

## A REVISION OF THE GENUS *HELWINGIA*

by

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The genus *Helwingia* is often treated as an aberrant genus of the Cornaceae, but it is unique in having epiphyllous flowers and fruits, and is considerably different from other members of Cornaceae in having 3–5-celled ovaries, and in anatomical and palynological characters. So the genus is sometimes regarded as an independent family Helwingiaceae (Decaisne 1836, Morren & Decaisne 1836, A. DC. 1868, Chao 1954, Li & Chao 1954, Takhtajan 1973), or sometimes as a member of the family Araliaceae (Bentham & Hooker f. 1867, Hutchinson 1959, 1969 & 1973, Eyde 1967).

The genus has been generally considered to include three main species, i.e. *Helwingia japonica* (Thunb.) Dietr. (1817) from Japan and China, *H. chinensis* Batalin (1893) from China, and *H. himalaica* Hook. f. et Thoms. (1879) from Himalaya. However, those species are variable, especially in China, and also several species, varieties and forms have been recently published, thus in 1951 Fang recognized 4 species and 4 varieties from China. Also the plants from Formosa and those from Ryukyu have been described as separate species, *H. formosana* Kanehira et Sasaki and *H. liukiensis* Hatusima respectively.

Since 1960 we have been carefully observing the plants of the genus in Japan and Himalaya, and we are cultivating in Japan all races except for the Chinese ones, namely *H. japonica* var. *japonica*, var. *parvifolia*, var. *hypoleuca*, subsp. *liukiensis*, subsp. *formosana* and *H. himalaica*.

The morphological differences between those species were briefly summarized by the senior author in 1966. But there still remain various problems which need further careful investigations especially in natural habitats.

For example, the colour of ripe fruits seems to be stable in the same race, but is often difficult to ascertain from herbarium specimens. In Japan all plants of *H. japonica* including var. *parvifolia* have consistently black fruits which turn from green to black when ripe (Pl. 5c). Subsp. *liukiensis* of Ryukyu and subsp. *formosana* of Formosa also have black fruits. On the other hand, *H. himalaica* from Himalaya always has red ripe fruits, as illustrated in colour in Pl. 5a, b.

In China, however, both black-fruited and red-fruited races occur. The Chinese plants referred to *H. japonica* and its var. *hypoleuca* have black fruits, and also *H. omeiensis* and its var. *oblanceolata* seem to have black fruits. While typical *H. chinensis* with linear-lanceolate leaves has red fruits, although Fang (1951) described the fruits of *H. chinensis* as black. Its broad-leaved var. *crenata* also seems to have red fruits. But according to the observations by Fang (1951) in China, the

fruits become red and then turn to black when mature. It may be true in some Chinese races, but such a change in colour never happens in Japan and Himalaya.

Cytologically *Helwingia japonica* from Japan has long been regarded as a high polyploid with more than 100 somatic chromosomes. The diploid number  $2n=38$  was first established in *H. himalaica* by the junior author in 1965. Since then she has examined cytologically several different races of the genus, and the results obtained are summarized below and in Pl. 33. It is noteworthy that the plants from Formosa and Ryukyu, and also the plant (*H. japonica* var. *hypoleuca*) raised from seeds collected in W. Hupeh (E. H. Wilson no. 132), are diploid. *H. japonica* var. *parvifolia* from south-western Japan seems to include both diploid and tetraploid races, and typical var. *japonica* from Japan is considered as hexaploid.

The pollen grains were also examined in various races. They are tricolporate (very rarely with 4 colpi) and finely spinulate (spinules less than  $1\mu$  long) on the surface. Except for *H. japonica* var. *japonica*, there are no remarkable differences in size and shape of grains among *H. japonica* var. *parvifolia*, subsp. *liukiensis*, subsp. *formosana*, and *H. himalaica*. The pollen grains of var. *japonica* (hexaploid) are slightly larger ( $18-26 \times 18-26\mu$  in size) statistically than those of the other ones ( $14-22 \times$

Chromosome numbers of the genus *Helwingia*

Species	2n	Locality	Author
<i>Helwingia japonica</i>	$\pm 80$	Cult.	Dermen 1932
	74, 144	Japan	Wanschler 1933
var. <i>japonica</i>	120	Mt. Haguro, Prov. Shimotsuke	Nakajima 1944
	ca. 114	Karuizawa, Prov. Shinano	Kurosawa 1966
	114	Mt. Takao, Tokyo	Kurosawa 1966
	114	Jinmuji, Prov. Sagami	Kurosawa 1966
	114	Mt. Kiyosumi, Prov. Awa	Kurosawa unpubl.
var. <i>parvifolia</i>	38	Kawadzu, Prov. Idzu	Kurosawa ex Hara 1972
	38	Mt. Fujiwara, Prov. Ise	Kurosawa unpubl.
	38	Kitayama, Prov. Kii	Kurosawa unpubl.
	38	Shirakodani, Prov. Tosa	Kurosawa unpubl.
	38	Monobemura, Prov. Tosa	Kurosawa unpubl.
	38	Yabudai, Prov. Suwo	Kurosawa unpubl.
	38	Mt. Tenno, Prov. Hizen	Kurosawa unpubl.
	38	Mt. Seburi, Prov. Hizen	Kurosawa unpubl.
	38	Mitsuse-tōge, Prov. Hizen	Kurosawa unpubl.
	38	Mt. Kanmuri, Prov. Satsuma	Kurosawa unpubl.
	76	Taishakukyo, Prov. Aki	Kurosawa unpubl.
	76	Mt. Tara, Prov. Hizen	Kurosawa unpubl.
	76	Mt. Kirishima, Prov. Hiuga	Kurosawa unpubl.
	var. <i>hypoleuca</i>	38	Cult., Edinb. Bot. Gard.
ssp. <i>liukiensis</i>	38	Mt. Katsūdake, Okinawa	Kurosawa ex Hara 1972
ssp. <i>formosana</i>	38	Keito Experim. Forest, Formosa	Kurosawa 1971
	38	Mt. Nankotaisan, Formosa	Kurosawa 1971
<i>H. himalaica</i>	38	Ghum, Darjeeling	Kurosawa 1965

14–22 $\mu$ ), but the differences are not very striking.

The structure of leaves was also studied. In *H. japonica* var. *japonica*, the leaves are thinner, the cuticular layer is hardly developed on the surface, the cell-wall of epidermal cells is thin, and the lateral veins are distinctly elevated on the lower surface. The leaves of *H. himalaica* are nearly the same as those of *H. japonica*, but their cuticular layer is very slightly thicker. But in *H. chinensis*, the cuticular layer of leaves is well developed and 3.5–5 $\mu$  thick, and also the cell-wall of the epidermal cells is sclerified, and the lateral veins are not prominently elevated. Still more in *H. omeiensis*, the cuticle of leaves is as much as 5–7 $\mu$  thick, and the lateral veins are not elevated on the lower surface.

