

***Bryoerythrophyllum latinervium* var. *rotundatum*  
X.L.Bai, D.M.Ren & L.Q.Yang (Pottiaceae),  
a new moss variety from northern China**

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**Abstract** – The moss *Bryoerythrophyllum latinervium* var. *rotundatum* X.L.Bai, D.M.Ren *et* L.Q.Yang is described as a new variety from Inner Mongolia, China. It is distinguished from *Bryoerythrophyllum latinervium* (Holmen) Fedosov *et* Ignatova by its rounded leaf apex. Light microscope photographs of the significant characters are provided and its distinctions from closely related taxa are discussed. A key to the Chinese species of *Bryoerythrophyllum* is provided.

***Bryoerythrophyllum* / Bryophytes / East Asia / Inner Mongolia / Taxonomy**

## INTRODUCTION

The genus *Bryoerythrophyllum* (Pottiaceae) currently consists of 34 species (Jiménez, 2007; Zander, 2007; Jiménez & Cano, 2012; Feng *et al.*, 2014; Sollman, 2015; Feng *et al.*, 2016; Kou *et al.*, 2016; Blockeel *et al.*, 2017). The genus is characterized by the red colour of the plants, bifid and crowded papillae of the upper laminal cells, and well differentiated basal cells (Zander, 1993). Jia and He (2013) summarized all records in a checklist of Chinese bryophytes, and listed nine species and one variety of *Bryoerythrophyllum* for China. Nine species and two varieties were recognized by Ren (2012). Recently, *Bryoerythrophyllum neimonggolicum* X.L.Bai & C.Feng (Feng *et al.*, 2014), *B. latinervium* (Holmen) Fedosov & Ignatova (Song *et al.*, 2015), *B. pseudomarginatum* J.Kou, X.M.Shao & C.Feng (Kou *et al.*, 2016), and *B. zanderi* C.Feng, X.M.Shao & J.Kou (Feng *et al.*, 2016) were described from China.

In October 2015, the research team collected a specimen of Pottiaceae in Daxianshan Mountain in Guyang County of Inner Mongolia. After microscopic examination and detailed comparison of morphological characteristics with other species in *Bryoerythrophyllum*, it was identified as a new variety of *Bryoerythrophyllum latinervium*.

