

THE GENUS *COCCULUS* DC. (MENISPERMACEAE) IN THE FLORA OF VIETNAM

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The genus *Cocculus* DC. comprises about eight species distribution in Africa, E, SE and S Asia, Pacific islands, Central and North America; two species China and Laos (Newman, M. 2007, Luo, X. R. 2008). In Vietnam four species (Pham, H. H. 1999, Nguyen, T. B. 2003). However, *C. sarmentosus* (Lour.) Diels has now been Synonymized with *C. orbiculatus* (Linn.) DC. (Diels, L. 1910). In genus *Cocculus* DC. most species are dioecious climbers, rarely trees, shrubs, or herbs and distributed in tropical region, sometimes subtropical regions and warm temperate zones.

In this paper, the morphological redescription and illustrations are provided along with notes on distribution, ecology, phenology and specimens examined of species.

I. MATERIALS AND METHODS

This study Genus *Cocculus* DC. of family Menispermaceae from Vietnam was based on field observations, laboratory and library work.

II. RESULTS AND DISCUSSION

Cocculus DC. Syst. Nat. 1: 515. 1817; Gagnep. Fl. Gen. Indoch. 1: 140. 1908; Gagnep. Suppl. Fl. Gen. Indoch. 1: 129. 1938; Backer & Bakh., Fl. Java 1: 158. 1963; Yuan, S. H., Fl. Yunn. 3: 237. 1983; Forman, Fl. Thailand 5(3): 352. 1991; Pham., Illustr. Fl. Vietn. 1(1): 412. 1991; Kessler, Fam. Gen. Vasc. Pl. 2: 417. 1993; Forman, Fl. Ceylon 9: 314. 1994; Lo, S. H., Fl. Reip. Pop. Sin. 30(1): 31. 1996; Nguyen, T.B., et al., Checkl. Pl. Sp. Vietn. 2: 141. 2003; Newman, M., ex al., Checkl. Vasc. Pl. Laos 230. 2007; Luo, X. R., et al, Fl. China 7: 12. 2008.

Type: *Cocculus hirsutus* (Linn.) Theob. Mason, Burma ed. Theob. 2: 657. 1883.

Cebatha Forsk. Fl. Aegypt. -Arab. 171. 1775.

Vernacular name: Hoàng thanh.

Woody vines, erect shrubs, or small trees. Leaf blade entire or lobed, not peltate, palmately veined. Inflorescences axillary or terminal, cymose or thyrsoid. Male flowers: sepals 6 in 2 whorls, imbricate, outer sepals smaller, inner sepals larger and concave; petals 6, apex 2-lobed, lobes divaricate, with basal reflexed auricles; stamens 6 or 9, free, anthers dehiscing with a transverse slit. Female flowers: sepals and petals as in male flowers; staminodes 6; carpels 3 or 6, style columnar, stigma reflexed. Drupes obovate or rotund, slightly flat, style scar near base;

endocarp bony, horseshoe-shaped, abaxially verruculose or ridged; condyle with 2 distinct lateral chambers, each with a large lateral aperture. Seed horseshoe-shaped; embryo with radicle short; endosperm scanty; cotyledons linear and flattened.

Key to species of *Cocculus* DC. in Vietnam.

- 1A. Slender climber. Leaves not acute at both apex and base, basal pair of nerves usually not continuing strongly beyond the middle of the lamina.
- 2A. Stem and leaves hairy..... 1. *C. orbiculatus*
- 2B. Stem and leaves glabrous.2. *C. diversifolius*
- 1B. Erect shrubs or small tree. Leaves acute apex and base, basal pair of nerves continuing conspicuously beyond the middle of the lamina, parallel to the margin 3. *C. laurifolius*

1. *Cocculus diversifolius* DC. Syst. Nat. 1: 523. 1818; Phamh. Illustr. Fl. Vietnam, 1: 339. 1999; Nguyen T.B., Checkl. Pl. Sp. Vietnam, 2: 141. 2003. - *Cebatha diversifolia* (DC.) Kuntze., Revis. Gen. Pl. 1: 9. 1891 - *Epibaterium diversifolium* (DC.) Tidestr in Proc. Biol. Soc. Wash. 48. 9: 39. 1935 - **Type:** Mexico. *Sesse & Mocino 4668* (Syntype: MA photo!).

