

***DICRANUM DIPLOSPINIFERUM* C. GAO & AUR, A NEW SYNONYM OF
D. CRISPIFOLIUM MÜLL. HAL. (DICRANACEAE, BRYOPHYTA)**

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Keywords: China; Dicranales; *Dicranum*; Moss; Synonym.

Dicranum diplospiniferum C. Gao & Aur was originally described in 1980 based on a collection made by the Chinese botanist Shu-Kun Chen during his expedition to southeastern Xizang, China (Gao and Aur, 1980). Later, Gao *et al.* (1999) treated this species as a synonym of *D. drummondii* Müll. Hal., without providing substantive evidence or critical discussion.

In the course of our recent studies on Chinese *Dicranum*, we re-examined the holotype specimen of *D. diplospiniferum* (S.-K. Chen 4876, IFP) which revealed several distinctive morphological features: clearly bistratose marginal laminal cells (Fig. 1G); (Gao and Aur, 1980), multilayered alar cells (Fig. 1G); (Gao and Aur, 1980), and undifferentiated epidermal cells on the ventral side of the costa (Fig. 1F); (Gao and Aur, 1980). These features clearly distinguish *D. diplospiniferum* from *D. drummondii*, which exhibits unistratose marginal laminal cells (Ireland Jr., 2007; Lüth, 2019; Huang *et al.*, 2024), bistratose alar cells (Ignatov and Ignatova, 2003; Ireland Jr., 2007; Huang *et al.*, 2024), and well-differentiated epidermal cells on the ventral side of the costa, or cells slightly larger than the adjacent stereids (Ignatov and Ignatova, 2003; Ireland Jr., 2007; Huang *et al.*, 2024). These consistent morphological distinctions strongly support the recognition of *D. diplospiniferum* as a separate species rather than as a synonym of *D. drummondii*.

Based on the type specimen of *Dicranum diplospiniferum*, all its morphological characteristics align closely with those of *D. crispifolium* Müll. Hal., a Himalayan endemic species. Both species exhibit (1) bistratose marginal laminal cells (Fig. 1F); (Gao and Aur, 1980; Gao, 1994; Engelmark, 1999; Gao *et al.*, 1999; Huang *et al.*, 2024); (2) multilayered alar cells (Fig. 1G); (Gao and Aur, 1980; Gao, 1994; Engelmark, 1999; Gao *et al.*, 1999; Huang *et al.*, 2024); (3) undifferentiated epidermal cells on the ventral side of the costa (Fig. 1F); (Gao and Aur, 1980; Gao, 1994; Engelmark, 1999); (4) costa with sharp serrations on the dorsal side of the leaf (Fig. 1D); (Gao, 1994; Gao *et al.*, 1999); (5) upper and middle laminal cells quadrate to short-rectangular and prorate on the abaxial surface (Fig. 1H, I); (Gao and Aur, 1980; Gao, 1994; Gao *et al.*, 1999); and (6) basal laminal cells elongated-rectangular and pitted (Fig. 1J), (Gao and Aur, 1980; Gao, 1994; Gao *et al.*, 1999). Therefore, we propose that *D. diplospiniferum* should be considered a new synonym of *D. crispifolium*.

Taxonomic Treatment

Dicranum crispifolium Müll.Hal., Bot. Zeitung (Berlin) 22: 349. 1864. **(Fig. 1)**
= *Dicranum diplospiniferum* C.Gao & Aur, Bull. Bot. Lab. N.-E. Forest. Inst., Harbin 7: 99. 1980.
syn. nov.

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Type: China. Xizang, Linzhi City, Milin County, Baga People's Commune, Xialong, 3000 m, on rock, 25 Aug. 1974, S.-K. Chen 4876 (Holotype: IFP!).

