

The Genus *Swertia* L. (Gentianaceae): An important Ethnomedicinal Plant of Darjeeling Himalaya of West Bengal, India

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ABSTRACT

The present investigation was carried out in Darjeeling Himalaya of West Bengal, India. The present paper discusses ethnomedicinal uses of two different species of *Swertia* L. (Gentianaceae) by the fringe villagers of Darjeeling Himalaya. Detailed taxonomic description, phenology, field status, bioactive compounds and exact existence of taxa are provided.

Key words Ethnomedicinal plant, *Swertia* spp., Field status, Exact existence, Darjeeling Himalaya.

The people living in villages and far-flung areas are directly related to the forest resources. Traditionally, local communities worldwide are very knowledgeable about the local plant species on which they are so intimately dependant. Such plant species not only supplement the food quantity but also providing medicine and about 80% of the world population is directly dependent upon traditional or folk medicines for primary health care.

In Ayurvedic medicine, *Swertia chirayita* is used in asthma and leucorrhoea and used as anthelmintic, antiperiodic, antipyretic and laxative and in Yunani system of medicine, the species is used as astringent, lessens inflammation, stomachic, tonic, sedative to pregnant uterus and chronic fevers (Kirtikar and Basu, 1984). It is also used in British and American pharmacopoeias as infusion and tincture (Joshi and Dhawan, 2005). It was first described by Roxburgh under the name of *Gentian chyrayita* in 1814 (Scartezzini and Speroni, 2000).

Swertia belongs to the family Gentianaceae is annual, biennial or perennial, erect herb representing approximately 135 species throughout the world and in India, 40 species are recorded (Kirtikar and Basu, 1984). *Swertia* is an important ethnomedicinal plant used to treat different disease ailments by local inhabitants of Darjeeling Himalaya. It tastes bitter from whole plant. Stem terete, angled or winged. Leaves opposite, whorled, sessile or petiolate. Flowers pedicellate in leafy panicles of axillary and terminal clusters. Calyx deeply lobed. Corolla rotate, tube very short. Stamens as many as corolla lobes. Ovary 1-celled. Style slender or absent; stigma bilobed. Fruit capsule.

Study Area

Darjeeling Himalaya is the northernmost part of West Bengal which is a part of the Eastern Himalaya and a part of Himalayan Hotspot and globally known as one of the mega biodiversity hotspot zones and is known to provide shelter to a large number of endemic, rare and interesting plant species and it lies between 27°31'05" and 26°27'10" North latitude and between 88°53'00" and 87°59'30" East longitude. The total area of the district is 3254.7 sq. km. The

Districts of Darjeeling Himalaya is Darjeeling and Kalimpong (Fig. 1). This region is blessed with wide variation in climatic condition and topography favouring luxuriant growth of myriad of species adding richness to the vegetation of the region. It harbours a large number of plant species with wide range of diversity and distribution (Das, 1995). In this region a representation of tropical, sub-tropical, temperate, sub-temperate and sub-alpine vegetation, with their characteristic species composition.

Darjeeling Himalayan region of West Bengal, India has multilingual, multicultural and multi ethnic races. The pre inhabited ethnic group live in the villages are Lepcha, Sherpa, Limbu or Subba, Tamang, Yolmo, Khambu Rai, Bhujel or Khawas, Manger or Thapa, Gurung and Mukhia. Other inhabitants of tea gardens, villages and remote rural areas are Sharma or Bhahun, Chettri, Newar or Pradhan, Kami, Damai and Sarki. To cure their different diseases, they depend on their traditional knowledge on local medicinal plants. The medicinal and ethnomedicinal plants of the region and their uses are partially studied by earlier workers like Biswas and Chopra, 1956, Yonzone *et al.* 1981, 1984, 1985, Lama, 1989, Yonzone, 1996, Rai *et al.* 1998 and Rai *et al.* 1999. Recently, many ethnomedicinal studies are undertaken in the region by different workers like Yonzone *et al.* 2012a, 2012b, 2012c, 2012d, Rai *et al.* 2013, Yonzone and Rai, 2016, 2017 and Yonzone, 2016.

