



Assessment of Field Availability Status and Medicinal Uses of Four Terrestrial Orchid Species of Darjeeling Himalaya of West Bengal, India

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Abstract

The Darjeeling Himalayan region is a natural green house for a large number of Tropical, Sub tropical, Temperate, Sub temperate and Sub alpine Orchid species. When considered from Agro - Floricultural point of view, the region is known throughout the world as botanical paradise. Present paper deals with assessment of field availability status and medicinal uses of four taxa of terrestrial Orchid species like *Goodyera schlechtendaliana* Rchb. f., *Habenaria furcifera* Lindl., *Herminium lanceum* (Thunb. ex Sw.) Vuijk and *Liparis nervosa* (Thunb.) Lindl., in Darjeeling Himalaya of West Bengal, India. Detailed taxonomic description with color photographs, flowering and fruiting, altitudinal range, local distribution within Darjeeling Himalaya and geographical distribution are provided.

Keywords: Field availability status; Medicinal uses; Four terrestrial Orchid species; Darjeeling Himalaya, West Bengal; India

Introduction

Orchids are known as 'Botanical Jewels' because of their most popularity as pot plants and cut flowers. The family Orchidaceae is regarded as highest and evolved family in the monocotyledons. Orchids comprise 25000 - 30000 species distributed throughout the world [1], except the Antarctica. Orchids exhibit incredible diversity in color, shape, size, structure and fragrance of flowers and four different life forms viz.,

- i. Epiphytic
- ii. Terrestrial and
- iii. Saprophytic (Figure 1 A - F) and are pretty admired among the professional and amateur Orchid lovers of the world and are important both botanically and commercially and highly evolved among the monocotyledons. Orchids are used as ornamentals, food, aphrodisiac, religious beliefs and as medicine.



Figure 1: Habit wise categorization of Orchid species (in habitat).
 A. *Epigegium roseum* (Lindl.) Summerh. (Saprophytic species)
 B. *Galeola lindleyana* (Hook. f. & Thomson) Rchb.f., (Saprophytic species)
 C. *Anthogonium gracile* Lindl. (Terrestrial species)
 D. *Diplomeris hirsuta* (Lindl.) Lindl. (Terrestrial species)
 E. *Podochilus cultratus* Lindl. (Epiphytic species)
 F. *Eria pannea* Lindl. (Epiphytic species).

In the earliest literature, Orchid species have been shown to be the important source of medicinal and aphrodisiac properties. The medicinal importance of Orchids is known as early as 250-300 BC by *Susruta* and *Vagbhata* in ancient Sanskrit literature. Ashtavarga, a group of eight drugs employed in the preparation of tonics such as *Chyawanprash* etc.; four species Jivak (*Malaxis muscifera*), Rishbhak (*Malaxis acuminata*), Ridhi (*Habenaria intermedia*) and Vridhi (*Habenaria edgeworthii*) are used in its preparation [2]. Alkaloids, triterpenoids, flavonoids and stilbenoids are reported from some Orchid species. Important phytochemicals like orchinol, hircinol, cypripedin, jibantine, nidemin and loroglossin are extracted from Orchids [3]. Presence of these phytochemicals provides antimicrobial, antitumor, anti-inflammatory, antiviral activities etc. and some species used as powerful inhibitor against gram positive and gram negative bacteria and some species were found to have strong anti-oxidative properties [4].

Study Region

Darjeeling Himalaya falls under Singalila and Chola range, the Sub-Himalayan region of Mt. Kanchanjanga and it is the northernmost hilly districts of West Bengal, India and it is the part of Eastern Himalaya with different physiographic features. They lie between 27°31'05" and 26°27'10" North latitude and between 88°53'00" and 87°59'30" East longitude. The Northern boundary commences on the West at Phalut (3600m), the trijunction of the boundaries of Nepal, Sikkim and West Bengal. From Phalut the Western boundary Nepal follows the Southward ridge until it joins the Mechi river upto the plains. On the South lies the district of West Dinajpur intercepted by the Mahananda River and the rest other part of the district is bounded by Bangladesh and the Jalpaiguri district. There are three Sub-Divisions in Darjeeling district viz., Darjeeling, Kurseong (hills) and Siliguri (plain) and three blocks come under Kalimpong

district viz., Kalimpong, Algarah and Gorubathan (till October 2018). The altitudinal variations range from 110m at Siliguri-Sevoke to as high as 3660m at Sandakphu.

