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Paraphlomis dabashanensis (Lamiaceae), a new species from the Daba Mountains in Central China

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ABSTRACT: *Paraphlomis dabashanensis*, a new species from the subtropical evergreen broad-leaved forests of the Daba Mountains in Central China, is described and illustrated. Morphologically, *P. dabashanensis* most resembles *P. lanceolata*, but differs in its persistent and longer bracteoles, densely tomentose calyces with broad-triangular and shorter teeth, as well as longer corollas. However, molecular phylogenetic reconstruction using two nuclear ribosomal DNA regions (ITS and ETS) and 80 plastid protein-coding genes indicates that *P. dabashanensis* is sister to *P. albiflora*, with the *P. dabashanensis*-*P. albiflora* clade further sister to *P. nana*. Although geographically closer to *P. albiflora* and *P. nana*, *P. dabashanensis* is easily distinguished by lamina shape and indumentum, calyx indumentum and tooth morphology, and corolla color. The new species also represents the northernmost distribution of *Paraphlomis* in China.

KEY WORDS: Lamioideae, Paraphlomideae, *Paraphlomis albiflora*, *Paraphlomis lanceolata*, *Paraphlomis nana*, plastome.

INTRODUCTION

As one of the 13 tribes of subfamily Lamioideae (Lamiaceae), Paraphlomideae was recently recircumscribed and now comprises a single genus, namely, *Paraphlomis* Prain (Bendiksby *et al.*, 2011; Chen *et al.*, 2021; Zhao *et al.*, 2021; Yuan *et al.*, 2024). Species of *Paraphlomis* are perennial, stoloniferous herbs distinguished by their axillary verticillasters, actinomorphic and tubular to obconical calyces with five lobes, bilabiate corollas with an entire upper lip and three-lobed lower lip, and obovoid to triquetrous-oblong nutlets, which may be glabrous or hairy (Wu and Li, 1977; Li and Hedge, 1994; Bendiksby *et al.*, 2011; Chen *et al.*, 2021). With the synonymization of *Matsumurella* Makino and *Ajugoides* Makino under *Paraphlomis*, along with the recent discovery of numerous new species, the genus now comprises 52 species and six varieties (Yuan *et al.*, 2024), nearly doubling the number recognized in Flora of China (Li and Hedge, 1994). *Paraphlomis* is closely associated with evergreen broad-leaved forests (EBLFs), with the majority of species confined to subtropical China and only a few reaching tropical Asia, Japan, and Korea (Wu and Li, 1977; Li and Hedge, 1994; Chen *et al.*, 2021; Yuan *et al.*, 2024).

The Qinling-Daba Mountains constitute a major biogeographic boundary that delineates the distinct geographic and climatic regimes of northern and southern China, and represent a critical transitional zone between the warm temperate and subtropical regions, characterized by marked shifts in vegetation and biodiversity patterns (Zhang *et al.*, 2022). During field investigations in the Daba Mountains in 2024, we discovered a putative new species of *Paraphlomis* within the EBLFs of this region. Morphological comparisons, together with molecular phylogenetic analyses based on plastome and nuclear ribosomal DNA (nrDNA) sequences, confirmed its distinctiveness and systematic placement. We herein designate this species as *P. dabashanensis* Hong Q.Zhang, S.R.Yi & Y.P.Chen, which is described and illustrated below.

MATERIALS AND METHODS

Molecular phylogenetic analyses

Based on the most recent molecular phylogenetic study of *Paraphlomis* (Yuan *et al.*, 2024), the nuclear ribosomal internal and external transcribed spacers (ITS and ETS) and protein-coding sequences (CDS) of plastomes were adopted to resolve the systematic placement of the new species. Only two accessions of *P. dabashanensis* were newly sampled and sequenced in the present study, and the remaining sequences were all obtained from GenBank, with their accession numbers listed in Table S1. For the nrDNA (ITS + ETS) dataset, the ingroup sampling consists of 45 species and four varieties of *Paraphlomis*, and the outgroup was represented by one species each of *Phlomis* L. and *Phlomoides* Moench, following Chen *et al.* (2021). For the CDS dataset, a total of 38 species and four varieties of *Paraphlomis* were included as the ingroup, while one species each of *Lamium* L., *Leucas* R.Br., *Paraleonurus* M.L. Qian, C.L. Xiang & Bo Li, *Phlomis*, and *Phlomoides* were selected as the outgroup, following Yuan *et al.* (2024).

Genomic DNA of the two samples of *P. dabashanensis* was isolated from silica gel-dried leaves using a modified cetyltrimethylammonium bromide (CTAB) method (Doyle and Doyle, 1987). DNA was subsequently fragmented to ca. 300 bp and used for library construction with the NEBNext® Ultra II™ DNA Library Prep Kit (Illumina, San Diego, California, USA). Paired-end sequencing (2 × 150 bp) was performed on a DNBSEQ-T7 platform (BGI Shenzhen Co., Ltd., Shenzhen, China), producing ca. 20 Gb of raw data per sample.

Quality control of sequencing reads was carried out with fastp v.0.20.1 (Chen *et al.*, 2018) using default settings. Filtered reads were then assembled into ITS, ETS, and plastome sequences with GetOrganelle v.1.7.5 (Jin *et al.*, 2020). Plastomes were annotated and checked in Geneious v.9.0.2 (Kearse *et al.*, 2012). Organelle genome maps were visualized using OGDRAW v.1.3.1 (Greiner *et al.*, 2019) and protein-coding sequences were extracted using get_annotated_regions_from_gb.py within the GetOrganelle pipeline. Multiple sequence alignment was performed in MAFFT v.7 (Katoh and Standley, 2013), and aligned columns with more than 70% missing data were removed using Phyx (Brown *et al.*, 2017). Two datasets were generated for phylogenetic reconstruction: (i) the nrDNA dataset, comprising concatenated ITS and ETS sequences, and (ii) the plastid CDS dataset, comprising 80 concatenated protein-coding genes.

