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Hodgsonia tsaii (Cucurbitaceae), a new species from Xizang, China

Jian-Yong SHEN*, Xing-Da MA, Wen-Guang WANG, Bo PAN

Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, Menglun, Mengla 666303, Yunnan, China.
**Corresponding author's email: shenjianyong@xtbg.ac.cn*

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ABSTRACT: *Hodgsonia tsaii* (Cucurbitaceae), a new species from Motuo, Xizang, China, is described. It is compared with *H. macrocarpa* and *H. heteroclita*, and differs from the two species by the entire or 3-lobed leaf, bigger and longer calyx lobes, 5-carpellate and 10-ovuled ovary, 5-lobed stigma, pepo with 20 deep grooves which are separated by 10 tall and 10 dwarf ribs. A comprehensive morphological description of *H. tsaii*, together with photographs, a conservation assessment, and a diagnostic key to 3 *Hodgsonia* species from Asia are provided. Distribution information of *Hodgsonia* is updated, and all the three species occur in China.

KEY WORDS: China, Cucurbitaceae, *Hodgsonia macrocarpa*, *H. heteroclita*, Hse-Tao Tsai, new species, Xi-Tao Cai, Xizang.

INTRODUCTION

Hodgsonia Hook.f. & Thomson (1853) is a small genus consisting of only two species, *Hodgsonia heteroclita* (Roxb.) Hook.f. & Thomson (1853) and *Hodgsonia macrocarpa* (Blume) Cogn. (1881), in the tribe Sicyoeae Schrad. (1838), family Cucurbitaceae Juss. (Renner and Schaefer, 2016), ranging from E. India and SW. China through Indochina to Borneo and W. Java (De Wilde and Duyfjes, 2001, 2008). Its economic importance lies in its seeds and leaves, the former being used for food and oil, the latter for medicine (Hu, 1964). *Hodgsonia* is characterized by the long fimbriate petals, 6- or 12-ovuled ovary and large globose fruit with simple or compound pyrenes (De Wilde and Duyfjes, 2001).

De Wilde and Duyfjes (2001) carried out a comprehensive revision of the genus, preserving two species, *H. heteroclita* and *H. macrocarpa*, and concluded that the two (possibly three) species, demarcated at the Isthmus of Kra in South Thailand; *H. heteroclita* occurs to the north of the Isthmus, while *H. macrocarpa* occurs to the south; *H. heteroclita* mostly bears compound pyrenes, ovary with about 12 ovules, while *H. macrocarpa* has simple pyrenes, ovary with 6 ovules. Xi-Tao Cai (1962), who studied the biology of *H. macrocarpa*, found compound pyrenes with three or four seeds, which is even more complicated.

From June to July, 2020, the first author participated in the second Tibetan Plateau Scientific Expedition and Research. When they went to Motuo County, on 28 June 2020, they saw a farmer carrying four fruits similar to *Hodgsonia* back home. Since there were no flowers available at the time, it was difficult to identify the species. On 5 June 2022, the author revisited this species, and found male and female flowers together with mature fruits. The features are completely different from the other two species. Through the morphological comparison of the other two species, we finally confirmed that this species is new to science.

TAXONOMIC TREATMENT

Hodgsonia tsaii J.Y.Shen, X.D.Ma, W.G.Wang & B.Pan bis, ***sp. nov.***

蔡氏油瓜 Fig. 1 & Tab. 1

Type: CHINA. Xizang, Motuo County, Beibeng town, along roadside, at the edge of forest, climbing on the trees, 95°11′02.01″E, 29°14′17.53″N, alt. 1415 m, 5 June 2022, *J. Y. Shen, W. G. Wang & X. D. Ma 2701* (holotype: HITBC; isotype: HITBC, HIB).

***Diagnosis*:** *Hodgsonia tsaii* can be distinguished from its congeners, *H. macrocarpa* and *H. heteroclita*, by several morphological features (Figs.1 & S1, Table 1), *H. tsaii* has 10–20 mm long calyx lobes (vs. 2–4 mm long calyx lobes in *H. macrocarpa* and *H. heteroclita*), pericarp with 20 grooves, separated by 10 tall ribs and 10 dwarf ribs (vs. smooth in *H. macrocarpa* and shallowly 10–12 grooved in *H. heteroclita*), ovary with 5 carpels (vs. 3 carpels in *H. macrocarpa* and *H. heteroclita*) and 10 separate ovules (vs. 12 ovules, parietal with pairs of ovules attached on each side of carpel in *H. macrocarpa* and *H. heteroclita*), and 5-lobed stigma (vs. 3-lobed stigma in *H. macrocarpa* and *H. heteroclita*).

