

广东丹霞山柿树科一新种

——彭华柿*

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摘要: 报道柿树科一新种彭华柿 *Diospyros penghuae*, 为广东省丹霞山特有种。彭华柿形态特征与乌柿 *D. cathayensis* 及老鸦柿 *D. rhombifolia* 相近, 但本种常绿, 无枝刺, 叶形及果实大小均可区别于两者。本种的命名是为了纪念中山大学地理科学与规划学院彭华教授, 他在丹霞地貌研究领域做出了卓越的贡献。

关键词: 彭华柿; 柿树科; 新种; 广东省; 丹霞山

中图分类号: Q948 **文献标志码:** A **文章编号:** 0529-6579(2018)05-0098-06

Diospyros penghuae, a new species of Ebenaceae from Danxiashan mountain in Guangdong, China

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Abstract: *Diospyros penghuae*, a new species of Ebenaceae endemic in Danxiashan mountain, Guangdong, China, is here described and illustrated. Morphologically, the new species is most similar to *D. cathayensis* and *D. rhombifolia*, but it differs in its evergreen shrub or small tree, non-spiny branchlets. The leaf shape and seed size are also clearly distinguished from *D. cathayensis* and *D. rhombifolia*. This new species is in honor of Prof. Peng Hua, School of Geography and Planning, Sun Yat-sen University, who made a significant contribution to our knowledge of Danxia Landform research.

Key words: *Diospyros penghuae*; Ebenaceae; new species; Guangdong province; Danxiashan mountain

Diospyros Linnaeus is the largest genus of the family Ebenaceae. It consists of over 500 species and widely distributed in the tropics and subtropics^[1]. The genus *Diospyros* has a very complex biogeography-

* 收稿日期: 2018-04-09

基金项目: 国家自然科学基金(31570195, 31670189); 广东省自然科学基金(2016A030313326); 广东省科技计划项目(20015A030302020); 第四次全国中药资源普查项目(2017-152-003-3); 丹霞山管理委员会生物多样性考察项目(2016-0293)

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cal history and phylogenetic relationship, and its infra-generic classification is still not clearly resolved^[2-3]. *Diospyros* is the only genus of Ebenaceae distributed in China with about 62 species (44 endemic). Among them, *Diospyros brandisiana* Kurz is a new record species of China found in Yunnan, and *D. lei* Liu Y., Shi S. & Huang Y. S. is a new species described from Guangxi^[4-6]. In Guangdong province, 12 species were recorded in this genus^[4], one of which, *D. saxicola* Miao is known as a narrowly endemic species of Yingde city in the central north of Guangdong^[7].

Danxiashan mountain is known as Red Stone Park of China^[8], and has now become a national park and a natural World Heritage Site. In Danxiashan mountain a typical Danxia landform characterized by red-colored sandstones and conglomerates, providing unique habitats for some endemic species here, such as *Firmiana danxiaensis* H. H. Hsue et H. S. Kiu, *Viola hybanthoides* W. B. Liao et Q. Fan^[9], *Danxiaorchis singchiana* J. W. Zhai, F. W. Xing et Z. J. Liu^[10]. From 2004 to present, we have taken continuous biological surveys on Danxiashan mountain in order to elucidate the biodiversity patterns of Danxia landforms^[11]. During the field survey, a distinct *Diospyros* species was collected in Danxiashan mountain. After two years of field observations, we confirmed it was a new species, which was described and illustrated below.

1 Materials and methods

All the specimens used for this study were collected from Danxiashan, Guangdong Province. Morphological data for description of the new species were observed and measured based on fresh and dry specimens using a micrometer and a stereomicroscope from 2014 to 2016. The voucher specimens were deposited in SYS, IBSC (acronyms according to Thiers 2016+).

