

Endemic flowering plants of the Kangchenjunga Landscape, Eastern Nepal: Distribution, life forms and conservation status

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Introduction

Plant endemism and degree of threat are the two main criteria that determine ‘biodiversity hotspots’ (Myers et al. 2002). Endemism is the main criterion for hotspot status determination because endemic species are entirely dependent on a single area for their survival, and by virtue of their more restricted ranges, are often the most vulnerable (Myers 1988). These species, when confined to highly threatened ecosystems, will almost certainly be the first to be affected by extinction, and hence need effective conservation actions (Heywood and Watson 1995).

Identifying biodiversity hotspots is one way to focus conservation programs (Myers et al. 2002). The Kangchenjunga Landscape (hereafter KL) is part of the Himalaya, and one of 34 Global Biodiversity Hotspots (Mittermeier et al. 2004). While endemic species were studied on the Indian side of the KL (see Behera et al. 2002), distribution data are unavailable on the Nepalese side, and thus conservation threats have not been identified. Preliminary screening of the literature shows rich diversity of endemic flowering plants in the KL-Nepal. However, this assessment is incomplete and the information on the conservation status of these species is lacking, causing an information gap preventing conservation action. Detail biological and ecological studies are needed to assess the viability of the populations of the endemic species before suggesting appropriate management and conservation strategies (Ghimire 2005).

Objectives of the research

The objectives of this study are (1) to identify the endemic plant species of the KL-Nepal, (2) to study the spatial distribution, conservation status and threats, community ecology, and abundance of these species, and (3) assess local uses and traditional ecological knowledge related to endemic species uses, ecology and threats.

Study area

The KL-Nepal comprises four districts of Mechi zone in eastern Nepal viz. Jhapa, Ilam, Panchthar, and Taplejung, bordering India in the east and south, China in the North and districts of Koshi zone in the west (Figure 1). The Kangchenjunga Landscape Conservation and Development Initiative (KLCDI) has been launched in this landscape for integrated conservation and development but plans do not specifically target endemic species.

The physiography of the KL-Nepal varies widely from Tarai to High Mountains. The KL-Nepal comprises four ecoregions, 11 bioclimatic zones, and 23 forest types. Several of the important plant areas and at least three important bird areas have been identified. Introduction of alien

invasive species, forest encroachment for extension of agriculture, habitat loss and fragmentation due to deforestation, erosion and landslide, over-grazing, and over-exploitation or unsustainable utilization of commercially important species are some of the threats to floral biodiversity thought out the KL-Nepal. The Kangchenjunga Conservation Area, only protected area of the KL-Nepal, has significant contribution in conservation of the flora and fauna. Several wetlands including Mai Pokhari Ramsar site have been bridging cultural and biological diversity in the KL-Nepal (Chaudhary et al. 2014).

