

Diversity and distribution of Gleicheniaceae in Darjiling Hills of West Bengal, India

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Abstract

This paper deals with the diversity and distribution of Gleicheniaceae Presl in Darjiling Hills. It revealed the occurrence of two genera with four species and represent 57 % of Gleicheniaceae present in the Indian sub-continent and these four species represent the diversity of this family for the state of West Bengal. These plants are distributed in the sub-tropical to temperate region and express a narrow ecological amplitude. The member of this family are used as cattle bed fern for domestic animals in villages and the humus collected from the decaying fronds are exploited by local nurseries for growing *Cymbidium* hybrids.

Key words: Gleicheniaceae, Darjiling Hills, ecological amplitude

INTRODUCTION

The Pteridophytes are the second most diverse group of land plants after the angiosperms with generally recognized 45 families (Smith *et al.* 2006; Christenhusz *et al.* 2011). Gleicheniaceae Presl is represented by 150 species in China (<http://www.efloras.org>) and 7 species are found in the Indian sub-continent (Fraser-Jenkins 2008). The Darjiling (Darjeeling) is the northernmost district of the Indian state of West Bengal that lies between 26°31' and 27° 13' N latitude and between 87°59' and 88°53' E longitude (O'Malley 1907). The Hills of Darjiling form the outer fringes of the Singalila Range of Eastern Himalaya, covering an area of 2436.55 km² with altitudinal variation ranging from ±150 m (at Sukna) to 3660 m (at Sandakphu – Phalut), presents diverse topographical conditions and offer suitable habitat for the occurrence of wide range of plants (Das 1995, 2004; Acharya & Acharya 2001). Though the district is floristically well explored but the occurrence of micro-niche in difficult terrains with negligible accessibility has lead some plants of the region remained undiscovered even today. Pteridophytic flora of Darjiling is quite rich and some such accounts include Mehra & Bir (1964) and Hara (1971). Members of Gleicheniaceae form dominant vegetation covering hill slopes and adding beauty to this favorite tourist destination. Commonly they are referred as 'welcome fern'!

MATERIALS AND METHODS

Regular field trips were made during April 2010 to July 2014 to document the occurrence and distribution of different members of Gleicheniaceae in various vegetation tracts of Darjiling Hills and processed into mounted herbarium-sheets following conventional techniques (Jain

& Rao 1977). Specimens were identified by matching with the pre-identified specimens in the Herbarium of the Llyod's Botanical Garden, Darjiling as well as through consultation of published literature including Mehra & Bir (1964), Hara (1971), Mathew (1971), Thapa (2002), Ghosh *et al.* (2004) and Fraser-jenkins (2008, 2015). The distribution of different species were noted in the field note book along with the precise altitude and coordinates using one GPS.

Voucher specimens have been deposited in the Herbarium of the Llyod's Botanical Garden and at the Herbarium of the Botany department, St. Joseph College, Darjilling.

RESULT AND DISCUSSION

The study revealed the occurrence of two genera of Gleicheniaceae, namely *Dicranopteris Bernahardii* represented by three species and *Diplopterygium* (Diesl) Nakai represented by single species. These four species of Gleicheniaceae represent the state of West Bengal which harbor 57 % of the species occurring in the Indian sub-continent. The member of this family are utilized as cattle bed fern (Sottar) for domesticated animal in the far flung villages. The humus deposited from the death and decaying fronds are utilized by the orchid nursery for growing *Cymbidium* hybrids. *Dicranopteris splendida* is restricted to temperate region of Darjiling hills and are distributed to the area neighboring the borders of Nepal. The remaining 3 spp of this family are widely distributed from Sub-tropical to temperate region and no such threats for its existence has been observed. An artificial key has been provided for the recognition of these plants.

Gleicheniaceae Presl, Rel. Haenk 1(1): 70. 1825.

Key to Genera:

- 1a. Plants straggling, fronds 200 – 500 cm in height / length **Diplopterygium**
- 1b. Plants scrambler, fronds around 100 cm in height **Dicranopteris**

DICRANOPTERIS Bernahardi, Schrad. Neu. J. Bot. 1(2): 38. 1905.