The undersurface of leaves was studied by scanning electron microscope. In *H. japonica* var. *hypoleuca* and var. *nanchuanensis*, the underside of leaves is covered with small papillae, and further the whole surface including that of papillae is densely and very minutely papillose under microscope (Pl. 31). In other races, the underside of leaves is almost smooth or slightly wrinkled or rugose but not papillose. However, the presence of very minute papillae on the surface seems not to be stable. In *H. omeiensis*, the undersurface is almost smooth in one specimen, but very minutely papillose in another specimen (Pl. 32). Regarding stomata, they are elliptic, and 38–48 $\mu$  × 27–43 $\mu$  in size, and larger in *H. japonica* var. *japonica*. While the stomata of diploid races of *H. japonica* are slightly smaller and generally 21–38 $\mu$  × 20–27 $\mu$  in size. In *H. himalaica* the length of stomata is similar to that of other diploid races, but they are much more roundish.

For this studies we have examined a large number (over 400) of specimens of the genus in many herbaria which include authentic specimens of almost all taxa hitherto published. We wish to express our sincere thanks to the authorities of the following herbaria for enabling us to study the specimens in their charge: British Museum (Natural History), London (BM), Royal Botanic Gardens, Kew ( $\kappa$ );

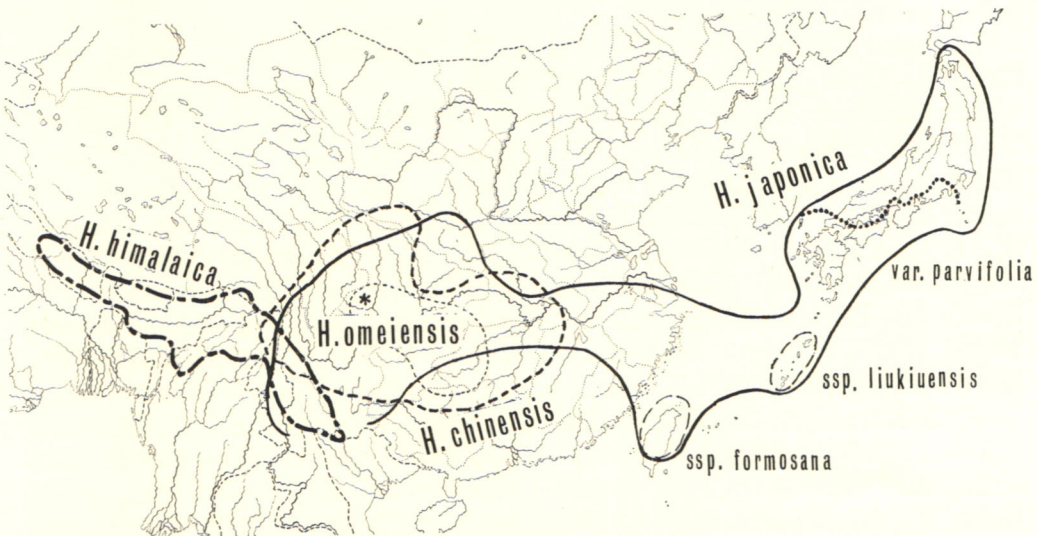


Fig. 72. Map showing an outline of distribution of the species of *Helwingia*.

Royal Botanic Garden, Edinburgh (E); Harvard Herbaria, Cambridge, U.S.A. (GH, A); New York Botanical Garden (NY); U. S. National Museum, Washington, D. C. (US); Central National Herbarium, Calcutta (CAL).

1) **Helwingia japonica** (Thunb.) F. G. Dietrich, Nachtr. Vollst. Lex. Gartn. Bot. **3**: 660 (1817)—Nakai in Bot. Mag. Tokyo **23**: 42 (1909)—Wangerin in Engl., Pfl.-reich IV-229 (Ht. 41): 35, f. 7 (1910)—Matsumura, Ind. Pl. Jap. **2**(2): 447 (1912)—Rehder in Sarg., Pl. Wilson. **2**: 570 (1916); Man. ed. 2, 681 (1940); Bibl. 495 (1949)—Hand.-Mazzetti, Symb. Sin. **7**: 685 (1933)—Fang in Act. Phytotax. Sin. **1**: 165 (1951)—Ohwi, Fl. Jap. 868 (1953); ed. Eng. 687 (1965); ed. 2, 1004 (1965)—Hara, Enum. Spermat. Jap. **3**: 337 (1954); Fl. E. Himal. 645 (1966)—Kitamura et Murata, Col. Ill. Woody Pl. Jap. **1**: 194, f. 115 (1971)—Icon. Cormophyt. Sin. **2**: 1110, f. 3949 (1972).

*Osyris japonica* Thunb., Fl. Jap. 31 (1784); Icon. Pl. Jap. **3**: t. 1 (1801).

*Helwingia rusciflora* Willd., Sp. Pl. **4**: 716 (1806), nom. superfl.—Sieb. et Zucc., Fl. Jap. **1**: 164, t. 86 (1835)—Decaisne in Ann. Sci. Nat. ser. 2, **6**, Bot.: 69, t. 7 (1836).

*H. japonica* (Thunb.) Morren et Decaisne in Bull. Acad. Sci. Brux. **3**: 170 (1836).

*H. szechuanensis* Fang, l.c. 167, f. 1 (1951).

subsp. **japonica** var. **japonica**.

[Pls. 5c, 16, 17. Fig. 73]

Leaves obovate-*elliptic* 4–15 cm long 1.5–7 cm wide, abruptly acuminate at the apex, broadly cuneate or roundish at the base, *crenate-serrate*, *teeth* incurved *aristate-cuspidate* at the apex, herbaceous dull green above pale green beneath, lateral veins 4–6-pairs impressed above and *conspicuously elevated beneath*, petioles 1–4 cm long; stipules 4–6 mm long *lacinate* into white flexuous filiform lobes. Male flowers *green* 4–6 mm in diameter, stamens 1–2 mm long, pedicels 1–4 mm long. Fruits always *black* when ripe, 7–8.5 mm long 6–9 mm in diameter; stones oblong 6–7 mm long reticulate.  $2n=ca. 114$ .

Representative specimens:

Hokkaido. Tanihujigawa, Prov. Iburi (I. Yamamoto, Jul. 27, 1939, KYO); Hakodate-Yama (S. Nozawa, Sep. 1887, fr., SAP).

Honshu. Prov. Mutsu: Shiriya-Kuwabata-yama, Shimokita (H. Ohashi, Jul. 31, 1964, TI); Natsudomari Penin. (K. Hosoi, Jun. 7, 1953, TI). Prov. Ugo: Nibetsu (H. Muramatsu, Jun. 30, 1929, TI); Mayama, Oga Penin. (R. Fujii, May 21, 1959, fl., TI); Kabuto-iwa, Yamadera (H. Ohashi, Y. Tateishi & H. Ohba, Aug. 3–4, 1970, TI). Prov. Rikuzen: Sendai (Y. Ogura, Jun. 26, 1916, fr., TI). Prov. Iwaki: Hagurosan, Sôma-shi (S. Kurosawa, May 18, 1958, TI). Prov. Iwashiro: Mt. Bandai (H. Hara, Aug. 2, 1957, TI). Prov. Hitachi: Mt. Tsukuba (M. Honda, May 2, 1926, TI). Prov. Shimotsuke: Urami, Nikko (H. Ito, 1931, TI). Prov. Kodzuke: Mt. Myogi (H. Kanai, May 19, 1962, fl., TI). Prov. Awa: Mt. Kiyosumi (H. Kanai, Jul. 29, 1948, TI). Prov. Musashi: Kariyose-yama (T. Nakai, May 8, 1930, TI); Shimura (M. Honda, Apr. 27, 1924, TI); Mt. Takaosan (K. Hisauchi, Jun. 30, 1918, TI). Prov. Sagami: Yokohama (Maximowicz, 1862, fr., K); Jinmuji (Y. Momiyama, May 7, 1933, fl., TI); Mt. Ôyama (K. Hisauchi, May 21, 1914, fl., TI). Prov. Idzu: Motomura, Oshima Is. (M. Mizushima, Sep. 20, 1950,



Fig. 73. *Helwingia japonica* (Th.) Dietr. var. *japonica*. a. Leaf,  $\times 1$ . b. Leaf-margin,  $\times 5$ . c-i. Stipules,  $\times 10$ . j. Cross section of leaf.  $\times 3$ , k. Cross section of midrib of leaf. l. A part of the upperside of k, mag.