***Description*:** Liana, to 30 m. Stem and branches glabrous. Dioecious. **Leaf blade:** 15–28 × 15–30 cm, leathery, both surfaces glabrous, entire or palmately 3-lobed, lower surface with small glands or absent; petiole robust, 4–8 cm, striate, with very short yellowish-brown pubescence. Tendrils 2-or 3-fid, up to 20 cm long. **Male inflorescences:** a 15–25 cm long raceme, peduncle 8–11 cm long, flowers 3–10, bracts elliptic or oblong, entire, 5–12 mm long, glandular abaxially. **Male flowers**: pedicel 5–10 cm long, calyx pilose, with few glands abaxially, calyx lobes 10–20 mm long; petals 3–5 cm long, margins fimbriate, threads to 20 cm long, yellowish, villous, pendent, spiraling. **Stamens**: 3, inserted just

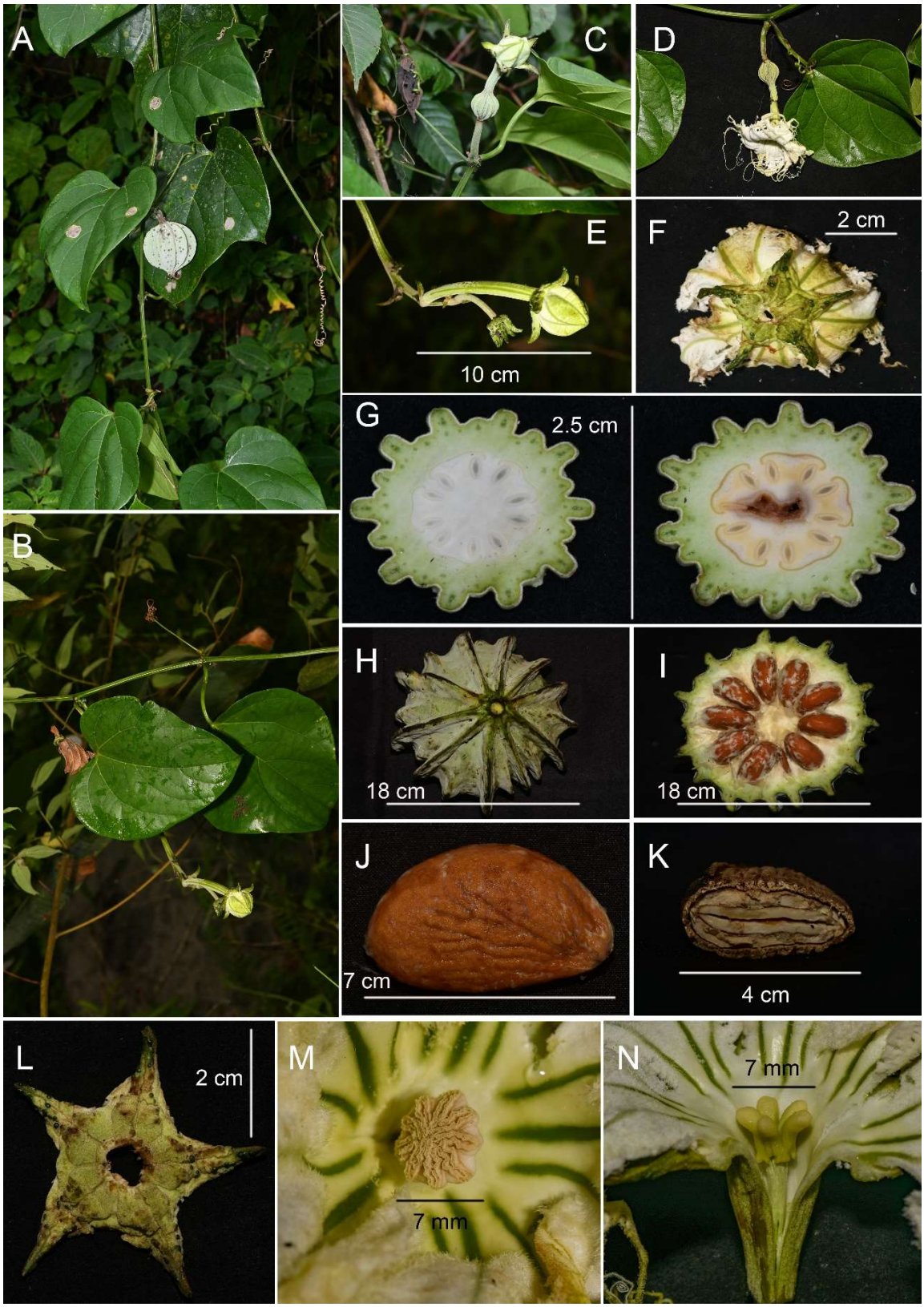

Fig. 1. ***Hodgsonia tsaii***. **A**. Plant bearing one young fruit. **B**. Plant with male inflorescence. **C**. Bud of a female flower. **D**. Female flower in bloom. **E**. Lateral view of male inflorescence. **F**. Back view of male flower **G**. Ovary cross section. **H**. Top view of the fruit. **I**. Cross section of the fruit showing ten seeds. **J**. Seed. **K**.Cross section of seed. **L**. Back view of calyx. **M**. Top view of stamens. **N**. Lateral view of the stigma. (Photos taken by Jian-Yong Shen on 5 June 2022 in type locality)

Table 1. Morphological comparison of ***Hodgsonia tsaii***, ***H. macrocarpa*** and ***H. heteroclita***.

Characters	***H. tsaii***	***H. macrocarpa***	***H. heteroclita***
Calyx lobes	10–20 mm long	2–4 mm long	2–4 mm long
Stigma	5-lobed	3-lobed	3-lobed
Ovary	5 carpels and 10 separate ovules	3 carpels and 12 ovules (in 6 pairs)	3 carpels and 12 ovules (in 6 pairs)
Fruits	20 grooved separated by 10 tall ribs (acute) and 10 dwarf ribs (a little bit obtuse), with (6–) 10 separate seeds	pericarp smooth, usually with 6 compound seeds	pericarp 10–12 shallowly grooved, usually with 6 compound seeds