Phylogenetic analyses were conducted using both Bayesian inference (BI) and maximum likelihood (ML) approaches implemented on the Cyberinfrastructure for Phylogenetic Research Science (CIPRES) Gateway online server (http://www.phylo.org/; Miller *et al.*, 2010). BI analysis was conducted using MrBayes v.3.2.7a (Ronquist *et al.*, 2012), whereas ML analysis was implemented in RAxML-HPC2 v.8.2.12 (Stamatakis, 2014), following the parameter settings of Yuan *et al.* (2024). The resulting BI tree, with posterior probability (PP) values, and the best-scoring ML tree, with bootstrap support (BS) values, were visualized and annotated in TreeGraph 2 (Stöver and Müller, 2010).

Morphological study

Morphological comparisons of the new species with other *Paraphlomis* taxa were carried out based on field observations, literature collation, as well as examination of herbarium specimens. Taxonomic literature and protologues of all described species of *Paraphlomis* were reviewed. Herbarium specimens, especially type specimens, from 26 herbaria (ANUB, BM, CDBI, CGMC, CSFI, E, GNNU, GXMI, HAST, HIB, IBK, IBSC, JIU, JJF, K, KUN, KYO, LBG, MW, NAS, PE, SM, SYS, SZ, TI, and WUK; abbreviations follow Thiers, 2025) were checked and measured. Distribution records were compiled from specimen data and online resources, including the Global Biodiversity Information Facility (GBIF, https://www.gbif.org/) and the Plant Photo Bank of China (PPBC, http://ppbc.iplant.cn/). These records were subsequently used to assess the distribution of the new species and its closely related taxa, and to generate a distribution map using ArcGIS v.10.8.

RESULTS

The plastomes of both accessions of the new species were successfully assembled, displaying the typical circular quadripartite structure with a large single-copy region (LSC), a small single-copy region (SSC), and a pair of inverted repeats (IR) (Fig. S1). The plastome of *P. dabashanensis* 1 (voucher: *S.R. Yi et al. YSR3402*) was 152004 bp in length, while that of *P. dabashanensis* 2 (voucher: *H.Q. Zhang et al. NQ01*) was 152012 bp long, both with a GC content of 38.4%. Each plastome contained 114 unique genes, including 80 protein-coding genes, 30 tRNAs, and four rRNAs.

The final aligned lengths of the nrDNA and CDS datasets were 1210 bp (comprising 773 bp for ITS and 437 bp for ETS) and 69111 bp, respectively. The BI and ML analyses yielded largely congruent topologies for both datasets, differing only at poorly supported nodes. As the ML trees exhibited slightly higher resolution, only ML results were presented (Figs. 1 & 2), with PP values from the BI trees indicated alongside the corresponding BS values. Due to the short aligned length and limited number of informative sites, the nuclear tree was poorly resolved with most nodes collapsing into polytomies. The two accessions of *P. dabashanensis* formed a moderately supported clade (Fig. 1: PP = 0.95, BS = 68%) and were recovered in a polytomy with *P. albiflora* (Hemsl.) Hand.-Mazz. var. *albiflora* and *P. albiflora* var. *biflora* (Y.Z. Sun) C.Y. Wu (Fig. 1: PP = 1.00, BS = 86%), with *P. nana* Y.P. Chen, C. Xiong & C.L. Xiang further sister to the *P. dabashanensis*-*P. albiflora* clade (Fig. 1: PP = 1.00, BS = 83%). In the plastid tree, three well-supported clades (Fig. 2: PP = 1.00, BS = 100%) can be recognized, corresponding to the core Paraphlomis clade, the Paraphlomis-Ajugoides clade, and the Paraphlomis-Matsumurella clade, as designated in Yuan *et al.* (2024). Consistent with the nuclear tree (Fig. 1), the two accessions of *P. dabashanensis* formed a clade (Fig. 2: PP = 0.99, BS = 68%) sister to the *P. albiflora* var. *albiflora*-*P. albiflora* var. *biflora* clade (Fig. 2: PP < 50%, BS = 67%), both species recovered within the Paraphlomis-Matsumurella clade.

Morphological comparisons revealed that the new species most closely resembles *P. lanceolata* Hand.-Mazz., however, both nuclear and plastid trees showed close relationships among *P. lanceolata*, *P. setulosa* C.Y.Wu & H.W.Li, and *P. montigena* (X.H.Guo & S.B.Zhou) J.C.Yuan, Y.P.Chen & C.L.Xiang (Fig. 1: PP = 1.00, BS = 94%; Fig. 2: PP < 50%, BS = 72%). The *P. lanceolata*-*P.*