Physiographic Features of the Study Region

Darjeeling Himalaya is blessed with ideal climatic and edaphic factors, which favour and add richness to the vegetation of the region and is classified into five categories:

- i. Plain and Tropical vegetation,
- ii. Sub-Tropical vegetation,
- iii. Sub Temperate vegetation,
- iv. Temperate vegetation and

- v. Sub Alpine vegetation (Figure 2 A - F and Figure 3 A and B).

The rivers and streams that originate from the Ghoom and Lava saddle however, flow northwards and complicated and zigzag ridges and spurs have directed the rivers to flow in different directions (Figure 3 C and D). The difficult network of the spurs and ridges govern the direction of the flow along different directions. The most important natural lakes include Kalpokhri, within Singalila National Park (3186 m), (Figure 4 E), two small ponds at Sandakphu (3660 m) that serve as the main sources of drinking water. In the Neora Valley region of the Kalimpong Sub-Division, a pair of natural lakes Jorepokhari within Neora Valley National Park, Rachel (3100 m) (Figure 3 F).

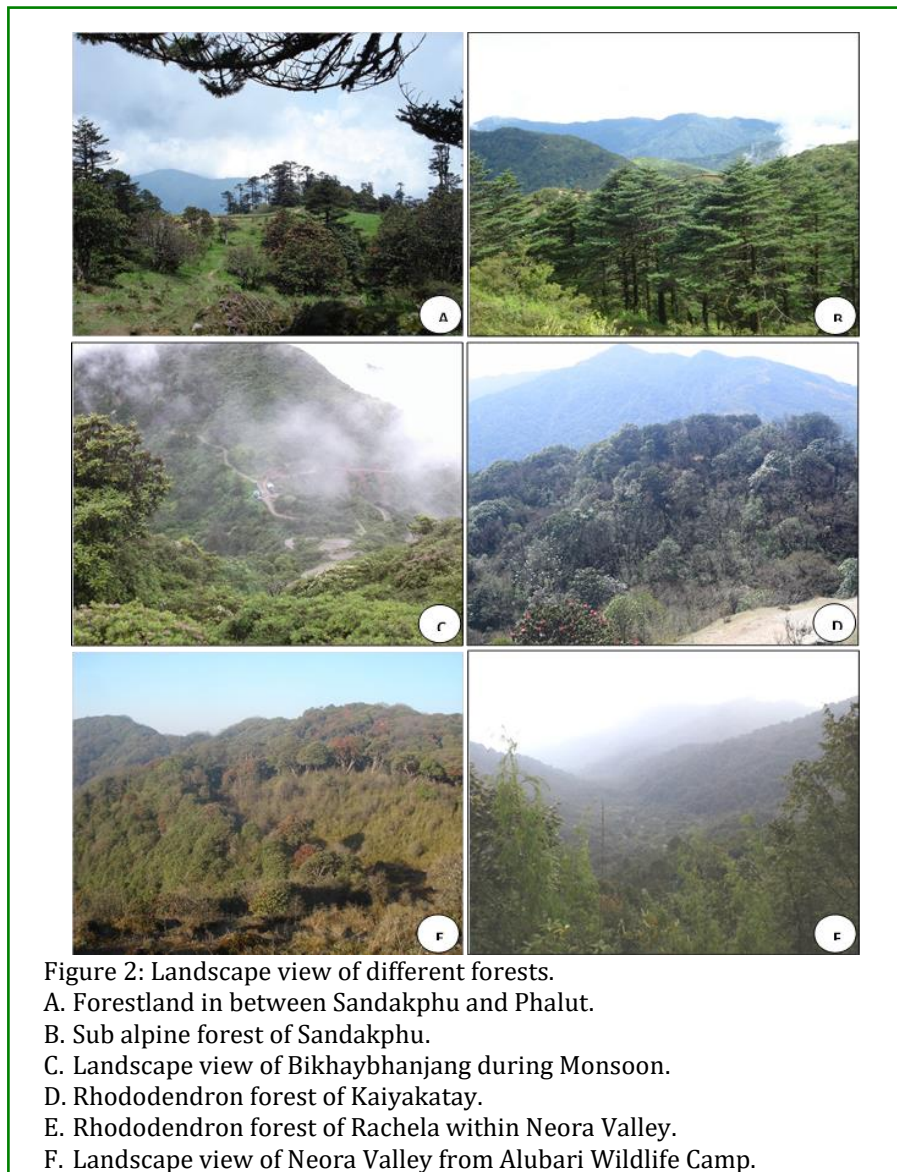




Figure 3: Neora river, main source of drinking water for Kalimpong town and surrounding areas.
 A. Inside view of Neora Valley forest.
 B. Landscape view of river Teesta Valley.
 C. Two rivers Teesta and Rangeet meet above Teesta bazar.
 D. Natural lake Kalpokhari within Singalila National Park, Darjeeling.
 E. Natural Lake of Jorepokhari at Rachela, within upper Neora Valley National Park, Kalimpong.

Materials and Methods

The intensive field survey work was started from June 2007 to October 2018 covering all the seasons of the year and far-flung villages, tea gardens, wild life areas and forests of Darjeeling Himalaya of West Bengal, India. The specimens were collected and properly worked out both in the field and laboratory