

Present status, diversity and distribution of *Goodyera* R. Brown [Orchidaceae] in Darjeeling part of the Eastern Himalaya

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Abstract

The paper deals with the present status, diversity and distribution of seven terrestrial species of *Goodyera* R. Brown (Orchidaceae) in Darjeeling part of the Eastern Himalaya.

Key words: Orchidaceae, *Goodyera* R. Brown; Status; Diversity; Distribution; Darjeeling Himalaya

INTRODUCTION

Darjeeling Himalaya is rich in Orchid diversity and is the northernmost part of the state of West Bengal. It is a roughly triangular region extending over an area of 3254.7 sq km. The area is bordered by Sikkim in the north, Terai and Dooars in the south, Bhutan in the east and Nepal in the west. While three of the four Sub-Divisions of Darjeeling district (Darjeeling, Kalimpong, Kurseong) are in the hills, the Siliguri subdivision is on the foot-hill plains. In the present investigation records the availability, distribution and diversity of the genus *Goodyera* R. Brown (Orchidaceae) in Darjeeling part of the Himalayas.

The genus *Goodyera* was established in 1813 by Robert Brown in the second edition of William Aiton's *Hortus Kewensis*. The genus comprises of about 40 species widely distributed in the northern temperate zone, south to Mexico and east to Madagascar, S.E. Asia, the Pacific Islands, New Guinea and Australia.

Plants are terrestrial, rhizome creeping, rooting at nodes. Pseudostems erect, leafy. Leaves several, clustered, fleshy, usually petiolate from inflated sheaths. Racemes terminal, erect, few to many-flowered; peduncle and rachis often pubescent. Flowers small, often secund and pubescent on outer surface. Sepals parallel to the floral axis or with lateral sepals spreading; dorsal sepal forming a hood with petals; lip unlobed, hollow or with saccate base, often setose within, narrowed to an acute apex which is often recurved; column short; rostellum long, deeply cleft; stigma undivided; pollinia 2.

MATERIALS AND METHODS

Intensive field survey was conducted during the years 2007 – 2014 covering all the seasons in all parts of the Darjeeling Himalayas and Sub-Himalayan regions including the forest areas, floral nurseries and farms covering all the altitudinal ranges as low as ± 130 m at Siliguri to as

high as 3636 m at Sandakphu – Phalut areas. While working on Orchid flora of Darjeeling Himalayan region, different species of the genus *Goodyera* R. Brown were collected and recorded in the field note book. The collected specimens were processed into mounted herbarium-sheets following Jain & Rao (1977); and identified and authenticated using literature like Hooker (1888 – 1890), King & Pantling (1898), Pradhan (1979), Pearce & Cribb (2002); Lucksom (2007) and confirmed by matching at CAL. For the updated nomenclature www.theplantlist.org has been largely consulted. Finally, one set of Voucher specimens were deposited in the herbarium of Department of Botany, St. Joseph's College, North Point, Darjeeling and at Taxonomy and Ethnobiology Research Laboratory, Cluny Women's College, Kalimpong. All the recorded species of *Goodyera* are enumerated below alphabetically to their species epithet and with exsiccatae, places and altitudinal range of local distribution, habitat, phenology and present availability status (Table 1).

RESULTS AND DISCUSSION

During recent field studies in the Darjeeling Himalaya of India, seven terrestrial species of *Goodyera* Robert Brown were recorded. Of those, two are sparse (*G. foliosa* and *G. schlechtendaliana*), one frequent (*G. procera*) and four (*G. fusca*, *G. hemsleyana*, *G. hispida* and *G. vittata*) are rarely observed in the vegetation during the present investigation. In general, *Goodyera* is a terrestrial genus but some species frequently grow in leaf mould on forest floor. Flowering season for different species is quite variable. *G. foliosa* flowers during August to September and found in an altitudinal range of 1500 to 2700 m; *G. fusca* flowers during August and persists till September and available from 3400 to 5100 m; *G. hemsleyana* flowers during July to August and available from 1800 to 2600 m; *G. hispida* and *G. vittata* flower during July to September and available at 350 to 2300 m and 1600 to 3100 m respectively; *G. procera* flowers during February to April and available in 400 to 1700 m; and, *G. schlechtendaliana* flowers during August to September and available at an altitudinal range of 1400 to 2400 m from the mean sea level. The population of *G. fusca* is extremely rare and need to be considered as a threatened species.