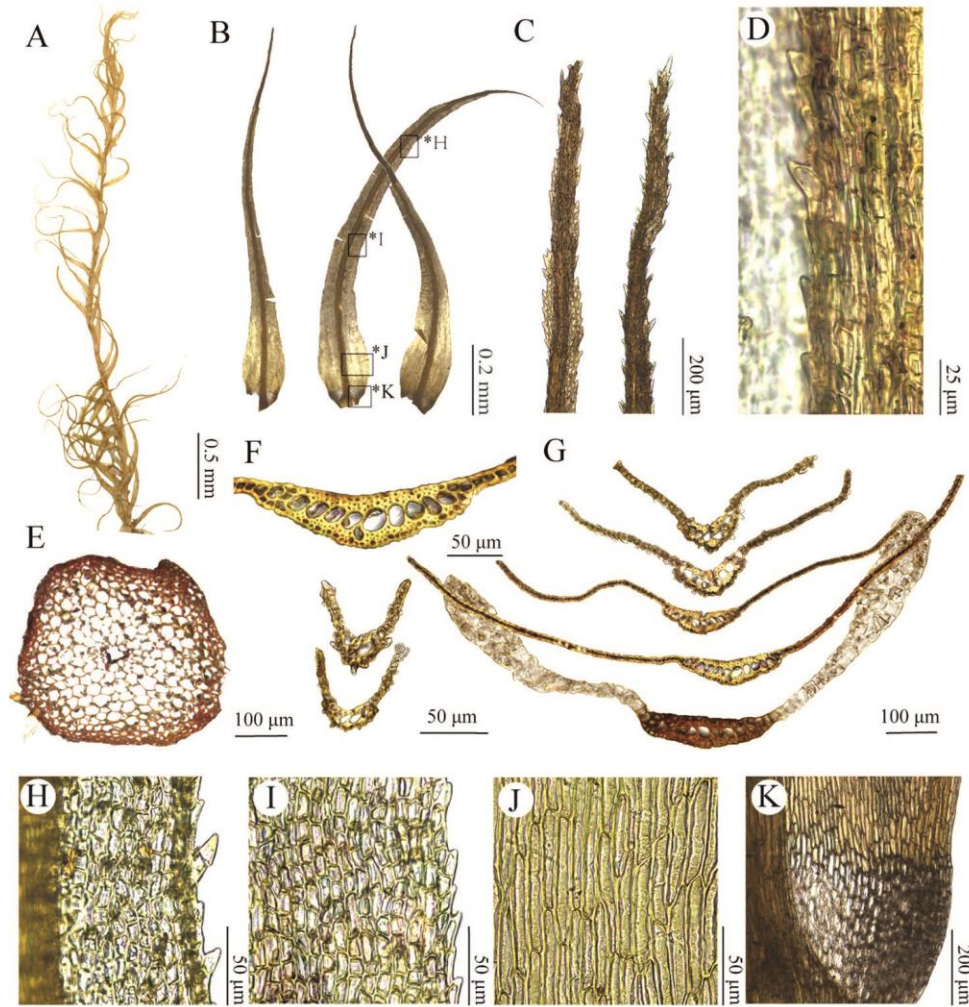


Fig. 1. *Dicranum crispifolium* Müll.Hal.. A. Plant; B. Leaves; C. Apices; D. Costa in the upper portion of leaf (in dorsal view); E. Transverse section of stem; F. Transverse section of the costa near the leaf base; G. Transverse sections of leaves; H. Upper laminal cells; I. Middle laminal cells; J. Basal laminal cells; K. Alar cells. All from holotype of *D. diplospiniferum* (S.-K. Chen 4876, IFP!).

Notes: *Dicranum crispifolium* may also be confused with *D. dispersum* Engelmark and *D. caesium* Mitt., as all three species share multilayered alar cells and bistratose marginal laminal cells (Fig. 1); (Takaki, 1964; Gao and Aur, 1980; Noguchi, 1987; Engelmark, 1999; Lüth, 2019; Huang *et al.*, 2024). However, *D. caesium* and *D. dispersum* can be readily distinguished from *D. crispifolium* by the presence of well-differentiated epidermal cells on the ventral side of the costa (Takaki, 1964; Noguchi, 1987; Engelmark, 1999; Lüth, 2019; Huang *et al.*, 2024), whereas these cells remain undifferentiated in *D. crispifolium* (Fig. 1F; Gao and Aur, 1980; Gao, 1994; Gao *et al.*, 1999). This distinction clearly differentiates *D. crispifolium* from the other two species.

Additional specimens examined: China. Yunnan, Dali Bai Autonomous Prefecture, Caojian County, 25°45'45.4" N, 99°05'42.05" E, 2530 m, on soil, Q. Liu & Q. Zuo 1401 (HSNU); Diqing Tibetan Autonomous Prefecture, Deqin County, Near the Quzonggong Field Workstation, 28°20'3" N, 99°2'30" E, 3910 m, on humus in forest, 26 Sept. 2016, W.-Z. Ma 16-7928 (KUN); Kunming City, Xundian County, Black-necked Crane Nature Reserve, Sanjiaohaizi, 25°35'30.59" N, 103°2'13.52" E, 2852 m, on soil, 5 Sept. 2021, W.-Z. Huang & S.-H. Lu 20210905-51 (HSNU); Lijiang City, Ninglang Yi Autonomous County, near Lugu Lake, 27°37'54.24" N, 100°48'47.59" E, 3257 m, on soil, 28 Aug. 2022, R.-L. Zhu et al. 20220828-9 (HSNU); Xizang, Changdu City, Leiwuqi County, Sangduo Town, near G317 Road, 31°14'5.08" N, 96°33'22.60" E, 3821 m, on soil, 16 Aug. 2020, X.-M. Shao et al. 20200816SWZ010 (BAU); Linzhi City, Gongbujiada County, Jiaying Village, 29°54'29.92" E, 93°25'46.91" N, 4710 m, on tree trunk, 8 Jul. 2020, H.-P. Ma 20200708P3G3026 (HTC); Linzhi City, Gongbujiada County, Songduo Village, 29°51'59.6" E, 92°19'54.70" N, 4710 m, on tree trunk, 8 Jul. 2020, H.-P. Ma 20200708P2U2027 (HTC).

Acknowledgments

We are grateful to the curators and staff of BAU, HSNU, IFP, and KUN for making specimens available for study through loans. This research was supported by the National Natural Science Foundation of China (Grant Nos. 32500183 and 32270215) and the Postdoctoral Research Start-up Fund of Hangzhou Normal University (Grant No. 4105C5022521509).

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