MATERIALS AND METHODS

Many field observation trips to the entire study area were carried out since June 2007 to November 2016 in order to acquire knowledge of the aromatic, medicinal and ethnomedicinal plants of Darjeeling Himalaya. During survey, field data of ethnomedicinal plants were collected along with two species of *Swertia*. The ethnomedicinal uses of *Swertia* species was collected from local inhabitants and persons with adequate knowledge. As per the suggestion of interviewed people and the literatures, all the *Swertia* species were collected during flowering times without uprooting and disturbing the nature. The collected specimens were worked out in the field and pressed in blotting paper and pressed. The plants were processed into voucher specimen following standard methods of Jain and Rao, 1977. Identification and authentication of identified specimens was done in the NBU herbaria, Siliguri, West Bengal. Voucher specimens were deposited in the herbarium of Cluny Women's College, Kalimpong. Necessary photographs were collected. The present paper revealed the field status, exact existence within Darjeeling Himalaya, phenology, plant parts used, bioactive compounds, general distribution and ethnomedicinal uses of two *Swertia* species with their taxonomic accounts in details.

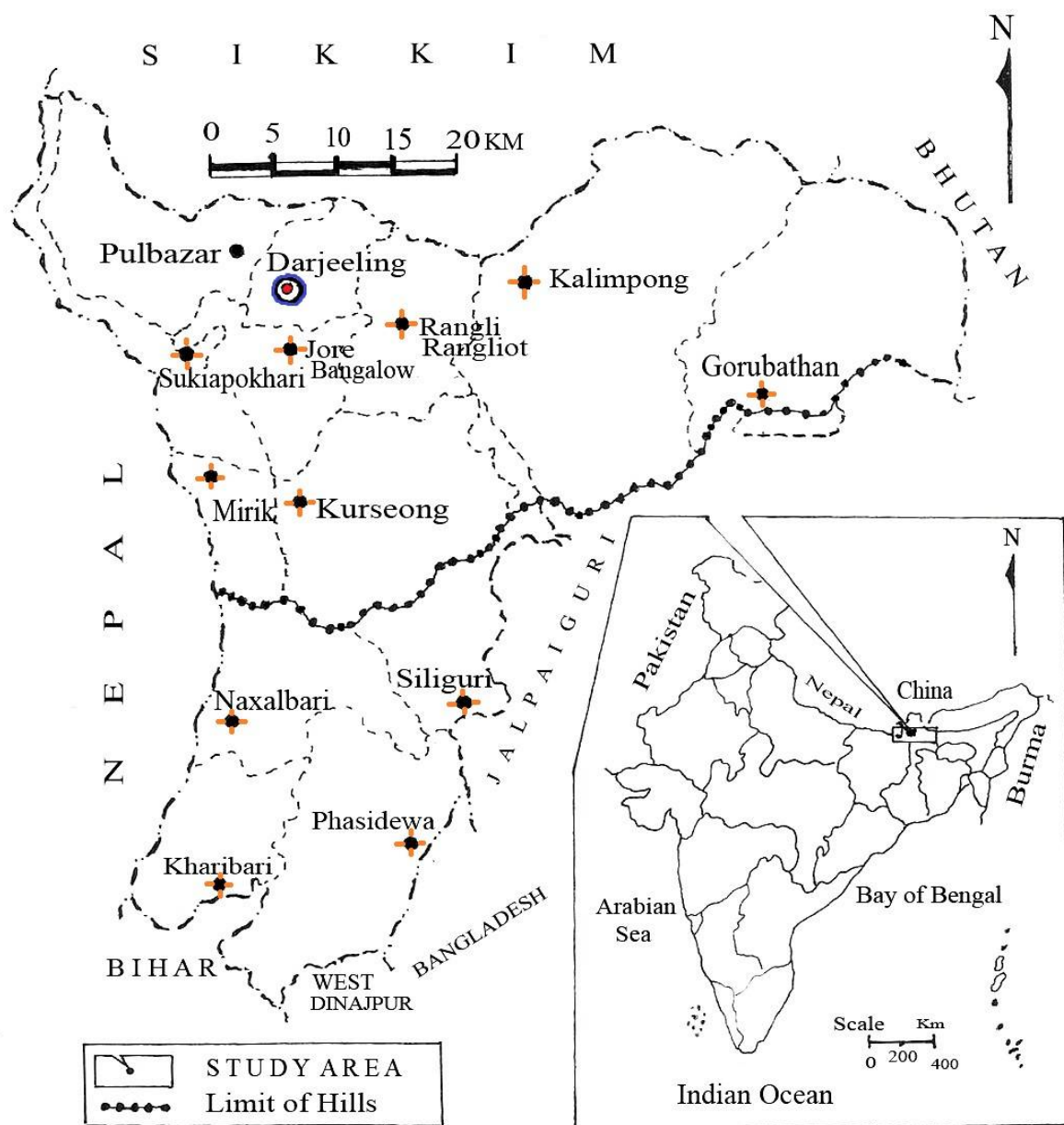


Fig. 1. Darjeeling Himalaya (Study regions)

Taxonomic Enumeration