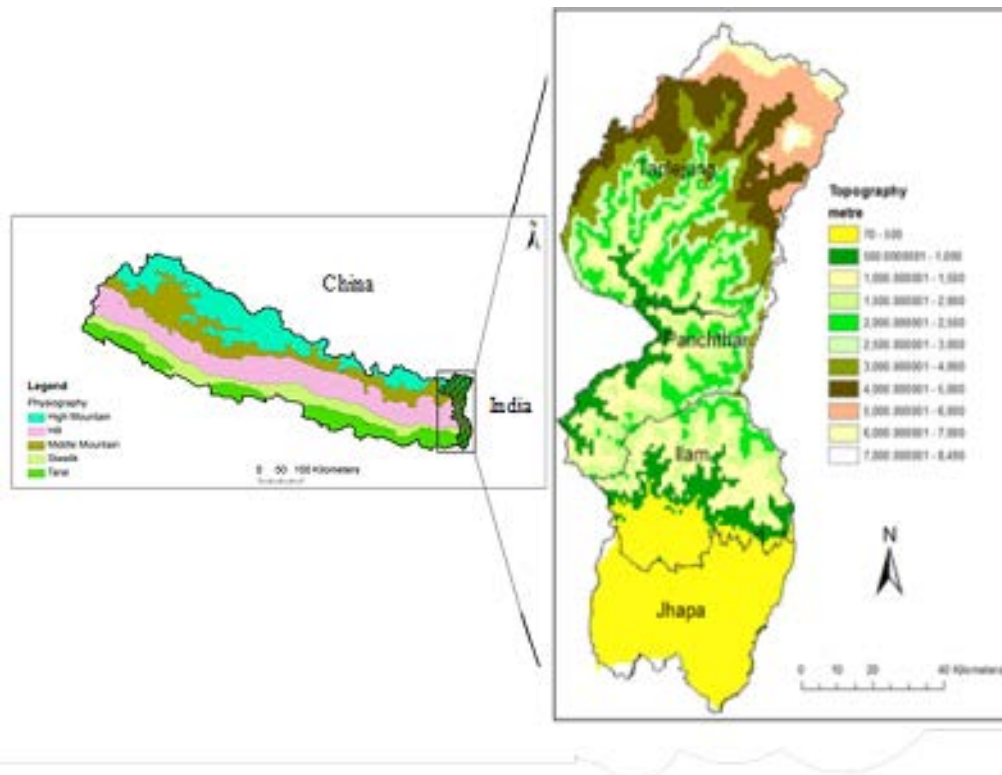


Figure 1: Map showing the districts covering Kangchenjunga Landscape of Nepal

Methodology

Literature review was conducted in the first phase of the research. Five major publications on endemic plants of Nepal were reviewed (Rajbhandari and Adhikari 2009, Rajbhandari and Dhungana 2010, 2011, Rajbhandary et al. 2010) and lists of endemic and sub-endemic plants were prepared.

In second phase, distribution, conservation status and population of the endemic species will be assessed in the field. The threats to these species will be identified. A spatial distribution map will be prepared and detail outline of the conservation measures will be proposed. Brochure

about the importance of endemic species will be prepared and community awareness programmes will be conducted in the districts.

Preliminary results

Based on the review of the publications, two categories of endemic plants are identified from the KL-Nepal. The first category represents the species strictly reported from the KL-Nepal whereas the second category represents the endemic species reported from the neighboring districts of the KL-Nepal. Such species are called as 'sub-endemic' to KL-Nepal. The description of the species provided in this report were exclusively taken from Rajbhandari and Adhikari (2009), Rajbhandari and Dhungana (2010, 2011) except for two species of *Begonia*. The two species of *Begonia* were identified as endemic to the KL-Nepal by Rajbhandary et al. (2010).

List of endemic plants strictly reported from four districts of KL-Nepal

Twelve species are strictly reported from the four districts of KL-Nepal as endemics in the literature.

1. *Aconitum staintonii* Lauener, Notes Roy. Bot. Gard. Edinb. 26: 4, f. 2c & 3c (1964). Hara et al., Enum. Fl. Pl. Nep. 2: 11 (1976). Shrestha & Joshi in Rare, Endem. Endang. Pl. Nep.: 40 (1996). Press et al. in Ann. Checkl. Fl. Pl. Nep.: 249 (2000).

Family: Ranunculaceae

Life form: Herb

Local name: Unknown

Local use: Unknown

Flowering time: July

Habitat and ecology: Amongst shrubs

Distribution: East Nepal; 3500-4100 m.

Distinguishing characters: Erect herb with c. 1 cm thick tuber. Stems 1.2 m tall; upper stems minutely pubescent; lower stems nearly glabrous. Cauline leaves cordate-orbicular or cordate-ovate, to 7 cm long, 10 cm wide, strigose on upper surface, 3-partite, middle segments rhomboid, 3-partite, lateral ones unequally 2-partite, all ultimate segments lobed, lobes dentate. Inflorescence erect, raceme. Sepals bluish white, sparsely pilose, liliate, helmet subnavicular. Petals to 2 cm long, hispid, claw thin, bent, spur globose, recurved, lamina emarginated, reflexed. Stamens hispid with blue filaments and white anther. Carpels 5, densely hispid.

Date of collection, Collector's names, type specimen number and place of deposition:

Taplejung district, Walanchung Gola, Tamur valley, 11500 ft., July 18, 1956, J.D.A. Stainton 1034 (Holotype, BM).

Threat status: Unknown. Only known from the type collection.