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Taxonomy Treatment: —*Diospyros penghuae* W. B. Liao, Q. Fan et W. Y. Zhao, *sp. nov.* (Fig. 1, Fig. 2)

Type: —China. Guangdong Province: Renhua County, Danxiashan mountain, Xianglonghu, foot of the mountain, in dense forest, 119 m, 25°01'N, 113°

44'E, 9 Sep. 2015 (fr.), W. —Y. Zhao *zwy* - 34 (holotype: SYS! isotypes: SYS! IBSC!).

Diagnosis: —Similar to *D. cathayensis*, but differs by shrubs evergreen, branchlets without spines, leaf blade elliptic to obovate-elliptic, margin revolute, stamens villose, glabrescent, styles 4 cleft to ovary, staminodes 3, fruiting pedicel 1.3 ~ 2.6 (~ 3.1) cm, seeds 3-sided or subreniform.

Description: —Evergreen shrubs, rarely small trees, 2 ~ 3 (5) m tall, 1 ~ 4 cm in diameter. Branchlets brown, slender, terete, young branches densely puberulent, never tipped with spines. Petiole 3 ~ 6 mm, puberulent; leaf blade elliptic to obovate-elliptic, ((4.0) 5.3 ~ 12.5 (14.0)) cm × ((1.6) 2.2 ~ 4.4 (5.3)) cm, thin leathery, base cuneate, apex obtuse, rounded or slightly blunt; adaxially dark green and lustrous, abaxially yellow-green, pubescent along midrib, lateral veins 4 ~ 9 per side, puberulent when young; reticulate veinlets slender and raised both surfaces, obvious, leaf margin revolute. Staminate flowers cymes (seldom solitary), per cymes three flower, peduncles 2 ~ 7 mm, pedicel 3 ~ 7 mm (1.1 mm when solitary), pubescent; calyx lobes 4, divided nearly to base, triangular or ovate, 1.5 ~ 7 mm; corolla pale yellow, urceolate, 3.5 ~ 5.5 mm, pubescent on both surfaces, lobes 4, ovate, ca. 1 mm, reflexed; stamens 16, per two stamens symphysis, with sparsely villose, then glabrescent. Pistillate flowers: pedicel 8 ~ 14 mm, pubescent; calyx lobes 4, ovate, ca. 1 cm, puberulent; corolla pale yellow, pubescent on both surfaces, tube ca. 4 mm, lobes 4, ovate or triangular, 1.5 ~ 2.5 mm; staminodes 3, glabrous; styles 4, divided to base, stigma 2-cleft; ovary villose. Fruiting pedicel 1.3 ~ 2.6 (3.1) cm, slender, densely puberulent. Fruiting calyx 4, divided to nearly base, slightly reflexed, subglabrous; lobes ovate or oblong-lanceolate, (1.1 ~ 1.5) cm × (4.5 ~ 9) mm, leathery, apex obtuse, veins several, subparallel, slightly raised. Berry orange, globose, 1.4 ~ 2 cm in diam, sparsely hairy. Seeds 1 ~ 8, brown, 3-sided or subreniform, ca. (8 ~ 12) mm × 6.5 mm × 4 mm.

Etymology: —The specific epithet is in honor of Prof. Hua Peng (1956–2018) of Sun Yat-sen University, chairman of Red Beds and Danxia Geomorphology Working Group of IAG, who made a great con-

tribution in Danxia landform research.

Phenology: —Flowering March to May and fruiting July to November.

Distribution and habitat: —*Diospyros penghuiae* is widely distributed in Mount Danxia, Renhua County, Guangdong Province, China. And usually distributed in dense forests or ravines where soil forming rock is red-colored sandstones, at altitudes of 90 ~ 260 m. The associated species included *Castanopsis jucunda* Hance, *Osteomeles subrotunda* K. Koch, *Pittosporum fulvipilosum* H. T. Chang et S. Z. Yan, *Rhus chinensis* Mill., *Diplospora dubia* (Lindl.) Masam., *Nandina domestica* Thunb., and *Stemona tuberosa* Lour. In addition, *Diospyros penghuiae* is diecious and the female and male ratio about 1/3.5 according to our field

observation in April 2015.