Key to the species:

1. Inflorescence dense, usually much longer than 10 cm; sepals glabrous outside; leaves over 9 cm long *G. procera*
- 1a. Inflorescence not dense, usually less than 10 cm long; sepals hairy outside; leaves less than 9 cm long 2
2. Leaves clustered at base, ovate to ovate-lanceolate, usually less than 3.5 cm long; flowers white; plants robust *G. fusca*
- 2a. Leaves distant along stem, lanceolate, usually over 3.5 cm long; flowers white, green or pink 3
3. Leaves strongly reticulate 4
- 3a. Leaves not strongly reticulate, green, blotched with white or with a central silvery band 5
4. Flowers over 5 mm across; floral bracts more than 1 cm long *G. hemsleyana*
- 4a. Flowers less than 5 mm across; floral bracts less than 1 cm long *G. hispida*
5. Lip bilamellate, petals united at apices; leaves with a median silvery band *G. vittata*
- 5a. Lip not lamellate, petals free; leaves green or mottled or white spotted 6
6. Floral bracts exceeding flowers, over 1.5 cm long; lamina ovate-lanceolate *G. foliosa*
- 6a. Floral bracts not exceeding flowers, less than 1 cm long; lamina lanceolate, with white blotches *G. schlechtendaliana*

Table 1. List of species of *Goodyera* Robert Brown recorded from Darjeeling Himalaya along with their habitat, reference voucher specimen, local distribution, altitudinal ranges, flowering time and present availability status.

Botanical name, Protologue; Exsiccatae	Occurrence in Darjeeling; altitudinal range of distribution (amsl)	Flowering time	Availability status
<i>G. foliosa</i> (Lindley) Bentham ex C.B. Clarke, J. Linn. Soc. Bot. 25: 73. 1889. Rajendra <i>et al</i> 1407, dtd. 08.08. 2010	Todey, Neora Valley, Lava; 1500 – 2700 m	August – September	Sparse
<i>G. fusca</i> (Lindley) Hooker f., Fl. Brit. India 6(1): 112. 1890. Rajendra <i>et al</i> 0701, dtd. 07.09. 2008	Sandakphu – Phalut areas; 3400 – 5100 m	August – September	Threatened
<i>G. hemsleyana</i> King et Pantling, J. Asiat. Soc. Bengal 64(3): 342. 1896. Rajendra <i>et al</i> 1388, dtd. 31.07. 2010	Senchale, Neora Valley, Palmajua, Sukiapokhari; 1800 – 2600 m	July – August	Rare
<i>G. hispida</i> Lindley, J. Linn. Soc., Bot. 1: 183. 1857. Rajendra <i>et al</i> 1421, dtd. 10.08. 2010	Takdah, Lava, Pedong, Kalijhora; 350 – 2300 m	July – September	Rare
<i>G. procera</i> (Ker Gawler) Hooker, Exot. Fl. 1(3): t.39. 1823. Rajendra <i>et al</i> 0761, dtd. 19.02. 2009	Samalbong, Suruk-Samthar, Pudung, Panbu, Kumsi, Sittong, Seokbir khani, Mangmaya; 400 – 1700 m	February – April	Frequent
<i>G. schlechtendaliana</i> Reichenbach f., Linnaea 22: 861. 1849. Rajendra <i>et al</i> 0698, dtd. 07.09. 2008	Lava, Kafer, Manaybhanjang, Takdah, Rimbick; 1400 – 2400 m	August – September	Sparse
<i>G. vittata</i> (Lindley) Bentham ex Hooker f., Fl. Brit. India 6(1): 113. 1890. Rajendra <i>et al</i> 0617, dtd. 06.08. 2008	Todey-Tangta, Gairibas forest, Jaunbari, Dhotrey; 1600 – 3100 m	July – September	Rare

It is observed that regular degradation of natural habitat through the erosion of top soil, collection of forest floor humus, accumulation of pesticide residues, overgrazing, extension of agricultural lands and roads, developmental projects and indiscriminate collection of plants by the paid agents of floral nursery businessmen are steadily reducing the population structure of these delicate species and rendering a threatened status.

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LITERATURE CITED

- Hooker, J.D. 1888 – 1890. *The Flora of British India*. Vols. 5 & 6. L. Reeve & Co. London.
- Jain, S.K. & Rao, R.R. 1977. *Field and Herbarium Methods*. Today and Tomorrow's Printers and Publishers. New Delhi.
- King, G. & Pantling, R. 1898. The Orchids of the Sikkim – Himalaya. *In Annals of the Royal Botanic Garden*, Botanical Survey of India, Calcutta.
- Lucksom, S.Z. 2007. *The Orchids of Sikkim and North East Himalaya: Development Area*, Jiwan Thing Marg, Gangtok, East Sikkim.
- Pearce, N.R. & Cribb, P.J. 2002. *Flora of Bhutan. The Orchids of Bhutan*. Vol. 3, Part 3. Royal Botanic Garden, Edinburgh.
- Pradhan, U.C. 1979. *Indian Orchids Guide to Identification and Culture*, (Vol. II) Premulaceae Books, Kalimpong.
- www.theplantlist.org