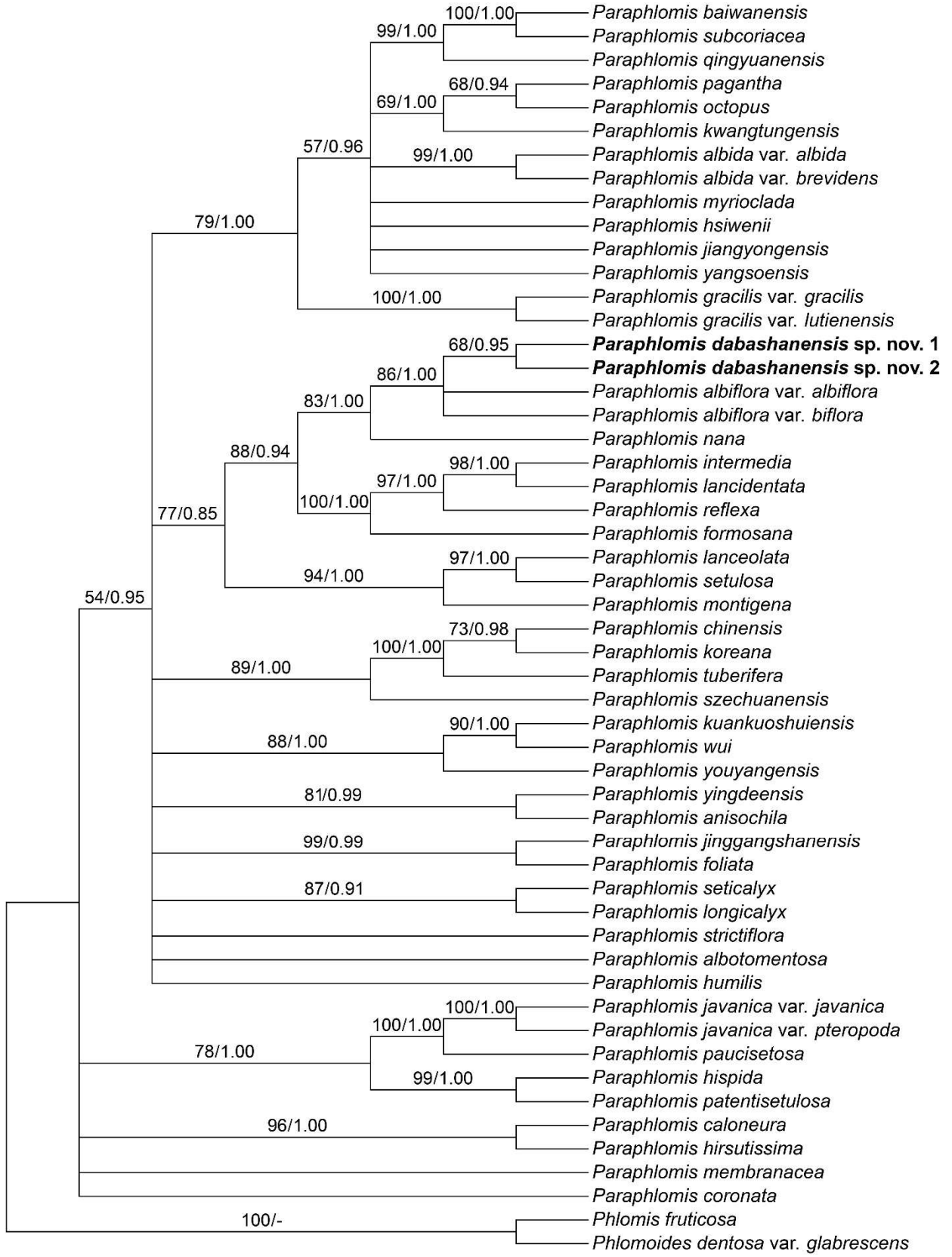

Fig. 1. Phylogram of the best-scoring maximum-likelihood tree of *Paraphlomis* based on the nrDNA dataset. Branches with support values < 50% BS are collapsed. Support values ≥ 50% BS or 0.50 PP are displayed above the branches.

