

# *Vitis shizishanensis*, a new species of the grape genus from Hubei province, China

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## Abstract

*Vitis shizishanensis* (Vitaceae), a new species from Hubei, China, is described and illustrated. It is morphologically similar to *V. flexuosa* and *V. bryoniifolia*, but differs in leaf lobing and pubescence. It can be easily distinguished from the two species based on its glabrous or with very sparse arachnoid tomentum on the abaxial mature leaf surface, and its unlobed to 3–7 lobed leaves. A detailed description, along with photographs for the new species, and a table for morphological comparisons with similar *Vitis* species, are also provided.

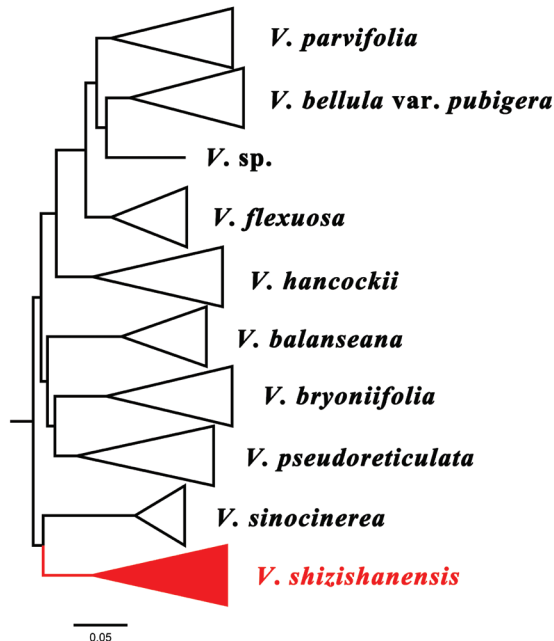
## Keywords

Grape, phylogenomics, taxonomy, Vitaceae, *Vitis*

## Introduction

The grapes (*Vitis vinifera* L.) represent one of the earliest domesticated and the most widely cultivated economic fruits in the world, as the source for grapes, raisins, and wine (Myles et al. 2011; Gerrath et al. 2015; Wen et al. 2018b). The grape genus *Vitis* L. contains ca. 70 species with an intercontinental disjunct distribution in North America (to northern South America), East Asia and Europe to West Asia (Galet 1988; Chen et al.

2007; Moore and Wen 2016; Wen et al. 2018a, 2018b). There are ca. 40 native species of *Vitis* in East Asia and most of them occur in China (Chen et al. 2007; Wan et al. 2008). Based on recent studies on molecular phylogeny and morphology of *Vitis*, a robust phylogenetic framework of *Vitis* has been reconstructed (Tröndle et al. 2010; Péros et al. 2011; Zecca et al. 2012; Aradhya et al. 2013; Wan et al. 2013; Liu et al. 2016; Ma et al. 2018a). However, due to rapid evolutionary radiations and extensive reticulate evolution of *Vitis* (Aradhya et al. 2013; Wan et al. 2013; Ma et al. 2018a, 2018b; Wen et al. 2018a), the species delimitation of *Vitis* is still controversial and the number of species of *Vitis* needs to be further assessed (Chen et al. 2007; Wan et al. 2008; Wen et al. 2018b; Ma et al. 2016, 2018b, 2020). Taxonomic challenges of some *Vitis* species are caused by their morphological similarity and overlapping geographic distribution (Chen et al. 2007; Moore and Wen 2016). A very complex group of *Vitis* is the *V. bryoniifolia* clade and its close allies (Ma et al. 2020). The phylogenetic relationships of the *V. bryoniifolia* clade have been reconstructed recently with robust support, which indicated that some samples previously difficult to identify need to be treated as a different species distinct from *V. bryoniifolia* based on molecular phylogenetic evidence (Ma et al. 2020) (Fig. 1). The leaf shape of this species shows a high level of phenotypic plasticity, varying from unlobed to 3–7 lobed, which caused problems for species identifications (Ma et al. 2020). After consulting relevant literature (Li et al. 1996; Wang et al. 2000; Chen et al. 2007; Wan et al. 2008) and our extensive field studies in East Asia, we herein propose to describe the new species, *Vitis shizishanensis* Z.Y.Ma, J. Wen, Q. Fu & X-Q. Liu.



