarakhand since past 40 years, and present report is the recent most collection after long time. Further, in the adjacent countries Bhutan and Nepal, presence of the species has also been claimed but no voucher specimens have been studied from these areas.

Gentiana cephalodes belonging to *Gentiana* sect. *Condrophyllae* ser. *Capitatae* is sometimes wrongly identified as *G. capitata*, however many authors (Ho and Pringle, 1995; Ho and Liu, 2001; Omar and Qaiser, 1993) reduced *G. cephalodes* as synonym of *G. capitata*, but (Garg, 1987; Aitken, 1999; Gupta *et al.*, 2009; Shabir *et al.*, 2017) recognized it as a valid species. *G. cephalodes* is differentiated from *G. capitata* by long naked slender stem, bearing a capitate inflorescence, enveloped by 4-broadly elliptic, petiolate leaves, calyx lobes triangular, apex capitate and flowers from mid-summer to autumn.

ACKNOWLEDGEMENTS

We are thankful to Head, Department of Botany and Microbiology, HNB Garhwal University and Director, CSIR-National Botanical Research Institute, Lucknow for providing necessary facilities and encouragement. The first author (NS) is grateful to Dr. Dinesh Singh, Central National Herbarium, BSI, Howrah, for the encouragement and guidance and is also thankful to UGC for providing fellowship to conduct the research work.

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