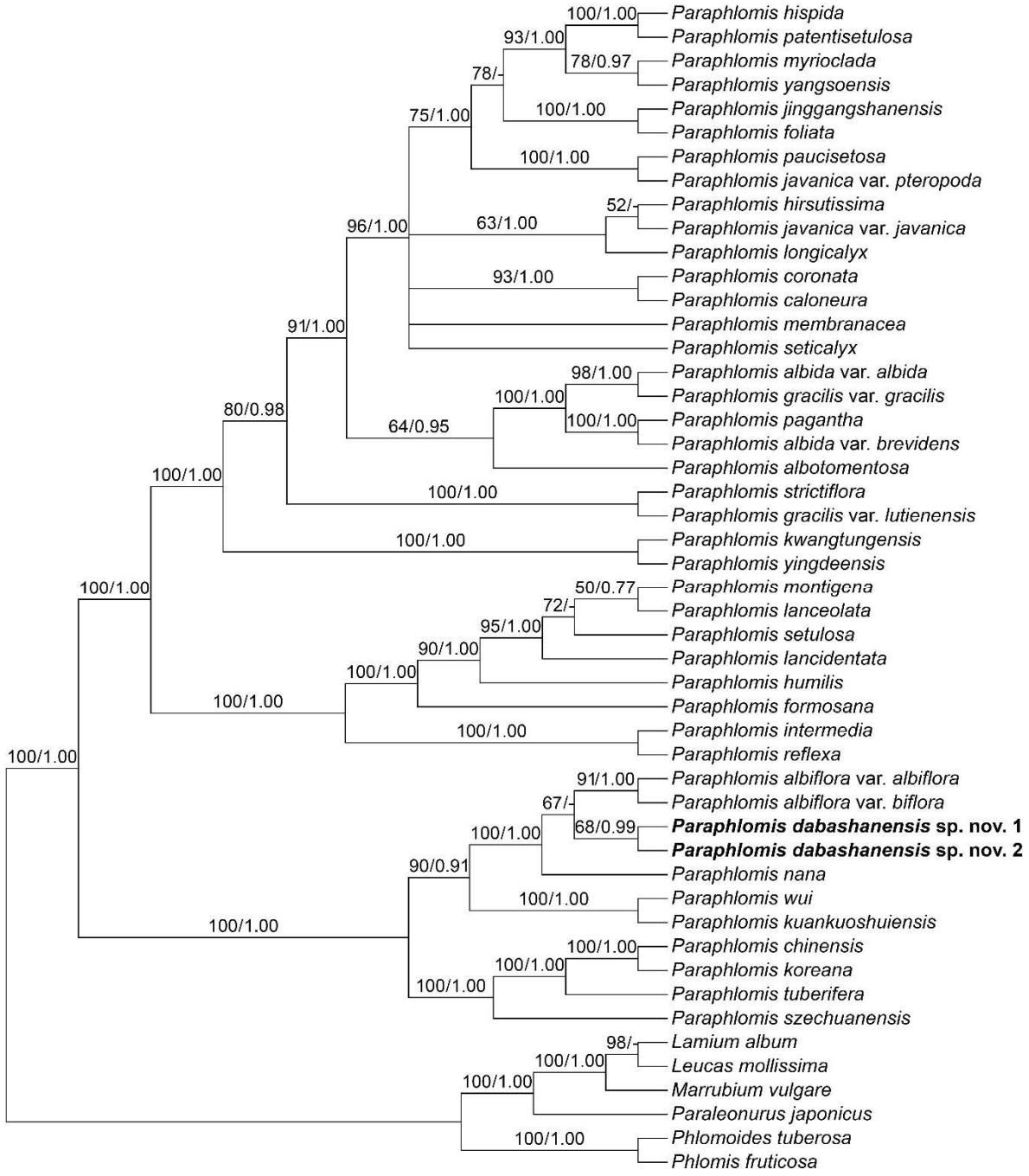

Fig. 2. Phylogram of the best-scoring maximum-likelihood tree of *Paraphlomis* inferred from the CDS dataset. Branches with support values < 50% BS are collapsed. Support values ≥ 50% BS or 0.50 PP are displayed above the branches.

setulosa-P. montigena clade was either recovered within the same clade with the *P. dabashanensis-P. albiflora-P. nana* clade (Fig. 1: PP = 0.85, BS = 77%) or placed in a separate clade (Fig. 2).

DISCUSSION

Both the nuclear (Fig. 1) and plastid (Fig. 2) trees were congruent with Yuan *et al.* (2024) and supported a sister relationship between the new species and *P. albiflora*, with the *P. dabashanensis-P. albiflora* clade further sister to *P. nana*. The close relationship among the three species was also recovered in Yuan (2024, unpublished) unpublished species tree of *Paraphlomis* based on 3781 low-copy nuclear orthologs. Despite their phylogenetic affinity, the three species are morphologically distinct. Specifically, *P. dabashanensis* differs from both *P. albiflora* (including the type variety and *P. albiflora* var.

Table 1. Morphological comparisons among ***Paraphlomis albiflora***, ***P. dabashanensis***, ***P. lanceolata***, and ***P. nana***.

Characters	*Paraphlomis albiflora*	*P. dabashanensis*	*P. lanceolata*	*P. nana*
Height	30–60 cm	20–40 cm	30–50 cm	1–5 cm
Stem indumentum	Densely villose and glandular pubescent	Densely to sparsely strigose	Subglabrous	Densely strigose
Number of verticillaster	2–20	Over 20	8–10	2–6
Lamina shape	Ovate to broadly ovate, base broadly cuneate to truncate	Elliptic to elliptic-lanceolate, base cuneate	Elliptic to lanceolate, base cuneate	Ovate, base cuneate to broadly cuneate
Lamina size	6–17 × 3.5–9 cm	10–20 × 2.5–7.5 cm	5–13 × 1.5–4 cm	2–7 × 1.5–4 cm
Lamina indumentum	Densely villose and glandular pubescent on both surfaces	Adaxially sparsely strigose, abaxially glabrous	Adaxially sparsely strigose, abaxially glabrous	Densely to sparsely strigose on both surfaces
Bracteole shape	Linear	Linear to lanceolate	Subulate	Subulate
Bracteole length	Approximately 2 mm long	4–8 mm long	Approximately 1 mm long	Approximately 1 mm long
Bracteole persistence	Persistent	Persistent	Early deciduous	Early deciduous
Calyx indumentum	Densely villose and glandular pubescent	Densely tomentose	Glabrous	Sparsely villose
Calyx tooth shape	Triangular, apex acute to acuminate	Broad-triangular, apex acute	Triangular to ovate-triangular, apex acute to acuminate	Triangular, apex bristlelike-acuminate
Calyx tooth length	1–3 mm long	Approximately 1 mm long	Approximately 2 mm long	Approximately 3 mm long
Corolla color	White	Yellow	Yellow	White
Corolla length	1.5–1.8 cm long	2–2.5 cm long	1.5–1.8 cm long	1.6–2 cm long

biflora) and *P. nana* in the lamina shape and indumentum, calyx tooth morphology, as well as corolla color (Figs. 3 & 4; Table 1). For instance, laminae of *P. dabashanensis* are elliptic to elliptic-lanceolate with subglabrous to glabrous surfaces, whereas those of *P. albiflora* are ovate to broadly ovate and densely villose and glandular pubescent, and those of *P. nana* are smaller, ovate and densely to sparsely strigose. The calyx teeth of *P. dabashanensis* are broad-triangular, ca. 1 mm long, and with an acute apex, contrasting with the triangular and 1–3 mm long teeth with an acute to acuminate apex in *P. albiflora*, and the triangular and ca. 3 mm long teeth with a bristlelike-acuminate apex in *P. nana*. Corolla color further distinguishes the taxa: both *P. albiflora* and *P. nana* have white corollas, while the new species has yellow corollas. Additionally, *P. nana* is unique in its dwarf habit, with stems only 1–5 cm tall. Geographically, both *P. dabashanensis* and *P. nana* are restricted to the Daba Mountains, whereas *P. albiflora* is mainly distributed along the Yangtze River (Fig. 5; Chen *et al.*, 2022).