**Figure 1.** Simplified phylogenetic relationships of the *V. bryoniifolia* clade based on Ma et al. 2020.

## Material and methods

Descriptions and measurements of morphological characters of the new species were based on field observations of living plants at the type locality and specimens in the herbarium of Huazhong Agricultural University (CCAU) and the United States National Herbarium (US). We also examined herbarium specimens of *Vitis* comparatively from the following herbaria: CCNU, CSFI, HIB, HNNU, HUNST, HZU, JIU, JXCM, NYA, PE, and WH (abbreviations following Thiers 2020), and from images of type specimens and dried herbarium specimens on the Chinese Virtual Herbarium Website (<http://www.cvh.ac.cn/>), JSTOR Global Plants (<http://plants.jstor.org>), National Specimen Information Infrastructure (<http://www.nsii.org.cn/>), and Sharing Platform of IBK (<http://www.gxib.cn/spIBK/>).

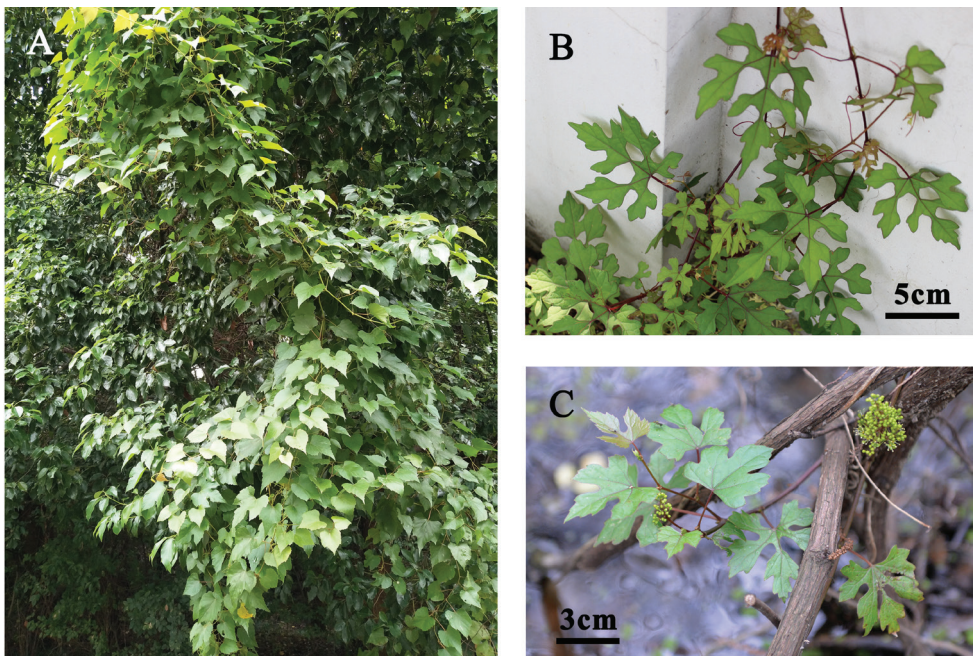
## Taxonomic treatment

*Vitis shizishanensis* Z.Y.Ma, J.Wen, Q.Fu & X.Q.Liu, sp. nov.

