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Amplified description of *Rhododendron lepidotum* Wallich ex G. Don (Ericaceae) with a note on its leaf-stomata

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Abstract

Rhododendron lepidotum Wallich ex G. Don, discovered from Nepal Himalaya by Nathaniel Wallich and validated by George Don, is for the first time provided with detailed description, detailed illustration and the structure of leaf-stomata.

Key words: *Rhododendron lepidotum*, Nepal Himalaya, Description, Illustration, Stomata.

INTRODUCTION

During the course of field studies in North Sikkim (2006 – 2008), the senior author collected several variable specimens of a common species of *Rhododendron* L. from Lachung, Yakche and Yumthang Valley and all those were identified as *R. lepidotum* Wallich ex G. Don distributed between 2200 – 4000 m altitude. Herbarium studies at CAL revealed that the species is variable in size and shape of leaf, flower colour and this has led to the creation of several other closely related species by different workers. However most of these species are now merged under *R. lepidotum* species complex by workers like Cullen (1980), Long (1991), Hanbi & Chamberlain (2005) and Bhattacharyya (2007). *R. lepidotum*, an ill-described, Sino-Himalayan-Burmese species, was discovered by Nathalien Wallich (based on Wall. Cat. 22, no. 758. 1829, *nom. nud*) from Nepal Himalaya. G. Don (1834) described and validated the species based on Wallichian specimens (*Wallich s. n.*, Holotype K; Isotype E). Workers like G. Don (1834), Royle (1835), A.P. de Candolle (1839), J.D. Hooker (1852), W.J. Hooker (1852), C.B. Clarke (1882), Hutchinson (1931), Biswas (1966), Cullen (1980), Hara (1982), Ghosh & Samaddar (1989), Pradhan & Lachungpa (1990), Long (1991), Hanbi & Chamberlain (2005) and Bhattacharyya (2007) described this species without detailed investigation. The present work includes an amplified detailed investigation of this species including unknown leaf-stomata based on available herbarium specimens at CAL, cibachrome Type photographs (E!), authentic specimens (CAL!, K, photo!), live collections and field data from Sikkim Himalaya by the senior author (July, 2006; September-October, 2007; April – May, 2008) and available taxonomic literature.

The genus *Rhododendron* L. consists of *c*. 850 species (Mabberley 1997) distributed in Asia (mostly), Europe, Temperate N. America and Australia (few), of these *c*. 74 species occur in India (Bhattacharyya 2007). *R. lepidotum* belongs to the Subgenus *Rhododendron*, Section *Lepipherum* G. Don and Subsection *Lepidota* (Hutch.) Sleumer.

Rhododendron lepidotum Wallich *ex* G. Don, Gen. Hist. Dichlam. 3: 845. 1834; Royle, Ill. bot. Himal. 1: 260, t. 64. 1835; DC. Prodr. 7(2): 724. 1839; Hook., *Bot. Mag*. 78: t. 4657. 1852; Hook.f., *Hort. Soc. London* 7: 81, 104. 1852; C.B. Clarke in Hook.f., Fl. Brit. India 3: 471. 1882; Hutch., *Notes Roy. Bot. Gard. Edinburgh* 16 (79): 171 – 183. 1931; Biswas, Pl. Darjeeling and Sikkim Himal.: 540. 1966; Cullen, *Notes Roy. Bot. Gard. Edinburgh* 39: 149. 1980; Hara in Hara *et al*.,

