A Revision of the Ebenaceae of Taiwan

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[Summary]

This is a revisionary treatment of the family Ebenaceae of Taiwan. One genus, *Diospyros*, with ten species is recognized. *Diospyros kotoensis* is an endemic species. *D. rhombifolia* Hemsley is a new record found at Tung-mao-shan, Taichung County. *D. fengchangensis* Lu and *D. vaccinioides* Lindley are conspecific. Agreeing with Hatusima's opinion, the authors treat *D. sasakii* Hayata as a synonymy of *D. oldhamii* Maxim. In addition to the description of the ten species, the habitat, the distribution, the utilization, and the illustrations of inflorescence and fruit are included.

Key Words: Ebenaceae, *Diospyros*, Revision, Taiwan, Species.

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臺灣柿樹科之訂正

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摘　　要

本文爲臺灣柿樹科之重新訂正。本省柿樹科有一屬十種。其中之蘭嶼柿爲蘭嶼固有種，菱葉柿爲發現於臺中縣東卯山之新紀錄。而楓港柿(Diospyros fengchangesis Lu)之學名應重新訂爲 Diospyros vaccinioides Lindley。作者等同意 Hatusima 的觀點，將 Diospyros sasakii Hayata 處理成 Diosypros oldhamii Maxim. 的異名。文中，除了各種的描述外，並給予生育地、分布、利用和果與花序的繪圖等資料。

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I. Introduction

The family Ebenaceae of Taiwan has never been revised. The first record in Taiwan was made by Henry (1896). He recognized three species and one unknown. Kanehira, in 1936, presented a rather complete treatment in his book, *Formosan Trees Indigenous to the Island*, which included two genera, *Diospyros* and *Maba*, and seven species. In 1963, Li accepted Bakhuizen's opinion (1933) to treat *Maba* as the synonymy of *Diospyros* and totally described seven taxa for the genus *Diospyros* of Taiwan. In 1974, one new species, *D. kotoensis* Yamazaki. The total number of the species of Ebenaceae was increased to 8. Following Bakhuizen's (1933) and Ng's (1978)treatments regarding *Maba* and *Diospyros* as being congeneric as well as plusing two newly recorded speices, the authors describe 10 species associated with additional synonymys for the genus *Diospyros* in this paper.

Except for the species *D. kotoensis*, endemic to the Lanyu islet, the others are also separately found in the vicinities of Taiwan, such as the Ryukyus, the Philippines, and the Mainland China. However, the geographic relationship of Taiwan *Diospyros* is overwhelmingly with the Mainland China.

Generally, the plants of this genus are mostly shade-tolerant and scattered in dense broad-leaved forests except *D. oldhamii* Maxim. and *D. japonica* Sieb. & Zucc. which can grow at road-sides and valleys of streams. Two species, *D. maritima* Bl. and *D. discolor* Willd., sometimes grow densely at the southern part of Taiwan, constituting the major components of the plant communities.

The fruit of the genus *Diospyros* is fleshy and edible or floatable. The species are therefore dispersed by birds, animals, and water. An introduced edible species, *D. kaki* L., is widely cultivated in Taiwan.

II. Taxonomic Treatment

Ebenaceae

Trees or shrubs without latex. Leaves alternate, rarely subopposite, estipulate, usually thick and coriaceous, entire. Flowers regular, usually dioecious, axillary, subsessile or in short cyme, the pedicels jointed under the flower; calyx gamosepalous, 3–5 lobed often accrescent in fruit; corolla gamosepalous, 3–5 lobed, often hairy without; stamens usually as many or 2–3 times as the corolla-lobes, hypogynous, the filaments free or variously united, the anthers dehiscing longitudinally. Ovary superior, 2–8– or more-celled, imperfectly septate; styles 2–8; ovules 1 or 2 in each locule, pendulous, anatropous. Fruit mostly fleshy, few- to several-seeded. Seeds usually oblong, compressed or longitudinally 2–3–furrowed; endosperm abundant, uniform or ruminated.

A family of two genera, namely, *Euclea* (in Africa), and *Diosypros*, widely distributed in the Tropics. The former includes ca. 20 species (Willis, 1973).

Diospyros Linn.

Trees or shrubs, usually with black, hard and brittle bark. Leaves simple, alternate, entire. Flowers 3–5; calyx shallowly or sometimes deeply lobed; corolla tubular, salver- or bell-shaped, the lobes 3–5, twisted to the right; male flowers with 3–20, rarely to 100 stamens; female flowers sometimes with staminodes, the ovary 2–8, the cells 1 or rarely 2-ovuled, the styles and stigmas 1–4. Fruit a globose or ellipsoid berry, often with a much enlarged calyx; seeds oblong, usually compressed, with thin leathery testa, thick, horny, or rarely ruminate endosperm.

A large genus of about 500 species (Willis, 1973) in the Tropics, especially abundant in the old world. 10 species in Taiwan.

Note. The female flowers of most species of Taiwan have no rudimentary stamens except for those of *D. eriantha* and *D. maritima*.