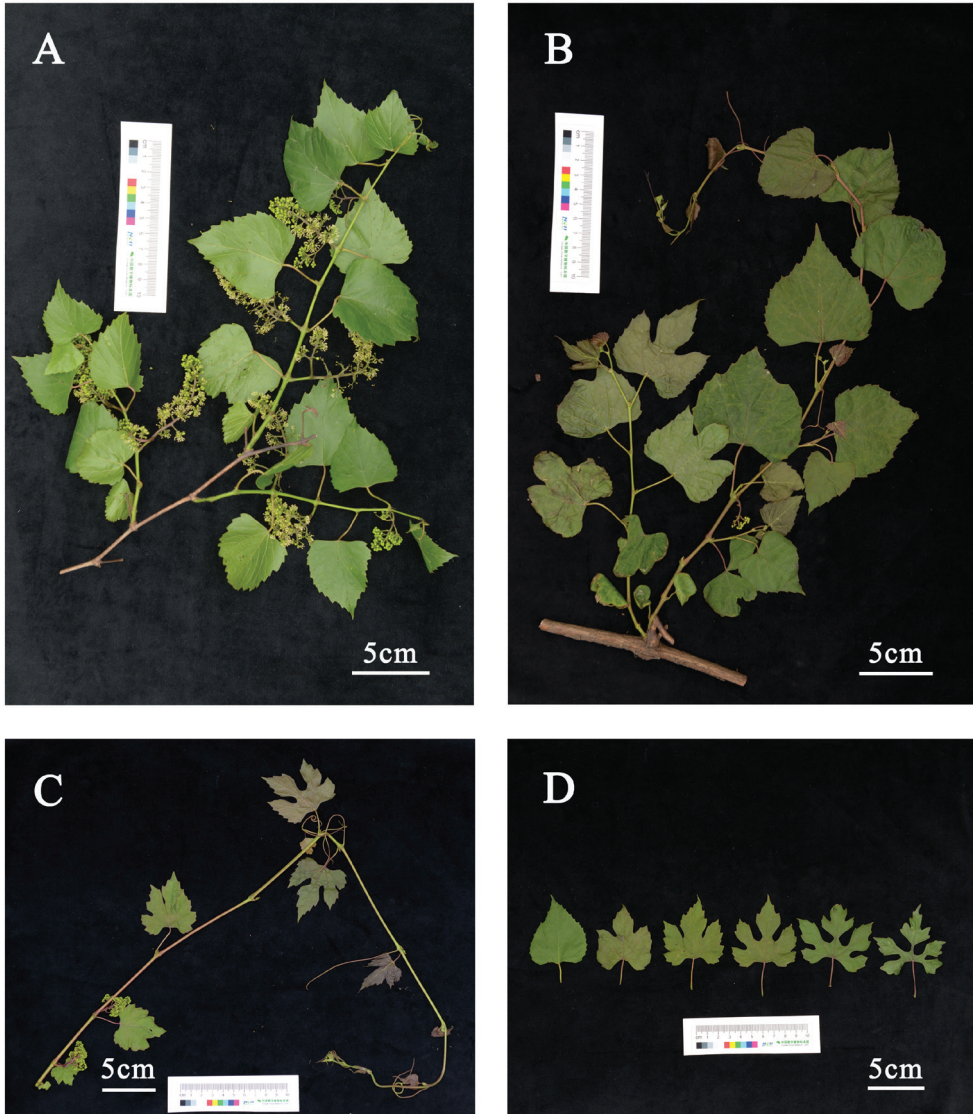
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Figures 2, 3, 4, 5, 6

**Type.** China. Hubei: Wuhan City, Shizishan Mountain, 30°28'44"N, 114°21'48"E, 21 m, 6 May 2021, in fl., X.Q. LIU 755 (holotype: CCAU!; isotypes: CCAU!, US!).