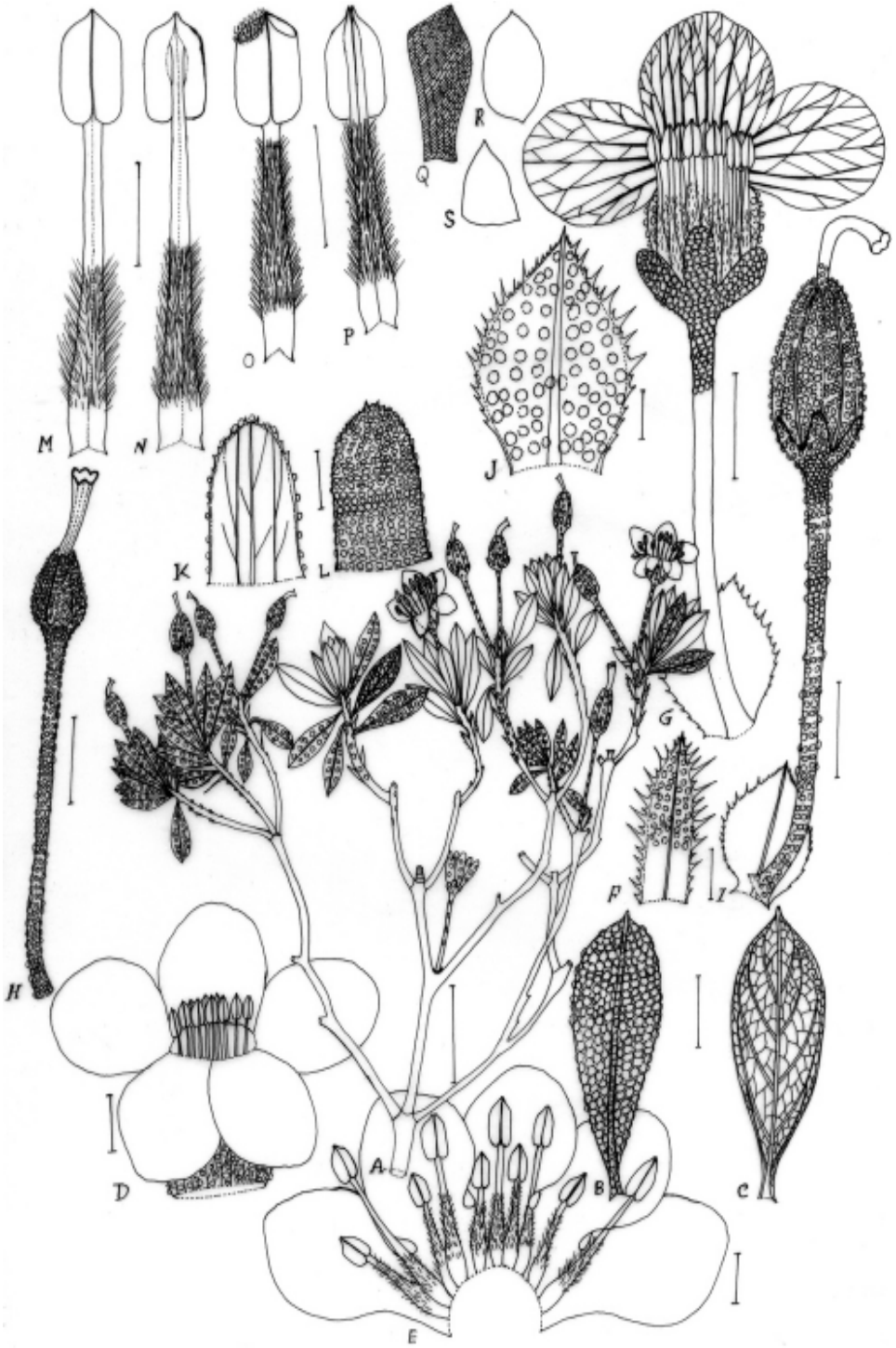

Fig.1: Rhododendron lepidotum Wall. ex G. Don: A. Habit; B. Abaxial surface of leaf (magnified); C. Adaxial leaf surface (magnified); D. Corolla (top view); E. Corolla split open showing arrangement of stamens; F. Inflorescence bract; G. Flower; H. Pistil; I. Capsule; J. Floral bract; K-L. Calyx lobes; M-N. Longer stamens; O-P. Shorter stamens; Q-S. Seeds; T. Scale bars. A= 2 cm, B-C, G-I= 4 mm; D,E, M-P= 2 mm; F, J-L= 1 mm. [A-S: drawn from S. Panda 30780, CAL]