2. *Begonia dolichoptera* S. Rajbhandary & KK Shrestha

Distribution: East Nepal; 2500 m

Date of collection, Collector's names, type specimen number and place of deposition:

Taplejung, SW of Amjilassa, Ghunsa Khola, 2500 m, 1989.09.05, M. Crawford et al. 248 (Holotype: K; isotypes: E, KATH)

3. *Begonia panchtharensis* S Rajbhandary

Distribution: East Nepal; 2200-2300 m

Perennial herb, 50-60 cm tall. Stem rhizomatous, 8-12 cm long, 20-30 mm in diameter, covered with long roots. Leaves several, arising from the rhizome, petiole 33-46 cm long, succulent, glabrous, grooved, yellowish green with red linear dots. Inflorescence bisexual, axillary, cymose, dichotomously branched, protandrous. Male flowers: pedicel 1-8 cm, light pink with linear red spots, glabrous; tepals 4, white to pink. Female flowers: pedicel 1.5-2 cm, glabrous; tepals 6-8, outermost tepals pink, innermost white, symmetrical. Fruits: pedicel 2.5-3 cm, glabrous; drying dark brown with green tinge, dehiscing along the sutures between the two smaller wings.

Date of collection, Collector's names, type specimen number and place of deposition:

Panchthar, Prangbung, Tinubote, Sisire, 2250 m, 2007.10.02, U. Thumsuang s.n. (Holotype: E, isotype: KATH).

4. *Cortiella lamondiana* Fullarton & M.F. Watson, Edinb. J. Bot. 53 (1): 130 (1996). Press et al. in Ann. Checkl. Fl. Pl. Nep.: 313 (2000).

Family: Ranunculaceae

Life form: Herb

Local name: Unknown

Local use: Unknown

Flowering time: September-October

Habitat and ecology: Exposed rock crevice

Distribution: East Nepal; 4200 m.

Distinguishing characters: Perennial dwarf rosette herb to 11 cm across. Stem reduced, almost absent to c. 1(-3) cm. Leaves pinnate and deeply pinnatifid, oblong-lanceolate in outline; ultimate leaflets with lanceolate lateral lobes and a trifid terminal lobe; petiole 1.5-4 cm. Umbels compound, primary terminal umbel sessile, secondary lateral umbels shortly pedunculate. Primary umbel c. 20-30-rayed; rays to 2 cm; bracts several, leaf-like, but with a sheathing base; umbellules c. 16-20-flowered; bracteoles several, linear. Secondary umbels similar to the primary but smaller and fewer-flowered. Flowers white to purple with a darker purple mid-vein.

Date of collection, Collector's names, type specimen number and place of deposition:

Taplejung district, Kambachen-Lhonak, 4200 m, September 10, 1989, C. Grey-Wilson, S. Zmarzty, M. Sinnott, D. Long, R. McBeath, H. Noltie & M. Subedi (KEKE) 506, (Holotype, E).

Threat status: Unknown.

5. *Eriocaulon exsertum* Satake in Hara, Fl.E.Himal.2: 156, f. 9 (1971). Satake in Hara et al., Enum.Fl.Pl.Nepal 1:96 (1978). Shrestha & Joshi in Rare, Endem. Endang.Pl. Nep.: 21 (1996). Press et al. in Ann. Checkl. Fl. Pl. Nep.: 67 (2000).

Family: Eriocaulaceae

Life form: Herb

Local name: Unknown

Local use: Unknown

Flowering time: December

Habitat and ecology: Unknown

Distribution: Eastern Nepal; 200-300 m.

Distinguishing characters: Stemless herb. Leaves 2-3 cm long, 7-9 nerved, apex gradually narrowed. Heads semiglobose, 3-4 mm across. Involucral bracts oblong, 1.5 mm long, obtuse, glabrous. Receptacles glabrous. Male flowers 1.5 mm long; sepals 2, connate at base; petals 3, tube connate; stamens 6; filaments extremely short; anthers oblong. Female flowers: sepals 2, free, linear-navicular, 1.5 mm long, apex acute; petals 3, free, linear, sparsely pilose, apex with exserted glands. Seeds elliptic.

Date of collection, Collector's names, type specimen number and place of deposition:

Jhapa district, Ghorwa-Sanischare, 300-200 m, 10 December 1963, Hara, Kanai, Kurosawa, Murata & Togashi 6305472 (Holotype, TI).

