



Schisandra cauliflora (*Schisandraceae*), a new species from Vietnam

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Key words

northern Vietnam
Schisandra
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Schisandraceae
Sphaerostema

Abstract *Schisandra cauliflora*, a new species found in northern Vietnam and described here is referable to *Schisandra* subg. *Sphaerostema*. A morphological comparison with related species, and a key to species in the subgenus is provided. A description including details of distribution and habitat is supplemented with a line-drawing.

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INTRODUCTION

Schisandra Michx. belongs to the family *Schisandraceae* in the order *Austrobaileyales* (APG IV, 2016). The family contains three genera (*Illicium* L., *Kadsura* Juss. and *Schisandra*) distributed in east and southeast Asia and eastern North America and the Greater Antilles. It is best known for the culinary herb Star Anise produced by *Illicium verum* Hook.f., formerly in the family *Illiciaceae*. In the most recent revision (Saunders 2000, 2001), the genus comprises twenty-three species of lianas. *Schisandra glabra* (Brickell) Rehder occurs in North America, all other species are from eastern Asia, extending from Hokkaido (Japan) and Far-Eastern Siberia in the north-east, to Java and Bali in the south and to Uttar Pradesh (India) in the west. The centre of diversity of the genus lies in central and southern China: 12 species occur in the Sikang-Yunnan Province, with eight species in the Central Chinese Province (Saunders 2000). Based on the results of a cladistic analysis (Lin & Yang 2007), the genus was divided into two subgenera, subg. *Schisandra* and subg. *Sphaerostema*. Subg. *Schisandra* was subdivided into four sections: sect. *Pleioestema* A.C.Sm., sect. *Maximowiczia* (Rupr.) Nakai, sect. *Sinoschisandra* (Y.W.Law) Q.Lin & Z.R.Yang and sect. *Schisandra*, while subg. *Sphaerostema* comprised merely *S. propinqua* (Wall.) Baill. and *S. plena* A.C.Sm. Yang & Lin (2009) and Lin et al. (2011) have described two new species in subg. *Sphaerostema*, namely *Schisandra parapropinqua* Z.R.Yang & Q.Lin from southwest China and *S. macrocarpa* Q.Lin & Y.M.Shui from Yunnan, China, making 25 species for the genus as a whole.

During our study on *Schisandra* in our herbarium (HN), we found some very distinctive *Schisandra* specimens. After close scrutiny of available literature: Gagnepain (1938), Law (1996), Saunders (2000, 2001), Xia et al. (2008), Yang & Lin (2009), Lin et al. (2011) and examination of type specimens in P, images of type specimens in NY and PE and relevant protologues, the specimens were referable to subg. *Sphaerostema* but did not

match any known *Schisandra* species. We also compared the new materials with specimens of *Schisandra* kept in Vietnamese herbaria (HN, HNU, NIMM, VNM, all acronyms following Thiers, cont. updated).

The specimens resembles *Schisandra propinqua* (from India, Nepal, Bangladesh, China, Myanmar, Thailand, Indonesia and Vietnam) by the morphological characters of stamens, and *S. macrocarpa* (from Yunnan province, China) by the morphological characters of leaves and fruits, but differs from both species in the characters of the number of flower in cluster or racemes (9–17 in the specimens, 1–3 in *S. propinqua*, 2–8 in *S. macrocarpa*); the length of peduncles (3–6 cm in the specimens, 0.2–1.7 cm in *S. propinqua*, 0.3–0.4 cm in *S. macrocarpa*). The morphological characters of the specimens differ from others species in subg. *Sphaerostema* as set out in Table 1. The data of stamens, carpels, apocarps and seeds are based on the protologues or other descriptions; the data of leaves and flowers are based on our own observations.

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Type. Daniel E. Atha, N.T. Hiep, P.V. The & N.V. Sang 4737 (holo HN; iso HN, NY), Vietnam, Bac Kan province, Ba Be district, Nam Mau municipality, Ba Be national park (N22°26.453' E105°36.627'), 12 July 2004. – Paratype: A. Gramain 547 (HN), Vietnam, Tuyen Quang province, Na Hang district, 5 Aug. 1999; *sine coll. sine num.* (HN, IBSC), Vietnam, Vinh Phuc province, Tam Dao national park, Oct. 1996; T.T. Bach et al. HNCNU 542 (HN, IBSC), Vietnam, Cao Bang province, Nguyen Binh district, 30 June 2017.