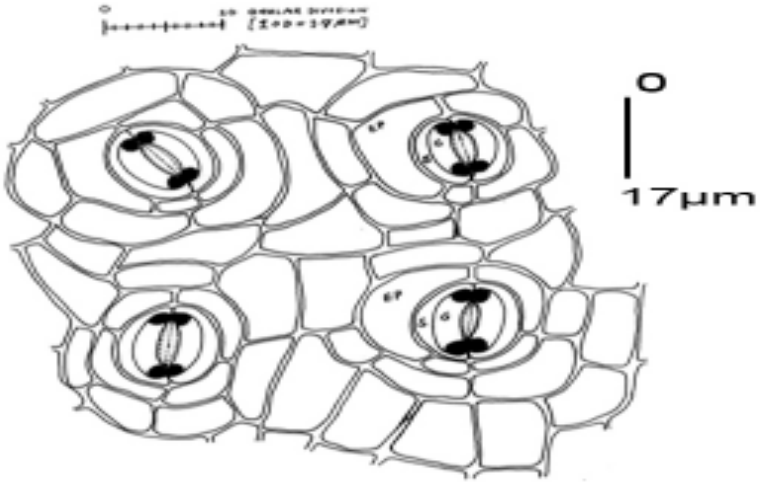

Fig. 2: Sketch of dorsal leaf-stomatal complex in *Rhododendron lepidotum* (1000X). EP= Epicermal cell; S= Subsidiary cell; G= Guard cell. [Drawn after S. Panda 30780]

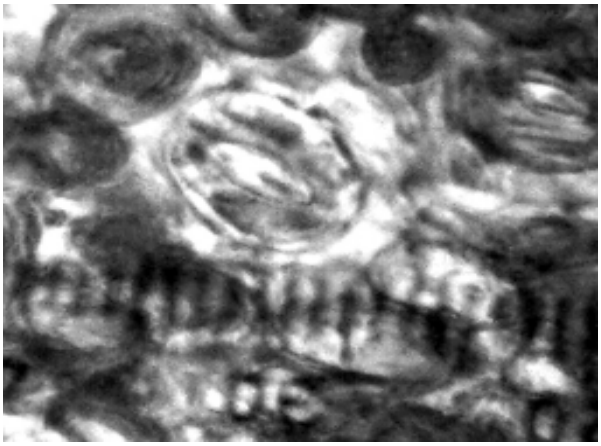

Fig. 3: Photograph of dorsal leaf-stomatal complex in *Rhododendron lepidotum* (450X).

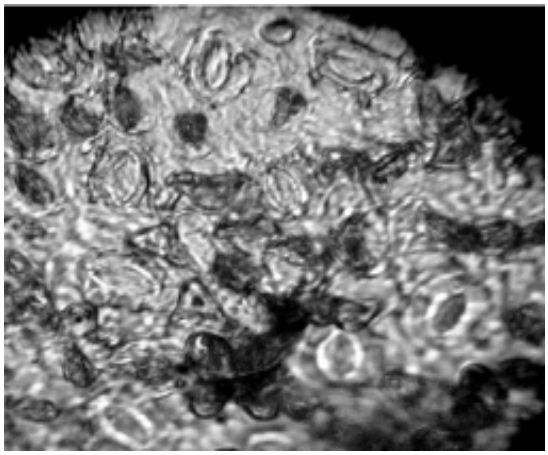

Fig. 4: Photograph of dorsal leaf-stomatal complex in *Rhododendron lepidotum* (1000X).

Enum. Fl. Pl. Nepal 3: 58. 1982; Ghosh and Samaddar, *J. Econ. Taxon. Bot*. 13(1): 212. 1989; Pradhan & Lachungpa, Sikkim-Himal. Rhodod.: 65. 1990; D.G. Long in Grierson & D.G. Long, Fl. Bhutan 2: 384 – 385. 1991; Hanbi & Chamberlain in Mingyuan *et al*. (eds.), Fl. China (Internet ed.) 14: 310. 2005; Bhattacharyya, Rev. Gen. Rhododendr. India (Ph. D. thesis): 83 – 84. 2007. [**Fig. 1**].

Type: Nepal, Gossainthan, *Wallich s. n*. (holo. K, *n.v.*; iso. E, photo!). *R. elaeagnoides* Hook.f., Rhododendr. Sikkim-Himal.: t. 23. 1851. *Type:* India, Sikkim, 14000 – 15000 ft, *J. D. Hooker s. n*. (K, photo!). *R. obovatum* Hook. f., Rhododendr. Sikkim-Himal.: 6. 1851. *Type*: India, Sikkim, 12000 ft, *J. D. Hooker s. n*. (K, photo!). *R. salignum* Hook. f., Rhododendr. Sikkim-Himal.: t. 23A. 1851. *Type:* India, Sikkim, 7000 ft, *J. D. Hooker s. n*. (K, photo!).