In contrast to the distinctions from *P. albiflora* and *P. nana*, the new species shows notable morphological similarity to *P. lanceolata*, particularly in habit, leaf, and corolla characters (Table 1). The two species mainly differ in bracteole and calyx morphology: *P. dabashanensis* has persistent, linear to lanceolate, and 4–8 mm long bracteoles, whereas those of *P. lanceolata* are early deciduous, subulate, and ca. 1 mm long. Calyces are densely tomentose with broad-triangular and ca. 1 mm long teeth in the new species, but are glabrous with triangular to ovate-triangular and ca. 2 mm long teeth in *P. lanceolata*. Additional distinctions include strigose stems, more densely flowered verticillasters, and longer corollas in *P. dabashanensis* (Table 1). The two species are also geographically isolated, with *P. lanceolata* distributed mainly in central-south to southeast China (Fig. 5).

The Yangtze River was previously regarded as the northern distributional limit of *Paraphlomis* in China (Wu and Li, 1977). The discovery of *P. dabashanensis*, however, extends the range of the genus further north, representing its northernmost occurrence in China. This finding highlights the Qinling-Daba Mountains as a critical biogeographic boundary (Zhang *et al.*, 2022) and underscores the role of EBLFs in shaping both the diversification and distribution limits of *Paraphlomis* in East Asia.

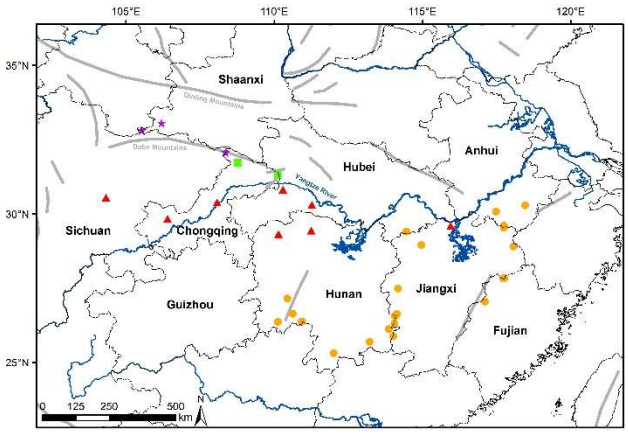

Fig. 3. Distribution of ***Paraphlomis albiflora*** (red triangles), ***P. dabashanensis*** (purple stars), ***P. lanceolata*** (orange circles), and ***P. nana*** (green squares) in China.