Vernacular name: Vê châu la dang.

Climber, to 3-4 m longer; rhizomes to 1.4 cm diam. Stems with appressed pubescence. Leaf: petiole to 1.8 cm. Leaf blade generally linear, lanceolate-oblong, oblong, or ovate-oblong, to 8.5 by 6 cm, ± leathery, base sometimes lobed, apex obtuse to rounded and often retuse, mucronate; surfaces glabrous, abaxially slightly pale; venation 3-5. Inflorescences to 7 cm; bracteoles and rachis glabrous or pubescent with short-appressed hairs, sometimes glaucous. Flowers: perianth parts glabrous, often glaucous; sepals in 3 series, outer sepals 0-3, ovate, 0.4-0.8 by 0.3-0.4 mm, middle 3 sepals ovate to elliptic or obovate, 0.6-1.6 by 0.4-1 mm, inner 3 sepals elliptic to nearly orbiculate, 1.2-2.2 by 1.2-1.8 mm; petals 6, usually yellowish, elliptic to obovate, 0.8-1.6 by 0.6-1 mm, glabrous. Staminate flowers: stamens 6, to 1.8 mm; pistillodes absent. Pistillate flowers: staminodes to 0.4 mm; pistils to 1.4 mm. Drupes black or bluish black, 4-6 mm diam., often glaucous. Dorsal ridge only slightly developed, raised but not projecting above surrounding protuberances. Condyle with large perforation. The distinctive appearance of this species is caused by the even and closely crowded nature of the ornamentation, which is clearly seen in the accompanying photograph.

Flowering: February to May. **Fruiting:** June to July.

Specimens examined: VIETNAM. 22 Aug. 1977, Nguyen Kim Dao 20 (HN).

Notes: in Pham HH. 1999 have species *Cebatha diversifolia* (DC.) O. Kuntze. This is species is synonym of *Cocculus diversifolius* DC. *Cocculus diversifolius* DC. is closely relate to *Cocculus orbiculatus* (Thunb.) DC. but differs in its Ornaments in an even, close arrangement of 4 dorsal rows of rounded radial ridges, those of the median 2 rows branched; border of lateral aperture entire.

2. *Cocculus laurifolius* DC. Syst. Nat. 1: 530. 1817; Hook. f. & Thomson, Fl. Brit, India 1: 101. 1872; Hook. f. & Thomson, Fl. Ind. 191. 1855; Kurz, Fores. Fl. Britis. Buma 1: 55. 1877; Gagnep. Fl. Gen. Indoch. 1: 140. 1908; Diels, Pflanzenr. IV. 94: 239. 1910; Lour. Pl. Cochinch. 156. 1935; Gagnep. Suppl. Fl. Gen. Indoch. 1: 129. 1938; Yamamoto, J. Soc. Trop. Agric. 16: 102. 1944; Backer, & Bakh. f., Fl. Java 1: 158. 1963; Forman, Kew Bull. 15(3): 485. 1962; Yuan, S. H., Fl. Yunn. 3: 237. 1983; Forman, Kew Bull. 43(3): 399. 1988; et., Fl. Thailand 5(3):

355. 1991; Pham., *Illustr. Fl. Vietn.* 1(1): 412. 1991; Kessler, *Fam. Gen. Vasc. Pl.* 2: 417. 1993; Huang, Shing- Fan & Tseng- Chieng, *Fl. Taiwan* 2: 591. 1996; Lo, S. H., *Fl. Reip. Pop. Sin.* 30(1): 31. 1996; Fu., G.L., et al., *High. Fl. China* 3: 608. 2000; Lui, *Fl. Hunan* 2: 769. 2000; Nguyen, T. B., *Checkl. Pl. Sp. Vietn.* 2: 141. 2003; Luo, X. R., et al, *Fl. China* 7: 13. 2008.- *Menispermum laurifolium* (DC.) Roxb., *Fl. Ind.*, ed. 2. 3: 815. 1832. - **Type:** India. *Inde sn* (Holotype: GDC photo!).

Cocculus angustifolium Hask., *Cat. Hort. Bogor.* 172. 1844.-[**Type:** not seen].