Dioecious or monoecious, evergreen, glabrous liana to 15 m long; stem to 5 cm thick at base. *Youngest branches* 4–5 mm thick; older ones lenticellate. *Leaves* simple, in spirals; petioles 6–8 cm, glabrous; leaf blades 16–22 by 8–12 cm, ovate or elliptic, subcoriaceous, glabrous, base rounded or cuneate, margin entire, apex acute or acuminate; midvein impressed on adaxial surface, conspicuously prominent on abaxial surface with lateral veins 8–10 on each side, nearly arcuate and raised on both surfaces when dry. *Flowers* ramiflorous or cauliflorous, glabrous, with 9–17 flowers in clusters or short racemes, rarely solitary; peduncles 3–6 cm long; tepals 11–13, greenish, yellowish or yellow; outer tepals 3–4, tepals 1.2–1.8 by 0.9–1.5 mm, ovate; inner tepals 7–10, tepals 6.5–10 by 4–6 mm, ovate, elliptic to obovate. *Staminate flowers* with 14–17 stamens, united as an

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Table 1 Comparison of morphological characteristics of *Schisandra cauliflora* with its putative allies. Data on *S. propinqua* from Saunders (2000, 2001) and isoelectotype *N. Wallich 4986* (P, P00207052); on *S. macrocarpa* from Lin et al. (2011) and paratype *K.M. Feng 22455* (PE, 01785476); on *S. plena* from Smith (1947), Saunders (2000, 2001) and isotype *A. Henry 10854* (NY, NY00061617); and on *S. parapropinqua* from Yang & Lin (2009) and isotype *Z.R. Yang & M.T. An 1* (P, P00710284).

Characters	<i>S. cauliflora</i>	<i>S. propinqua</i>	<i>S. macrocarpa</i>	<i>S. plena</i>	<i>S. parapropinqua</i>
Leaves (cm)	blades 16–22 by 8–12 petioles 6–8	blades 7–11.5 by 2–4 petioles 0.8–1.6	blades 8–20 by 5–12 petioles 1.5–7	blades 8–14 by 3.5–5 petioles 1.3–1.6	blades 4.5–11.2 by 1.0–2.5 petioles 0.6–1.4
Flowers	ramiflorous or cauliflorous, 9–17 in clusters or short racemes	axillary, solitary or in clusters	axillary, ramiflorous or cauliflorous, mostly 2–5 in clusters or 3–8 in racemes, rarely solitary	axillary, solitary or 2–5 in clusters	axillary, solitary or 2–3 in clusters, 3–5 in racemes
Stamens	peduncles 3–6 cm long 14–17 anthers on free connectives arising from cavities on the surface of androecium	peduncles 0.2–1.7 cm long 8–18 anthers on free connectives arising from cavities on the surface of androecium	peduncles 0.3–0.4 cm long 3–8 anthers on the abaxial side of cavities on the surface of androecium	peduncles 0.7–1.5 cm long 5–9 anthers on opposing side of cavities on the surface of androecium	peduncles 0.5–0.8 cm long 9–13 anthers on opposing side of cavities on the surface of androecium
Carpels	22–30	18–52	20–30	26–33	30–39
Apocarp width (mm)	15–20	4–8.5	15–20	8–12	7–9
Seeds (mm)	usually 2 per apocarp 8–12 by 10–15	1 or 2 per apocarp 3.7–4.5 by 4.2–4.9	1 per apocarp 8–10 by 10–12	1 or 2 per apocarp 5–6 by 10–12	1 or 2 per apocarp 3–4 by 4–4.6