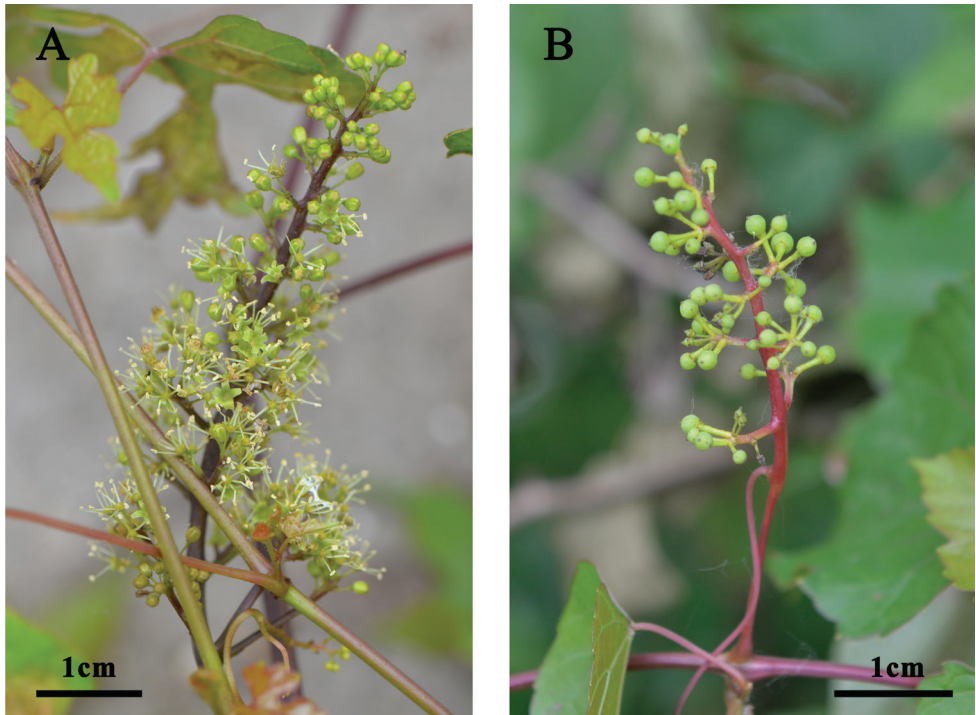


**Figure 2.** *Vitis shizishanensis* Z.Y.Ma, J.Wen, Q.Fu & X.Q.Liu, sp. nov. **A** habit **B** individual with 5–7 deeply lobed leaves **C** a flowering branch with 3–5 deeply lobed leaves.



**Figure 3.** Branches and leaves of *Vitis shizishanensis* sp. nov. (X.Q. LIU 755) **A** branches with unlobed leaves **B** branches with unlobed to 3 lobed leaves **C** branches with 3–5 deeply lobed leaves **D** unlobed to 5–7 deeply lobed leaves.

**Diagnosis.** *Vitis shizishanensis* is morphologically similar to *V. bryoniifolia* Bunge, *V. flexuosa* Thunb, *V. sinocinerea* W. T. Wang, and *V. bellula* (Rehder) W. T. Wang, but differs from the *V. bryoniifolia*, *V. sinocinerea*, and *V. bellula* in its glabrous to hirtellously pubescent abaxial mature leaf surface (vs. abaxially densely arachnoid tomentose in *V. bryoniifolia*, *V. sinocinerea*, and *V. bellula*). It differs from *Vitis flexuosa* in its leaves varying from unlobed to 3–7 lobed (vs. unlobed to slightly 3-lobed leaves in *V. flexuosa*), tendrils unbranched or bifurcate from upper half (vs.



**Figure 4.** Inflorescences of *Vitis shizishanensis* sp. nov. **A** male flowers **B** female flowers after anthesis.



**Figure 5.** Seeds of *Vitis shizishanensis* sp. nov. **A** ventral view **B** dorsal view **C** lateral view **D** transverse section.

tendrils bifurcate from approximately midway in *V. flexuosa*), lack of arachnoid tomentum (vs. with sparse arachnoid tomentum to glabrescent in *V. flexuosa*), and subcordate to cordate or sometimes truncate leaf base (vs. subtruncate or slightly subcordate leaf base in *V. flexuosa*).

**Description.** Woody climber, sprawling to moderately high climbing, sparsely branched. Branchlets terete, glabrous, with longitudinal ridges, tendrils unbranched or bifurcate from upper half. Leaves simple; stipules ovate-elliptic or lanceolate, 1–4 mm; petiole 2–6 cm, hirtellous or glabrous; blade 3–10 × 3–9 cm, unlobed to slightly 3-lobed, or 3–7

