

***DIDYMODON MONGOLICUS* (BRYOPHYTA, POTTIACEAE),
A NEW SPECIES FROM MONGOLIAN PLATEAU**

DONG-PING ZHAO¹, TONG-RUI ZHANG, XUE-LIANG BAI AND DONG-MEI REN

*Department of Biology, School of Life Science, Inner Mongolia University,
West College Road 235, Hohhot 010021, China*

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Abstract

Didymodon mongolicus D. P. Zhao & T. R. Zhang is described as a new species from northern China and Mongolia. The new taxon is distinguished from others species of the genus by its small, ovate leaves, weakly recurved margins, smooth laminal cells and costa ending several cells below the apex, with 1 layer of ventral stereids in the lower part of the leaf. Drawings and light microscope photographs of the main characters are given, and its relationships with some closely related species within the genus are discussed.

Introduction

The genus *Didymodon* Hedw. (Pottiaceae) currently consists of 126 species with distribution nearly throughout the world (Zander, 1993; 2007). The genus concept of *Didymodon* has been controversial, especially the morphological delimitation of *Didymodon* versus *Barbula* Hedw. The taxonomic differences between the two genera are mainly on gametophytic characteristics: *Barbula* has entirely hyaline axillary hairs, while in *Didymodon* the hairs have one or two brown basal cells. The leaves of *Barbula* are ovate to long-elliptical, the basal cells are hyaline, elongate and well differentiated, while those of *Didymodon* are mostly lanceolate to long-lanceolate, the basal cells are usually green, shortly rectangular and little differentiated (Saito, 1975; Zander, 1993, 2007; Jiménez *et al.*, 2005; Werner *et al.*, 2005; Jiménez, 2006). Recently, Jiménez *et al.* (2012) described *Andina* J.A. Jiménez & M.J. Cano as a new genus, which contained several species earlier recognized within *Pseudocrossidium* R.S. Williams and *Didymodon*. *Andina* and *Didymodon* both have brown basal cells in axillary hairs; however, *Andina* can be easily distinguished from the latter by the cucullate leaf apices, strongly recurved to revolute leaves with margins infolded in the apex, ventral costal outgrowths differentiated as pads of bulging and papillose cells, filaments or lamellae, and upper laminal cells usually bulging on both surfaces.

Mongolian Plateau is divided politically and geographically by Mongolia in the north and the Inner Mongolia Autonomous Region of China in the south. *Didymodon* is the most species-rich genus in the Pottiaceae in this region and includes 30 species (Bai, 1997; Tsegmed, 2010; Zhao *et al.*, 2014, 2015). Over the last several years we have been studying *Didymodon* of the Mongolian Plateau (e.g., Zhao 2010; Zhao *et al.* 2013, 2014, 2015). In the course of this work we found that several specimens fit into the generic concept of *Didymodon* based on the presence of stem sclerodermis, axillary hairs with one brownish basal cells, costa with ventral and dorsal stereids, upper laminal cells rounded, subquadrate or oval, and basal cells little differentiated. Nevertheless, they were not referable to any known *Didymodon* species. After studying the types deposited in H and JE herbaria and after comparison between the specimens with published information (Saito, 1975; Zander, 1993; Zander and Ochyra, 2001; Li *et al.* 2001; Jiménez *et al.*, 2005; Jiménez,

¹ Corresponding author. Email: topalizdp@aliyun.com

2006; Zander, 2007; Kučera and Ignatov, 2015), we conclude that our samples belong to an undescribed species of *Didymodon*, which is described, illustrated and compared with the most closely related species in the study.

***Didymodon mongolicus* D. P. Zhao & T. R. Zhang, sp. nov. (Figs 1 & 2).**

Diagnosis: *Didymodon mongolicus* is differentiated from other species in the genus by the following combination of characters: small sized, ovate leaves, weakly recurved margins up to 3/4 of the apex, smooth laminal cells, costa ending below the apex and cross-section of the costa with 1 layer of ventral stereids in the lower part of the leaf.

Type: China. Inner Mongolia Autonomous Region, Helan Mountain National Nature Reserve, Xuelingzi valley, 38°39'54" N, 105°47'25" E, 1900 m, on soil in *Juniperus communis* L. forests, 1 Aug. 2012, X. L. Bai1459 (Holotype: HIMC; Isotypes: KUN).