Vernacular names: *Bhale Sunpate, Saluma* (Nepalese of Sikkim and Darjeeling); *Tasluma, Tsuma* (Bhutias of North Sikkim); *Taghisha, Simiris* (Garhwalese, based on herbarium specimens in CAL).

Stout dwarf shrub, 0.3 – 1.5 m high, aromatic. Branchlets and young shoots beset with dense lepidote scales; branches glabrous. Leaves pseudo-verticillate, subalternate to alternate; lamina elliptic, narrowly elliptic-oblong, obovate to rarely lanceolate to oblanceolate, (5-) 8 – 20 (-25) × (2-) 3 – 9 (-12) mm, entire, base cuneate, mucronate, coriaceous, dark green, glabrous to sparsely lepidote adaxially, light green, beset with dense, overlapping orange-brown lepidote scales beneath; venation brochidodromous with 4 – 7 pairs of opposite to subopposite lateral nerves, conspicuous adaxially, obscure abaxially. Petioles 1 – 3 mm. Inflorescence axillary raceme, 1 – 2-flowered, rachis short, *c*. 10 mm long, glabrous to lepidote, perulate. Flowers actinomorphic, hypogynous, pentamerous, 25 – 40 mm long; pedicels 15 – 25 mm long, densely lepidote toward apex, rest glabrous; bract 1, basal, light green, ovate-elliptic, *c*. 5 × 4 mm, margin ciliate, mucronulate, lepidote outside, glabrous inside (*S. Panda* 30780, Barasat Govt. College Hrbarium & CAL); ebracteolate; calyx campanulate, *c*. 3.5 × 3 mm, 5-lobed, lobes subequal, light pink, oblong, 2.5 – 3 × 2 – 2.5 mm, apex rounded, finely ciliolate toward apex (*S. Panda* 30780), densely lepidote outside, glabrous and reticulate inside; corolla broadly campanulate with short tube, varies from greenish-white, light yellow to pink, glabrous to lepidote basally, 10 – 15 × 15 mm; tube *c*. 4 × 5 mm; 5-lobed, equal, lobes *c*. 7 mm long, broadly ovate, rounded at apex, finely reticulate throughout; stamens 10, diplostemonous (5 + 5), free to loosely epipetalous, outer 5 longer, *c*. 9 mm long, inner 5 shorter, *c*. 6 mm long; longer filaments *c*. 7 mm long, slender, greyish-white, densely pilose at middle up to just above the base, shorter filaments *c*. 4 mm long, slender, greyish-white, densely pilose throughout except base; anther lobes 2, dark brown, longer 2 – 2.5 mm long, shorter 1.5 – 2 mm long, smooth; pistil *c*. 5 mm long; ovary light green, ovoid-triangular to deltoid, beset with dense lepidote scales, *c*. 2.5 × 2 mm, 5-locular, syncarpus, ovules numerous in each locule on axile placenta; disc minute, dentate; style *c*. 3 mm long, slender to slightly deflexed, glabrous, longitudinally grooved; stigma 5-lobed. Capsules 5-valved with persistent calyx and deflexed style, densely lepidote, *c*. 29 mm long including *c*. 18 mm long fruiting stalk, terete-ovoid, *c*. 7 × 3.5 mm; seeds numerous, 0.5 – 1 mm long, obconical, scariose.

Distribution: INDIA (Himalayas: Jammu & Kashmir, Himachal Pradesh, Uttaranchal, Sikkim, Darjeeling in West Bengal and Arunachal Pradesh; Nagaland: Saramati Mt. peak (ref. Hynniewta, 1994); W PAKISTAN; NEPAL; BHUTAN; SW CHINA and NE MYANMAR.

Habitat: This species grows gregariously in moist and humus-covered rocky slopes, open cliffs, moorland, shallow snow clad soils, also in alpine pastures amongst *Gaultheria trichophylla, G. pyrolifolia*, *Rhododendron vaccinioides, R. anthopogon, R. setosum* and *Saxifraga spp.* in between 2200 – 4000 m altitude.

Flowering: June – October. **Fruiting:** September – December.