Threat status: Unknown

6. *Eriocaulon obclavatum* Satake in Hara, Fl.E.Himal.2: 156, f. 11 (1971). Satake in Hara et al., Enum.Fl.Pl.Nepal 1:96 (1978). Shrestha & Joshi in Rare, Endem. Endang.Pl. Nep.: 22 (1996). Press et al. in Ann. Checkl. Fl. Pl. Nep.: 105 (2000).

Family: Eriocaulaceae

Life form: Herb

Local name: Unknown

Local use: Unknown

Flowering time: December

Habitat and ecology: In wet place

Distribution: Eastern Nepal; 200-300 m.

Distinguishing characters: Stemless herb. Leaves linear-lanceolate, 2-2.5 cm long, subacute, 5-7 nerved. Heads conical, 3-4 mm across. Involucral bracts lanceolate, glabrous, longer than the head. Receptacles obclavatum, sparsely pilose. Male flowers: sepals 2, 2 mm long, navicular; petals 3, tubular with trilobed connate apex; stamens 6; filaments extremely short; anthers oblong, blackish. Female flowers: sepals 2, free, linear, 2 mm long, acute, glabrous; petals 3, free, linear apex 1-4 ciliolate, eglandular. Seeds elliptic, extremely minutely reticulate.

Date of collection, Collector's names, type specimen number and place of deposition:

Jhapa district, Ghorwa-Sanischare, 300-200 m, 10 December 1963, Hara, Kanai, Kurosawa, Murata & Togashi 6305469 (Holotype, TI).

Threat status: Unknown

7. *Euphorbia pseudosikkimensis* (Hurusawa & Ya. Tanaka) Radcl.-Smith in Kew Bull. 32: 216 (1981). Short & Vickery in Hara et al., Enum.Fl. Pl. Nepal 1:196 (1982). Press et al. in Ann. Checkl. Fl. Pl. Nep.: 108 (2000).

Synonym: *Tithymalus pseudosikkimensis* Hurusawa & Ya. Tanaka in Hara, Fl. E. Him. 182 (1966)

Family: Euphorbiaceae

Life form: Herb

Local name: Unknown

Local use: Unknown

Flowering time: November

Habitat and ecology:

Distribution: Eastern Nepal; 1500-3200 m.

Distinguishing characters: Herb, stem erect, glabrous, branched upwards, rays 5-6, 2-3 divided then bifid. Cauline leaf sub-petiolate, ovate-rhomboid, yellowish. Involucre 3 mm in diameter, campanulate, glabrous outside, hairy inside, lobes ovate, margin ciliate, glandular, hemispheric-oblong, bracteole broad or subulate, white-villous. Ovary depresso-globosum, obscure and minute, tuberculate, glabrous. Style 3 mm long, tripartite, base up to $\frac{1}{2}$ - $\frac{1}{3}$ connate, apex shortly bifid. Capsule 4 mm in diameter, globose-depressed, sub-verrucose.

Date of collection, Collector's names, type specimen number and place of deposition:

Taplejung district, Helok-Baroya Khimty, 15 November 1963, Hara, Kanai, Murata, Togashi & Tuyama 6306781 (Holotype, TI).

Threat status: Unknown

8. *Pedicularis terrenoflora* Yamazaki in Fl. E. Him. 3: 102, f. 11 & 12 (1975). Hara in Hara et al., Enum. Fl. Pl. Nep. 3: 125 (1982). Shrestha & Joshi in Rare, Endem. Endang. Pl. Nepal: 124 (1996). Press et al. in Ann. Checkl. Fl. Pl. Nep.: 299 (2000).

Family: Scrophulariaceae

Life form: Herb

Local name: Unknown

Local use: Unknown

Flowering time: June

Habitat and ecology: On mossy rocks

Distribution: East Nepal; 2200 m.