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## TAXONOMIC TREATMENT

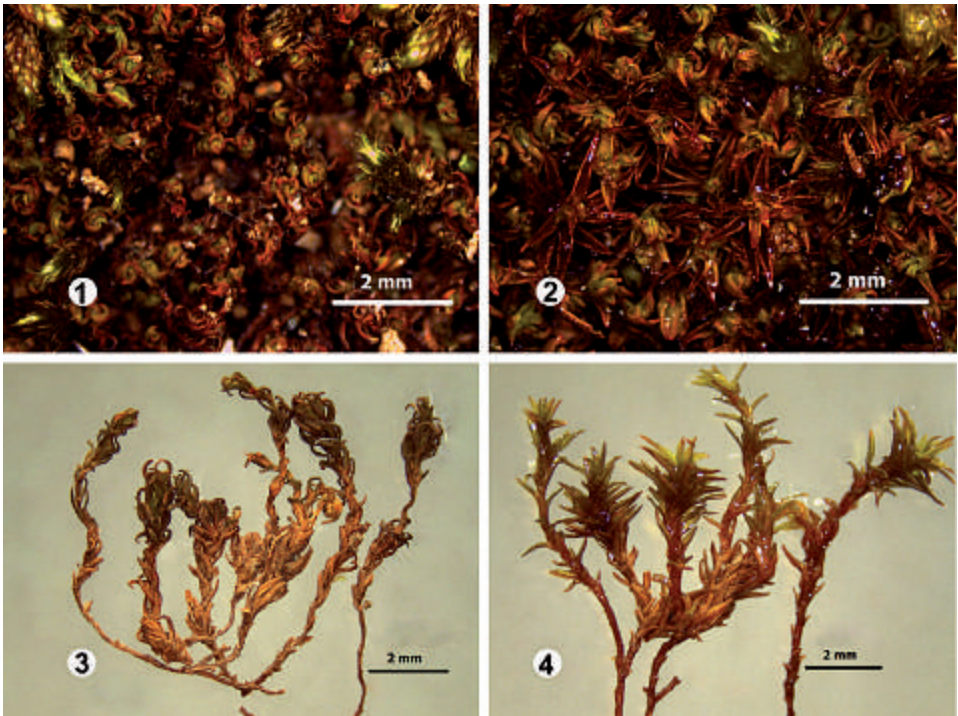
### Description of new taxon

*Bryoerythrophyllum latinervium* var. *rotundatum* X.L.Bai, D.M.Ren *et* L.Q.Yang, var. nov. Figs 1-15

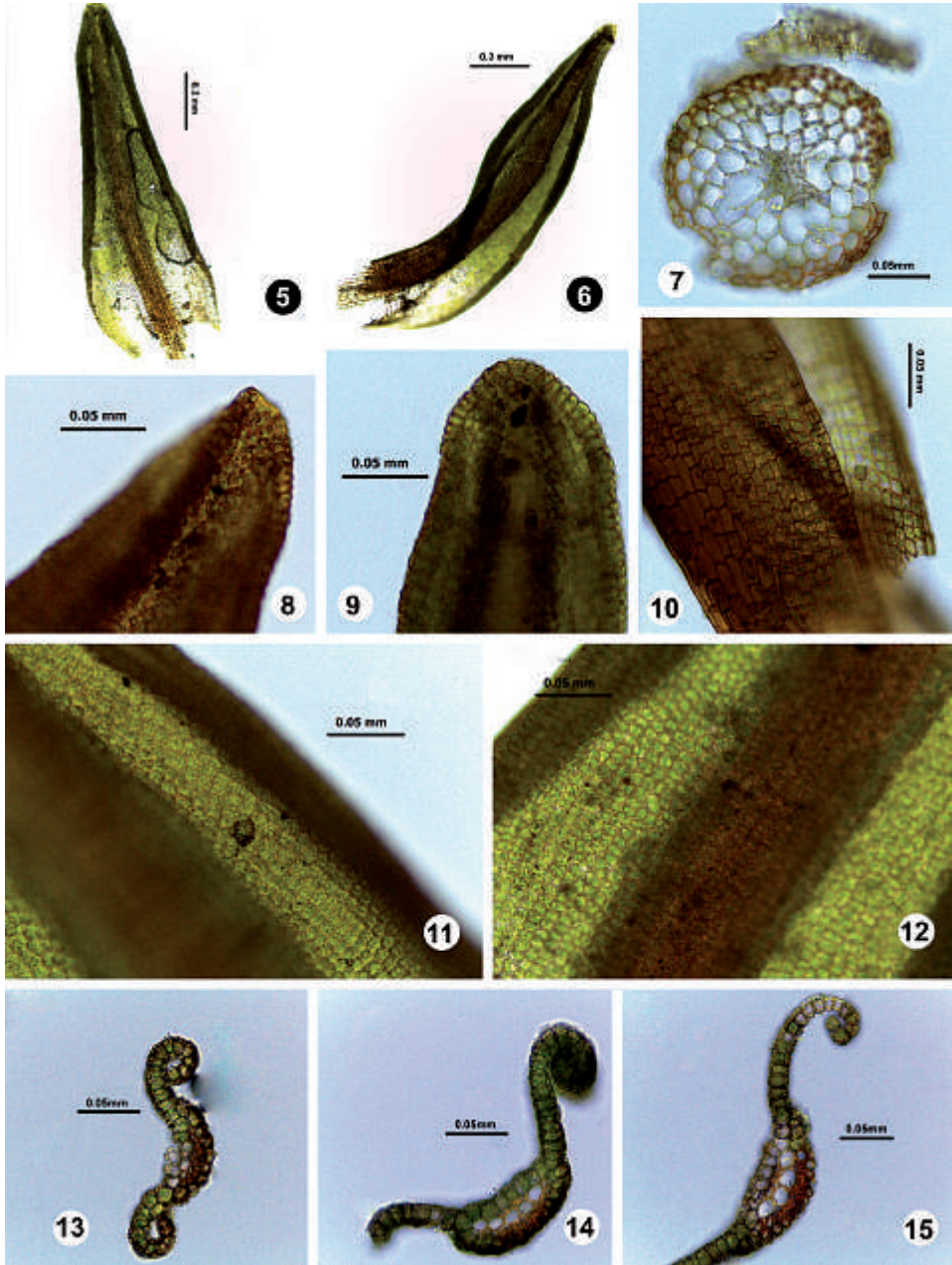
**Diagnosis:** Leaves ovate-lanceolate, leaf apex rounded, not apiculate and margins revolute strongly from leaf base to the apex; stem with strongly differentiated central strand; costa strong, flat and wide, occupying more than 1/3 of the leaf width in the middle to upper part of leaf.