Plants small, 0.5-0.9 cm high, green above, brownish below, in dense turfs. Stems erect, simple or branched, transverse section rounded, sclerodermis present, without hyalodermis, central strand differentiated. Rhizoidal tubers absent. Leaves monomorphic, appressed when dry, erect-patent to spreading when moist, ovate, not keeled, 0.5-1.0 × 0.3-0.5 mm; lamina unistratose, yellowish green with KOH; apex acuminate, not deciduous; margins entire, weakly recurved from base to 3/4 of the leaf, unistratose. Costa single, ending several cells below the apex; ventral cells of the costa, in the upper middle of the leaf, rectangular to subquadrate, dorsal cells of the costa, in the upper middle of the leaf, rounded or subquadrate; 5-7 rows of cells across ventrally at midleaf; costal transverse section elliptical at leaf base, with 4 guide cells in 1 layer, 1 layer of ventral stereids, 1-2 layers of dorsal stereids, without hydroids, ventral epidermis differentiated, not bulging, smooth, dorsal epidermis differentiated, papillose or smooth. Upper and middle laminal cells rounded, subquadrate or oval, 7.8-10.4 × 7.2-9.6 μm, smooth, lightly thick-walled; basal cells quadrate or shortly rectangular, 10.4-15.6 × 10.4-13.0 μm, not differentiated, not hyaline, smooth, thick-walled, not pitted. Gemmae absent. Sexual condition unknown. Sporophyte unknown.

Etymology: Named after the type locality, Mongolian Plateau.

Habitat and Distribution: *Didymodon mongolicus* grows on soil and rocks in *Juniperus communis* forests. It forms small and mostly monospecific patches. Besides the type locality, we discovered four additional populations from Inner Mongolia and ones from Mongolia. The new species seems to be restricted to the Mongolian Plateau, but it is likely to be found elsewhere in this large plateau with progress in field studies.

Paratypes: China. Inner Mongolia Autonomous Region: Helan Mountain National Nature Reserve, Xuelingzi valley, 1 Aug. 2012, X. L. Bai1452 (HIMC); Baotou City, Bayan-obo Mining District, 5 Aug. 2013, D. M. Ren201308085 (HIMC); Ordos City, Jungar Banner, 1 July 2005, X. L. Bais.n. (HIMC); Mausoleum of Genghis Khan, 27 Oct. 2008, X. L. Bai0810001 (HIMC); Xingan League, Bailang Town, 31 July 1988, X. L. Bai1636 (HIMC); Mongolia. Bayankhongor Province: 13 June 1971, N. S. Golubkova and U. Tsogt 5 (HIMC, UBA); Töv Province: 29 June 1974, N. S. Golubkova and U. Tsogt 111 (HIMC, UBA); Khovd Province: 24 July 1984, TS. Tsegmed 9045 (HIMC, UBA).

Note: *Didymodon mongolicus* is most closely related to *D. tectorum* (Müll. Hal.) K. Saito and *D. cordatus* Jur., sharing such characteristics as the shape of the leaves, yellowish green colour of the lamina with KOH reaction, rectangular to subquadrate ventral cells of costa above midleaf, and growing in dry soil and rock. In fact the small forms of *D. tectorum*, which lack gemmae cannot be easily distinguished from the new species. *Didymodon mongolicus* can be separated readily from *D. tectorum* by its leaf margins weakly recurved from base to 3/4 of the leaf (Fig. 2: A, F),

cells smooth above midleaf (Fig. 2: C, D, H, I), and transverse section of costa with 1 layer of ventral stereids (Fig. 2: E, J). Although the type of *D. tectorum* does not contain gemmae,

