



THE GENUS *Geranium* L. (GERANIACEAE) IN SIKKIM

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Abstract

The diversity of the genus *Geranium* L. of the family Geraniaceae in Sikkim is presented. Enumeration of all known species of the state along with their distributional pattern of different is incorporated.

Keywords: Himalaya, ethnomedicine, phenology.

Introduction

The genus *Geranium* L. is the sole representative of the family Geraniaceae in Sikkim. It is represented by seven species in the state, majority of which are concentrated in the temperate and alpine forests (Maity *et al.*, 2018; Singh *et al.*, 2019; Gogoi *et al.*, 2021), though few are found in the subtropical forest. In India the genus is represented by 28 species and two varieties (Edgeworth & Hooker, 1875; <https://efloraindia.bsi.gov.in>). Maximum species diversity is, however, concentrated in the Western Himalaya where from 22 species are reported (Singh *et al.*, 2019; <https://efloraindia.bsi.gov.in>). Eastern Himalaya shelters 14 species (Singh *et al.*, 2019). Nine species are commonly shared by both the Himalayas (Wagh *et al.*, 2015). Among Eastern Himalayan species, seven are found in Sikkim. Notably, in India Sikkim appears as the only habitat for two species, namely *G. nakaonum* and *G. refractum* (Edgeworth & Hooker, 1875; Maity *et al.*, 2018; Singh *et al.*, 2019). The record of *G. wallichianum* D. Don ex Sweet in Sikkim is doubtful and needs further investigation. In the country highest species concentration is found in Jammu & Kashmir, where nearly 75% Indian members (c. 21 species) are flourished. The only species *G. nepalense* is extended to Western Ghats (<https://efloraindia.bsi.gov.in>). Globally, with about 430 species *Geranium* is cosmopolitan in distribution and chiefly concentrated in temperate to tropical mountains regions (Langran & Aedo, 2008; Mabberley, 2017).

This present communication aims to provide an outline of the diversity of the genus in Sikkim along with their detailed distributional records and phenological information. Altitudinal distribution of all the species is also highlighted. Additionally, the ethnomedicinal uses of the species, whenever available, are also incorporated. An easily recognizable key for the known species of the genus in Sikkim is also provided for correct identification.

Materials and Methods

This study is conducted through extensive field observation and herbarium consultation. Different repositories like CAL, BSHC, CUH, etc. are also consulted. Old depositions are also examined from different world digital herbaria like K, E, PE, G, GH, BM, etc. All the relevant literature (Edgeworth & Hooker, 1875; Campbell & Long, 1987; Langran & Aedo, 2008; Maity *et al.*, 2018) is studied carefully.

Results

Species enumeration (arranged in alphabetical sequence)

1. *Geranium donianum* Sweet in Geraniaceae 4: t. 338. 1827.

Fl. & Fr.: June - October.

Distribution: INDIA: Sikkim, Uttarakhand; BHUTAN; CHINA; NEPAL [2400-4850 m amsl].

Specimen examined: Thi La to Jakthang, 3500 m, *Maity* 22905 [BSHC].

2. *Geranium lambertii* Sweet in Geraniaceae 4. t. 338. 1827.

Fl. & Fr.: July - September.

Distribution: INDIA: Himachal Pradesh, Jammu & Kashmir, Sikkim, Uttarakhand; BHUTAN; CHINA; NEPAL; PAKISTAN [2300-4200m amsl].

Specimen examined: Sikkim, July 1887, King *s.n.* [P, P05095468].

3. *Geranium nakaoanum* Hara, Acta Phytotax. Geobot. 16(1): 1. 1955.

Fl. & Fr.: February - August

Distribution: INDIA: Sikkim; BHUTAN; NEPAL; MYANMAR [2800-5000m amsl].

Specimens examined: Dzongri to Bakhim, 2800 m, *Maity* 21948 [BSHC].