**Type:** CHINA. Inner Mongolia, Baotou City, Guyang Co., Daxian Mountain, 41°06'08" N, 109°57'24" E, 1486 m, growing on soil in the rock crevice, mixed with *Hypnum vaucheri* Lesq., 24 Oct. 2015, D.-M. Ren & X.-L. Bai 201510035 (Holotype: HIMC!).

**Plants** small to medium-sized, greenish or brownish green above, brownish below, growing in dense turfs. **Stems** 8-10 mm in length, erect, sparsely branched, transverse section rounded, without hyalodermis, sclerodermis present; a central strand distinctly differentiated. **Leaves** appressed and often slightly spirally twisted when dry, spreading when wet; ovate-lanceolate, 1.65-2.07×0.56-0.70 mm; lamina unistratose throughout, red colour with KOH; **apex obtuse**, not apiculate; **margins** entire,



Figs 1-4. *Bryoerythrophyllum latinervium* var. *rotundatum* var. nov. 1. Dry community. 2. Moist community. 3. Dry plants. 4. Moist plants. All from the holotype.



Figs 5-15. *Bryoerythrophyllum latinervium* var. *rotundatum* var. nov. 5-6. Leaves. 7. Cross-sections of stem. 8. Lateral view of leaf apex. 9. Ventral view of leaf apex. 10. Basal laminal cells. 11. Upper laminal cells. 12. Median laminal cells. 13-15. Cross-sections of leaf, sequentially from apex to base. All from the holotype.

strongly revolute from leaf base to apex, weakly channeled near apex; **costa** very strong, flat, 85-110  $\mu\text{m}$  wide, occupying more than 1/3 in mid-leaf, percurrent; costal ventral surface cells above middle part subquadrate, dorsal surface cells rectangular, both the two sides of the surface with papillae; costal transverse section crescent, with 4-6 guide cells in 1 layer, 1-2 layers of ventral stereids, 2-3 layers of dorsal stereids; **upper and median laminal cells** quadrate or subquadrate, 4.75-7.94 $\times$ 5.24-8.10  $\mu\text{m}$ , with bifid or C-shaped papillae; **basal juxtacostal cells** rectangular, 17.30-30.00 $\times$ 7.44-8.66  $\mu\text{m}$ , smooth, slightly thick-walled; **basal marginal cells** quadrate to short-rectangular, 8.77-23.70 $\times$ 7.16-15.50  $\mu\text{m}$ , smooth, thin-walled. Sexual condition and sporophyte unknown.

**Etymology:** The epithet of the variety refers to the obtuse leaf apex.

**Selected specimens examined for comparison:** *Bryoerythrophyllum latinervium* var. *latinervium*: Greenland. 12 Aug. 1947, K. Holmen 277d (Isotype: MO); 9 June 1949, K. Holmen 7128 (Paratype: MO); China. Helan Mountain. 3 Aug. 1963, Z-G. Tong 2179 (HIMC).