***Exiccata*:** (all specimens examined are in CAL, otherwise mentioned): **Sikkim:** North district: Lachung, 9000 ft, 30.07.1892. *G. A. Gammie s n.*, acc. no. 268873 (fr.); Lachung to Yumyhang, 9000 ft, 24.05.1945, *Dr. K. Biswas* 6857 (fr.); Lachung samdong, 8000 ft, July, 1885, *George King's Collector s.n.*, acc. no. 268864 (fl. red); **Bitchu to Lachung, 8000 ft, 02.10.2007, *S. Panda* 30780 (Barasat Govt. College Herbarium & CAL); Yakche, 10000 ft, 03.10.2007, *S. Panda* 30788 (Barasat Govt. College Herbarium);** Lachen to Chungthang, 9450 ft, 16.05.1955, *R.S. Rao* 590; Paigu, 13000 ft, 18.02.1906, Cave 151; Thangu, 12000 – 12900 ft, 18.05.1945, *Dr. K. Biswas* 6607; West district: Dzongri, 14000 ft, 21.06.1892, *G.A. Gammie* 178 (fl.); Sikkim, 8000 ft, no locality, *J.D.H. s.n.*, acc. no. 268872 (fl. & fr.). **Uttaranchal:** Jumnotri, 3300 m, 14.06.1961,

M.A. Rau 15713 (fl.); Near Mussourie, 1869, *G. King s.n*., acc. no. 268451 (fl.); Ramni hill top, 3000 m, 13.06.1959, *M. A. Rau* 10127 (fl. red); above Sdilling, 10000ft, 30.06.1890, *J.H. Lace* 319 (fl.). **West Bengal (Darjeeling):** Sandakphu, 11900 ft, 12.06.1892, *G.A. Gammie* 31 (fl.); Sandakphu, 12500 ft, 08.10.1941, *Dr. K. Biswas* 5717 (fl.).

Field Notes: The Lachung population in North Sikkim (*S. Panda* 30780) showed brochododromous leaf venation, perulate short rachis up to 10 mm long, presence of ovate-elliptic, *c*. 5 × 4 mm, single basal bract, ciliolate calyx lobes, *c*. 4 mm long corolla tube, diplostemonous longer (5) and shorter (5) stamens, comparatively shorter filaments, *c*. 5 mm long pistil and 0.5 – 1 mm long numerous, obconical scariose seeds not reported earlier.

STOMATA

Materials and Methods: Mature leaves were obtained from the herbarium specimens (*S. Panda* 30780 & 30788, CAL & Barasat Govt. College herbarium). Small square pieces (*c*. 1 sq cm) were excised from the base, middle and apical regions of lamina. These pieces were soaked in 10% KOH solutions for overnight (±12 hours). KOH treated pieces were then boiled for 10 minutes, cooled and peeled. Peeled pieces were cleared by ringing in distilled water. Cleared pieces were dehydrated in an ethanol series; stained with 10% safranin and mounted in DPX (keeping basal, middle and apical regions on one slide). Slides were examined under various magnifications and drawn using a drawing prism. Slides are preserved in the Taxonomy & Biosystematics Laboratory of the PG Department of Botany, Barasat Govt. College.

Observations: The mature stomata (Figs. 2 – 4) are distributed evenly over the entire dorsal surface in between the veins, but usually not over the finer veins and the main vein. The stomata are separated from each other by epidermal cells. However, most of the epidermal cells are covered with scales. The stomata from all three zones (basal, median and apical) are paracytic (Stace 1989; Fahn 1990; Judd *et al*. 2008), though Patel (1979) described it as euparacytic. Each guard cell is accompanied by one subsidiary cell, the longitudinal axis of which is parallel to that of the guard cell and aperture. Each paracytic stoma (Fig. 2) is surrounded by four unequal epidermal cells. The mean length of longer epidermal cell is 25.5µ and breadth 8µ. The mean length of smaller epidermal cell is 4.5µ and breadth 4µ. The average dimension of the subsidiary cells is 17.5µ × 3.4µ, while that of the guard cells is 13µ × 4.2µ and the average dimension of the aperture is (9.7µ × 3.3µ).

Conclusion: The newly added information on stomatal structure in *R. lepidotum,* in combination with detailed external morphological characters, is expected to help in proper recognition of the species.

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