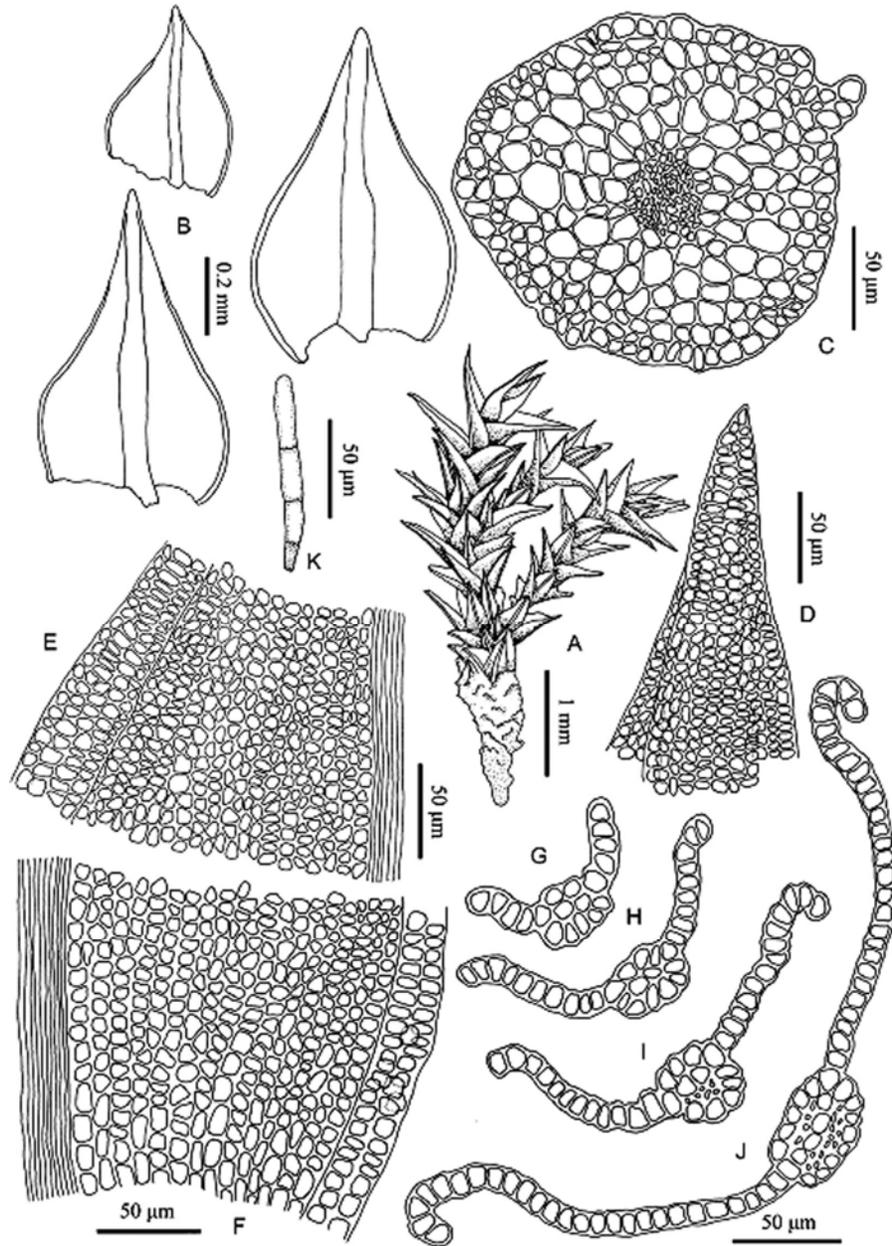


Fig. 1. *Didymodon mongolicus* sp. nov.: A. Plants, B. Leaves, C. Transverse section of stem, D. Leaf apex, E. Middle part of leaves, F. Basal part of leaves, G-J. Transverse section of leaves from apex to base, K. Axillary hair. (All drawn from the holotype).