below the throat, filaments ca. 5 mm long. **Female flowers:** solitary, pedicels robust, pilose, 4–7 cm long; resembling male flowers; style filiform, stigma large, obconical, 5-lobed. **Ovary:** globose or subglobose, 15–25 mm in diam., with 20 ribs and few glands on the surface, puberulous, 5-carpellate, with 10 separate ovules (each carpel has 2 separate ovules). **Fruits:** a large drupe, hard-skinned, with few glands on the surface, 15–20 cm in diam., pericarp 20 grooved, separated by 10 tall ribs and 10 dwarf ribs, containing (6–) 10 large simple ellipsoid, deeply veined seeds. **Seeds:** large, hard shelled, ellipsoid, 7–8 × 3–4 cm.

***Distribution & habitat*:** Currently only ca. 100 individuals were observed in Motuo County, this species often grows along forest edges, occasionally in the forest, at an elevation of 600–1450 m. PPBC photos (http://ppbc.iplant.cn/sp/175797) show that Dr. You-Sheng Chen had photographed immature fruits of this species in Putao County, northern Myanmar on 21 June 2016.

***Phenology*:** Flowers were observed from April to early June. Mature fruits were found from early June to July.

***Etymology*:** The epithet is in honor of Prof. Xi-Tao Cai (or Hse-Tao Tsai (蔡希陶), 1911–1981), who founded Xishuangbanna Tropical Botanical Garden in 1950s, and carried out botanical research of *Hodgsonia* in early 1960s.

***Conservation assessment*:** Since this new species is also distributed in Putao in northern Myanmar, it is possible that this species has a relatively wide distribution range. Due to insufficient field investigation, the natural distribution of this species in the wild is not clear. According to IUCN Red List criteria (2019), this new species should be assessed as Data Deficient (DD; criteria B1ab(i–v) + 2ab(i–v)).