Additional specimens examined (Paratypes): —China. Guangdong Province: Renhua County, Danxiashan mountain, Xianglonghu, foot of the mountain, in dense forest, fruit, 125 m, 25°01' N, 113°44' E, 3 Sep. 2014, Q. Fan 12702 (SYS! IBSC!); ibid, pistillate flower, 9 Apr. 2015, W. - Y. Zhao zwy - 59 (SYS! IBSC!); Danxiashan mountain, hill slope near the Sengmaofeng, pistillate flower, 117 m, 25°01' N; 113°45' E, 8 Apr. 2015, W. - Y. Zhao & Z. - X. Chen zwy - 48; ibid, staminate flower, W. - Y. Zhao & Z. - X. Chen zwy - 49 (SYS! IBSC!); Danxiashan mountain, hill slope near the Danxiashanzhuang, pistillate flower, 120m, 25°01' N; 113°45'E, 8 Apr. 2015, W. - Y. Zhao & Z. - X. Chen

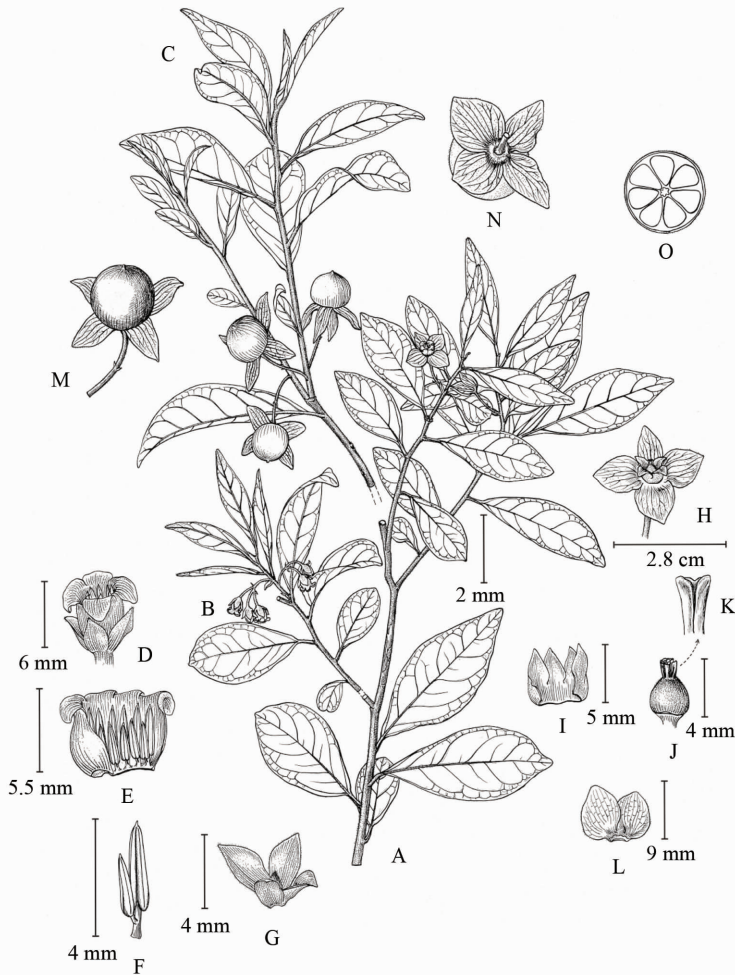


Fig. 1 *Diospyros penghuiae* W. B. Liao, Q. Fan et W. Y. Zhao

(A - C: Branch with pistillate flower, staminate flower, fruit; D - E: Staminate flower; F: Stamen; G: Calyx lobes of staminate flower; H: Pistillate flower, front view; I: Corolla of pistillate flower; J: Ovary; K: Stigma; L: Calyx of pistillate flower; M: Fruit; N: Fruiting calyx; O: Cross section of fruit; illustration is drawn by Liu Yunxiao)