тi). Prov. Shinano: Usui Pass (H. Hara & S. Kurosawa, Aug. 10, 1971, тi); Mt. Hachibuse (S. Momose, Jul. 29, 1933, fr., тi). Prov. Kai: Mt. Mishōtai (H. Kanai, Jun. 4, 1956, тi); Oshino, Mt. Fuji (M. Togashi, May 23, 1964, тi). Prov. Suruga: Mt. Kunosan (M. Mizushima, Dec. 13, 1951, тi); Tokusa, Ikawa-mura (M. Matsuda, Jul. 8, 1954, тi). Prov. Mikawa: Higashisonome, Tōei-machi (K. Torii, Jul. 10, 1949, тi). Prov. Kaga: Chūgū-onsen (N. Satomi, Jun. 5, 1951, тi). Prov. Etchu: Futakamiyama, Takaoka-shi (N. Satomi, May 12, 1963, тi). Prov. Omi: Mt. Ibuki (Kitamura & Murata, Jul. 7, 1963, кyo); Mt. Hiei (H. Yamamoto, Jun. 4, 1933, тi). Prov. Tanba: Asiu (T. Nakai, Jul. 16, 1940, тi). Prov. Tango: Mt. Misen (G. Koidzumi, May 27, 1928, кyo). Prov. Kawachi: Mt. Kongōsan (T. Nakai, Nov. 1921, тi). Prov. Kii: Akitsukawa-mura (T. Nakajima, Jun. 22, 1930, тi). Prov. Hōki: Mt. Daisen (Y. Okamoto, кyo). Prov. Oki: Okino-shima (G. Koidzumi, Jul. 1924, кyo). Prov. Iwami: Azōjisan, Nanukaichimura (H. Kanai, Oct. 29, 1958, тi). Prov. Aki: Garyusan, Geihoku-machi (H. Kanai, Oct. 15, 1955, тi).

Shikoku. Prov. Tosa: Mt. Ishidate, 800 m (H. Ohashi, Jun. 20, 1966, тi).

Kyushu. Prov. Buzen: Iwatake (Matsumura?, Aug. 3, 1882, тi). Prov. Hizen: Miadzi, Nagasaki (Maximowicz, 1863, fl., к, вm). Prov. Higo: Kishimadake, Mt. Aso, 1000 m (H. Kanai, Oct. 29, 1958, тi); Mt. Nokeeboshi (T. Shimizu, Aug. 29, 1959, кyo). Prov. Hiuga: Mi-ike, Higashi-Kirishima, 400 m (M. Togashi, Apr. 27, 1970, тi). Prov. Osumi: Mt. Takakuma (H. Ohba & J. Murata, Jul. 3, 1974, тi). Prov. Satsuma: Kamuridake, Kushikino-shi, 500 m (M. Togashi, Apr. 25, 1970, тi).

China. Chekiang: Tihtaishan (R. C. Ching no. 1418, e); Tien Mou Shan (R. C. Ching no. 4998, к, e).

Anhwei: Tien Chu Shan (Fan & Li no. 233, вm); Chiu Hwa Shan (Fan & Li no. 94, к, e); *ibid.* (R. C. Ching no. 2800, к, e); Wang Shan (A. N. Steward no. 7135, fr., a, к).

Kiangsi: Lu Shan (N. K. Ip no. 1093, к).

Hupei: Patung (Henry nos. 2849 & 3775, к); W. Hupei (Henry no. 5282E, вm, к); W. Hupei (E. H. Wilson, no. 632, к, e).

Kweichow: Fan Ching Shan (Steward, Chiao & Cheo no. 503, вm).

Yunnan: E. flank of Tali Range (Forrest no. 4608, к, e); E. flank of Lichiang Range (Forrest no. 5758, e, к); Lichiang Range (Forrest no. 10060, e, к, вm); Mekong-Salwin Divide (Forrest no. 14600, fr. black, e); Chienchuan-Mekong divide (Forrest no. 21942, fr. black, a, e, к); Ho-ki-keon (Maire no. 481, fr. black, e); Atuntze (T. T. Yü no. 10183, fr. black, e, вm); Lichiang Snow Range (T. T. Yü no. 15042, вm, e); without precise locality (K-Ward no. 641, e); (Y. Tsiang no. 13202, к).

Szechuan: Nanchuan (Fang nos. 965, 1008 & 1118, e); Kuan Hsien (Fang no. 2197, fr. black, e); Mt. Omei (Fang nos. 3094, e; 6565, к; 7661, к; 7758, к; 12665, вm); Mt. Omei (S. S. Chien no. 5530, e); Mt. Omei (H. C. Chow no. 7574, a); Pao-hsing-hsien (K. L. Chu nos. 3161, 3203 & 3534, вm, e); Szechuan sept. (Potanin, Aug. 13, 1885, к). Szechuan-Tibet, Tachienlu (Pratt no. 62, к, вm).

Distr. S. Hokkaido, Honshu (alt. 100-1400 m), Shikoku, Kyushu, and C. & W.

China.

Typical var. *japonica* from Japan seems to be hexaploid, and has usually large herbaceous broad leaves, divided flexuous stipules, larger green flowers, shorter pedicels of male flowers, and invariably black fruits. Narrow-leaved individuals (f. *lancifolia* Hayashi in Bull. Forest Exper. Stat. **107**: 28, t. 3, f. 29, 1958) are rarely found in Central Honshu.

The plants from Kyushu sometimes show intermediate morphological characters between var. *japonica* and var. *parvifolia*, and also a tetraploid race was found in Kyushu. More detailed studies are needed on the plants from Kyushu (see a note under var. *parvifolia*). The occurrence of this species in Is. Yakushima is uncertain.

Handel-Mazzetti (1933) and Fang (1951) included various specimens with broad leaves from China in *H. japonica*. But the specimens from N. Burma and Bhutan cited by them under *H. japonica* are, in our opinion, identical with *H. himalaica*. Some Chinese specimens (Pl. 17) agree well with typical *H. japonica* of Japan in leaves, stipules, flowers and fruits, and they cannot be distinguished from the Japanese specimens also in pollen and stomata. Judging from the original description and figure, *H. szechuanensis* Fang seems to be an extreme form of *H. japonica* with fruits in the upper part of leaves.

However, these Chinese plants have hitherto never been cytologically studied, and it is urgent to know whether the Chinese plants referred to *H. japonica* are hexaploid as var. *japonica* or not.