***Additional specimens examined*:** **CHINA. Xizang:** Motuo County, on the way from Xirang Village to Didong Village, alt. 900 m, in an evergreen broadleaved forest along the riverside, 31 May 1983, *Zhi-Cheng Ni 290* (PE01671058). Motuo County, near the county town, alt. 1000 m, in the broadleaved forest, 29 Aug. 1974, *Qinghai-Tibet Plateau Expedition Team 4603* (PE01179224; PE01179225). **MYANMAR. Kachin:** Putao, Ziyardam, alt. 1100 m, 19 Jun. 2016, *Xiao-Hua Jin, Rui-Jiang Wang, You-Sheng Chen PT-2401* (PE 02112873).

Taxonomic key to the 3 species of *Hodgsonia* known from Asia.

1a Calyx lobes 10–20 mm long, ovary with 5 carpels and 10 separate ovules, stigma 5-lobed, pericarp 20 grooved …….. ***H. tsaii***

1b Calyx lobes 2–4 mm long, ovary with 3 carpels and 12 ovules (in 6 pairs), stigma 3-lobed, pericarp smooth or 10–12 grooved ……. 2

2a Ovary and pericarp surface smooth ……..…….... ***H. macrocarpa***

2b Ovary and pericarp surface 10–12 shallowly grooved …….. ……..…... ***H. heteroclita***

Notes: *Hodgsonia heteroclita* (Roxb.) Hook. f. & Thomson (1853) was originally described as *Trichosanthes heteroclita* Roxb. (1832), based on transplanted materials from east Bengal. The plants were brought to Calcutta Botanic Garden in 1805 from Silhet by Mr. Robert Keith Dick. Holotype of this species is a watercolor illustration (No. 2399) available on Kew gardens website (https://images.kew.org/botanical-art/trichosanthes-heteroclita-r-654499.html), which clearly shows the 5-lobed leaves, fimbriate petals, compound seeds, and grooved pepo. However, the character of grooves was not elaborated in the original description.

Hodgsonia macrocarpa (Blume) Cogn. (1881) was originally described as *Trichosanthes macrocarpa* Blume (1826), based on materials from Java, Indonesia. The holotype is a sterile material collected by Blume without collection number deposited at P herbarium. The fruit was described as 'pomis (maximis) globosis', which means 'big globose pome' in the protologue, and no grooves were mentioned.

Historically the taxonomy of *H. heteroclita* and *H. macrocarpa* has often been confusing. Their leaves and male flowers are almost identical, while major differences between the two lie in the morphology of female flowers and fruit. The ovaries of both species consist of 3 carpels, 4 ovules per carpel, and a pair of connate ovules attached on each side of the carpel. The seeds of both species are mostly compound pyrenes with a few simple pyrenes (Fig. S1). To date, few specimens with female flowers, fruit slices or seeds have been collected, making it difficult to distinguish them. Blume, Roxburgh (1832), Hooker and Thomson (1853) and Miquel (1860) published four or five species, while Cogniaux (1881) combined all of them as one, naming it *H. macrocarpa*, due to the lack of flower and fruit characters (Hu, 1964).

Flora Reipublicae Popularis Sinicae (Lu and Zhang, 1986) recorded one species and one variety from China, *H. macrocarpa* (In this book, the fruit was described as 12 grooved, obviously, the 12-grooved pepo actually depicts *H. heteroclita*) and *H. macrocarpa* var. *capniocarpa* (a synonym of *H. macrocarpa*). However, in Flora of China (Lu and Jeffrey, 2011), only one species, *H. heteroclita*, was recognized.

Report of the natural distribution range of *H. macrocarpa* and *H. heteroclita* is ambiguous and disputable as well. Hu (1964) temporally used four names for this genus, *H. macrocarpa* from Java, *H. heteroclita* from Himalayan region and Vietnam, *H. kadam* from Sumatra, and *H. capniocarpa* from Malay Penisular. She stated that resolve of the problem awaits the effort of SE. aisan botanists. However, De Wilde and Duyfjes (2001) considered the Kra Isthmus is the boundary between *H. heteroclita* and *H. macrocarpa*. Our recent field investigation shows that both *H. heteroclita* and *H. macrocarpa* occur in Yunnan, SW China, which is very different from previous studies. Taxonomy, phytogeography, and phylogeny of *Hodgsonia* need further study in the future.

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Supplementary materials are available from Journal Website.