Distinguishing characters: Herb. Stems slender, prostrate, 10-20 cm long, spreading dark villous. Basal leaves large, petioled, oblong to ovate, 2.5-3 cm long, pinnatisect, segments 4-6-paired. Cauline leaves petioled, oblong-ovate or ovate, 1-2 cm long, pilose beneath, pinnatipartite, segments ovate or oblong, pinnatifid. Flowers solitary, axillary, with spreading dark villous pedicels 3-8 mm long. Bracts leaf-like. Calyx tubular to campanulate, 8-10 mm long, 5-lobed. Corolla 20-22 mm long, galea arcuate to incurved, glabrous. Anterior filaments glabrous and posterior sparsely pilose.

Date of collection, Collector's names, type specimen number and place of deposition:

Taplejung, Shewaden – Mewa Khola, 2200 m, 1972.06.29, H. Kanai et al. 720925 (Holotype: TI); Shewaden - Papung, 2050 m, ann. 1977, Ohashi et al. 773961 (TI).

Threat status:

9. *Poa imperialis* Bor, Kew Bull. 1957: 414 (1958). Melderis in Enum. Fl. Pl. Nepal 1: 131 (1978). Shrestha & Joshi in Rare, Endem. Endang. Pl. Nep.: 34 (1996). Press et al. in Ann. Checkl. Fl. Pl. Nep.: 139 (2000).

Family: Gramineae

Life form: Herb

Local name: Unknown

Local use: Unknown

Flowering time: April-July

Habitat and ecology: On stones at the edge of streams

Distribution: Eastern Nepal; 4400 m.

Distinguishing characters: Perennial stoloniferous grass. Culms terete, smooth. Leaf-blades linear, acuminate, flat, glabrous; ligule oblong, obtuse. Panicle with spreading branches. Spikelets oblong or elliptic-oblong. Lower glumes elliptic, acute, 1-nerved. Upper glumes oblong, acute, 3-nerved. Callus glabrous. Lowest lemma elliptic-oblong, glabrous, 5-nerved. Palea elliptic-oblong, keeled, keel semipilose.

Date of collection, Collector's names, type specimen number and place of deposition:

East Nepal, Taplejung district, Tamur valley, Yangma Khola, NE of Walanchung Gola, 14500 ft., July 24, 1956, J.D.A. Stainton 1105 (Holotype, BM).

Threat status: Unknown

Note: This species may be found in China (Szechuan).

10. *Salix plectilis* Kimura in Fl. E. Himal.: 45, t. 17 b (1966). Kimura in Hara et al., Enum. Fl. Pl. Nep. 3: 219 (1982). Shrestha & Joshi in Rare, Endem. Endang. Pl. Nepal: 139 (1996). Press et al. in Ann. Checkl. Fl. Pl. Nep.: 283 (2000).

Family: Salicaceae

Life form: Shrub

Local name: Unknown

Local use: Unknown

Flowering time: December

Habitat and ecology: Along river

Distribution: East Nepal; 200 m.

Distinguishing characters: **Shrub.** Upper leaves papery, elliptic, broadly elliptic or oblong-elliptic, 7-14.5 cm long, 3.7-6.6 cm wide, entire or obsolete crenate or crenate-serrulate; lower leaves minor, broadly elliptic or obovate-elliptic. Stipules frequently oblique, ovate, acuminate, nearly entire or crenate-serrulate, pubescent on both surfaces. Catkins long cylindrical, borne on leafy peduncles. Leaves on peduncles 2-5, elliptic, c. 0.2-0.3 mm long; stigmas short, subentire, keeled; ovary glabrous.

Date of collection, Collector's names, type specimen number and place of deposition:

Jhapa, Mahara Bahara – Gauriganja-Kathgara, 200 m, 1963.12.13, Kanai, Murata & Togashi 6304749 (Holotype; TI).

Threat status: Vulnerable to heavy encroachment into its habitat.

11. *Saussurea topkegolensis* H.Ohba and S. Akiyama, Alpine Fl. Jaljale Himal: 68 (1992). Press et al. in Ann. Checkl. Fl. Pl. Nep.: 66 (2000).

Family: Compositae

Life form: Perennial herb

Local name: Unknown

Local use: Unknown

Distribution: East Nepal; 4500 m

Flowering time: August

Distinguishing characters: Stems 5-7 cm tall, erect, cylindric, densely tomentose-pilose, reddish, 1 cm in diameter. Cauline leaf congested, 12-16 cm long, 3-7 mm wide, sessile, linear, sparsely toothed, apex acute, pilose. Flowers in somewhat flat head, compactly aggregated.