Key to species:

- 1a. Dichotomy and apical buds pubescent *D. lanigera*
- 1b. Dichotomy and apical buds glabrous 2
- 2a. Deflexed pinnae entire at each dichotomy *D. splendida*
- 2b. Deflexed pinnae segmented at each dichotomy *D. taiwanensis*

Dicranopteris lanigera (D. Don) Fraser-Jenkins, Tax. Revi. of Three Hundred Ind. Subcon. Pterid. With a Revi. Cen. List. 35. 2008; Fraser-Jenkins *et al.*, Ferns & Fern-allies of Nepal I: 125. 2015.

Gleichenia lanigera D. Don, *Prodr. Fl. Nepal.* 17. 1825.

Plant terrestrial, scrambler, 80 – 90 cm tall; rhizomes creeping, 0.3 – 0.6 cm in diam.; Stipe stramineous, 25 – 35 × 0.2 – 0.4 cm, glabrous; rachis 2 or more times dichotomously branched; apical buds ovate, small, pubescent; rachis with a first pair of pinnae at each dichotomy, lanceolate, 5 – 7 × 1.5 – 3 cm, base and apex attenuate, apex acuminate; segments 25 – 33 on each side, linear-lanceolate, 1 – 1.5 × 0.2 – 0.4 cm, margin entire, apex obtuse, papery, glabrous; costae prominent on both surface, veins forked, free; Sori brown, spherical,

arranged in single line on each side of the costule; sporangia globose, golden-brown, 140 – 160 μm , spores light brown, spherical, 26 – 28 μm .

Exsiccatae: West Bengal, Darjiling hills, Rohini, 03.04.2012, *Nayan Thapa & Dorjay Lama 108A (SJCBH), 108B (LBH)*, 26°54'10.5" N and 88°20'33.5" E, Alt. 850 m \pm 11.5

Local distribution: Lebong, Third Mile, Algarah, Payow, Dilaram

Global distribution: China, Taiwan, Nepal, India, Bhutan.

Dicranopteris splendida (Handel-Mazzetti) Tagawa, Acta Phytotax. Geobot. 8: 164. 1939; Thapa, Pterid. Nepal 36. 2002; Fraser-Jenkins, Tax. Revi. of Three Hundred Ind. Subcon. Pterid. With Revi. Cen. List 532.2008; Fraser-Jenkins *et al.*, Ferns and fern-allies of Nepal I: 128. 2015.

Gleichenia splendida Handel-Mazzetti, Akad. Anz. Akad. Wein 19: 81. 1924.

Dicranopteris ampla Ching & Chiu in Ching & Wang, Acta Phytotax. Sin. 8: 161. 1959.

Plants terrestrial, scrambler, upto 70 – 100 cm tall; rhizome creeping, pubescent, hairs brown, ca. 0.3 cm; Stipe brown, cylindrical, 20 – 30 \times 0.2 – 0.4 cm, glabrous; rachis 1 – 3 times dichotomously branched, apical bud ovate, glabrous; rachis brown, smooth, glabrous; each dichotomy of a rachis bears a deflexed segment, linear-lanceolate, 3 – 7 \times 0.8 – 1 cm, ultimate pinnae linear-lanceolate, 15 – 35 \times 5 – 10 cm, apex attenuate; segment 30 – 45 on each side, lanceolate, 3 – 4 \times 0.8 – 1 cm, margin entire, apex obtuse; lamina papery, glaucous abaxially, dark green adaxially, glabrous; costae prominent; veins free, forked; Sori dark brown, scattered; sporangia globose, 200 – 220 μm ; spores hyaline, spherical, 33 – 37 μm .

Exsiccatae: West Bengal, Darjiling hills, Dhotrey, 30.06.2013, *Nayan Thapa & Dorjay Lama, 145A (SJCBH), 145B (LBH)*, 26p 59'12.9" N and 88p 14'46.7" E, Alt. 872 m \pm 12

Local Distribution: Sukhia, Pasupathi fatak, Takdah.

Global distribution: Myanmar, Thailand, Nepal, India.

Dicranopteris taiwanensis Ching & Chiu in Chien & Chun, Fl. Reip. Pop. Sin. 2: 346. 1959; Thapa, Pterid. Nepal 36. 2002; Fraser-Jenkins, Tax. Revi. Three Hundred Ind. Subcon. Pterid. with Revi. Cen. List 532. 2008; Fraser-Jenkins *et al.*, Ferns and fern-allies of Nepal I: 128. 2015.