and pressed in blotting paper. The Orchid species which were in blooming were photographed in their habitat. The Orchid species collected by the author in vegetative stage from places of the study areas were reared to full blooming in the Orchid Germplasm Conservation and Propagation Centre, The Orchid Society of Eastern Himalaya, Purba Samalbung

Busty, P.O. Sinji, Kalimpong Circle, District Kalimpong, West Bengal, India. The species identification and authentication was done mainly with the help of published literatures and national level Orchid species experts. Medicinal uses of Orchid species have been done by consulting those relevant literatures including [5-12]. Some earlier workers like [13-25] studied the Orchids of Darjeeling district. Recently, medicinal Orchids of the region and their uses are partially studied by workers like [26-38]. However, no attention has yet been given on the field availability status and medicinal uses of *Goodyera schlechtendaliana* Rchb. f., *Habenaria furcifera* Lindl., *Herminium lanceum* (Thunb. ex Sw.) Vuijk and *Liparis nervosa* (Thunb.) Lindl., from the region. Therefore,

present statement is aimed to provide taxonomic notes and medicinal uses with flowering and fruiting, altitudinal range, local distribution within Darjeeling Himalaya and geographical distribution of these four terrestrial Orchid species in details.

Goodyera schlechtendaliana Rchb. f., *Linnaea* 22: 861. 1849.

Genus etymology: Named in honour of John Goodyer (1592-1664), an English botanist.

Species etymology: Named after Dieterich Leonhard von Schlechtendal (1794-1866), a German botanist.

Georchis schlechtendaliana (Rchb. f.) Rchb. f., *Bonplandia* 5: 36. 1854.

Orchiodes schlechtendaliana (Rchb. f.) Kuntze, *Revis. Gen. Pl.* 2: 675. 1891.

Epipactis labiata (Pampanini) Hu, *Rhodora* 27: 106. 1925. (Figure 4 A and B).