1a) *H. japonica* var. **parvifolia** Makino in Bot. Mag. Tokyo **27**: 80 (1913)—Hara, Enum. Spermat. Jap. **3**: 337 (1954)—Yamanaka in Journ. Jap. Bot. **41**: 375 (1966)—Kitamura et Murata, Col. Ill. Woody Pl. Jap. **1**: 195 (1971).

[Pl. 19a. Fig. 74a-i]

*H. japonica* f. *parvifolia* (Makino) Sugimoto et f. *microphylla* Sugimoto, New Key Jap. Tr. 462 (1961).

Leaves smaller (2–)3–6(–8) cm long (1–)1.5–3(–4) cm wide, dark green and often somewhat glossy above, light green beneath, lateral veins 2–3(–4)-pairs; stipules divided as in the type, but often smaller 1.5–4 mm long. Anthers smaller. Fruits black.  $2n=38$  (or 76).

Representative specimens:

Japan. Honshu. Prov. Kai: Shimobe (K. Hisauchi, Jul. 21, 1939, fr.,  $\tau$ ); Kainokoma, 900 m (H. Uematsu, Jul. 28, 1949, fr.,  $\tau$ ). Prov. Idzu: Nekko, Mt. Amagi (T. Nakai, Jun. 1932, fr.,  $\tau$ ); Kawadzu (H. Hara & S. Kurosawa, Apr. 25, 1972,  $\tau$ ); Simoda (C. Wright 1853–56, GH, NY, K). Prov. Suruga: Subashiri-Ipponmatsu (Y. Satake, May 26, 1935, fl.,  $\tau$ ); Mt. Ryusô (M. Honda, Jun. 16, 1935, fr.,  $\tau$ ); Sakashita, Setonoya-mura (D. Shimidzu, Oct. 20, 1929,  $\tau$ ). Prov. Totomi: Misakubo-Yamadzumi (H. Hara, May 5, 1957, bud,  $\tau$ ). Prov. Kii: Doba, Kitayama-mura (H. Hara & S. Kurosawa, Jun. 1, 1961,  $\tau$ ); Ikuma-mura, Nishimuro-gun (T. Nakajima, Jun. 8, 1930, fr.,  $\tau$ ). Prov. Yamashiro: Kibune (T. Nakai, Jul. 19, 1940, fr.,  $\tau$ ). Prov. Settsu: Maya-san (S. Okamoto, Jun. 6, 1936,  $\tau$ ). Prov. Bizen: Tanagase, Niimi (T. Shimidzu, Sep. 13, 1958,  $\kappa\gamma$ ). Prov. Aki: Gokurakujiyama (Z. Tashiro, May 27, 1928,  $\kappa\gamma$ ). Prov. Suwo: Namerayama Forest (K. Oka, Aug. 6, 1948,  $\kappa\gamma$ ). Prov. Nagato: Naganobori, Mine-gun (T.

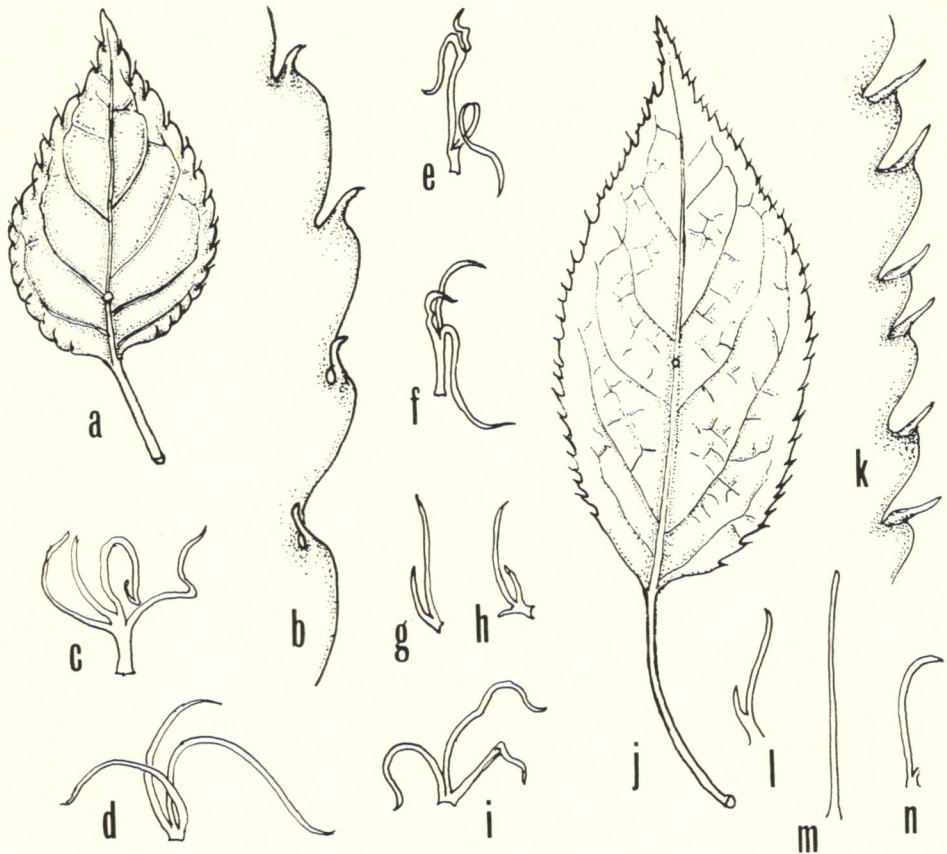


Fig. 74. *Helwingia japonica* var. *parvifolia* Makino (a-i) and var. *hypoleuca* Hemsl. ex Rehder (j-m). a & j. Leaf,  $\times 1$ . b & k. Leaf-margin,  $\times 5$ . c-i & l-n. Stipules,  $\times 10$ .

Nakai, Oct. 1920,  $\pi$ ).

Shikoku. Prov. Awa: Shimomyō, Nishi-iyayama (Yatabe?, Jul. 25, 1888,  $\pi$ ). Prov. Tosa: Mt. Ishidate (H. Ohashi, Jun. 20, 1966, fr.,  $\pi$ ); Nanokawa-mura (K. Watanabe, Apr. 25, 1889, fl.,  $\pi$ ). Prov. Iyo: Mt. Onigajō (T. Nakai,  $\pi$ ).

Kyushu. Prov. Tsushima: Hidakatsu, Kamitsushima (T. Nakai, Jul. 28, 1921,  $\pi$ ). Prov. Buzen: Ehikosan (Faurie no. 55, May 3, 1907, A,  $\kappa\gamma\omicron$ ). Prov. Hizen: Mt. Tara (K. Ohki, Aug. 6, 1934,  $\pi$ ); Mt. Kinugasa, Unzen (H. Hara, Oct. 17, 1941,  $\pi$ ). Prov. Hiuga: Shiiba-mura (H. Kanai, Oct. 21, 1958,  $\pi$ ); Udo-jingū (T. Yamazaki, May 2, 1954,  $\pi$ ). Prov. Osumi: Tashiro-mura (Z. Tashiro, Jul. 28, 1928,  $\kappa\gamma\omicron$ ).

Distr. South-western Honshu, Shikoku, and Kyushu (in forests at lower altitudes below 900 m high).