Dicranopteris linearis var. *montana* Holttum, Reinw. 4: 276. 1957.

Plant terrestrial, scrambler, up to 90 – 100 cm tall; rhizomes creeping, 0.3 – 0.6 cm in diam.; Stipe dark brown, 30 – 40 \times 0.2 – 0.4 cm, glabrous; rachis 2 or more times dichotomously branched; apical buds ovate, small; rachis with a first pair of deflexed lateral pinnae at each dichotomy, broadly lanceolate, 7 – 9 \times 3 – 4 cm, base and apex attenuate; second pair smaller, 3 – 5 \times 0.5 – 1.5 cm; ultimate pinnae oblong-lanceolate, 15 – 25 \times 4 – 7 cm, base attenuate, apex acuminate; segments 25 – 30 on each side, linear-lanceolate, 3 – 3.5 \times 0.4 – 0.6 cm, margin entire, apex obtuse, papery, glabrous; costae prominent on both surface, veins forked, free; sori brown, spherical, arranged in single line on each side of the costule; sporangia globose, golden-brown, 180 – 190 μm , spores light brown, spherical, 29 – 32 μm .

Exsiccatae: West Bengal, Darjiling hills, Lebong, 11.07.2011, *Nayan Thapa & Dorjay Lama, 16A (SJCBH), 16B (LBH)*, 27°04'13.5" N and 88°15'59.7.7" E, Alt. 1659 m \pm 11.5

Local distribution: Lebong, Third Mile, Algarah, Payow, Dilaram.

Global distribution: China, Taiwan, Nepal, India, Bhutan.



PLATE - I: Gleicheniaceae in Darjiling Hills: **A.** *Dicranopteris lanigera* (D. Don) Fraser-Jenkins; **B.** *Dicranopteris taiwanensis* Ching & Chui; **C.** *Dicranopteris splendida* (Handel-Mazzetti) Tagawa; **D.** *Diplopterygium giganteum* (Wallich ex Hooker & Bauer) Nakai

DIPLOPTERYGIUM (Diels) Nakai, Bull. Natl. Sci. Mus., Tokyo. 29: 47. 1950.

Diplopterygium giganteum (Wallich ex Hooker & Bauer) Nakai, Bull. Natl. Sci. Mus., Tokyo. 29: 50. 1950; Fraser-Jenkins *et al.*, Ferns and fern-allies of Nepal I: 130. 2015.

Gleichenia gigantea Wallich ex Hooker & Bauer, Gen. Fil. t. 39. 1840.

Dicranopteris gigantea Ching, Fl. Reipubl. Popularis Sin. 2: 346. 1959.

Plants terrestrial, straggling, 300 – 350 cm tall; Rhizomes thin, long creeping. Stipes dark brown, smooth, cylindrical, 100 – 150 × 0.3 – 0.9 cm, branches to produce two primary rachis an axillary bud, further dichotomous branching for 2 – 3 times,; axillary buds ovate, ca 0.2 cm, covered with dense brown hairs; rachis branches 100 – 150 × 0.2 – 0.4 cm, bi-

pinnatifid, lateral pinnae 23 – 30 pairs, 25 – 30 × 1.5 – 3 cm; ultimate segments 0.7 – 1.5 × 0.4 – 1 cm, oblong-lanceolate, obtuse, hairy on undersurface, veins once forked; sori in single line on each side of costule, medial region, naked with 2 – 5 sporangia, sporangia globose, golden-brown, 190 – 200 µm; spore tetrahedral, smooth, grayish, 16 – 20 µm.

Exsiccatae: West Bengal, Darjiling hills, Chatakpur, 20.10.2011, Nayan Thapa & Dorjay Lama 082A (SJCBH), 082B(LBH), 27° 00'35" N and 88°17'15" E, alt. 2121 m ± 13.5

Local distribution: Takdah, Lava, Lebong, Kuresong, Sonada, Algarah.

Global distribution: Nepal, Bhutan, China, Myanmar, Vietnam, Thailand.

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