Holopeira australis Miers, *Ann. Mag. Nat. Hist.* III. 19: 29. 1867. - **Types:** Java: *Horsfield 245* (Syntype: K photo!); Indonesia. 1843 *Siebols sn* (Syntype: K photo!).

Holopeira fusiformis Miers, *Ann. Mag. Nat. Hist.* III. 19: 29. 1867. - **Type:** Java: *Horsfield sn* (Holotype: K!).

Cocculus laurifolius DC. var. *angustifolius* (Hassk.) Boerl. *Cat. Pl. Phan. Hort. Bot. Bog.* 1: 39. 1899.-[**Type:** unknow].

Cocculus laurifolius DC. var. *bariensis* Gang. Lecomte, *Fl. Indo- Chine*, 1: 141. 1908. - **Type:** Cochinchina. Mt. Dinh, Baria: *Pierre sn* (Paratype: P!).

Cinnamomum esquirolii H. Léveillé, *Fl. Kouy-Tchéou*, 218. 1915. - **Type:** China. Bois de taraum, rivire de Lo hou, Mar. 1912. *Esquiroi 3586* (Isosyntype: A photo!, E photo!).

Vernacular name: Dây hồ cầu Bà Rịa.

Erect shrubs or small trees, usually 1-5 m long. Branches striate; branchlets slightly angular, glabrous. Petiole usually less than 1 cm, glabrous; leaf blade elliptic or long elliptic to lanceolate-elliptic, rarely oblanceolate, 7-11 by 3.5-5 cm, thinly leathery, both surfaces glabrous and glossy, base cuneate or acute, apex acute and attenuate, palmately 3-veined, basal pair of veins well-defined beyond middle of leaf blade, reticulate veins fine, raised on both surfaces. Inflorescences axillary, cymose or thyrsoid, 1-5 cm, glabrous. Male flowers: sepals 6, outer whorl subelliptic, 0.8-1 mm, inner whorl ovate-elliptic to broadly elliptic-rotund, ca. 1.3 mm; petals 6, obcordate, 0.2-0.4 mm, base not reflexed inward, apex 2-lobed; stamens 6, ca. 1 mm; stamens 6. Female flowers: sepals and petals as in male flower; staminodes 6, minute; carpels 3, glabrous. Drupes black, rotund, slightly flattened, 6-7 mm; endocarp bony, abaxially ornamented with branched ridges; endocarp horseshoe- shaped, rounded in outline with excavated face; one slight dorsal groove, one lateral ridge on each side, about 18 transverse and reticulated low ridges; dorsal face convex; one limb ending more outwards than the other; double external condyle, not perforated; central area very small and completely closed.

Locality: Vietnam, Thai Nguyen, Hoa Binh (Mai Chau), Nghe An (Quynh Chau), Quang Binh (Dong Hoi); Ba Rịa-Vung Tau province.

Distribution: China (S Guizhou, NW Hunan, Taiwan, Xizang, Gyirong; India, Indonesia, Japan, Laos, Malaysia, Java Myanmar, Nepal, Thailand.

Phenology: Flowering: Spring to summer, **fruiting:** Autumn.

Local uses: An alkaloid in the bark has an similar to that of curare. In (flora China 2008), plant has also been used as a diuretic and as vermifuge.

Specimens examined: VIETNAM. VH 4804 (HN). **Son La** prov.: Yen Chau distr. Muong Lum, N 21°00'17", E 104°29'08", 1242 m alt., 3 Mar. 2001, D. K. Harder, Phan Ke Loc, L. V. Averyanov, Nguyen Xuan Tam 7330 (HN, MO); D.K. Harder et al., 7163 (HN, MO); Moc