Typical var. *parvifolia* (Pl. 19a) has smaller often roundish dark green and somewhat glossy leaves with 2-3 pairs of lateral veins, and was proved to be diploid by the junior author for the first time. It is distributed in the south-western parts of



Japan, and in Shikoku and Kyushu var. *parvifolia* is more common than var. *japonica*. The variety often occurs at the lower altitudes than var. *japonica*.

But intermediate forms with larger often elongate leaves with 4–5-pairs of lateral nerves are found here and there. It is remarkable that some of them from Prov. Hizen, Prov. Hiuga, and also from Prov. Aki have ca. 76 somatic chromosomes (Pl. 33g), and are possibly tetraploid (see a note under *H. japonica* var. *japonica*). It is uncertain whether this tetraploid race was derived from diploid var. *parvifolia*, or it is of a hybrid origin between diploid var. *parvifolia* and hexaploid var. *japonica*.

1b) *H. japonica* var. **hypoleuca** Hemsley ex Rehder in Sarg., Pl. Wilson. **2**: 570 (1916)—Hand.-Mzt., Symb. Sin. **7**: 686 (1933)—Fang in Act. Phytotax. Sin. **1**: 166 (1951). [Pl. 18c, d. Fig. 74j–m]

*H. rusciflora* Willd. sensu Hemsley in Journ. Linn. Soc. **23**: 441 (1888), p.p.

Leaves ovate-oblong 4–9 cm long 1.8–4 cm wide long-acuminate at the apex, crenate-serrate with incurved long-cuspidate teeth, thick-herbaceous dull green above, more or less *glaucous* and *densely covered with small papillae* under lens on the lower surface, lateral veins 4–5-pairs, stipules to 2 mm long *1–3-divided*.  $2n=38$ .

Specimens examined:

China. Yunnan: Lichiang Range (McLaren no. C45, κ).

Szechuan: Mt. Omei (Fang no. 2793, ε); *ibid.* (L. Y. Tai no. T142, fr. black, A); E. Szechuan (Farges no. 758, A).

Shensi: Tai-pei-shan (Purdum no. 901, κ); (Giraldi, Jul. 16, 1897, κ).

Hupei: Patung (Henry no. 1706—type of var. *hypoleuca*, A, κ); W. Hupei (E. H. Wilson no. 132, ε; no. 132a, A).

Fortunately we could cytologically examine a plant of this variety cultivated in the Royal Botanic Garden at Edinburgh. The plant was raised from the seeds of Wilson No. 132 from Hupei, and was proved to be diploid with 38 somatic chromosomes.

In this variety the underside of leaves is densely and minutely papillose, and moreover the whole surface even of papillae is densely covered with very minute papillae under microscope (Pl. 31a, b). But some Chinese specimens seem to be intermediate between var. *hypoleuca* and var. *japonica*.

1c) *H. japonica* var. **nanchuanensis** Fang in Act. Phytotax. Sin. **1**: 167 (1951). [Pl. 18a, b]

Shrub ca. 6 m high. Leaves *oblong-lanceolate* 4.5–5 cm long 12–15 mm wide *acutish* at the apex obtuse or cuneate at the base, *minutely serrate* with many small teeth, somewhat thick, lateral veins 4–5-pairs *conspicuously impressed above elevated beneath*, petioles 2–3 cm long slender, stipules *subulate* sometimes bifid.

Specimen examined:

China. Szechuan: Jin-fo-shan, Nanchuan Hsien (C. Y. Hwang no. 91, Aug. 1926, fr. green—isotype, A).

It is noteworthy that the underside of leaves is minutely papillose as in var. *hypoleuca* (Pl. 31c, d). In some morphological characters the specimen resembles *H. himalaica* var. *parvifolia* and also *H. omeiensis* var. *oblanceolata*. But the material of this variety is too scanty to fix its real affinity.

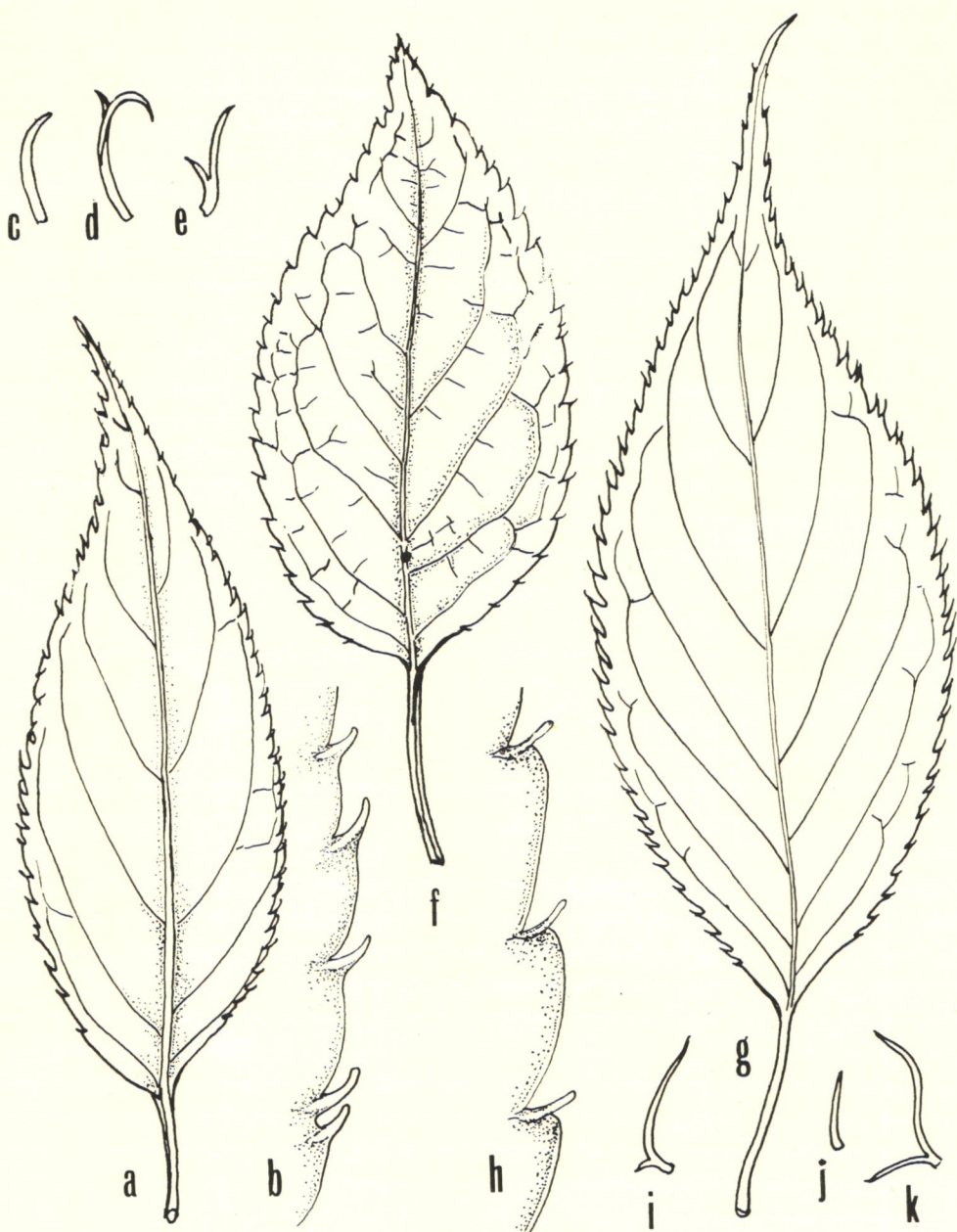


Fig. 75. *Helwingia japonica* subsp. *liukiensis* (Hatus.) Hara et Kurosawa (a-e) and subsp. *formosana* (Kanch. et Sasaki) Hara et Kurosawa (f-k). a, f & g. Leaf,  $\times 1$ . b & h. Leaf-margin,  $\times 5$ . c-e & i-k. Stipules,  $\times 10$ .