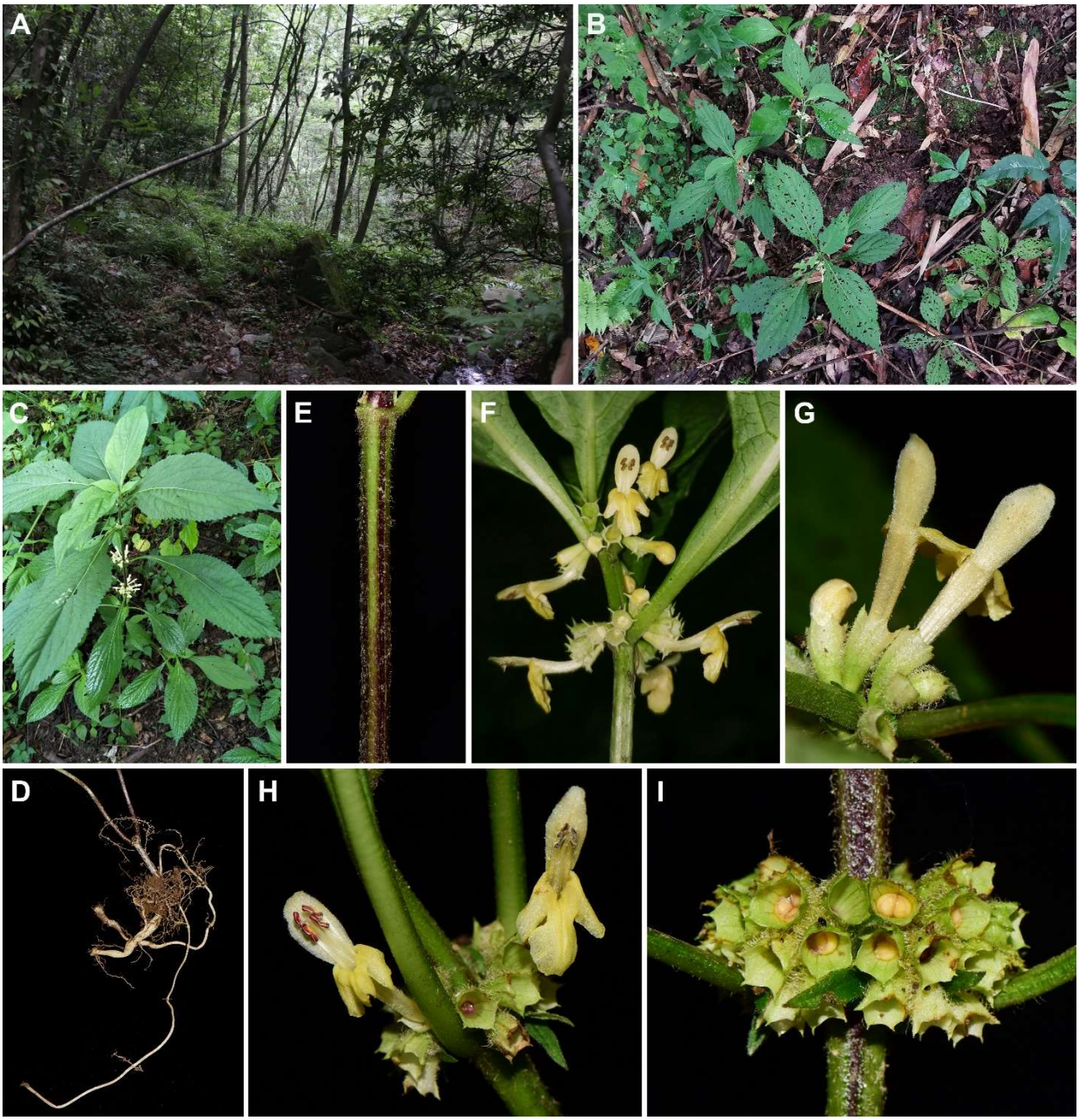

Fig. 4. Morphology of ***Paraphlomis dabashanensis*** from the type locality. **A**. Habitat; **B, C**. Habit; **D.** Stolons; **E.** Stem; **F.** Inflorescence; **G.** Dorsal view of flowers; **H.** Frontal view of flowers; **I.** Frontal view of calyces. **A**, **F** photographed by Xu Zhang; **B**, **C** photographed by Si-Rong Yi; **D**, **E**, **G–I** photographed by Ya-Ping Chen.

TAXONOMIC TREATMENT

Paraphlomis dabashanensis Hong Q.Zhang, S.R.Yi & Y.P.Chen, ***sp. nov.*** **Figs. 4 & 5**

Type: **CHINA.** Sichuan: Wanyuan City, Dazhu Town, Miaoziya, in the forest, 32°4′21.57″N, 108°21′32.19″E, alt. 1560 m, 7 Jul. 2024, *S.R. Yi et al. YSR3402* (holotype: KUN!; isotypes: CGMC!, K!, KUN!, P!).

***Diagnosis*:** *Paraphlomis dabashanensis* is morphologically most similar to *P. lanceolata* but differs in having persistent (vs. early deciduous) and 4–8 mm long (vs. 1 mm long) bracteoles, densely tomentose (vs. glabrous) calyces with broadly triangular (vs. ovate-triangular) and ca. 1 mm (vs. ca. 2 mm) long teeth, and 2–2.5 cm long (vs. 1.5–1.8 cm long) corollas.

***Description*:** Perennial herbs, 20–40 cm tall, erect, stoloniferous. **Stems** 4-angled, densely to sparsely retrorse strigose. **Leaves** opposite; **lamina** elliptic to elliptic-lanceolate, papery, 10–20 cm long, 2.5–7.5 cm wide, apex acuminate, margin serrate to crenate-serrate,