**Habitat and distribution:** *Bryoerythrophyllum latinervium* var. *rotundatum* is known only from middle area of Inner Mongolia, China, growing on thin soil in rock crevices, mixed with *Hypnum vaucheri* Lesq. The specimen was collected in Daxian Mountain, which is located 10 kilometers northwest of Guyang County, a radius of 15 square km belonging to the extension of the Yinshan Mountains range, the main area of about 1 square km. The panoramic area is about three square km. The overall height of the mountainous terrain is about 60 meters. The mountain foundation is granite stone, mainly granulite, covered with black, yellow, green, white, brown lichens, fungi and algae. Occasionally there occur yellow assassins, spiraea and other small shrubs. The area has a temperate continental climate, the average annual temperature is 4°C, the annual precipitation is 300 mm, and the average elevation is 1300 m.

## Taxonomic notes

*Bryoerythrophyllum latinervium* var. *rotundatum* resembles the Chinese endemic *B. neimonggolicum* and *B. latinervium* in leaf shape, ovate-lanceolate, strong revolute from leaf base to apex, and costa strong, but it is easy to distinguish the new variety from *B. neimonggolicum* by its costa. The former is flat and wider, yet the latter nearly circular. The costa characteristic is more important in bryophytes taxonomy. Secondly, its central strand distinctly differentiated forming an empty cavity vs. central strand weakly differentiated. Additionally, the former's leaf apex completely rounded and revolute vs. plane, with one cell apiculus. The new variety and *B. latinervium* share the most similarities, such as leaves ovate-lanceolate, leaf margins strong revolute from leaf base to the apex, the costa flat and wider, central strand distinctly differentiated and so on. However, the former has completely rounded and revolute leaf apex, the latter narrowly acute, rarely subobtusate (Fedosov & Ignatova, 2008), with an apiculus consisted of 2-3 cells (Song *et al.*, 2015); as for the costa cross-section, the new variety is crescent, occupying more than 1/3 of the leaf width in the middle to upper part of leaf, the original variety semi-circular, less than 1/4. The characteristics of leaf apex are also an important taxonomic criterion for the species identification of *Bryoerythrophyllum*. So we suggest it as a new variety of *B. latinervium* (Table 1).

*Bryoerythrophyllum latinervium* var. *rotundatum* is also similar to *B. brachystegium* and *B. inaequalifolium* in the shape of leaf apex, being entire, rounded, and not apiculate and edentate. A comparison of morphological differences among these taxa is given in Table 2.



**Table 1.** Comparison of morphological characters of *Bryoerythrophyllum latinervium* var. *rotundatum*, *B. latinervium* and *B. neimonggolicum*

Character	<i>B. latinervium</i> var. <i>rotundatum</i>	<i>B. latinervium</i>	<i>B. neimonggolicum</i>
Plant height	8-10 mm high	5-16 mm high	4-7 mm high
Central strand	present, forming a empty cavity	present	weak
Leaf apex	rounded apex, not apiculate, revolute	narrowly acute rarely subobtuse, with 2-3 cells apiculus, plane	obtuse, with one cell apiculus, plane
Costa cross-section shape, width:thickness	crescent, 3:1	semi-circular, 2:1	nearly circular, 1:1
Costa width:leaf width	median 1:2 base 1:3	median 1:3 base 1:4	median 1:5 base 1:5

**Table 2.** Comparison of morphological characters of *Bryoerythrophyllum latinervium* var. *rotundatum*, *B. brachystegium*, and *B. inaequalifolium*

Character	<i>B. latinervium</i> var. <i>rotundatum</i>	<i>B. brachystegium</i>	<i>B. inaequalifolium</i>
Plant height	8-10 mm high	10-15 mm high	1-6 mm high
Central strand	present, forming a empty cavity	present	present
Leaf marginal revolute	strongly revolute from leaf base to apex	only recurved in mid-leaf	strongly revolute from leaf base to apex
Keeling of upper part of leaf	keeled	widely keeled distally	not keeled
Basal laminal cells	smooth and hyaline	smooth and hyaline	sparsely papillose, smooth only at extreme
Costa cross-section shape, width:thickness	crescent, 3:1	semi-circular, 1-1.5:1	elliptical, 1.5:1
Costa width:leaf width	median 1:2 base 1:3	median 1:4 base 1:6	median 1:5 base 1:5