Principally, the inflorescences of *Diospyros* of Taiwan are cymose consisting of 3 or 4–5 flowers of which the central one blooms first. The species of which inflorescence has 3 flowers include *D. ferrea*, *D. japonica*, *D. discolor*, and *D. morrisiana*, and the species of which inflorescence has 5 flowers *D. oldhamii* and *D. kotoensis*. One kind of spike-like male inflorescence with 4 or 5 flowers and one or two leaf-like bracts bearing near the apex of the rachis was observed in the species *D. rhombifolia* Hemsley (Figure 1: 3b), and the flowers

mature and bloom basipetally. Here, the authors postulate that the spike-like inflorescence is a primitive type in *Diospyros*, while the cymose is derived.

Key to the species

1. Leaves large, more than 4 cm long.
   2. Leaves 4–10 cm long, 1.5–5 cm broad.
      3. Leaves rhomboid . 9. *D. rhombifolia*.
      3. Leaves not as above.
         4. Leaves smaller, 4–6.5 cm long, 1.5–3 cm broad . . 5. *D. kotoensis*.
         4. Leaves larger, 7–10 cm long, 2.5–5 cm broad.
            5. Leaves oblong-lanceolate; inflorescence densely pubescent; calyx lobe to 3/4 the length . . . . . 2. *D. eriantha*.
            5. Leaves ovate to elliptic; inflorescence slightly pubescent; calyx lobe to 1/2 the length.
               6. Leaves chartaceous, petioles 1.8–2.4 cm long . . . . . 8. *D. oldhamii*.
               6. Leaves coriaceous, petioles 0.7–1.0 cm long . . . . . 7. *D. morrisiana*.
   2. Leaves larger; generally over10 cm long and 5 cm broad.
      7. Leaves coriaceous.
         8. Leaves very large, 15–20 cm long, 6–10 cm broad, the base auriculate-cordate . . . . . 1. *D. discolor*.
         8. Leaves 7–17 cm long, 4–8 cm broad, the base obtuse to slightly cuneate . . . . . 6. *D. maritima*.
      7. Leaves chartaceous, to 15 cm long, and 7 cm broad.
         9. Lateral veins 4–5 pairs; 4–5–flowered cyme; fruit 2.5–4.0 cm across . . . . . 8. *D. oldhamii*.
         9. Lateral veins 6–8 pairs; 1–3–flowered cyme; fruit 2 cm across . . . . . 4. *D. japonica*.
1. Leaves very small, shorter than 3 cm.
   10. Leaves distinctly obovate, the apex rounded . . . . . 3. *D. ferrea*.
   10. Leaves elliptic to suborbicular, the apex acute to mucronate 10. *D. vaccinioides*.

Description of the species

1. *Diospyros discolor* Willd., Sp., Pl. 4: 1108. 1805; Kanehira, Form. Trees 337. 1917; Li, Woody Fl. Taiwan. 731. f. 298. 1963 *et* in Li *et al.*, Fl. Taiwan. 4: 100. 1978.

   D. utilis Hemsl. in Ann. Bot. 9: 154. 1896; Kanehira, Form. Trees rev. ed. 572. f. 530. 1936.

   毛柿

A large evergreen tree to 14 m high, the branches fulvoustomentose. Leaves coriaceous (Figure 2: 7), lanceolate, 8–30 cm long, 3–12 cm broad, very variable in size, acute at the apex, rounded-cordate to auriculate at the base, entire or undulate and slightly revolute on margins, dark, shining and glabrous above, pale and appressed-villous beneath, the midrib impressed above, strongly raised beneath, the veins and reticulations slightlyraised above, indistinct beneath; petioles stout, ca. 1 cm long. Male flowers several, in short axillary cymes ca. 2.5 cm long (Figure 3: 7); pedicels 1–7 mm long, densely villous; calyx deeply 4-lobed, the lobes overlapping, oblong, villous, corolla slightly hirsute without, the lobes strongly reflexed; stamens numerous into 2 series. Female flowers solitary, axillary, shortly peduncled. Fruit depressed-globose (Figure 3: 7a), ca. 8 cm across, densely villous, dark reddish purple, sessile; endosperm smooth.

The Philippines. Taiwan, in the eastern and southern parts, in thickets, sometimes forming dense woods. The fruit is edible, and the wood is good for lumber and for making handicrafts.

Specimens examined. TAIPEI: Cultivated in Bot. Gard., *Lin s. n.* in 1940. PINGTUNG: Hengchun, *Konishi s. n.* in 1898, *Henry 523*, *815* Type coll., *D. utilis* Hemsley); Kenting, *Lu 19223*. TAITUNG: Lanyu, *Miyake s. n.* in 1899, *Sasaki s. n.* in 1926, *Lu 17517*. HUALIEN: *Price 428, 660*.

2. *Diospyros eriantha* Champ. ex Benth. in Hook. Kew J. Bot. 4: 302. 1852; Kanehira, Form. Trees rev. ed. 573. f. 531. 1936; Li, Woody Fl. Taiwan. 730. 1963 *et* in Li *et al.*, Fl. Taiwan. 4: 100. 1978.