Swertia bimaculata (Sieb. & Zucc.) Hook. f. & Thoms. ex Clarke, Journ. Linn. Soc. 14:449. 1875; Fl. Brit. Ind. 4:123. 1883; Fl. E. Him. 1:256. 1966; En. Fl. Pl. Nep. 3:96. 1982; Trans. Bose Res. Inst. 50(4):128. 1987; Fl. Bhutan 2(2):624. 1999. *Ophelia bimaculata* Sieb. & Zucc., Abh. Akad. Wiss. Munchen. 4(3):159. 1846.

Silene esquirolii H. Lev., Fl. Kouy-Tcheou 174. 1914.

Swertia bimaculata var. *macrocarpa* Nakai, Bot. Mag. (Tokyo) 47(556): 262. 1933.

Swertia platyphylla Merr., Lingnan Sci. J. 15(3): 424-425, f. 1. 1936. [Plate 1. A & B]

Vernacular Name: Bhale chirowto (Nepali).

Plant erect herb, 75-140cm tall, branches 4-angular. Leaves elliptic or ovate, 3-12×2-4.5cm, acuminate, 3-nerved, glabrous, base narrowed, petiolate 0.5-9cm. Inflorescence

corymbose. Flowers many; pedicel 1.5-3.5cm long. Calyx tube 1.2-1.6mm; lobes unequal, sepals elliptic. Corolla tube 1.2-1.5mm; petals creamy white, broadly elliptic. Stamens inserted at base; anther hastate. Ovary ellipsoid-ovoid. Fruit ovoid, 0.9-1.2cm.

Flowering and Fruiting: July - November.

Exact Existence within Darjeeling Himalaya: Algarah, Damsang Gari, Lava forest, Charkhol forest, Gumbadara, Kafer, Neora Valley, Baggonra, Lamahatta, Sonada, Takdah, Sukiapokhari, Tiger Hill, Senchel, Manaybhanjang, Dhotrey, Ramam, Tonglu, within an altitudinal range 1550-3100m.

Field Status: Sparse in the wild.

General Distribution: Himalaya (Nepal-Bhutan), Meghalaya, Naga Hills, South East Tibet, China, Japan.

Plant parts used: Entire plant parts with roots (both fresh and dry).