Chau, Van Ho, Hua Tat, N 20°46'35", E 140°46'31", 1400 to 1500 m alt., 6 Mar. 2001. D. K. Harder et al., 7163 (HN); Hu Tat, N 20°46'18", E 104°47'45", 1250 to 1375 m alt., 7 Oct. 2000, D.K. Harder, Nguyen Tien Hiep, Nguyen Quang Hieu, A. L. Thomas & P. Mans 5821 (HN, MO). **Lang Son** prov.: Cau Son, 16 Jane 1974 sn (HN); Cau Sao, 6 Jane 1974, Nguyen Thi Lan 011 (HN). **Hoa Binh** prov.: Mai Chau distr, Hang Kia, Nature reserve, 16 June 1999, Ban, Phuong, Khoi, Binh, Bach 1911 (HN). **Quang Binh** prov.: Dong Hoi distr. Minh Hoa, Thuong Hoa, Yen Son, 18 May 1997, N 17° 40', E 105° 57', VH 4804 (HN). **Baria - Vung Tau** prov.: Cochinchina. Mt. Dinh, Baria: Pierre s.n. (P). **Tonkin**: Phuong Lan, 2 May, Balansa 1888 (P) (♂), Phuong Lam, 2 July 1889 M, Balansa 4250 (P). **Nghe An** prov.: Quynh Chau distr. Chau Hoi, 12 June 2005, Trai, Thuat, linh 8367 A,B,C (NIMM); Quy Hop distr. 12 June 2005, Trai, Thuat June 1974, Chuong, Tap 2228 A,B (NIMM); Linh 8567 A,B,C (NIMM).

IDIA. Inde Sn (GDC).

JAVA. Horsfield 245 (K);

CHINA. Mar. 1912. J. H. Esquirol, 3586 (A).

Note: This species is most closely related to with species in genus *Cocculus*, but differs by having Erect shrubs or small trees and leaf blade elliptic or long elliptic to lanceolate-elliptic.

3. *Cocculus orbiculatus* (Linn.) DC. Syst. Nat. 1: 515. 1817; Kurz, Fores. Fl. Britis. Buma 1: 55. 1877; Gagnep. Fl. Gen. Indoch. 1: 140. 1908; Lour. Pl. Cochinch. 156. 1935; Gagnep. Suppl. Fl. Gen. Indoch. 1: 129. 1938; Backer, & Bakh. f., Fl. Java 1: 158. 1963; Yuan, S. H., Fl. Yunn. 3: 237. 1983; Forman, Kew Bull. 22(3): 347. 1968; et., 43(3): 399. 1988; et., Fl. Thailand 5(3): 352. 1991; Pham., Illustr. Fl. Vietn. 1(1): 412. 1991; Kessler, Fam. Gen. Vasc. Pl. 2: 417. 1993; Huang, Shing- Fan & Tseng- Chieng, Fl. Taiwan 2: 591. 1996; Lo S. H., Fl. Reip. Pop. Sin. 30(1): 31. 1996; Fu., G. L., et al., High. Fl. China 3: 608. 2000; Lui, Fl. Hunan, 2: 770. 2000 Nguyen, T.B., Checkl. Pl. Sp. Vietn. 2: 141. 2003.-*Menispermum orbiculatum* Linn. Sp. Pl. 1: 341 341 1753.- **Type:** E. Ind. *Anon sn* (Syntype: LINN Photo!). – *Nephroia caudata* Miers. Contrib. Bot. 3: 263. 1871. - **Type:** Japan. R. Nagasaki: Jane 1862. *Oldham*, 231 (Syntype: K!). – *Cocculus cuneatus* Benth., J. Linn. Soc. Bot. 5(Suppl. 2): 50. 1861. - **Type:** Taiwan: 1985. *Wilford sn* (Holotype: K!).

Cocculus lenissimus Gagnep. Bull. Soc. Bot. France 55: 36. 1908. - **Type:** China. Yunnan: *Delavay 4359* (Holotype: P!, Isotype: P!, NY photo!).

Limacia kustleri King. J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 58(2): 383. 1889. - **Type:** Singapore. *Kunstler 70* (Isotype: K!).

Cocculus sarmentosus var. *stenophyllus* Mierr., Philipp. J. Sci. 13(1): 10. 10. 1918. - **Type:** Philippines. Buros Ilocos Norte Luzon: *Ramos 27231* (Isotypes: NY photo! K photo, P photo!).

Nephroia sarmentosa Lour. Fl. Cochinch. 539-565. 1790.-*Cocculus sarmentosus* (Lour.) Diels., Pflanz. IV. 94: 233. 1910. - **Type:** Vietnam. *Loureiro 565* (Syntype: BM photo!).

Cocculus triflorus DC., Syst. Nat. 1: 529. 1817. -**Type:** No 3445 (Syntype: P!).

Vernacular name: Vây sam.