   軟毛柿

A tree to 13 m high; branchelts fulvoustomentose. Leaves thin-chartaceous, oblong-lanceolate (Figure 2: 9), 7–10 cm long, 2–3 cm broad, acute to acuminate at the apex,

acute to obtuse at the base, entire, dark and glabrous above to puberulous along the midrib, pale and tomentose along the midrib and veins beneath, the midrib and veins indistinct above, raised beneath, the lateral veins 4–5; petioles 2–4 mm long, tomentose. Male flowers 4-merous, 4–5 in short axillary cyme (Figure 3: 9); pedicels very short, pubescent; calyx deeply lobed, puberulous; corolla puberulous, shallowly lobed, the lobes narrowly ovate or lanceolate; female flowers axillary, solitary, subsessile; calyx densely fulvous-villous, deeply lobed, the lobes oblong, ca. 3 mm long and 1 mm broad; corolla ca. 9 mm long, densely villous without; stamens with both filaments and anthers densely villous. Fruit ovoid (Figure 3: 9a), 15–20 mm long and 8–10 mm across, acute, villous without.

Southern China to Malaysia. Taiwan, common in forests at low altitudes throughout the island.

Specimens examined. TAIPEI: *Keng s. n.* in 1950, *Lin s. n.* in 1940; Guaninshan, *Lu 15324*; Yuantong Temple, *Lu 13789*; Datoonshan, *Lu 16503*; Matsao, *Lu 16626*. TAOYUAN: Baling, *Lu 19131*. NANTOU: *Wilson 10013*. PINGTUNG: Hengchun, *Wilson 11043*, *Matsuda 1064*; Kenting, *Lu 17283*; Tachin Fall, *Lu 18723*. TAITUNG: *Keng 1775*, *Miyake s. n.* in 1889; Tawu, *Lu 15144*. HUALIEN: *Wilson 11104*.

3. *Diospyros ferrea* (Willd.) Bakhuizen in Gard. Bull. Straits Settlem. 7: 162. 1933; Li in Li *et al.*, Fl. Taiw. 4: 102. pl. 931. 1978. 象牙柿

   D. ferrea (Willd.) Bakhuizen var. *buxifolia* (Rottb.) Bakhuizen in Gard. Bull. Straits Settlem. 7: 162. 1933.

   Pisonia buxifolia Rottb. in Nye Samml. Dan. Vid. Salsk. Skr. 2: 536. f. 4, f. 2. 1783.

   Maba buxifolia (Rottb.) Persoon, Syn. Pl. 2: 606. 1807; Kanehira, Form. Trees. rev. ed. 579. f. 536. 1936.

A small evergreen tree. Leaves thick-coriaceous, obovate (Figure 2: 1), 2–3 cm long, 1.5–2 cm broad, rounded and emarginate at the apex, attenuate at the base, entire and somewhat revolute on margins, glabrous and concolored on both surfaces, the midrib impresed above, raised beneath, the lateral veins and reticulations indistinct; petioles ca. 2 mm long. Male flowers 3-merous, usually 3 in a cyme with very short peduncle (Figure 3: 1); calyx shallowly lobed, the lobes valvate, rounded at the apex, puberulous; stamens usually 12 into 2 series; females flowers 3-merous, axillary, small, 3–4 mm long; calyx brownish tomentose without, the lobes 3, sometimes 4; corollalobes 3 or sometimes absent. Fruit ellipsoid (Figure 3: 1a), ca. 10 mm long, black.

West Africa to India, Burma, Thailand, Vietnam, Malesia to Australia, the Ryikyus. Taiwan, in forests along the coasts of Hengchun Peninsula and Lanyu Islet, scarce.

Specimens examined. TAIPEI: Cult., *Lin s. n.* in 1939; *Lu s. n.* in 1985. PINGTUNG: *Keng s. n.* in 1950. TAITUNG: *Hosokawa 9883*; Lanyu, *Lu 17502*.

4. *Diospyros japonica* Sieb. & Zucc. in Abh. Bayer. Akad. Wiss. Math.-Phys. Cl. 4(3): 136. 1846 (Fl. Jap. Fam. Nat.); Hatusima in J. Jap. Bot. 14: 238, *et* 26: 372. 1951; Li in Li *et al.*, Fl. Taiwan 4: 102. 1978.

   D. oldhamii sensu Li, in Li *et al.*, Fl. Taiwan 4: 102. 1978. *pro part.*; *non* Maxim. 山柿

A tree to 30 m high. Leaves ovate to ovate-oblong (Figure 2: 10), 9–13 cm long, 5–8 cm broad, glabrous, green above, paler and somewhat glaucous beneath, acute or obtuse at the apex, rarely acuminate, obtuse to rounded at the base, the lateral veins 6–8 pairs; petioles 1–2.5 cm long. Flowers yellowish white; male flowers 4-merous, 1–3 in a cyme on very short stalks (Figure 3: 10), calyx puberulous, shallowly 4-lobed, the lobes acute at the apex; corolla shortly 4-lobed, the lobes reflexed; stamens somewhat 20 into two series; female flowers 4-merous, solitary; corolla 7–8 mm long, glabrous; staminodes 4. Fruit globose (Figure 3: 10a), ca. 2 cm in diameter, dark yellowish changing to purplish black.

Central China to the Ryukyus and southern Japan. Taiwan.

Specimens examined. TAICHUNG: *Lu 16981*, *17008*; Lishan to Shihyuan, *Lu s. n.* in 1981. NANTOU: Wushe, *Lu 15918*. PINGTUNG: Wutai, *Lu 13041*; Dahanshan, *Lu 19036*, *et 19040*. HUALIEN: Loshao, *Lu s. n.*

in 1985.