1d) *H. japonica* subsp. **liukiensis** (Hatusima) Hara et Kurosawa, stat. nov.  
[Pl. 19b. Fig. 75a-e]

*H. rusciflora* Willd. sensu Ito et Matsumura, Tent. Fl. Lutch. 536 (1899).

*H. liukiensis* Hatusima in Journ. Jap. Bot. **12**: 874 (1936)—Hara, Enum. Spermat. Jap. **3**: 337 (1954)—Masamune in Sci. Rep. Kanazawa Univ. **3**: 295 (1955)—Hatusima, Fl. Ryukyus 457 (1971).

*H. japonica* var. *liukiensis* (Hatusima) Murata [in Kitamura et Murata, Col. Ill. Woody Pl. Jap. **1**: 195 in textu (1971), comb. nud.] in Act. Phytotax. Geobot. **25**: 39 (1972).

Leaves oblong-lanceolate-ovate 5–18 cm long 2–8 cm wide, caudate-acuminate at the apex, broadly cuneate at the base, *aristate-serrate*, herbaceous somewhat thickish and *glossy*, lateral veins 4–6-pairs obscurely impressed above *slightly elevated beneath*; petioles 0.8–6 cm long; stipules 1–3 mm long *filiform* mostly undivided sometimes 1–2-serrulate. Male flowers green ca. 4 mm in diameter, pedicels 1.5–5 mm long. Fruits *black* when mature 5–6 mm in diameter, stones ca. 5 mm long, reticulate-pitted.  $2n=38$ .

Representative specimens:

Amami-Oshima: Okumata, Naze City (Hatusima & Sako nos. 21848 & 21849,  $\tau_1$ ); Yuwan, 50 m (Sako no. 6007, fl.,  $\tau_1$ ); Yuwan-dake (Enomoto, Apr. 26, 1969 fl.,  $\tau_1$ ); Nishinahama, 100 m (Fukuoka no. 7900, fl.,  $\tau_1$ ); Shidokan, 200 m (Sako no. 5959, fr.,  $\tau_1$ ).

Okinawa (T. Miyagi, young fr.,  $\tau_1$ ); Onnadake, 200 m (Hatusima no. 17839,  $\tau_1$ ); Katsūdake, 300–400 m (Yamazaki no. 311, fr.,  $\tau_1$ ); Hentona-Yonahadake (Y. Kimura & Hurusawa, Sep. 17, 1940,  $\tau_1$ ); Mt. Nago, 300 m (Kurata & Nakaike no. 1406,  $\kappa_0$ ,  $\kappa$ ).

Distr. S. Kyushu (Amami-Oshima, Tokunoshima) and Ryukyu (Okinawa, Ihiya).

The Ryukyu plants are closely related to *H. japonica*, but are distinguishable from the latter in having lustrous leaves with less conspicuous veins when fresh, generally undivided shorter stipules, and 38 somatic chromosomes.

1e) *H. japonica* subsp. **formosana** (Kanehira et Sasaki) Hara et Kurosawa, stat. nov. [Pl. 19c. Fig. 75f-k]

*H. rusciflora* Willd. sensu Hayata, Gen. Ind. Fl. Formos. 33 (1917).

*H. formosana* Kanehira et Sasaki in Kanehira, Formos. Tr. ed. rev. 532, f. 491 (1936).

*H. japonica* Dietr. sensu Liu, Ill. Lign. Pls. Taiwan **2**: 955, f. 788 (1962).

*H. chinensis* Batal. sensu H. L. Li, Woody Fl. Taiwan 679, f. 284 (1963).

*H. japonica* var. *formosana* (Kanehira et Sasaki) Kitamura [in Kitamura et Murata, Col. Ill. Woody Pl. Jap. **1**: 195 in textu (1971), comb. nud.] in Act. Phytotax. Geobot. **25**: 39 (1972).

Leaves oblong-lanceolate-elliptic 5–12 cm long 1.5–6 cm wide, *caudately acuminate* at the apex, broad-cuneate at the base, *closely aristate crenate-serrate*, herbaceous, lateral veins 5–6-pairs, veins impressed above *conspicuously elevated beneath*; petioles 0.5–5 cm long; stipules 0.5–2 mm long *filiform* undivided or 2–3-divided. Male flowers light green 3.5–5 mm in diameter; pedicels 1.5–3 mm long, often on bract-like leaves. Fruits globose *black* when mature, 5–7 mm across.  $2n=38$ .

## Representative specimens:

Formosa. Mt. Taipei-zan (Hayata & Sasaki, May 7, 1917, fl. ♂-isosytype,  $\tau_1$ ); Keitao (Hayata, Apr. 12, 1916, fl. ♀,  $\tau_1$ ); Nantou Hsien (M. T. Kao no. 7176, fr.,  $\tau_1$ ); Nanhutashan, 1700 m (Yamazaki et al. no. 542,  $\tau_1$ ); Tawushan (Namba et al. no. 382, fr.,  $\tau_1$ ); Arisan, 2500 m (Faurie no. 437,  $\kappa_0$ ).

Distr. Formosa (in high montane forests, rare).

This subspecies is most closely related to *H. japonica*, but differs from the latter by somewhat elongate leaves with a caudate apex, shorter less divided stipules, and is diploid. In the shape of leaves it also resembles *H. himalaica*, but has leaves with aristate teeth and fewer conspicuous lateral veins, larger green flowers, and black fruits. *H. japonica* including subsp. *liukiuensis* and subsp. *formosana* are totally deciduous, but in *H. himalaica* the leaves persist throughout winter in warmer places or in green house. It is presumed that a diploid ancestral race had once been distributed continuously from China to Japan, then it was separated geographically in China, Formosa, Ryukyu, and Japan, and the populations in Formosa and Ryukyu have differentiated into different races.

2) ***Helwingia himalaica*** Hook. f. et Thoms. ex C. B. Clarke in Fl. Brit. Ind. **2**: 726 (1879)—Wangerin in Engl., Pfl.-reich IV-229 (Ht. 41): 37 (1910)—Rehder in Sarg., Pl. Wilson. **2**: 571 (1916), p.p.—Hand.-Mzt., Symb. Sin. **7**: 686 (1933), p.p.—Das, Fl. Assam **2**: 372 (1938)—Li in Taiwaniana **1**: 95 (1948), p.p.—Fang in Act. Phytotax. Sin. **1**: 168 (1951), p.p.—Hara, Fl. E. Himal. 232, 645 & 662, pl. 4a (1966); **2**: 92 (1971)—Icon. Cormophyt. Sin. **2**: 1111, f. 3951 (1972)—Stainton, Forests of Nepal f. 73 (1972). [Pls. 5a, b, 20. Fig. 76]

*H. japonica* var. *himalaica* (Hook. f. et Thoms.) Franchet, Pl. David. **2**: 67 (1885), quoad basionym tantum.