Woody vines ca. 4 m long. Young branches striate, puberulent to subglabrous. Petiole 1-3.5 cm longer, whitish tomentose or pubescent; leaf blade variable in shape, linear-lanceolate to broadly ovate, narrowly elliptic to rotund, oblanceolate to obcordate, sometimes 3 sometimes 5-lobed, 3-8 cm, variable in width, papery to thinly leathery, both surfaces puberulent to glabrous,

base rounded to truncate, occasionally broadly cuneate or shallowly cordate, margin entire, apex acute or obtuse, with a finely mucronate acumen, sometimes slightly emarginate or 2-lobed, palmately 3 or 5-veined, basal pair of veins usually obscure beyond middle of leaf blade, slightly raised abaxially. Inflorescences axillary, cymose, few flowered, or many flowered arranged in a narrow terminal or axillary thyrses, up to 10 cm, puberulent. Male flowers: yellowish, bracteoles 1 or 2, ca. 0.5 mm, closely adnate to sepals, puberulent; sepals 3-5, apex 2-lobed, outer whorl ovate or elliptic-ovate, 1-1.8 mm, inner whorl broadly elliptic to rotund, sometimes broadly obovate, up to 2.5 mm or slightly longer; petals 6, 1-2 mm, with sides shortly above base folded inward around opposite filament, apex divided into 2 acuminate or acute lobes; stamens 6, shorter than petals. Female flowers: sepals and petals as in male flower; staminodes 6, minute; carpels 6, glabrous. Drupes rotund, redish to reddish purple, usually 5-6 mm in diam.; endocarp horseshoe-shaped, rounded in outline with excavated faces; one dorsal groove, one lateral ridge on each side, about 18 transverse and reticulated ridges; dorsal face convex; one limb ending more outwards than the other; double external condyle, not perforated; central area very small and completely closed. Length, 5.1 mm; width, 5.2 mm; thickness, 3 mm.

Locality: Vietnam. Lang Son (Ky La), Hanoi (Ba Vi), Thai Nguyen (Vo Nhai, Dai Tu), Phu Ly (Dong Van), Thanh Hoa (Pu Hu), Nghe An (Quynh Luu), Ninh Thuan (Ninh Hai), Dong Nai (Tram Bom), Kien Giang (Phu Quoc) provinces.

Distribution: China (Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang); India (Mauritius, Réunion), Indonesia, Japan, Laos, Malaysia, Nepal, Philippines and Pacific islands (Hawaii).

Phenology: Flowering: Mar. **Fruiting:** April to May.

Local uses: Laveas used to prepare a jelly.

Specimens examined: VIETNAM. **Tonkin:** 2 Mar. 1919, Poilane 40041 (P); 20 May 1929, F. Evarard 2800 (P), Dong 137 (P). Lam Mat, 1881, R.P. Bon 193 (P); Tho Mat, 6 May 1881, R.P. Bon (P); **Ha Giang** prov.: Pho Ban distr. 7 July 1977, Nguyen Kim Dao 12 (HN). **Lang Son** prov.: Ky Lua distr. 12 Nov. 1976, Nguyen Huu Hien 15,379 (HN). **Thai Nguyen** prov.: Pelot 6783 (VNM). Ha Nam prov., Dong Van distr. 11 Aug. 1977, Nguyen Huu Hien 087 (HN) (♂). **Thanh Hoa** prov.: Hon Me island, 17 May 2000, Chieu, Trai, Son, Tap 5130 (NIMM). **Nghe An** prov.: Quynh Luu distr. Quynh Giang, 18 July 2005, Trai, Phuong 8361 (NIMM); Dien Chau, Dien An, 15 Jan. 2005, Trai, Thuat, Linh 8368 (NIMM); Nhia dan, Nghia Lam, 24 June 2005, Trai, Thuat, Linh 8342 A,B,C (NIMM). **Ninh Thuan** prov.: Ninh Hai distr. Vinh Hai, Da Hang, Nui Chua National Park, N11⁰41'24", E109⁰09'56", 5 to 150 m, 28 Mar. 2004, Collectors Nguyen Tap, Ngo Va Trai, Nguyen Quang Hung et al., HLF 4232 Collectors Nguyen Tap, Ngo Va Trai, Nguyen Quang hung et al. HLF 3382 (HN); N 11⁰41'24", E 109⁰09'56", 28 Mar. 2004, HLF 3382 (HN). **Dong Nai** prov.: Petelot 3868 (HM). Bien Hoa, 900 m, 18 Feb. 1935, Petelot 24344 (P) (♂). **Sai Gon** city: 2 Mar. 1919, Poilane 40041 (P); 20 May 1929, F. Evarard 2800 (P), Dong 137 (P). **Long An** prov.: Rach Cat distr. Cam Duc, 2 Mar. 1919, Poilane 40041 (P) (♂); 2 Mar. 1919, Poilane 40036 (P) (♂). **Kien Giang** prov.: Phu Quoc, VK 3734 (HN, KRIBB). **Cochinchine:** 20 May 1929, Dong 137 (P). Tonkin: Nov. 1923, Petelot 1258 (P) (♂); Oct. 1923, Petelot 1475 (P) (♂).