Note. Hatusima (1971) indicated that *D. japonica* S. & Z. was distributed in Taiwan. However, Li (1978) stated that the occurrence of this species in Taiwan remained to be clarified. After examining the specimens deposited in the Herbaria TAI and TAIF, we found that the specimens in the folders of *D. oldhamii* Maxim. could be devided into two groups by the number of lateral veins, the vestiture of leaves, and the number of flowers of the inflorescence. One group is characterized by having 4–5 pairs of lateral veins, 4–5 flowers of the inflorescence as well as leaves glabrous beneath; the other group by having 6–8 pairs of lateral veins, 1–3 flowers of the inflorescence as well as leaves glacous beneath. In the comparison of the specimens of Japan and the Ryukyus deposited in the Herbaria, the characters of the first group agree exactly with those of *D. oldhamii*, and the second *D. japonica*. It therefore came to a conclusion that *D. japonica* is positively and widely distributed on this island.

5. *Diospyros kotoensis* Yamazaki in J. Jap. Bot. **49**: 247. f. 2, 3. 1974; Li in Li *et al.*, Fl. Taiwan **4**: 102. 1978. 蘭嶼柿

   D. nitida sensu Liu, Sasaki, & Keng in Quart. J. Taiwan Mus. **8**: 314. 1955; Hatusima in Mem. Fac. Agr. Kagoshima Univ. **7**: 320. 1970; *non* Merrill.

A tree with branchlets glabrous. Leaves chartaceous, persistent, elliptic to oblong (Figure 2: 6), 4–6.5 cm long, 1.5–3 cm broad, botuse at the apex, cuneate at the base, entire on margins, glabrous on both surfaces, dark when dry, with 6–8 arcuate inconspicuous lateral veins; petioles 3–4 mm long, scabrid. Male flowers 3–5 in cymes (Figure 3: 6), with short glabrous peduncles; calyx glabrous, 2 mm long, deeply 4-lobed, the lobes ovate, minutely ciliate without; corolla glabrous, 4-lobed, the lobes reflexed; stamens 12 in 2 series, the anthers sagittate, the filaments glabrous. Fruit globose (Figure 3: 6a), ca. 1.5 cm across, glabrous; seeds fuscate, compressed, about 4 mm long and 4 mm broad, with the persistent calyx-lobes ovate.

Endemic to Lanyu, in forests at around 250 m in elevation.

Specimens examined. TAITUNG: *Chang 2788, et 3160, Lu 18410, et 18412.*

Note. This species is very closely related to the Philippine species *D. nitida* Merrill, but differs in having branchlets and leaves glabrous, calyx-lobes ovate, and fruit and seeds large.

6. *Diospyros maritima* Blume, Bijdr. Fl. Nederl. Ind. 669. 1825; Kanehira, Form. Trees rev. ed. 575. f. 532. 1936; Li, Woody Fl. Taiwan 731. 1963 *et* in Li *et al.*, Fl. Taiwan. **4**: 104. 1978. 黃心柿

   D. liukiuensis Makino in Bot. Mag. Tokyo **22**: 159. 1908.

   D. Kusanoi Hayata in J. Coll. Sci. Univ. Tokyo **30**: 186. 1911 (Mat. Fl. Form.).

A small evergreen tree to 15 m high, the branchelts glabrescent. Leaves coriaceous, elliptic to obovate-oblong (Figure 2: 5), 7–17 cm long, 3–8 cm broad, acute to obtuse at the apex, obtuse to slightly attenuate at the base, entire, glabrous on both surfaces and nearly concolored, sometimes glabrescent beneath, the midrib slightly impressed above, raised beneath, the lateral veins ca. 5 pairs, slender and raised on both surfaces, the reticulations subconspicuous; petioles to 1 cm long. Male flowers axillary, 4-merous, sessile, 2–3 together in a cyme (Figure 3: 5); calyx 4-lobed, the tube ca. 9 mm long, fulvoustomentose without, glabrous within, the lobes ca. 6 mm long, acute to obtuse at the apex; corolla 4-lobed, the lobes glabrous, reflexed; stamens 16, the filaments glabrous. Fruit depressed-globose (Figure 3: 5a), 3–4 cm across, glabrous or slightly puberulous, orange-colored when mature, sessile.

New Guinea, tropical Austrlaia, the Philippines, and the Ryukyus. Taiwan, known from northern Taiwan, Hengchun Peninsula and Lanyu; in thickets and along seashores.

Specimens examined. TAIPEI: *Sasaki s.n.* in 1924, *Faurie 364*. PINGTUNG: Hengchun, *Wilson 11020*, *Price 663*; Kenting, *Lu 18543, et 19228*. TAITUNG: Lanyu, *Hosokawa 8169*. ILAN: Kongliao, *Lu 16604, et 16605*.