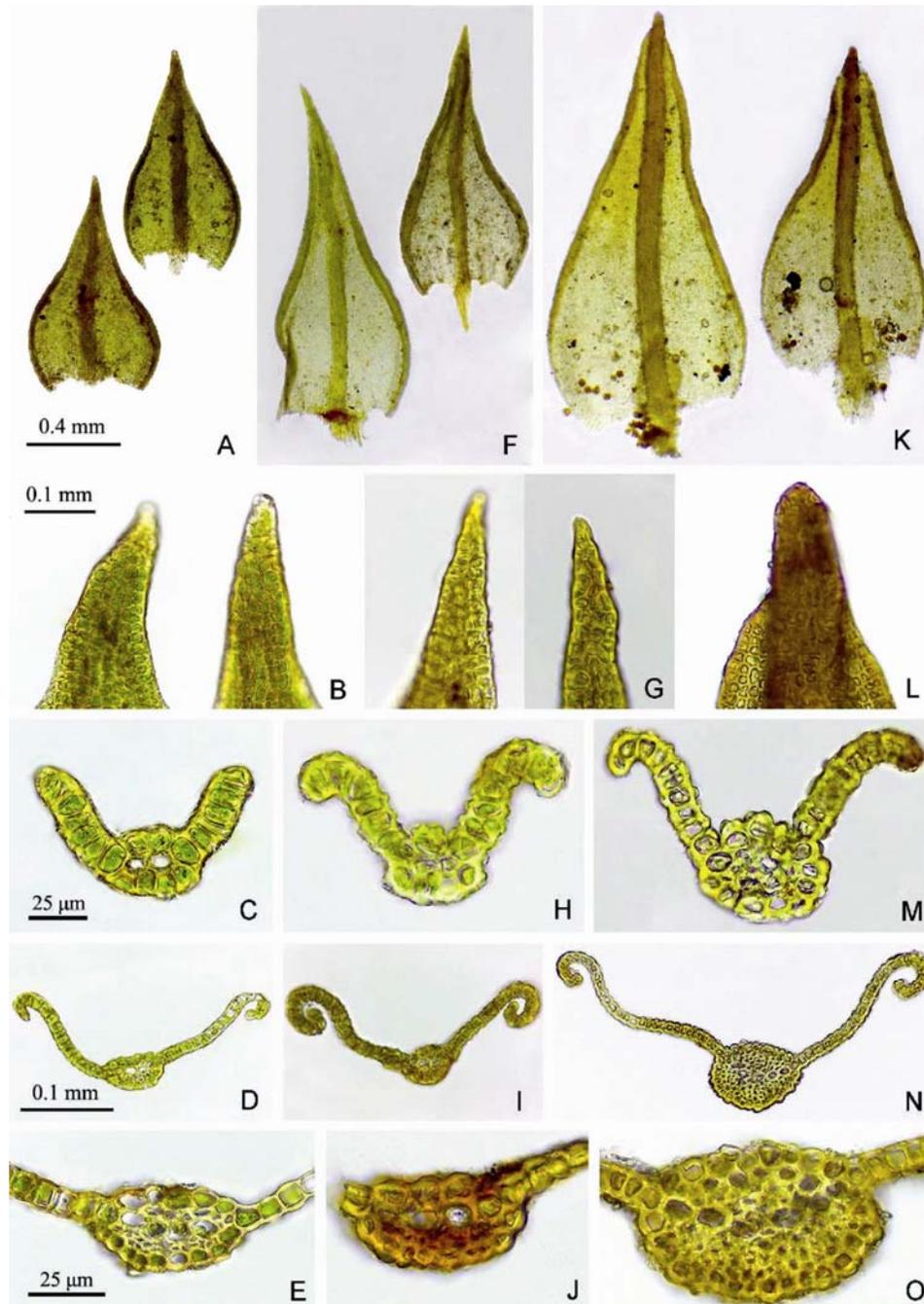


Fig. 2. A-E. *Didymodon mongolicus* sp. nov. (holotype, X. L. Bai 1459, HIMC), F-J. *Didymodon tectorum* (isotype, Rev. Jos. Giraldi 849, H), K-O. *Didymodon cordatus* (isolectotype, C. Schliephacke s.n., JE), A, F, K. Leaves. B, G, L. Leaf apex. C, H, M. Transverse section at upper leaves. D, I, N. Transverse section at midleaves. E, J, O. Transverse section near leaf bases.

numerous specimens of *D. tectorum* from China and Mongolia have copious gemmae. *D. cordatus* differs from *D. mongolicus* in having a stout costa that is shortly excurrent, ending in a wide mucro (Fig. 2: L) and with 2-5 layers of ventral stereoids (Fig. 2: N, O), and margins revolute up to the apex.

Small forms of *Didymodon acutus* (Brid.) K. Saito may be confused with *D. mongolicus*, as both species have appressed leaves when dry, smooth laminal cells, slightly recurved margins, and absence of gemmae in the axils of the leaves, but *D. mongolicus* differs in its smaller size, more ovate leaf shape and never having lanceolate leaves, and the costa ending before the apex. *D. validus* Limpr., a species known from Central Asia and Europe (Jiménez, 2006), resembles *D. mongolicus* in the smooth laminal cells. It differs from the new species by its recurved or incurved leaves when dry, shape of leaves ovate-lanceolate or linear-lanceolate, costa long-excurrent and transverse section of the costa with 1-3 layers of ventral stereoids while *D. mongolicus* has appressed leaves when dry, ovate leaves, costa ending several cells below the apex and transverse section of the costa with 1 layer of ventral stereoids.

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