Plant terrestrial herb, 14-38 cm tall. Stem 6-8 cm tall, sheathed. Leaves 4-8, 2.3-7.5 × 1.1-2.8 cm, lanceolate, acute, petiolate, green with white blotching, reticulate. Inflorescence 12 to 24-flowered, secund, hairy to tomentose. Flowers 0.9-1.1 cm long, yellowish-pink, hairy. Dorsal sepal 0.9-1.1 × 0.3-0.4 cm, broadly lanceolate, dorsally pubescent; lateral pair 1-1.2 × 0.3-0.4 cm, obliquely ovate, hairy. Petals 0.8-0.9 × 0.3-0.32cm, white, obovate-lanceolate, appressed to the dorsal sepal. Lip 0.8-1.1 × 0.5-0.7 cm, saccate, white tipped with green.

Specimen examined: Lava forest 2100 m; **Altitudinal range:** 1500 – 2300 m.

Flowering and Fruiting: August – October; **Field Availability Status:** Rare.

Distribution within Darjeeling Himalaya: Kafer, Takdah, Manaybhanjang, Rimbick.

Geographical distribution: India, Thailand, China, South East Asia, Japan and Sumatra.

Habenaria furcifera Lindl., *Gen. Sp. Orchid. Pl.*: 319. 1835.

Genus etymology: The generic name is derived from the Latin word *habena* (reins) in reference to the long, strap-like divisions of the petals and lip of some species.

Species etymology: Derived from the Latin words *furcatus* (forked) and *fer* (carrying) in reference to the forked lip.

Habenaria hamigera Griff., *Calcutta J. Nat. Hist.* 4: 380, t. 234-235. 1844.

H. ovalifolia Wight, *Icon. Pl. Ind. Orient.* 5: 13, t.1708. 1951.

H. tenuicornis Wall. *ex Hook. f., Fl. Brit. India* 6(1): 149. 1890. (Figure 4 C and D).

Plant terrestrial, tuberous herb, 41-53 cm tall. Stem glabrous. Leaves 4-6, 7-19 × 3-4.6 cm, narrowly elliptic, acute, petiolate, sheathing base. Inflorescence laxly many-

flowered. Flowers 0.8-1 cm long, green; floral bracts lanceolate. Sepals unequal; dorsal sepal 3.6-4 × 2-3.5 mm, ovate-oblong, obtuse; lateral pair 4-4.6 × 1.4-1.8 mm, lanceolate, acute, reflexed to spreading. Petals 4-5 × 1.5-2 mm, erect, oblong, obtuse, forming a hood with the dorsal sepal. Lip 7-8 mm, 3-lobed, spurred, shortly clawed; side lobes filiform; apical lobe linear, shorter and broader than the side lobes; spur longer than the ovary.

Specimen examined: Kumsi forest 650 m; **Altitudinal range:** 600 – 1000 m.

Flowering and Fruiting: July – October; **Field Availability Status:** Sparse.

Distribution within Darjeeling Himalaya: Relli – Pala river sides, Sittong, Pudung-Sendaybong.

Geographical distribution: India (Sikkim, West Bengal); China, Myanmar, Nepal and Thailand.

Herminium lanceum (Thunb. *ex Sw.*) Vuijk, *Blumea* 11(1): 228. 1961.

Genus etymology: Derived from the Greek word *ermin* (bed-post), probably referring to the shape of the tubers.

Species etymology: Derived from the Latin word *lanceus* (lance-shaped) in reference to the leaf shape.

Satyrium lanceum (Thunb. *ex Sw.*) Pers., *Syn. Pl.* 2: 507. 1807.

Platanthera angustifolia (Lindl.) Rchb. f., *Otia Bot. Hamburg.* 1: 39. 1878.

Herminium angustifolium (Lindl.) Benth. & Hook. f., *Gen. Pl.* 3: 622. 1880. (Figure 4 E).

Plant terrestrial tuberous herb 26-48 cm tall. Stem erect, sheathed. Leaves 3-4, 9-23 × 0.9-1.8 cm, linear-lanceolate, acuminate, sessile. Inflorescence slender, cylindrical, densely many-flowered. Flowers 0.8-1 cm long, green. Sepals oblong; dorsal sepal 3-4 × 1-1.4 mm, concave, hooded; lateral pair 2.5-3.4 × 1.1-2 mm, spreading. Petals 2.2-2.9 × 0.6-0.7 mm, narrowly linear, subacute. Lip 0.8-1 × 0.1 cm, 3-lobed, deflexed, base clawed.