7. *Diospyros morrisiana* Hance in Walp. Ann. Bot. Syst. **3**: 14. 1852; Kanehira, Form. Trees rev. ed. 576. f. 533. 1936; Li, Woody Fl. Taiwan 730. 1963, *et* in Li *et al.*, Fl. Taiwan **4**: 104. 1978. *pro part.* 山紅柿

A small deciduous tree; branchlets glabrescent. Leaves coriaceous, elliptic to ovate-lanceolate (Figure 2: 8), 7–10 cm long, 2.5–3 cm broad, acuminate, obtuse at the base, entire to slightly wavy, dark above, pale beneath, glabrous to slightly pubescent along the midrib beneath, the midrib and veins subconspicuous above, slender and raised beneath, the reticulations indistinct. Male flowers 4-merous, axillary, 2–5–fascicled (Figure 3: 8); pedicels 3–4 mm long, pubescent or glabrous; calyx 4-lobed, the lobes triangular, slightly pubescent on both surfaces to nearly glabrous; corolla 4-lobed, glabrous without; stamens 14–16, the filaments and anthers somewhat pubescent. Fruit globose (Figure 3: 8a), about 1.5 cm across, yellowish.

Southeastern China, the Ryukyus and Japan. Taiwan, in the forests of the central and northern parts to 1,400 m in elevetion.

Specimens examined. TAIPEI: *Shimada s. n.* in 1917; Chishingshan, *Lu 19428*; Neihu, *Lu 19532*; Wuchihshan, *Lu 14828*; Peiyi Highway, *Lu 16243*; Keelung, *Makino s. n.* in 1896. TAICHUNG: Sun-moon Lake, *Gressitt 233, et 750, Kanehira 21335*.

8. *Diospyros oldhamii* Maxim. in Bull. Acad. Sci. St. Petersb. **31**: 67. 1886, *et* in Mel. Biol. **12**: 493. 1886; Li, Woody Fl. Taiwan 733. *pro part*. 1963, *et* in Li *et al*., Fl. Taiwan **4**: 105. 1978. *pro part*. 俄氏柿

D. oldhamii Maxim. var. *chartacea* Hayata in J. Coll. Sci. Univ. Tokyo **30**(1): 186. 1911 (Mat. Fl. Form.); Kanehira, Form. Trees rev. ed. 576. f. 534. 1936..

D. hayatai Odashima in J. Soc. Trop. Agr. 7: 82. 1935.

D. taitoensis Odashima in J. Soc. Trop. Agr. 7: 83. f. 1. 1935.

D. sasakii Hayata, Ic. Pl. Form. 7: 33. pl. 8. 1918.

D. odashimae Hatusima in J. Jap. Bot. **13**: 680. 1937.

D. oldhamii Maxim. f. *ellipsoidea* (Odashima) Li, Woody Fl. Taiwan 733. 1963. *syn. nov.*

D. hayatai Odashima f. *ellipsoidea* Odashima in J. Soc. Trop. Agr. 7: 83. 1935.

A small deciduous tree; branchlets glabrescent. Leaves chartaceous, elliptic to ovate-oblong (Figure 2: 3), 8–12 cm long, 4–5 cm broad, acuminate at the apex, acute to obtuse at the base, entire to slightly wavy, glabrous above, slightly pubescent at the axil of lateral veins or glabrous beneath, the midrib and veins impressed above, raised beneath, the lateral veins 4–5 pairs; petioles 1.8–2.4 cm long. Flowers pink; male flowers 4–5 in axillary cymes (Figure 3: 3) with short glabrous peduncles 3–4 mm long; calyx 4-lobed, the lobes glabrous; stamens 14–16; female flowers 4-merous, solitary; corolla 6 mm long, glabrous. Fruit subglobose (Figure 3: 3a), ca. 2.5–4.0 cm across, glabrous, yellowish.

The Ryukyus. Taiwan, in forests in the central and eastern parts to 400–1,400 m in elevetion.

Specimens examined. TAOYUAN: Baling, *Lu 12901*. TAICHUNG: Chingshan, *Lu 15400*; Tungshih, *Lu 15383*. NANTOU: Wuliting, *Lu 15509*.

Note. Since the shape of the fruit of *D. oldhamii* varies from subglobose to globose to ellipsoid, we reduce the form *D. oldhamii* f. *ellipsoidea* (Odashima) Li to its specific status.

9. *Diospyros rhombifolia* Hemsl. in J. Linn. Soc. **26**: 70. 1889. Fig. 1. 菱葉柿

A small evergreen tree, the bark dark brown; branchlets velutinous. Leaves coriaceous, deciduous, rhomboid-ovate (Figure 2: 4), 5–11 cm long, 2–6 cm wide, acuminate or caudate at the apex, acute or cuneate at the base, the lateral veins 6–7 pairs, the midrib and the veins conspicuously raised; petioles 4–6 mm long, pubescent. Male inflorescence spike-like with 2–5 flowers borne on the lower part of new branchlet (Figure 3: 4b), or sometimes solitary or clustered at the axil of leaves (Figure 3: 4a), basipetally blooming; male flowers 4-merous; calyx ca. 1.8 mm long, pubescent, the lobes ovate, ca. 1.3 mm long, acute at the apex; corolla yellowish white, urn-like, ca. 4.2 mm long, pubescent in- and outside, the lobes broad-ovate, ca. 1.1 mm long, 1.7 mm broad; stamens ca. 11 into 2 series, 3 mm long; anthers ca. 2 mm long; filaments ca. 1 mm long, pubescent. Female flowers solitary, axillary, sometimes 1–2 on the lower part of young branchlet, 4-merous; calyx ca. 8.5 mm long, the lobes elliptic, 8 mm long, 3.8 mm

broad, obtuse to rounded at the apex, without staminodes; corolla yellowish-white, urn-like, ca. 5.5 mm long, pubescent, the lobes ovate, ca. 2 mm long, ca. 1.2 mm broad, obtuse to rounded at the apex; ovary ovoid, ca. 2.5 mm long, pubescent; style ca. 1.5 mm long, pubescent. Fruit ellipsoid (Figure 3: 4c).