Date of collection, Collector's names, type specimen number and place of deposition:

Sankhuwasabha district, Topke Gola-Bomrang, 4500 m, 9 August 1991, Ohba, Akiyama, Ikeda, Kikuchi, Noshiro, Omori, Sudedi and Wakabayashi 9153380 (Holotype TI).

Threat status: Unknown

12. *Senecio topkegolensis* Kitam. in Acta Phytotax. Geobot.32: 140 (1981). Chater in Hara et al., Enum. Fl. Pl. Nep. 3: 42 (1982). Shrestha and Joshi in Rare, Endem. Endang. Pl. Nep.: 104 (1996). Press et al. in Ann. Checkl.Fl. Pl.Nep: 67 (2000).

Family: Compositae

Life form: Perennial herb

Local name: Unknown

Local use: Unknown

Flowering time: August

Habitat and ecology: In open alpine meadows

Distribution: Eastern Nepal; 3600-4350m

Distinguishing characters: Perennial erect herb. Stems 90-100 cm tall, striate. Basal leaves long-petioled, pinnatifid, terminal lobes ovate-hastate, mucronulate-dentate. Middle cauline leaves oblong, 14-16 cm long, acuminate, base broadly auriculate-amplexicaule, pinnatifid, lobes ovate-hastate or sagittate. Heads many, small, 5 mm long, c. 4 mm broad. Involucre tubular, 3.5 mm long. Ray-florets 2, female, fertile; corolla yellow. Disc-florets 3, bisexual, fertile; corolla

yellow. Anthers base bifid. Styles branched, apex rounded-truncate, ciliolate. Immature achenes cylindrical, minutely pilose.

Date of collection, Collector's names, type specimen number and place of deposition:

Taplejung district, Tasagon-Topke Gola, 3600-4350 m, 17 August 1977, Ohashi, Kanai, Ohba & Tateishi 775175 (Holotype, TI).

Threat status: Unknown



Begonia panchtharensis S. Rajbhandary, a newly reported endemic plant of Nepal (Photo courtesy: Sangeeta Rajbhandary).

Table 1: Endemic plants in the KL-Nepal districts

SN	Family	Taxon name	Elevation (m)	Localities
1	Apiaceae (Umbelliferae)	Cortiella lamondiana Fullarton & M.F. Watson	4200-5900	<i>Taplejung</i> , Kambachen – Lhonak, 27 44'N, 88 01'E, 4200 m, 1989.09.10, KEKE 506 (Holotype: E!).
2	Asteraceae (Compositae)	Saussurea topkegolensis H. Ohba & S. Akiyama	4100-4600	<i>Taplejung</i> , Jaljale Himal, Topke Gola – Bomrang, 4500 m, 1991.08.9, H. Ohba et al. 9153380 (Holotype: TI); Shuwan Kharka – Topke Gola, 3570-4360 m, TI 9153353b; Bomrang – Singoa Kharka, 4140-4630 m, TI 9110428.
3	Asteraceae (Compositae)	Senecio topkegolensis Kitam.	3600-4400	<i>Taplejung</i> , Topke Gola – Jalang Chhyongo, 27 38'N, 87 35'E, 4300 m, 1977.08.20, H. Ohba 772588 (TI); <i>Taplejung</i> , 27 40'N, 87 34'E, 1977 08 17, H. Ohashi et al. 775175 (TI).
4	Begoniaceae	Begonia dolichoptera S. Rajbhandary & KK Shrestha	2500	<i>Taplejung</i> , SW of Amjilassa, Ghunsa Khola, 2500 m, 1989.09.05, M. Crawford et al. 248 (Holotype: K; isotypes: E, KATH)
5	Begoniaceae	Begonia panchtharensis S Rajbhandary	2200-2300	<i>Panchthar</i> , Prangbung, Tinubote, Sisire, 2250 m, 2007.10.02, U. Thumsuang s.n. (Holotype: E, isotype: KATH).
6	Eriocaulaceae	Eriocaulon exsertum Satake, in H. Hara, Fl. E. Himal. 2: 156, f. 9 (1971).	200-300	<i>Jhapa</i> , Ghorwa – Sanischare, 200-300 m, 10.12, 1963, Hara et al. 6305472 (Holotype: TI). <i>Ilam</i> , 26-46, 87-56, 1963 12 10, H. Hara et al. 6300935 (TI).
7	Eriocaulaceae	Eriocaulon obclavatum Satake	200-300	<i>Jhapa</i> , Ghorwa – Sanischare, 200-300 m, December 10, 1963, Hara et al. 6305469 (Holotype: TI). <i>Ilam</i> , 26-46, 87-56; 1963 12 10, H. Hara et al. 6305469 (TI).
8	Euphorbiaceae	Euphorbia pseudosikkimensis (Hurusawa & Ya. Tanaka) Radcl.-Smith	1500-3200	<i>Taplejung</i> , Helok-Baroya Khimty, 15 November 1963, Hara, Kanai, Murata, Togashi & Tuyama 6306781 (Holotype, TI).