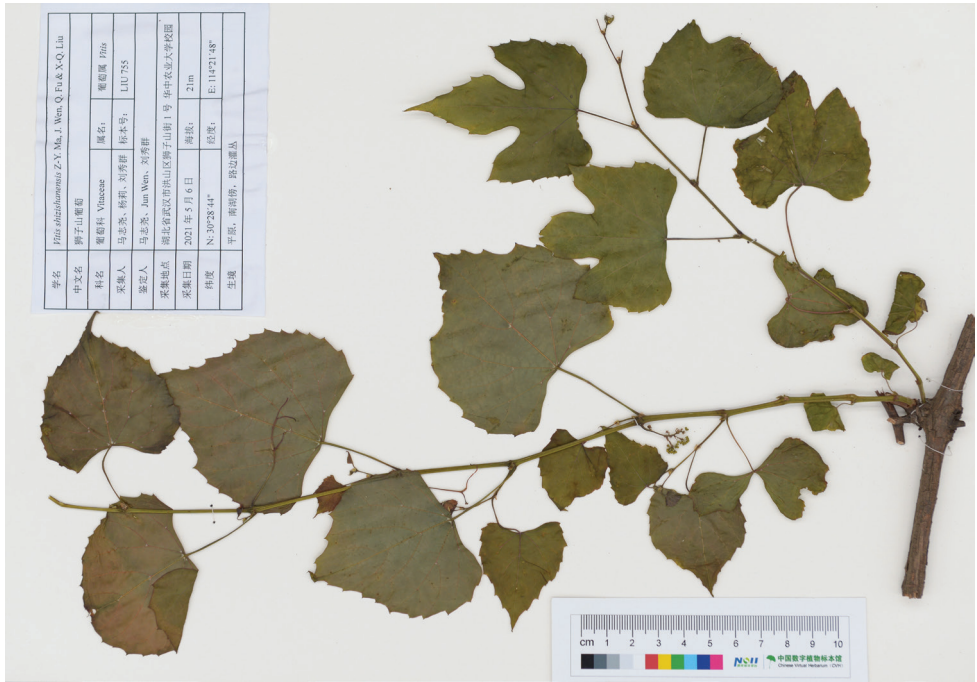


Figure 6. Holotype of *Vitis shizishanensis* sp. nov. Z.Y.Ma, J. Wen, Q. Fu & X-Q. Liu (X.Q. LIU 755).

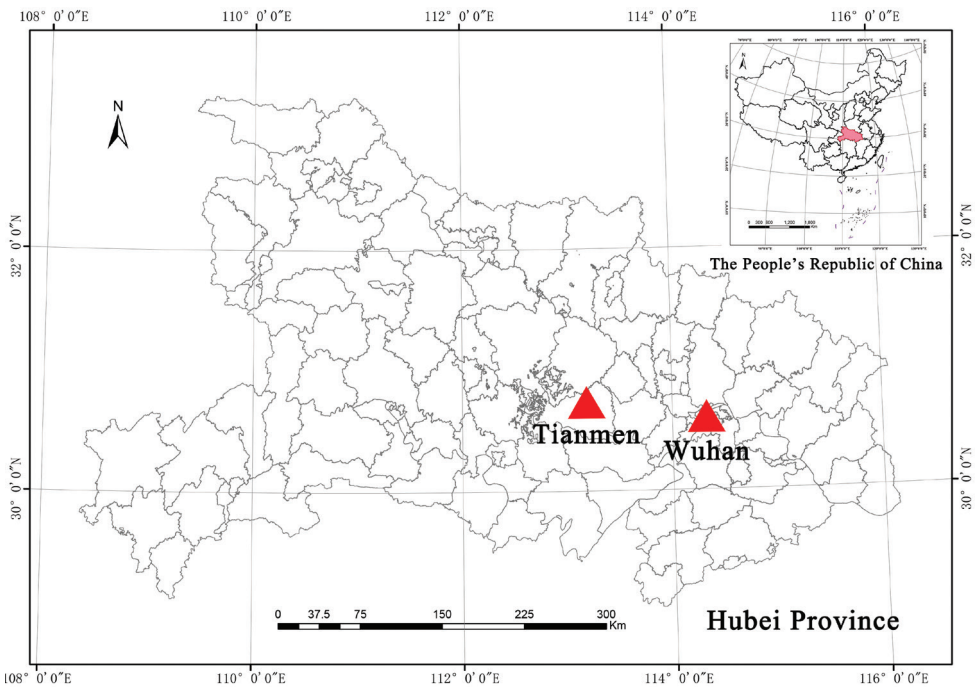


Figure 7. Distribution of *Vitis shizishanensis* sp. nov. (triangle).

**Table 1.** Morphological comparisons among *Vitis shizishanensis*, *V. bryoniifolia*, *V. flexuosa*, *V. sinocinerea*, and *V. bellula*.