Specimen examined: Dello Hill 1560 m; **Altitudinal range:** 1100 – 2400 m.

Flowering and Fruiting: July – October; **Field Availability Status:** Sparse.

Distribution within Darjeeling Himalaya: Algarah forest, Manibhanjang, Senchale, Rimbick, Dilaram, Ramam, Kalpokhari, Rachela, Lava, Today.

Geographical distribution: India (Kashmir to Arunchal Pradesh); Bhutan, China, Korea, Japan, Java, Malaysia, Myanmar, Nepal, Phillipines, South East Asia, Sulawesi and Thailand.

Liparis nervosa (Thunb.) Lindl., *Gen. Sp. Orchid. Pl.*: 26. 1830.

Genus etymology: Derived from the Greek word *liparos* (oily, greasy), referring to the smooth, gloosy leaves of many species.

Species etymology: Derived from the Latin word *nervosus* (veined) in reference to the leaves.

Cymbidium nervosum (Thunb.) Sw., Nova Acta Regiae Soc. Sci. Upsal. 6: 76. 1799.

Malaxis nervosa (Thunb.) Sw., Kongl. Vetensk. Acad. Nya. Handl. 21: 235. 1800.

Liparis nervosa var. *formosana* (Rchb. f.) Hiroe, Orchid flowers 2: 77. 1971. (Figure 4 F).

Plant terrestrial herb, 29-42 cm tall. Pseudobulbs conical, sheathed. Stem erect, longer than the leaves, glabrous. Leaves 3-7, 7-20 × 3.2-7.1 cm, plicate, broadly elliptic-ovate, acute, sheathing. Inflorescence laxly many-

flowered. Flowers 1.5-1.9 cm across, pale yellow. Sepals subsimilar, reflexed; dorsal sepal 9-11 × 1-1.6 mm, elliptic-oblong, acute, margins revolute; lateral pair 7-9 × 1.7-2.5 mm, falcate-ovate, acute, margins revolute. Petals 7-9 × 0.7-1 mm, reflexed, linear-oblongate. Lip 7-9 × 3-4 mm, wedge-shaped, yellowish-green with purple markings.

Specimen examined: Takdah forest 1130 m; **Altitudinal range:** 900 – 2300 m.

Flowering and Fruiting: May – September; **Field Availability Status:** Sparse.

Distribution within Darjeeling Himalaya: Algarah, Dello Hill, Lava, Rambh forest, Manaybhanjang.

Geographical distribution: India (North West India, West Bengal); Nepal.