Specimens examined. TAICHUNG: Tungmaoshan, *Lu s. n.* Apr. 21, 1986.

Note. This species is new to the flora of Taiwan. It can be easily distinguished from other native species by the leaves rhomboid-ovate and calyx-lobes rigid, coriaceous, oblong and with several conspicuous lateral veins. This species is also distributed in Fukien, Chekiang, and Kiangsu of Mainland China.

10. *Diospyros vaccinioides* Lindl. in Hook. Exot. Fl. II. t. 139. 1825. 楓港柿

D. fengchangensis Lu in Quart. Journ. Chin. For. 18(2): 113. f. l. 1985. *syn. nov.*

An evergreen shrub or small tree to 2–4 m high; branchlets puberulous. Leaves subcoriaceous, elliptic to suborbicular (Figure 2: 2), 1.1–1.9 cm long, 0.6–1.2 cm wide, acute to mucronate at the apex, acute to rotundate at the base, glabrate when young, entire, dark green and shining above, pale beneath, the midrib raised on both surfaces, the lateral veins and secondary veins indistinct. Flowers 4- or 5-merous, axillary, solitary (Figure 3: 2); calyx-tube deeply 4-5-lobed, the lobes triangular-lanceolate, ca. 1.6 mm long, 10 mm broad; corolla urceolate, ca. 2 mm long; stamens 14–16, the filaments and anthers glabrous. Fruit ovate Figure 3: 2a), ca. 1 cm long, glabrous, with persistent calyx, ripening soft and black.

Kwangtung, Mainland China. Taiwan, in the plantation of *Acacia confusa* Merr. at low elevetion near Fengchang, South Taiwan; very rare.

Specimens examined. PINGTUNG: Fengchang, *Lu 12267* (Type of *D. fengchangensis* Lu, TAIF).

Note. This species is also distributed at Little Hongkong, Kwangtung. A specimen collected by Y. K. Wang (*no. 3041*) in 1929 and examined as *D. vaccinioides* Lindley by E. D. Merrill was taken into comparison with the specimens gathered at Fengchang. No difference was found. After reading the original description of *D. vaccinioides*, we concluded that the two species are conspecific, and treated *D. fengchangensis* Lu as a synonymy of *D. vaccinioides*.

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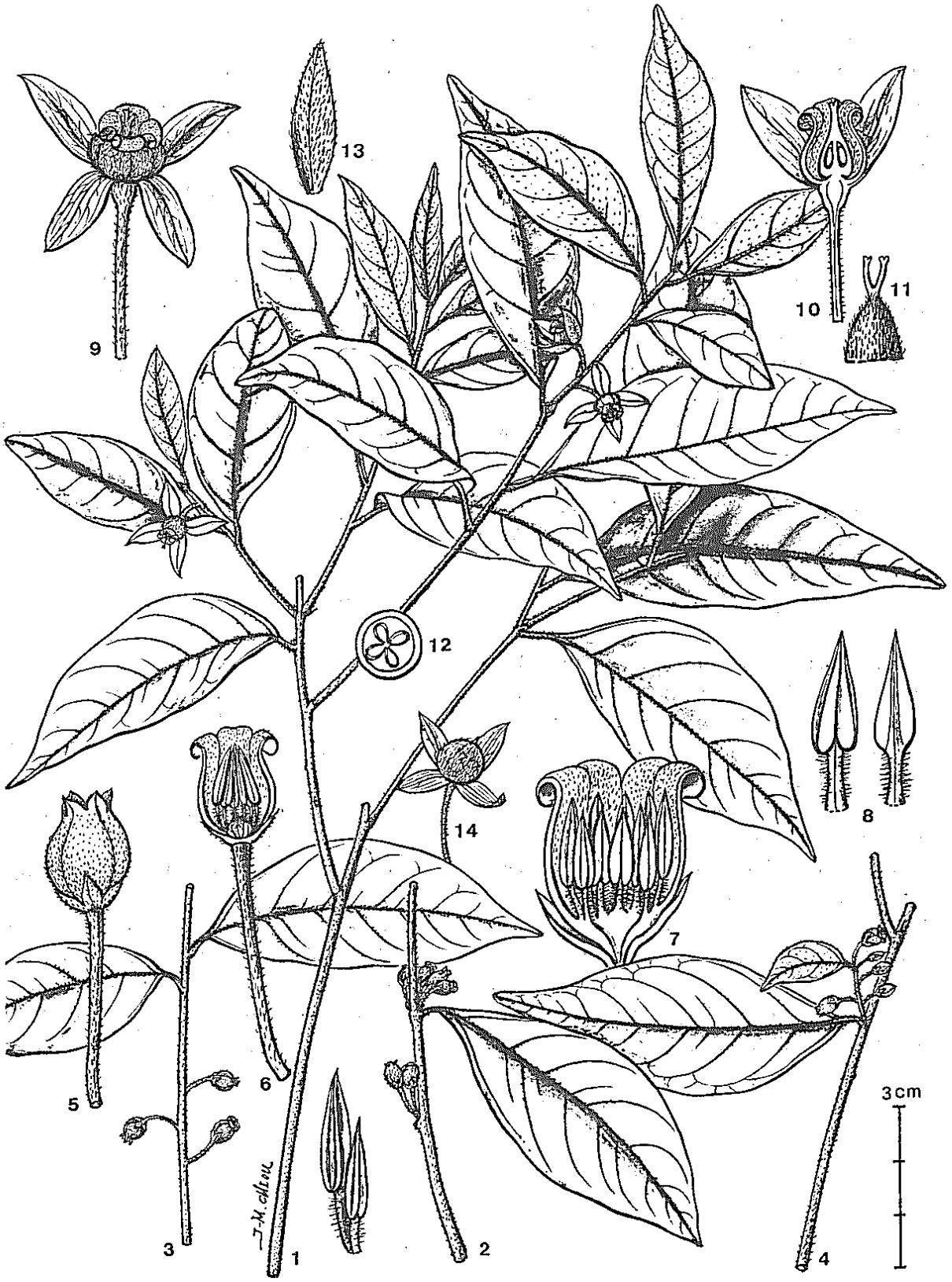