Characters	<i>V. shizishanensis</i>	<i>V. flexuosa</i>	<i>V. bryoniifolia</i>	<i>V. sinocinerea</i>	<i>V. bellula</i>
tendrils	unbranched or bifurcate in the upper half	bifurcate to the middle	bifurcate	unbranched or bifurcate	unbranched or bifurcate
Size of leaves	ca. 3–10 × 3–9 cm	ca. 5–12 × 3.5–10 cm	ca. 2.5–8 × 2–5 cm	ca. 3–8 × 3–6 cm	ca. 3–7 × 2–4 cm
Leaf base	subtruncate or subcordate to deeply cordate	slightly subcordate or subtruncate, rarely cordate	cordate or deeply cordate	subcordate or subtruncate	subcordate, subtruncate, or subrounded
Shape of leaves	unlobed to 3–7 lobed	unlobed to slightly 3-lobed	unlobed to 3–7 lobed	3-lobed or inconspicuously divided	unlobed
Abaxial mature leaf surfaces	usually glabrous	with sparse arachnoid tomentum to glabrescent	with dense arachnoid tomentum	with dense arachnoid tomentum	with dense arachnoid tomentum
Size of fruits	5–8 mm in diam	8–10 mm in diam	5–8 mm in diam	6–10 mm in diam	6–10 mm in diam
Altitude	10–50 m	100–2300 m	100–2500 m	200–2800 m	400–1600 m
Distribution	China (Hubei)	China, India, Japan, Laos, Nepal, Philippines, Thailand, Vietnam	China (Anhui, Fujian, Guangdong, Guangxi, Hebei, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan)	China (Fujian, Hubei, Hunan, Jiangsu, Jiangxi, Taiwan, Yunnan, Zhejiang)	China (Guangdong, Guangxi, Hubei, Hunan, Sichuan)

lobed, apex acute to acuminate, base subtruncate or subcordate to cordate, abaxial surface usually glabrous, veins and vein axils hirtellous, adaxial surface glabrous, basal veins 5, with lateral veins 4–6 pairs. veinlets inconspicuous, base subcordate to cordate, occasionally truncate. Margin with 8–16 obtuse teeth on each side. Inflorescences a panicle, 3.4–9 cm, leaf-opposed, peduncle 1–6.4 cm, pedicel 1–2.5 mm, usually glabrous. Calyx shallow and saucer-shaped, glabrous. Petals 5, occasionally 6, connate distally, forming calyptra. Berries black, globose, 5–8 mm in diam. Seeds obovoid or obovoid-elliptic, 3–4 × 2–3 mm, abaxial surface with a round to elliptic chalaza, adaxial surface with 2 furrows (ventral infolds) running ½ through seed length, endosperm M-shaped in transverse section.

**Additional specimens examined.** China. Hubei. Tianmen City, Mawan Town, 15 Jul 2020, fr, *X. Q. Liu 944* (CCAU); Wuhan, Shizhishan, 26 m, May 6, 2021, in flower, *X. Q. Liu 155* (CCAU) (see photos in Suppl. material 1: Fig. S1, Suppl. material 2: Fig. S2, Suppl. material 3: Fig. S3).

**Phenology.** Flowering from March to May, fruiting from July to October.

**Etymology.** The specific epithet is derived from the type locality, Shizhishan, Wuhan, Hubei, China. The Chinese name is given as “狮子山葡萄”.

**Distribution and habitat.** The new species is currently known from Wuhan and Tianmen in Hubei province, China (Fig. 7). It occurs on the scrubland and the roadside of farmland at an altitude of ca. 10–50 m.

*Vitis shizishanensis* is morphologically similar to *V. bryoniifolia*, *V. flexuosa*, *V. sinocinerea*, and *V. bellula*. Detailed morphological comparisons among the three species are provided in Table 1. These characters were based on field observations, and herbarium and literature studies (Li et al. 1996; Chen et al. 2007; Wan et al. 2008).

## Acknowledgements

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## Supplementary material I

### Figure S1

Authors: Zhi-Yao Ma, Jun Wen, Qiang Fu, Xiu-Qun Liu

Data type: Jpg file.

Explanation note: Isotype of *Vitis shizishanensis* Z.Y.Ma, J. Wen, Q. Fu & X-Q. Liu (X.Q. LIU 155) with 5–7 lobed leaves.

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## Supplementary material 2

### Figure S2

Authors: Zhi-Yao Ma, Jun Wen, Qiang Fu, Xiu-Qun Liu

Data type: Jpg file.

Explanation note: Isotype of *Vitis shizishanensis* Z.Y.Ma, J. Wen, Q. Fu & X-Q. Liu (X.Q. LIU 155) with male flowers.

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## Supplementary material 3

### Figure S3

Authors: Zhi-Yao Ma, Jun Wen, Qiang Fu, Xiu-Qun Liu

Data type: Jpg file.

Explanation note: Isotype of *Vitis shizishanensis* Z.Y.Ma, J. Wen, Q. Fu & X-Q. Liu (X.Q. LIU 944) with fruits.

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