*H. lanceolata* Watt ex Das, l.c. 373 (1938), nom. subnud.

*H. himalaica* var. *lanceolata* Deb in Bull. Bot. Surv. Ind. **3**: 273 (1962).

Leaves *elongate* broad lanceolate—oblong sometimes elliptic 5–11(–18) cm long 1–4(–6.5) cm wide, *long-caudately acuminate* at the apex, broad cuneate or obtuse at the base, closely crenate-serrate with depressed *shortly cuspidate teeth*, rarely persistent, thick herbaceous, lateral veins *conspicuous* 5–9-pairs slightly impressed above *elevated beneath*; petioles 0.8–3.5 cm long; stipules *filiform* to 2 mm long undivided or divided into 2–3 filiform lobes. Male flowers green *often dark purplish* ca. 3–3.5 mm in diameter, often even on bract-like leaves; pedicels 0.5–3 mm long. Fruits consistently *red* when mature, 6–9 mm long, 6–8 mm in diameter, stones 5–6 mm long.  $2n=38$ .

## Representative specimens:

E. Himalaya (Griffith no. 4687, fr.,  $\kappa$ ).

Nepal: Siklis, N. of Pokhara, 7000 ft. (Stainton, Sykes & Williams no. 4919, BM, E); Arun Valley (Stainton no. 5930, BM); Minchin Dhap—Mul Pokhari (Hara et al. no. 6300518, fr. red,  $\tau_1$ ); Tamur Valley, 8000 ft. (Stainton no. 1301, fr., BM).

Darjeeling: 8000 ft. (C. B. Clarke no. 27361A, fr.,  $\kappa$ ); Senchal, 8000 ft. (Gamble no. 3043B & C,  $\kappa$ ; no. 8068,  $\kappa$ ); Ghum, 2300 m (Hara, Kurosawa & Ohashi nos. 69779 & 69780, fr. red,  $\tau_1$ ); Palmajua—Batasi, 2200–2100 m (Kanai et al., Aug. 8,

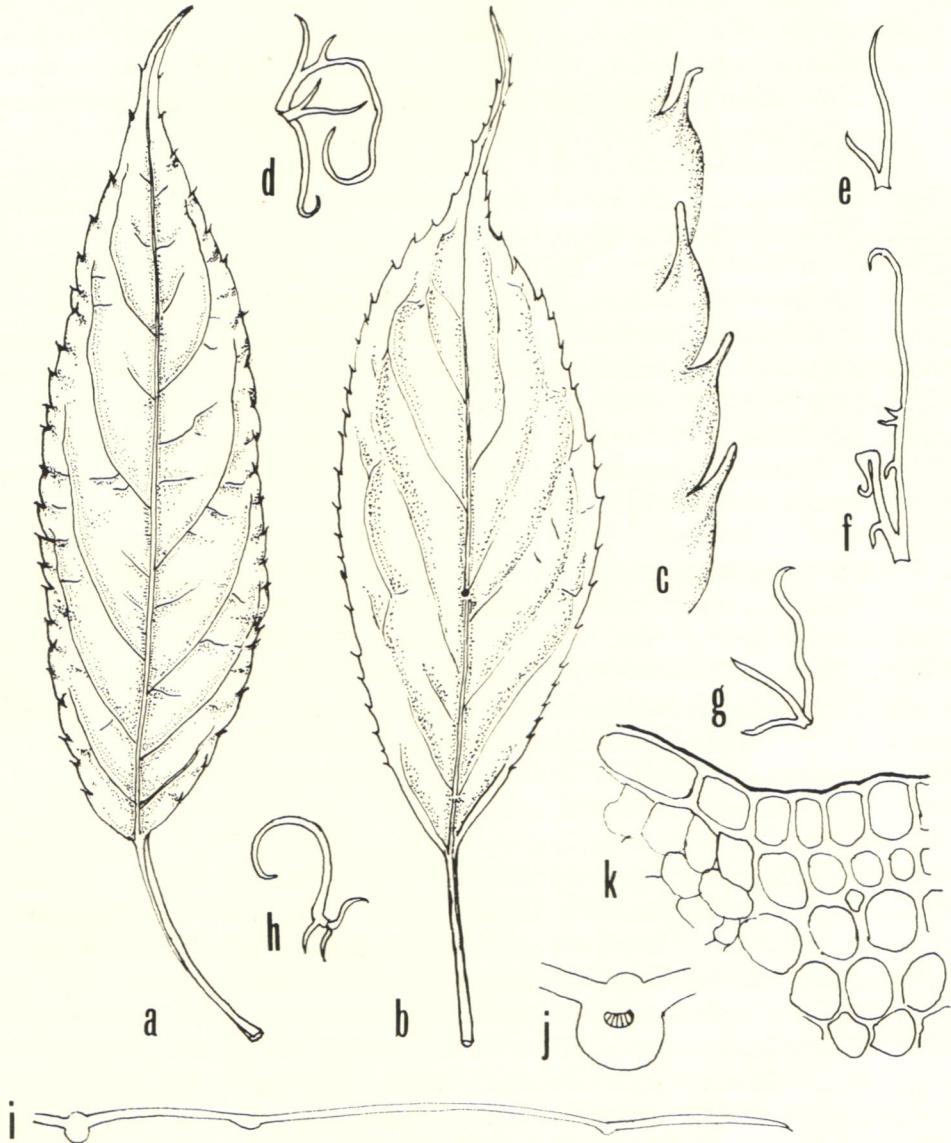


Fig. 76. *Helwingia himalaica* Hook. f. et Thoms. a, b. Leaf,  $\times 1$ . c. Leaf-margin,  $\times 5$ . d-h. Stipules,  $\times 10$ . i. Cross section of leaf,  $\times 3$ . j. Cross section of midrib of leaf. k. A part of the upperside of j, mag.

1972, fr. red,  $\pi$ ); Gairibas-Tonglu (Hara et al. no. 6135,  $\pi$ ).

Sikkim: 8-9000 ft. (Hooker f.-type of *H. himalaica*,  $\kappa$ ).

Bhutan: Duke La, Timpu, 10000 ft. (Cooper no. 2684, E, BM); Gasa-Pari La (Kanai et al. no. 12692,  $\pi$ ); Tamji-Gasa (Kanai et al. no. 13012,  $\pi$ ).

Assam: Delei Valley, 5-6000 ft. (K.-Ward no. 8104, fl.,  $\kappa$ ); Khasia, 5-7000 ft. (Hook. f. et Thoms.,  $\kappa$ ); Shillong (C. B. Clarke nos. 43411A & 44075J, BM);

Konoma (Watt no. 11532, CAL).

Manipur: Sirohifura, 8000 ft. (Watt no. 6465—type of var. *lanceolata*, CAL, K).

N. Burma: Seinghki Wang, 5000 ft. (K.-Ward no. 6714, E); Valley of Naungchaung, Lashi County (K.-Ward no. 1579, E); Laikam, Myitkyina (Kermode no. 17075, fl., K).

China. Yunnan: Kiukiang Valley, 1700 m (T. T. Yü no. 19402, E).