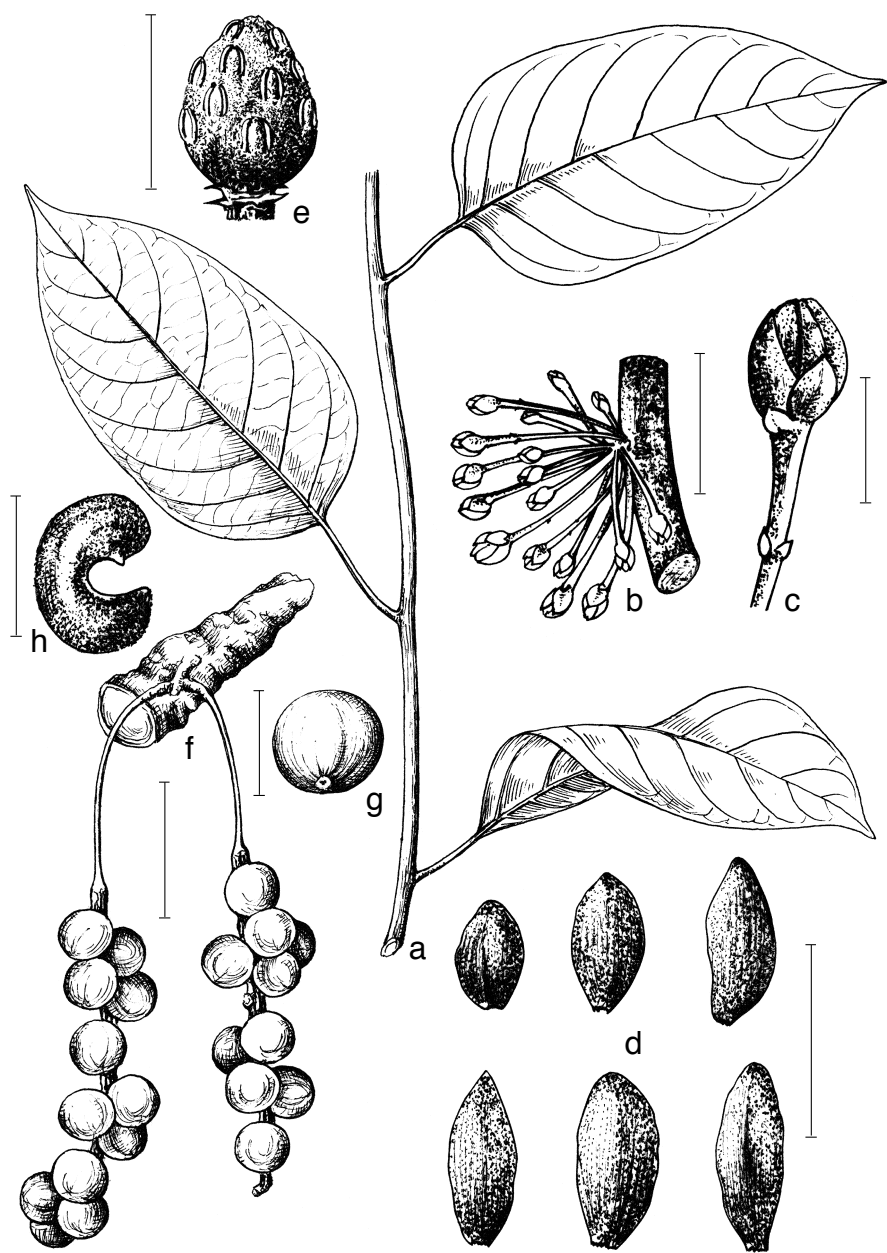
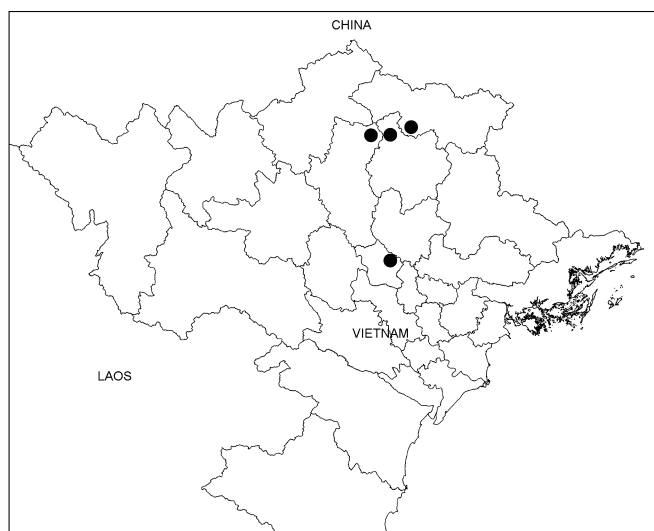