*Bryoerythrophyllum latinervium* var. *rotundatum* is quite like *B. berthoanus* (Thér.) J.A.Jiménez or *B. sharpii* R.H.Zander in the rounded leaf apex, but the former has an ovate-lanceolate leaf, the latter a lingulate leaf. The leaves strongly revolute from base to apex, and costa strong, flat and wide give *B. latinervium* var. *rotundatum* some similarity with *B. zanderi*, but leaf ovate-lanceolate, vs. ovate or triangular, apex obtuse vs. apiculate, no axillary hairs vs. filiform ones are traits that differentiate *B. latinervium* var. *rotundatum* from *B. zanderi*.

Microenvironment and substrate play an important role in bryophyte diversity and distribution (Sarula *et al.*, 2013). Habitat and environmental changes have led to some morphological variation between varieties. *Bryoerythrophyllum*

*latinervium* has a widely disjunctive distribution in Asia and North America. It is known from Tibet and Helanshan in China, growing on thin soil of cliff rock surface, while the new variety described in this paper is distributed in Daxianshan Mountain of Guyang, Baotou City, Inner Mongolia. This region belongs to desert steppe climate and is northward close to Bayan Obo rare earth mining area, The typical variety of *B. latinervium* is distributed in high-altitude mountainous areas, which may also be responsible for the species variability.

### Key to the Chinese taxa of *Bryoerythrophyllum*

1. Leaves with completely rounded apex .....2
1. Leaves acuminate or slightly obtuse, sometimes with small apiculus .....4
2. Unicellular gemmae in leaf axils absent .....3
2. Unicellular gemmae present in masses in leaf axils ..... 5. *B. inaequalifolium*
3. Margins plane at upper part of leaf ..... 2. *B. brachystegium*
3. Margins strongly revolute at upper part of leaf to the apex .....  
..... 7. *B. latinervium* var. *rotundatum*
4. Leaves oval or ovate-lanceolate, leaf margin cells not differentiated .....5
4. Leaves ligulate, leaf margin cells differentiated, with one or more rows less papillose hyaline cells .....14
5. Leaves long and narrow, acuminate at apex .....6
5. Leaves short and wide, acute forming a small apiculus at apex .....8
6. Leaves oblong-lanceolate, usually edentate at apex .....7
6. Leaves narrow oval lanceolate, usually dentate at apex .....10. *B. recurvirostrum*
7. Plants medium-sized to large, margins strongly revolute from above leaf base to apex .....11. *B. rubrum*
7. Plants small and slender, margins plane in upper part of leaf, revolute in mid-leaf .....12. *B. rubrum* var. *minus*
8. Margins revolute in middle and lower part of leaf, plane in upper part .....9
8. Margins strongly revolute from leaf base to apex .....12
9. Leaf margins edentate and smooth ..... 3. *B. gymnostomum*
9. Leaf margins denticulate to dentate above .....10
10. Dentate only at leaf apex .....11
10. Denticulate at mid-upper margin of leaf .....1. *B. alpigenum*
11. Narrow at leaf base, with irregular coarse teeth at apex .....14. *B. yunnanense*
11. Wider at leaf base, with sparse fine teeth at apex .....  
.....15. *B. yunnanense* var. *pulvinans*
12. Costa cross-section rounded .....8. *B. neimonggolicum*
12. Costa cross-section oblate .....13
13. Leaves wider at the base, ovate or triangular, axillary hairs filiform, hyaline ....  
.....16. *B. zanderi*
13. Leaves narrow at the base, ovate-lanceolate, no axillary hairs ... 6. *B. latinervium*
14. Leaf marginal cells weakly differentiated, sparsely papillose, transparent cells in one row .....9. *B. pseudomarginatum*

14. Leaf marginal cells obviously differentiated, with thick walls, epapillose cells in many rows ..... 15  
 15. Margins with regular fine teeth in upper part leaf..... 13. *B. wallichii*  
 15. Margins with irregular coarse teeth in upper part leaf ..... 4. *B. hostile*

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