Note: *G. nakaoanum* resemble to *G. polyanthes* by monochasial inflorescence but differs by opposite leaves (Aedo, 2016).

4. *Geranium nepalense* Sweet in Geraniaceae i. t. 12. 12. 1820. [Fig. 1]

Fl. & Fr.: February - November

Distribution: INDIA: Arunachal Pradesh, Assam, Himachal Pradesh, Jammu & Kashmir, Nilgiri, Sikkim, Uttarakhand, Western Ghats; AFGHANISTAN; BHUTAN; CHINA; INDONESIA; LAOS; MYANMAR; NEPAL; PAKISTAN; SRI LANKA; THAILAND; VIETNAM [1000-3600m amsl].

Specimen examined: Bakhim, 2900 m, *Maity* 21650 [BSHC].

5. *Geranium polyanthes* Edgew. & Hook.*f.* in Hooker, J.D., Fl. Brit. India 1: 431. 1874.

Fl. & Fr.: April - October.

Distribution: INDIA: Arunachal Pradesh, Assam, Himachal Pradesh, Jammu & Kashmir, Sikkim, Uttarakhand; BHUTAN; CHINA; NEPAL [2000-4600m amsl]

Specimen examined: Kishong, 4000 m, *Maity* 21378 [BSHC].

6. *Geranium procurrens* Yeo, Bot. Mag. 179(3): t. 644. 1973.

Fl. & Fr.: July - September

Distribution: INDIA: Assam, Sikkim, Uttarakhand; BHUTAN; NEPAL [2400-3600m amsl]

Specimen examined: Lachen (also Lachung), 8000-10000 ft. (2400-3000 m), *Smith & Cave* 2532, 2616 [CAL].

7. *Geranium refractum* Edgew. & Hook.*f.* in Hooker, J.D., Fl. Brit. India 1: 428. 1874.

Fl. & Fr.: June- August

Distribution: INDIA: Sikkim; BHUTAN; CHINA; MYANMAR; NEPAL [1800-4600m amsl].

Specimen examined: Sikkim, 3658–3962 m, *Hooker* 15 [K, K000729345].

Ethnomedicinal use:

Different species of *Geranium* are used as home remedy for various illnesses. Six out of nine species found in Sikkim are used by people as a source of ethnomedicine. The uses of such species are given in tabular form along with the source of informations.

Table 1: *Geranium* species of Sikkim with reported ethnomedicinal uses

Sl.	Name of species	Uses	Source
1.	<i>G. donianum</i>	fever, cough and bodyache	Pandey, 2006
2.	<i>G. nakaoanum</i>	fever, cough and bodyache	Pandey, 2006
3.	<i>G. nepalense</i>	antibacterial & astringent	Singh & Rawat, 2011
4.	<i>G. polyanthes</i>	ulcers, headache, tonsillitis	Singh and Rawat, 2011; Maity <i>et al.</i> , 2003
5.	<i>G. procurrens</i>	Sprain	Budha-Magar <i>et al.</i> , 2020
6.	<i>G. wallichianum</i>	dysentery and cold	Singh & Rawat, 2011

Key to the species of *Geranium* in Sikkim:

1. Flower solitary on peduncle.....**G. nakaoanum**
- Flowers 2 or many in umbel2
2. Pedicels with glandular trichomes.....**G. procurrens**
- Pedicels with eglandular trichomes (sometimes mixed in *G. refractum* 3
3. Petal apex emarginate **G. donianum**
- Petal apex rounded (rounded or retuse in *G. polyanthes*, then flowers 3-10 in umbels).....4
4. Flowers 3-10; anthers yellow..... **G. polyanthes**
- Flowers 2; anthers never yellow, otherwise.....5
5. Anthers violet.....**G. nepalense**
- Anthers blackish.....6
6. Stems rooting at nodes; filaments blackish except base.....**G. lambertii**
- Stems not rooting at nodes; filaments reddish purple to pink...**G. refractum**



Fig 1: *Geranium nepalense* Sweet

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