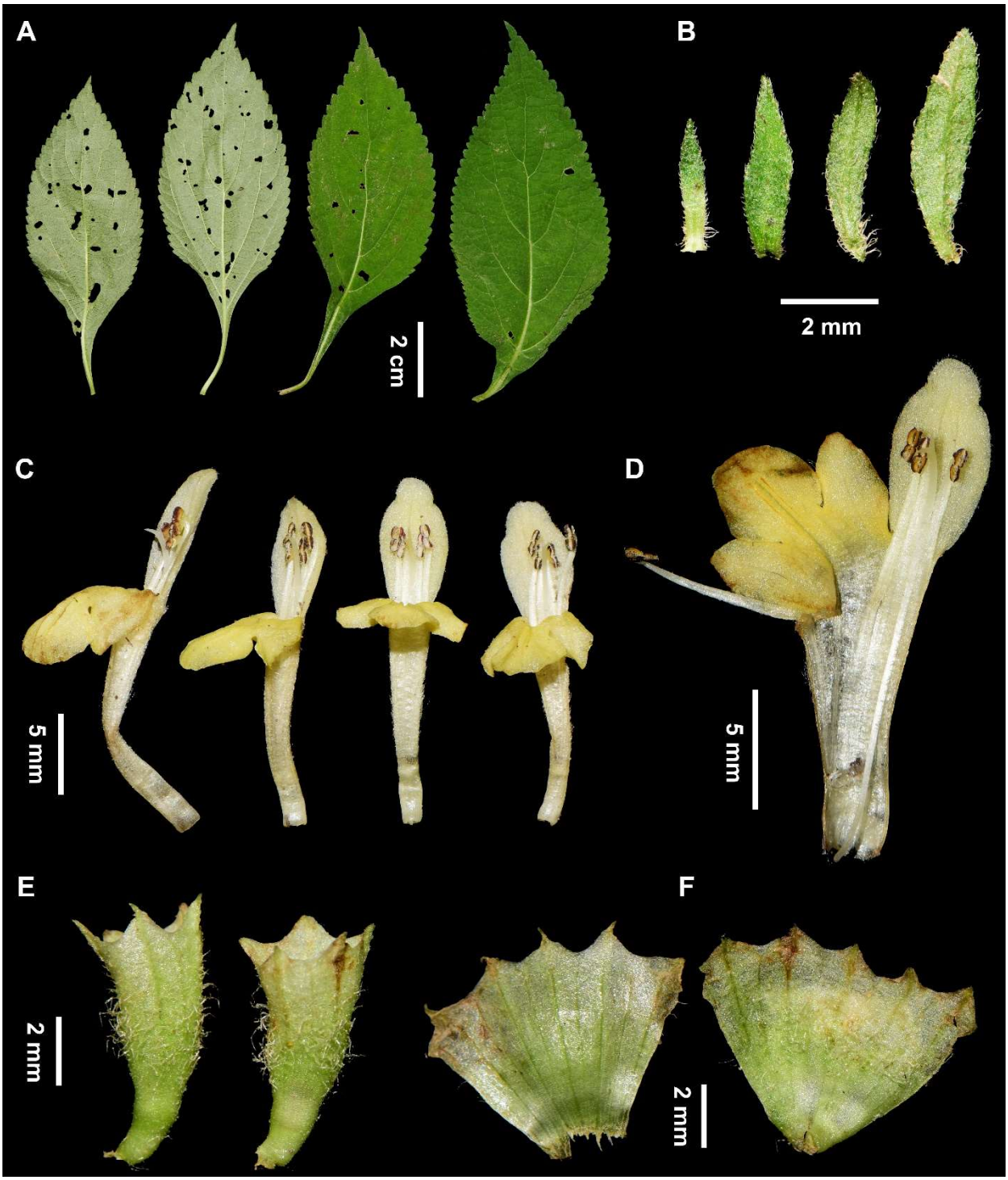

Fig. 5. Foliar and floral morphology of ***Paraphlomis dabashanensis***. **A.** Leaves; **B.** Bracteoles; **C.** Corollas; **D.** Dissected corolla; **E.** Calyces; **F.** Dissected calyces. Photographed by Ya-Ping Chen.

base cuneate, decurrent, adaxially green, sparsely appressed strigose, abaxially light green, glabrous, sparsely glandular; lateral veins 3–5-paired; petioles 1–5 cm long, sparsely retrorse strigose to glabrous. **Verticillasters** many-flowered, globose, ca. 5 cm in diam.; **bracteoles** linear to lanceolate, 4–8 mm long, 0.5–2 mm wide, sparsely strigose on both surfaces. **Calyx** light green, 7–8 mm long, ca. 4 mm wide, densely tomentose outside, glabrous inside, inconspicuously 10-veined; teeth 5, subequal, broad-triangular, ca. 1 mm long, ca. 1.8 mm wide, apex acute, sometimes folded. **Corolla** yellow, 2–2.5 cm long; tube 1.3–1.6 cm long, ca. 1.5 mm

wide, pubescent annulate inside at 1/3 distance from base, densely pubescent outside; 2-lipped, upper lip oblong, entire, erect, concave, 7–9 mm long, ca. 4 mm wide, densely pubescent outside, margin entire; lower lip spreading, 7.5–9 mm long, 7–9 mm wide, apex 3-lobed, medium lobe largest, suborbicular, 4–6 mm long, 4–6 mm wide, margin entire, lateral lobes oblong, 3–4 mm long, 2–2.5 mm wide, margin entire. **Stamens** 4, straight, included, filaments flat, base pubescent, thecae 2, divaricate at 180°. **Style** included, glabrous, apex slightly 2-lobed, lobes subulate. **Ovary** glabrous, apex truncate. **Nutlets** not seen.

***Phenology*:** Flowering from May to July.

Etymology: The specific epithet is derived from the type locality of the new species, i.e. the Daba Mountains in central China.

Distribution and habitat: The new species is known only from the Daba Mountains in central China (Fig. 3). It typically grows in subtropical evergreen broad-leaved forests at altitudes ranging from 930 to 1560 m.

Conservation status: All three known populations of the new species occur in well-preserved forests with minimal human disturbance (Fig. 3). Fewer than 1000 individuals are estimated based on current observations. Therefore, the conservation status of *P. dabashanensis* is provisionally assessed as Vulnerable [VU D1 & D2] according to the IUCN Red List criteria (IUCN 2024). Additional field surveys are required for a more comprehensive assessment.

Common name (assigned here): dà bā shān jiǎ cāo sū (大巴山假糙苏; Chinese name)