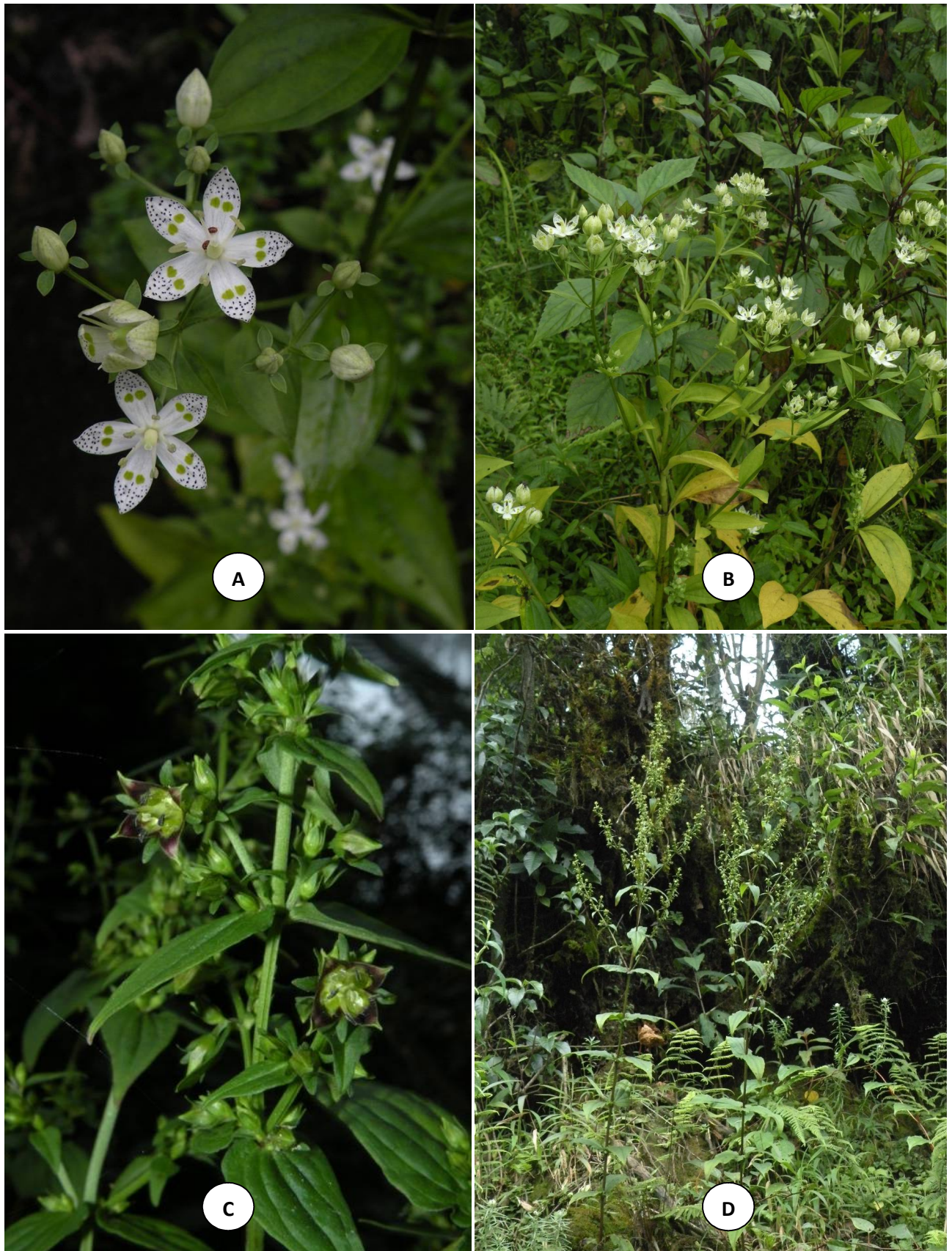


Plate 1. A. *Swertia bimaculata*, full blooming stage (Close up view), B. Habitat with vegetative stage of *Ageratina adenophora*; C. *Swertia chirayita*, full blooming stage (Close up view), D. Habitat with ferns.

Ethnomedicinal uses: It is a good substitute for *Swertia chirayita*. Decoction of whole plant is orally administered at bed time by local people of Darjeeling Himalayan and

Sub Himalayan regions in case of headache, anorexia, cough, cold, fever, malaria fever, gastritis, urinary calculi, hemorrhoids, asthma and bodyache.

Swertia chirayita (Roxb. ex Fleming) Karsten, Deuts. Fl. 1025. 1880-83; Fl. Brit. Ind. 4:124. 1883; Trans. Bose Res. Inst. 50(4):128. 1987; Fl. Bhutan 2(2):626. 1999. *Gentiana chirayita* Roxb. ex Fleming, Asiat. Research. 11. 167. 1812. [Plate I. C & D]

Vernacular Name: Chirowto, Cherowta (Nepali); Chirata, Chiretta (Hindi); Rungkyong (Lepcha); Tagota (Tibetan); Anaryatikta, Bhunimba, Chiratitka, Kairata (Sanskrit); Chiretta (English).