CHINA. Yunnan prov.: J. Cavalerie 984 (P); P. J. M. Delavay 4359 (P); J. de Loureiro 565 (BM); Taiwan: 1985. C. Wilford, sn; Gaudichau C. 180; Huchne 135 (US).

JAPAN. Jun. 1862. R. Olsham, 231 (K, P); C. Wright, 12 (US); R. Nagasaki: Jane 1862. Oldham 231 (K!).

PHILIPPINES. Bueros Ilocos Norte Luzon: M. Ramos 27231(K).



Figure 1 : *Cocculus laurifolius* DC.
a. fuiting branch; b. carpels; c. male flower;
d. petal, staminodes; e. seed.
(from Vu Tien Chinh 2014).

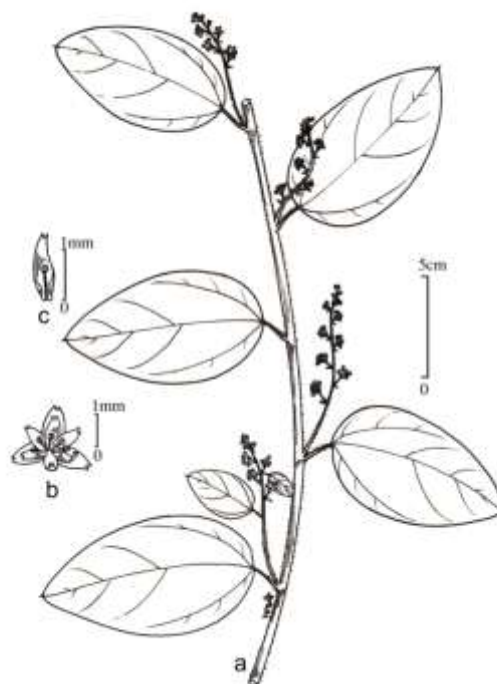


Figure 2: *Cocculus orbiculatus* (Thunb.) DC.
a. branch bearing male inflorescence;
b. male flower; c. petal.
(from Vu Tien Chinh 2014).

Notes: in Checklist of Plant Species of Vietnam (Nguyen, T. B. 2003 and Pham, H. H. 1999) exist species (*Cocculus sarmentosus* (Lour.) Diels). Moreover, in his has a *Cocculus orbiculatus* (Thunb.) DC. not true author. However, this species today is *Synonym* of species *Cocculus orbiculatus* (Linn.) DC.

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**CHI *COCCULUS* DC. (MENISPERMACEAE)
TRONG HỆ THỰC VẬT VIỆT NAM**

**Vũ Tiến Chính, Trần Thị Phương Anh, Phạm Thị Hồng Nhung,
Vũ Văn Quân, Nguyễn Hải Yến, Trần Bích Thủy,
Mai Duy Ngân, Hoàng Lê Tuấn Anh**

TÓM TẮT

Chi *Cocculus* DC. (Menispermaceae) chủ yếu là dây leo, cây thảo rất hiếm khi là cây bụi, đơn tính khác gốc. Ở Việt Nam được biết có 3 loài. Bài báo này chúng tôi mô tả đặc điểm hình thái một số hình vẽ được minh họa cùng với những ghi chú về phân bố, sinh thái, mùa ra hoa, quả, công dụng của các loài. Các mẫu nghiên cứu được lưu dưới dạng tiêu bản trong các bảo tàng ở Việt Nam, Lào, Trung Quốc, Anh, Pháp.