Additional specimens examined (Paratypes): CHINA. Shaanxi: Ningqiang County, Daijiaba Town, Donghuanggou, in the forest, 33°3'18.6"N, 106°12'11.54"E, alt. 956 m, 1 Jun. 2024, *H.Q. Zhang et al. NQ01* (KUN); Ningqiang County, Qingmuchuan Town, Nanba Village, Sifanggou, in the forest, 32°48'11.26"N, 105°31'59.96"E, alt. 930 m, 12 Jun. 2024, *H.Q. Zhang et al. NQ02* (KUN). ***Specimens of P. albiflora examined:*** CHINA. Chongqing: Beibei District, Jinyun Mountain, Beiquan Hydrological Station, alt. 200 m, 6 Jun. 1982, *Z.M. Huang 1461* (PE00992680); Beibei District, Jinyun Mountain, 29 Apr. 2022, *Y. Zhao & R.Z. Bai ZY56* (KUN); Zhongxian County, Mopan Village, alt. 700 m, 16 May 1959, *Y.H. Feng 1816* (KUN0228009, SM717305106). Hubei: Badong County, alt. 800 m, 4 Jun. 1939, *T.P. Wang 10836* (PE00834687); Badong County, alt. 120 m, 8 Jun. 1939, *T.P. Wang 10874* (PE00834688, WUK0026126); Ichang, *A. Henry 1575* (syntypes: BM000950526, K000479950), *1910* (syntypes: E00284218, K000479951, P00738064), *3576* (syntypes: GH00001404, K000479952, P00738065), *720* (syntypes: G00424543, K000479953); Yichang City, 10 May 1929, *K.K. Chung 3506* (PEY0047059); Yidu City, Jiufenggu Resort, alt. 167 m, 18 Jun. 2017, *Y.T. Hou et al. 20170618253* (QFNU0046849). Hunan: Zhangjiajie City, Yongding District, Maoyanhe Town, Hujiapo, 20 Jun. 2022, *A. Liu et al. HN01514* (KUN); Jiangxi: Jiujiang City, Lushan Mountain, Donglin Temple, 28 May 2013, *C.M. Tan & X.G. Wang 13268* (JJF00034347); *ibid.*, 6 Jun. 2018, *C.M. Tan et al. 1806393* (JJF00034350). ***Specimens of P. lanceolata examined:*** CHINA. Anhui: Xiuning County, Fengcun Village, 400 m, 11 Jun. 1983, *D.Y. Liu 734* (ANUB13030817); Jinde County, Suncun Town, Niushan, 900 m, 15 Jun. 2006, *M. Liu et al. A90069* (PE01798472); Shimen County, Guniujiang Natural Reserve, 983 m, 18 May 2016, *K. Liu et al. ANUB00886* (ANUB000034); *ibid.*, 210 m, 10 Jun. 2018, *Y.N. Xiong et al. 722* (NAS00614069). Fujian: Taining County, Xinqiao Town, 1500 m, 16 Jun. 1978, *G.L. Cai 438* (KUN0277933). Hunan: Dongkou County, Yuexi Forest Farm, 1612 m, 7 Jul. 2014, *J.J. Zhou et al. 14070709* (CSFI028752, CSFI028753); Guidong Couty, Oujiang Town, Pingshui Village, 8 May 2022, *C.Z. Huang s.n.* (KUN); Ningyuan County, Jiuyishan Natural Reserve, 11 Jun. 2020, *A. Liu et al. LK0825* (KUN); Suining County, Huangsang Natural Reserve, Laolongtang, 1595 m, 9 Jun. 2014, *J.J. Zhou et al. 14060903* (CSFI028750, CSFI028751); Wugang City, Yunshan, 1000–1200 m, 18 Jul. 1918, *H. Handel-Mazzetti 12247* (holotype: WU0063811; isotypes: C10013186, E00284169, GH00001399, IBSC0005125, WU0063810, WU0063812); *ibid.*, 25 Jun. 2021, *A. Liu et al. WGYS085* (KUN); Xinning County, Furongfeng, 1100 m, 28 Jul. 1985, *Y.B. Luo 2735* (PE00834740, PE00834741); Xinning County, Dayunshan, 1850 m, 29 Jul. 1985, *Y.B. Luo 2784* (PE00834738, PE00834739); Yanling County, Jiuqushui, 755 m, 16 Jun. 2017, *Z.C. Liu et al. LXP-13-23944* (SYS00198865). Jiangxi: Jinggangshan City, Ganggangshan, 1300 m, 9 Jul. 1965, *S.K. Lai et al. 4403* (KUN0277698, LBG00079218); Jinggangshan City, Pengshuishan, 1500 m, 19 Jun. 1965, *S.K. Lai 4198* (KUN0277270); Luxi County, Wugong Mountains, Hongyangu, 26 Jun. 2017, *R.L. Liu 170626012* (GNNU0006352); Shangrao City, Sanqing Mountains, 1610 m, 18 Oct. 2013, *X.F. Zeng ZXF14880* (CZH0008950); Suichuan County, Daijiapu, 1891 m, 12 Jun. 2017, *Z.C. Liu et al. LXP-13-23679* (SYS00202186); Wuning County, Luoxi Town, Shimensi, 150 m, 23 Aug. 2016, *J.H. Zhang 2377* (JJF00034354); Wuyuan County, 26 May 2025, *B. Chen CB03598* (CSH); Yanshan County, Wuyishan Nationa Natural Reserve, Xiayanpu, 979 m, 4 Jul. 2017, *F.B. Chen et al. 17586* (JJF00034355, JJF00034356); Yanshan County, Wuyishan Nationa Natural Reserve, Huanggangshan, 1833 m, 8 Jul. 2017, *P. Lei 17242* (JJF00034355, JJF00034356); Yanshan County, Wuyishan Nationa Natural Reserve, Huanggangshan, 1754 m, 11 Aug. 2017, *C.M. Tan et al. 17569* (JJF00034360). ***Specimens of P. nana examined:*** CHINA. Chongqing: Chongkou County, Mingzhong Town, Jinchi Village, Longmenxi, Dabashan National Natural Reserve, 108°46′9.24″E, 31°43′55.49″N, alt. 996 m, 7 Jul. 2021, *C. Xiong XC21097* (holotype: KUN; isotypes: CQNM, IBK); Wushan County, Zhuxian Town, Shizhuzi Village, Daguling, Wulipo National Natural Reserve, 110°6′36.25″E, 31°18′23.79″N, alt. 1310 m, 18 Jul. 2021, *C. Xiong & H.L. Zhou XC21126* (KUN); *ibid*., 11 Sept. 2021, *H.L. Zhou s.n.* (KUN).

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