Fig. 1 *Schisandra cauliflora* N.T.Cuong, D.V.Hai, N.Q.Hung, M.H.Dat. a. Branch bearing leaves; b. branch bearing flowers; c. staminate bud; d. tepals; e. androecium; f. branch bearing fruits; g. apocarp; h. seed (a, f–h: *A. Gramain 547*; b–e: *Daniel A. Atha, N.T. Hiep, P.V. The DA 4737*; all HN). — Scale bars: a–b = 6 cm; ; c–d, h = 1 cm; e = 5 mm; f = 4 cm; g = 2 cm. — Drawing by: a, f–h: L.K. Chi; b–e: N.Q. Hung.



Map 1 Distribution of *Schisandra cauliflora* N.T.Cuong, D.V.Hai, N.Q.Hung, M.H.Dat.

androecial mass, 4–5 mm long, 3–4 mm wide, with anthers on free connectives arising from cavities on androecial surface. *Pistillate flowers* with gynoecium 4–4.5 mm long, 3–3.5 mm wide, ovoid, with 22–30 free carpels; carpels 1.3–2 mm long, 1.2–1.8 mm wide, obovoid; pseudostyle subulate. *Fruiting peduncles* 4–8 cm long; torus 4–9 cm long; apocarps 1.5–2 cm wide, globose, greenish to white. *Seeds* usually 2 per apocarp, 8–12 by 10–15 mm, 3–4 mm thick, yellow, flattened-ellipsoidal; testa smooth, hilum large, U-shaped.

Distribution & Habitat — Vietnam: Cao Bang province (Nguyen Binh district), Tuyen Quang province (Na Hang district), Bac Kan (Ba Be national park), Vinh Phuc (Tam Dao national park). In evergreen forests on soil or limestone mountains at altitudes of 180–800 m.

Phenology — Flowering: June to July; fruiting: August to October.

Conservation status — *Schisandra cauliflora* is known only from the area which includes Cao Bang province (Nguyen Binh district), Tuyen Quang (Na Hang district), Bac Kan (Ba Be national park), Vinh Phuc (Tam Dao national park). Detailed distribution, the size of populations and their phenology have so far not been investigated. More research is needed so that the species has provisionally to be regarded as Not Evaluated (NE) in the threat categories of IUCN (2012).

Key to the species of *Schisandra* subg. *Sphaerostema*

1. Anthers on free connectives arising from cavities on the surface of androecium 2
1. Anthers sessile on the abaxial side of cavities or on opposing side of cavities on the surface of androecium 3
2. Leaf blades 16–22 by 8–12 cm, petioles 6–8 cm; peduncles 3–6 cm long; apocarps 1.5–2 cm wide; seeds 8–12 mm long by 10–15 mm wide. — Northern Vietnam *S. cauliflora*
2. Leaf blades 7–11.5 by 2–4 cm, petioles 0.8–1.6 cm; peduncles 0.2–1.7 cm long; apocarps 4–8.5 mm wide; seeds 3.7–4.5 mm long, 4.2–4.9 mm wide. — India, Nepal, Bangladesh, China, Myanmar, Thailand, Indonesia, Vietnam *S. propinqua*
3. Anthers on the abaxial side of cavities on the surface of androecium. — China: Yunnan *S. macrocarpa*
3. Anthers on opposing side of cavities on the surface of androecium 4
4. Leaf blade margins serrate or serrulate; stamens 9–13; fruiting peduncles 0.7–1 cm long, apocarps 0.7–0.9 cm wide; seeds 3–4 mm long. — Southwest China *S. parapropinqua*
4. Leaf blade margins entire; stamens 5–9; fruiting peduncles 1–1.5 cm long, apocarps 0.8–1.2 cm wide; seeds 5–6 mm long. — China, India, Myanmar, Vietnam *S. plena*

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