Plant annual erect branched herb, 45-90cm tall. Stem terete or quadrangular. Leaves sub-sessile, glabrous, ovate or elliptic, 4-8×1.5-2.6cm, acute, 5-nerved; lower leaves often larger. Inflorescence panicles, many flowered. Flowers tetramerous; bracts 10-24mm long. Sepals lanceolate, petals lurid, greenish yellow, purple nerved, ovate, acute. Fruit capsule ellipsoid.

Flowering and Fruiting: September - November.

Field Status: Rare in wild (due to indiscriminate collection and habitat destruction).

Exact Existence within Darjeeling Himalaya: Throughout Temperate and Sub Temperate zones (Sukiapokhari, Baggonra, Chimney, Takdah, Ghoom, Manaybhanjang, Dhotre, Ramam, Darjeeling, Algarah, Lava forest, Gumba dara, Neora Valley) of Darjeeling Himalaya within an altitudinal range 1700-3000m.

According to the International Union of Conservation of Nature (IUCN) criteria, conservation status of this species has been categorized as "Critically Endangered" (Joshi and Dhawan, 2005).

General Distribution: Himalaya (Kashmir-Bhutan), Meghalaya.

Plant parts used: Whole plant parts with roots (both fresh and dry).

Ethnomedicinal uses: This species is frequently used by the inhabitants of Darjeeling Himalayan and Sub Himalayan regions. Decoction of whole plant parts about 100-150ml administered orally twice daily regularly upto 10 days in case of fever, malarial fever, anorexia, bronchial asthma, acidity, liver disorders, bodyache, diabetes, headache and as blood purifier. It is a favorite remedy for intermittent fevers and in bilious dyspepsia accompanied by fever. It is also effective in skin diseases; the bitter plant extract is orally administered in case of acidity, liver inactivity and as febrifuge, tonic, anthelmintic, antidiarrhoeal, stomachic, and laxative (Rai and Sharma, 1994, Yonzon *et al.* 2012b). It is considered as astringent, stomachic, joints pain, scabies, leucoderma and chronic fever (Gurung, 2002); asthma, gonorrhoea, leprosy, thirst (Jain, 2015). It relieves nausea and headache associated with pregnancy (Dakpa, 2007). Decoction of the whole plant is also given to the local poultry incase of fever and epidemic.

Whole plant is used for the treatment of anemia, bronchial asthma, bile secretion, blood purification, chronic fever, diabetes, constipation, dyspepsia, epilepsy, liver disorders, gastritis, skin diseases, ulcers, hypertension and melancholia (Karan *et al.* 1999, Banerjee *et al.* 2000, Saha *et al.* 2004 and Chen *et al.* 2011).

Most bitter compound isolated from *Swertia*

chirayita i.e., amarogentin, gentiopicrin, mangiferin, swerchirin, sweroside and swertiamarin are helpful for human welfare (Joshi and Dhawan, 2005). The most important bioactives is xanthenes and their derivatives like alkaloids, flavonoids, lignans, iridoids, secoiridoids, terpenoids and other compounds like chiratin, oleic acid, palmitic acid and stearic acid (Pant *et al.* 2000, Patil *et al.* 2013) but other secondary metabolites *viz.*, flavonoids, iridoid glycosides and triterpenoides are also found in *Swertia*. These metabolites played major role in antihepatotoxic, anti-inflammatory, antimicrobial, anticarcinogenic, antileprosy, hypoglycemic, antimalarial, antioxidant, anticholinergic, CNS depressant, hepatoprotective and mutagenicity (Negi *et al.* 2011).

RESULTS AND DISCUSSION

Two species of *Swertia* i.e., *Swertia bimaculata* and *S. chirayita* are economically important since these are used in medicine by common people of the regions. But natural population of these species regularly depleting by means of various reasons like indiscriminate collection for illegal trade, immature harvesting during monsoon, deforestation, top layer soil erosion, cattle grazing, harvesting of grasses, herbicidal effects, plantation of Cinchona and Tea gardens, frequent landslides and several fluctuating environmental factors are responsible for decrease of *Swertia* species from the regions. Habitat conservation is highly emphasized to protect the species population throughout the region.

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