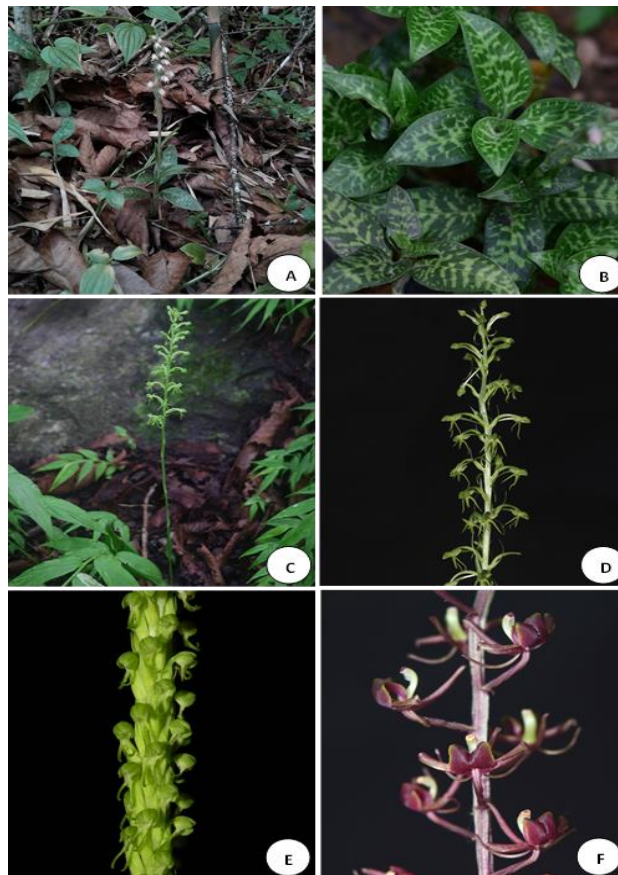


Figure 4: Photographs of Orchid species.

A. *Goodyera schlechtendaliana* Rchb. f. in habitat.

B. *Goodyera schlechtendaliana* Rchb. f. (Close up view at vegetative stage).

C. *Habenaria furcifera* Lindl. In habitat.

D. *Habenaria furcifera* Lindl. (Close up view of inflorescence).

E. *Herminium lanceum* (Thunb. ex Sw.) Vuijk, (Close up view of inflorescence).

F. *Liparis nervosa* (Thunb.) Lindl., (Close up view of inflorescence).

Results and Discussion

Field availability status

Present investigation show that four terrestrial Orchid species *i.e.*, *Goodyera schlechtendaliana* Rchb. f., specimen cited at Lava forest (within Kalimpong Block I), field availability status is rare and available within altitudinal range 1500 – 2300m, flowering and fruiting is August to October and *Habenaria furcifera* Lindl., specimen cited at Kumsi forest (within Kalimpong Block I), field availability status is sparse and available with altitudinal range 600 – 1000m, flowering and fruiting is July to October and another species *Herminium lanceum* (Thunb. ex Sw.) Vuijk, specimen cited at Dello hill (within Kalimpong Block I), field availability status is sparse and available within altitudinal range 1100 – 2400m and flowering and fruiting is July to October and last species *Liparis nervosa* (Thunb.) Lindl., specimen cited at Takdah forest (within Darjeeling), field availability status is sparse and available within altitudinal range 900 – 2300m, flowering and fruiting is May to September. The availability statuses of three of them are sparse and another one is found in rare status in the region.

Medicinal uses

Whole plant of *Goodyera schlechtendaliana* can be dried, crushed and boiled in water and resultant aqueous extract may be used as tonic for curing internal injuries and also to improve circulation of fluid of the body [6]. whole plant of *Habenaria furcifera* used by the traditional Healers of Chhattisgarh and Orissa (India) use it specially for treatment of Sickle Cell Anemia [9]. Extract of whole plant of *Herminium lanceum* are given in suppressed urination and fresh tuber of *Liparis nervosa* used to treat stomachache and malignant ulcers [5,7,8].

Threats and conservation

The natural population of Orchid species of Darjeeling Himalaya is depleting by means of various threats. Some of them are deforestation, frequent landslides, construction and extension of motor vehicle roads, indiscriminate collection from habitat, frequent landslides, forest fire, harvesting of timber, harvesting of annual grass along with annual Orchid species for the fodder of Cattle and Goats, many developmental projects, grazing of Cattle, Goats and Sheeps, top layer soil erosion cause by terrace farming in hilly slopes and torrential rain water during monsoon, pesticidal residues in the soil, collection of humus from forest lands etc. Therefore, to conserve the Orchid diversity resources of Darjeeling Himalaya region needs major attention to conserve the natural habitats and micro climatic areas of the region. If possible, Orchid sanctuaries and germplasm conservation

centres should be established both *in situ* and *ex situ* conservation in the region and mass multiplication by means of tissue culture techniques should emphasized to conserve and plantation in the suitable habitat in nature and public awareness programmes are utmost necessary to conserve the remaining population of Orchid species of Darjeeling Himalayan regions of West Bengal, India.

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