9	Poaceae (Gramineae)	Poa imperialis Bor,	4400 m (Nepal, ?China)	<i>Taplejung</i> , Tamur Valley, Yangma Khola, NE of Walungchung Gola, 14,500', 1956.7.24, Stainton 1105 (Holotype: BM, iso: K, E!). PS. See Fl. China, Vol. 22 (2006).
10	Ranunculaceae	Aconitum staintonii Lauener	3500-4100	<i>Taplejung</i> , Tamur Valley, Wolangchung Gola, 11,500' [3510 m], 1956.07.18, Stainton 1034 (Holotype: BM, iso: E!).
11	Salicaceae	Salix plectilis Kimura	200	<i>Jhapa</i> , Mahara Bahara – Gauriganja-Kathgara, 200 m, 1963.12.13, Kanai, Murata & Togashi 6304749 (Holotype; TI).
12	Scrophulariaceae	Pedicularis terrenoflora T. Yamaz.	2000-2200	<i>Taplejung</i> , Shewaden – Mewa Khola, 2200 m, 1972.06.29, H. Kanai et al. 720925 (Holotype: TI); Shewaden - Papung, 2050 m, ann. 1977, Ohashi et al. 773961 (TI).

Sources: **Rajbhandari and Adhikari (2009), Rajbhandari and Dhungana (2010, 2011), Rajbhandary et al. (2010).**

List of endemic species reported from adjoining districts.

Twenty four species of endemic plants are reported from the adjoining districts of the KL-Nepal. These species are called as ‘sub-endemic’ to the KL-Nepal. The possibility of presence of these species in the KL-Nepal will be examined by consulting experts and the herbariums.

1. *Aconitum angulatum* (Deoma)
2. *Anemone fuscopurpurea* (Banduke Pokhari –Saju Pokhari)
3. *Begonia minicarpa* (Dharan)
4. *Begonia tribenensis* (Sunsari, Barakshetra)
5. *Bistorta diopetes* (Sankhuwasabha)
6. *Bistorta milletioides* (Sankhuwasabha)
7. *Carex himalaica* (Sankhuwasabha)
8. *Cortia staintoniana* (Topke gola, Arun-Tamur watershed)
9. *Disideria nepalensis* (Sankhuwasabha)
10. *Eriocaulon staintonii* (Sankhuwasabha)
11. *Eriocaulon trisectoides* (Mul Pokhari, Nissim)
12. *Impatiens arunensis* (Sankhuwasabha)
13. *Impatiens mallae* (Sankhuwasabha)
14. *Isodon dhankutanus* (Dhankuta)
15. *Jasminum amabile* (Sunsari, Sanguri danda)
16. *Malaxis tamurensis* (Dhankuta)
17. *Microtoena nepalensis* (Tinjure danda)
18. *Pedicularis cornigera* (Lamni Nama)
19. *Pedicularis oxyrhyncha* (Tasagon – Tokpe Gola)
20. *Pedicularis tamurensis* (Mewa Khola, Tamur valley)
21. *Potentilla x microcontigua* (Jaljale-Tin Pokhari)
22. *Potentilla x polyjosephiana* (Milke dada)
23. *Saxifraga jaljalensis* (Shuwan Kharka-Topke gola, Jaljale himal)
24. *Senecio-brunneo-villosus* (Chyamtang, Sankhuwasabha)

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