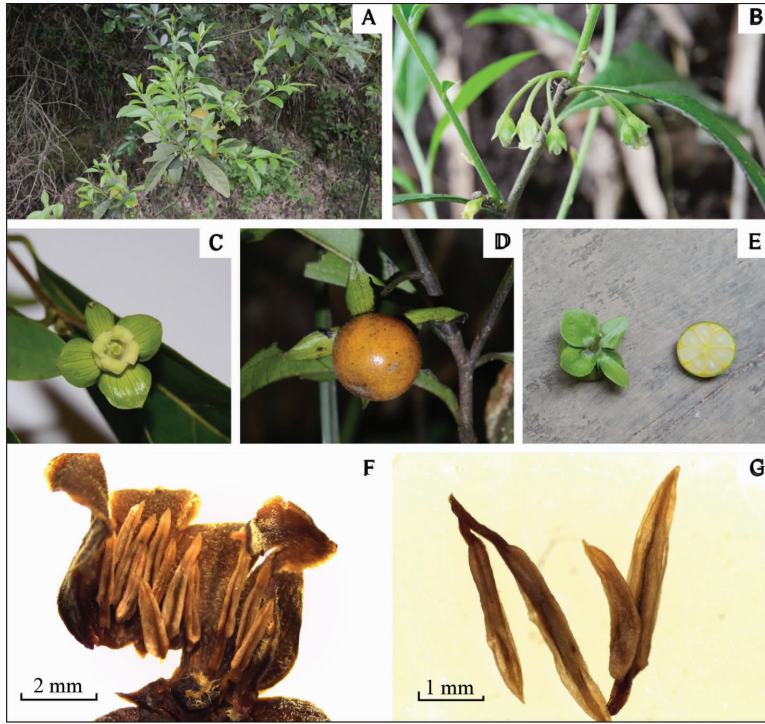


Fig. 2 Morphological characters of *Diospyros penghuai* W. B. Liao, Q. Fan et W. Y. Zhao

(A: Habit of plant; B: Staminate flower; C: Pistillate flower; D: Fruit; E: Cross section of fruit;

F: Stamens of staminate flower, and vestigial ovary; G: Stamens of staminate flower, per two stamens symphysis.)

zwy - 52; *ibid*, staminate flower, 8 Apr. 2015, W. - Y. Zhao & Z. - X. Chen zwy - 54 (SYS! IBSC!); Danxiashan mountain, hill slope near the Xianglonghu, Aiqinggu, pistillate flower, 125m, 25° 01' N; 113° 45' E, 9 Apr. 2015, W. - Y. Zhao zwy - 60; *ibid*, staminate flower, 9 Apr. 2015, W. - Y. Zhao zwy - 61 (SYS! IBSC!); Danxiashan mountain, hill slope of the Wolonggang, fruit, 137 m, 25° 01' N; 113° 45' E, 20 Nov. 2015, Q. Fan 14038 (SYS! IBSC!).

3 Discussion

Currently, the infrageneric classification of *Diospyros* is still not very clear. Furthermore, some taxonomic study and phylogenetic analysis of genus *Diospyros* were primarily based on species distributed in Pacific region^[12], Africa^[13], India^[14] and New Caledonian^[3]. However, the species endemic to China were not included in these studies. The new species *D. penghuai* described here is similar to *Diospyros cathayensis* Steward^[15], *D. armata* Hemsley^[16], *D. rhombifolia* Hemsley^[16], *D. reticulineris* C. Y. Wu^[17], *D. caloneura* C. Y. Wu^[17], and *D. tutcheri* Dunn in the

raised leaf venation, long slender pedicels and conspicuously veined, spreading or slightly reflexed, and leathery or papery calyx lobes. This resemblance might represent an infrageneric evolution clade^[4].