Figure 1. Diospyros rhombifolia Hemsl: 1. flowering branch; 2–4. male inflorescences; 5. flower; 6–7. longitudinal section of flower; 8. stamens; 9. female flower; 10. longitudinal section of flower; 11. pistile; 12. cross section of ovary; 13. bract; 14. fruit.

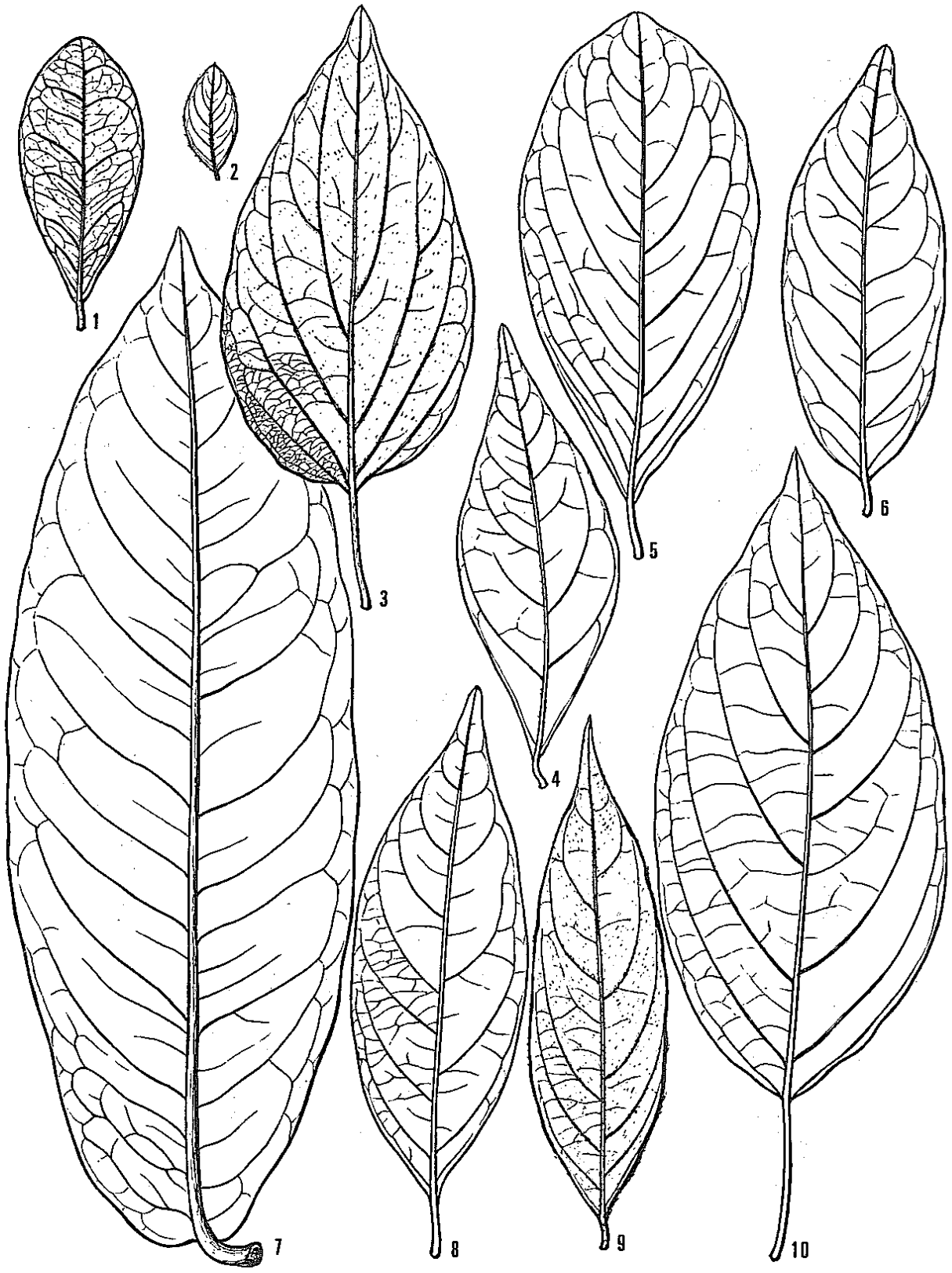


Figure 2. Leaf Morphology of *Diospyros* spp. 1. *D. ferrea*; 2. *D. vaccinioides*; 3. *D. oldhamii*; 4. *D. rhombifolia*; 5. *D. maritima*; 6. *D. maritima*; 7. *D. discolor*; 8. *D. morrisiana*; 9. *D. erientha*; 10. *D. japonica*.

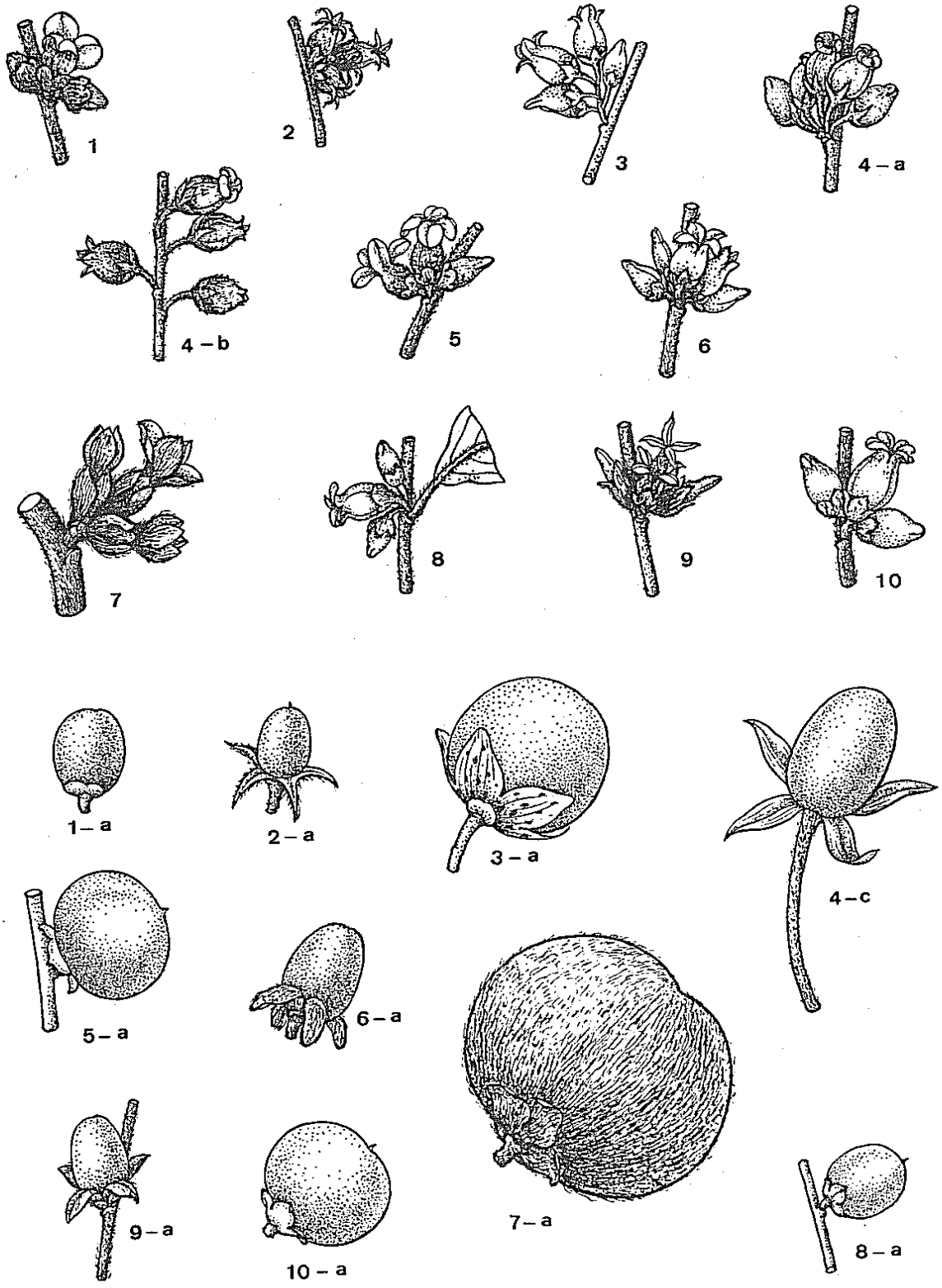


Figure 3. Inflorescences and Fruits of *Diospyros*. 1. *D. ferrea*; 2. *D. vaccinioides*; 3. *D. oldhamii*; 4. *D. rhombifolia*; 5. *D. maritima*; 6. *D. maritima*; 7. *D. discolor*; 8. *D. morrisiana*; 9. *D. erientha*; 10. *D. japonica*.

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