D. cathayensis is the closest species relative to *D. penghuai* based on morphology. However, *D. penghuai* is readily distinguished from *D. cathayensis* by the shrub (vs. small tree) habit, the non-spiny (vs. inconspicuous spiny) branchlets, the different leaf shape (elliptic to obovate-elliptic vs. elliptic) and size ((5.3 ~ 12.5) cm × (2.2 ~ 4.4) cm vs. (4 ~ 9) cm × (1.5 ~ 3.6) cm), the shorter fruiting pedicels (1.3 ~ 2.6 cm vs. 2.5 ~ 4 cm), the smaller fruits (1.4 ~ 2 cm vs. 1.5 ~ 3 cm in diam.) and the inconspicuous (vs. beak shaped) hilum. *D. rhombifolia* also has many features in common with *D. penghuai*, but has stout leafless branch spines, 4-sporangiate (vs. 8-sporangiate) ovary, 2 (vs. 4) styles, hemispherical or trigonous (vs. 3-sided or subreniform) seeds. In addition, *D. rhombifolia* is a deciduous tree species reaching 5 ~ 8 m in height, however, the latter is an evergreen shrub species only 2 ~ 3 (5) m tall (Table 1).

Table 1 Morphological differences between *Diospyros penghuae* sp. nov., *D. rhombifolia* and *D. cathayensis*

Characters	<i>D. penghuae</i>	<i>D. rhombifolia</i>	<i>D. cathayensis</i>
Habit	shrubs or small tree, 2 ~ 3 (5) m, evergreen	small tree, 5 ~ 8 m, deciduous	small tree, 6 ~ 10 m, evergreen or semi-evergreen
Branch spines	without branch spines	with short stout leafless spines	tipped with slender inconspicuous spines
Leaf	thin leathery, elliptic to obovate-elliptic, ((4.0) 5.3 ~ 12.5 (14.0)) cm × ((1.6) 2.2 ~ 4.4 (5.3)) cm, leaf margin revolute when dried	papery, rhombic-obovate, (4 ~ 8.5) cm × (1.8 ~ 3.8) cm, margin ciliate	thin leathery, elliptic, 4 ~ 9 (~ 11) cm × 1.5 ~ 3.6 cm, leaf margin revolute explanate or unobvious revolute when dried
Leaf shape	elliptic to obovate-elliptic	rhombic-obovate	Elliptic
Leaf size	(5.3 ~ 12.5 (14.0)) cm × ((1.6) 2.2 ~ 4.4 (5.3)) cm	(4 ~ 8.5) cm × (1.8 ~ 3.8) cm	(4 ~ 9 (~ 11)) cm × (1.5 ~ 3.6) cm
Lateral veins	4 ~ 9 per side	5 ~ 7 per side	7 ~ 12 per side
Pistillate flower	tube ca. 4 mm	tube ca. 3.5 mm	tube ca. 5 mm
Ovary and-styles	ovary 8-sporangiate, styles 4, stigma 2 lobed	ovary 4-sporangiate, styles 2, stigma lobed	ovary 8-sporangiate, styles 4, stigma 2 lobed
Fruiting pedicel	1.3 ~ 2.6 (3.1) cm	1.5 ~ 2.5 cm	2.5 ~ 4 (6) cm
Fruiting sepals	lobe ovate or oblong-lanceolate, (1.1 ~ 1.5) cm × (0.5 ~ 0.9) cm	lobe oblong-lanceolate, (1.6 ~ 2.0) cm × 0.5 cm	lobe lanceolate, (1.2 ~ 2.5) cm × (0.5 ~ 1.1) cm
Fruits	globose, 1.4 ~ 2 cm in diam.	globose, 2 cm in diam	globose to ovoid, 1.5 ~ 3 cm in diam.
Seeds	(8 ~ 10 (~ 12)) mm × 6.5 mm × 4 mm, 3-sided or subreniform, yellowish-brown, hilum inconspicuous	(8 ~ 12 (~ 15)) mm × 6.5 mm × 4 mm, hemispherical or trigonous, brown, hilum inconspicuous	15 mm × 6.5 mm × 4 mm, compressed, dark brown, hilum beak shaped, obvious

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