Tonkin: Chapa, 1500 m (Pételot no. 3126, US, NY; no. 5679, A); *ibid.* (Hayata, Jun. 21, 1917, fr. red-purple, TI).

Distr. Eastern Himalaya (C. Nepal to Bhutan, alt. 2000–3300 m), Assam, Manipur, N. Burma, W. China (Yunnan), and N. Tonkin.

The Himalayan plants are clearly distinguished from typical *H. japonica* of Japan by elongate and long-caudately acuminate leaves often with more lateral veins and with sharp (but not long-aristate) teeth, less-branched stipules, smaller often purplish flowers, always red ripe fruits, and are diploid. They also differ from typical *H. chinensis* by broader and closely serrate leaves with long-caudate apex and with conspicuous veins elevated beneath, and shorter pedicels of male flowers. The leaves of *H. japonica* of Japan are strictly deciduous, but in *H. himalaica* and *H. chinensis*, some leaves are persistent during mild winter.

Rehder (1916) first suggested that the fruits of the Himalayan specimens are red, and this fact has been verified by our field observations in Eastern Himalaya since 1960 (see Plate 5a, b). He also referred the Chinese specimens with red fruits from Szechuan to *H. himalaica*. Handel-Mazzetti (1933) noticed that they somewhat differ from typical *H. himalaica* but included the Chinese specimens even with linear-lanceolate leaves in *H. himalaica*. In our opinion, however, the Szechuan plants mostly belong to *H. chinensis*.

*H. himalaica*, *H. chinensis* and *H. japonica* meet in Yunnan of West China. It is true that some puzzling intermediate forms occur there, and it is difficult to identify some herbarium specimens from Yunnan and Szechuan. Handel-Mazzetti suggested the occurrence of a natural hybrid between *H. himalaica* and *H. japonica*. At present we cannot settle the problem, and it is essential to carry out careful observations in the field of the district, and cytological studies on the plants in question. West China is surely the secondary centre of differentiation of the genus.

2a) *H. himalaica* var. **parvifolia** H. L. Li in Journ. Arnold Arb. **25**: 310 (1944)—Fang in Act. Phytotax. Sin. **1**: 169 (1951). [Pl. 21a]

Leaves lanceolate 2–5.5(–7) cm long 5–12(–20) mm wide, caudate-acuminate at the apex, cuneate at the base, minutely serrate, old leaves thickish and slightly lustrous, lateral veins conspicuously elevated beneath.

Specimens examined:

China. Yunnan: Mts. of Londjire, 15–16000 ft. (Rock no. 8871, fl. ♂-type, A, us); Mengze, 5000 ft. (Henry no. 9032C, K, E, A); Pe-long-tsin, 3200 m (Maire no. 134, E); Weisi Hsien (Wang no. 67959, A).

The exact taxonomic status of this variety is uncertain. It may be only a small-leaved form of *H. himalaica*, or it may be related to *H. chinensis*. Henry no. 9032C from Yunnan seems to agree with var. *parvifolia*, but Henry nos. 9032 & 9032A resemble a broad-leaved form of *H. chinensis*.

3) ***Helwingia chinensis*** Batalin in Act. Hort. Petrop. **13**: 97 (1893)—Harms ex Diels in Engl., Bot. Jahrb. **29**: 505 (1900), p.p.—Wangerin in Engl., Pfl.-reich IV-229 (Ht. 41): 37, f. 8 (1910)—Rehder in Sarg., Pl. Wilson. **2**: 571 (1916), p.p.; Bibl. 495 (1949)—Hand.-Mzt., Symb. Sin. **7**: 688 (1933), p.p.—Fang in Act. Phytotax. Sin. **1**: 170 (1951), p.p.—Hara, Fl. E. Himal. 646 (1966)—Icon. Cormophyt. Sin. **2**: 1110, f. 3950 (1972).

var. ***chinensis***.

[Pls. 22–24, 26b. Fig. 77a–c, f, g, j–l]

*H. chinensis* var. a. *genuina* et b. *longipedicellata* Wangerin in Fedde, Rep. **4**: 337 (1907).

*H. chinensis* var. *macrocarpa* Pampanini in Nuov. Giorn. Bot. Ital. n.s. **17**: 681, f. 16a (1910)—Rehder, l.c. 571 (1916).

*H. himalaica* var. *stenophylla* Merrill in Brittonia **4**: 137 (1941)—Li in Journ. Arnold Arb. **25**: 310 (1944); in Brittonia **1**: 96 (1948).

Leaves linear-lanceolate–*lanceolate* 4–15 cm long 4–20 mm wide long-attenuate to the apex, *cuneate* or obtuse and often entire at the base, *remotely serrate* with *short suberect callose-tipped teeth*, sometimes persistent subcoriaceous, *lateral veins obscure*, smooth beneath; petioles 0.5–4 cm long; stipules generally *filiform*. Male flowers 3–4 mm in diameter; pedicels *capillary* 2–15(–25) mm long. Fruits *red* when ripe 5–9 mm in diameter, stones 5–6 mm long.

Representative specimens:

N. Burma. Ngawchang Valley, 5–6000 ft. (K.-Ward no. 63, young fr.—type of *H. himalaica* var. *stenophylla*, A, NY); without precise locality (K.-Ward no. 324, BM); Chimi-li Maikha–Salwin Divide (Forrest nos. 24967 & 25408, E, K).

China. Yunnan: E. flank of Tali Range (Forrest no. 4609, E; no. 4610, K, E\*); W. of Tengyueh (Forrest no. 7554, fr. red, K); East of Tali Range (Forrest no. 9828, K, E); Mekong–Salwin Divide (Forrest no. 20395, fr. crimson, K\*); without precise locality (Forrest no. 29073, E); Ta Tsin Teou (P. S. Ten no. 126, A; no. 127, E, US\*; no. 369, E); Shunning, Holungtan, 2950 m (T. T. Yü no. 16202, E\*).

Szechuan: Wushan (Henry no. 6719A, CAL—isosytype of *H. chinensis*); Kuan Hsien (S. S. Chien no. 5684, E); Mt. Omei (H. C. Chow nos. 8295 & 9924, fl., A); Omei Shan (W. P. Fang no. 7882, K); Kikiang Hsien (Fang no. 1334, E). W. Szechuan (E. H. Wilson no. 4471, K, BM\*).

Kansu: Kaon kia ho et Lao ling (Licent no. 5037, BM, K).

Kweichou: without precise locality (Cavalerie ann. 1905, E).

Hupei: Feng (Henry no. 6719, K, BM, GH, US); S. Patung (Henry no. 6719B, K, E); Ichang (Henry no. 5127, K, TI); Hsing-shan Hsien (E. H. Wilson no. 172, K, BM, E, A); Patung (Chow no. 133, E; no. 613, E\*).

Distr. N. Burma and W. & C. China (Yunnan, Szechuan, S. Kansu, Kweichou, Hupei).

Typical *Helwingia chinensis* is characteristic (Pls. 22 & 23) in having narrow-lanceolate coarsely serrate thickish leaves with obscure veins, less laciniate stipules, longer filiform pedicels of male flowers, and red fruits.

Rehder (1916) referred such specimens with black fruits as Wilson no. 4472 to *H. chinensis*, hence Handel-Mazzetti (1933) and Fang (1951) considered the fruits

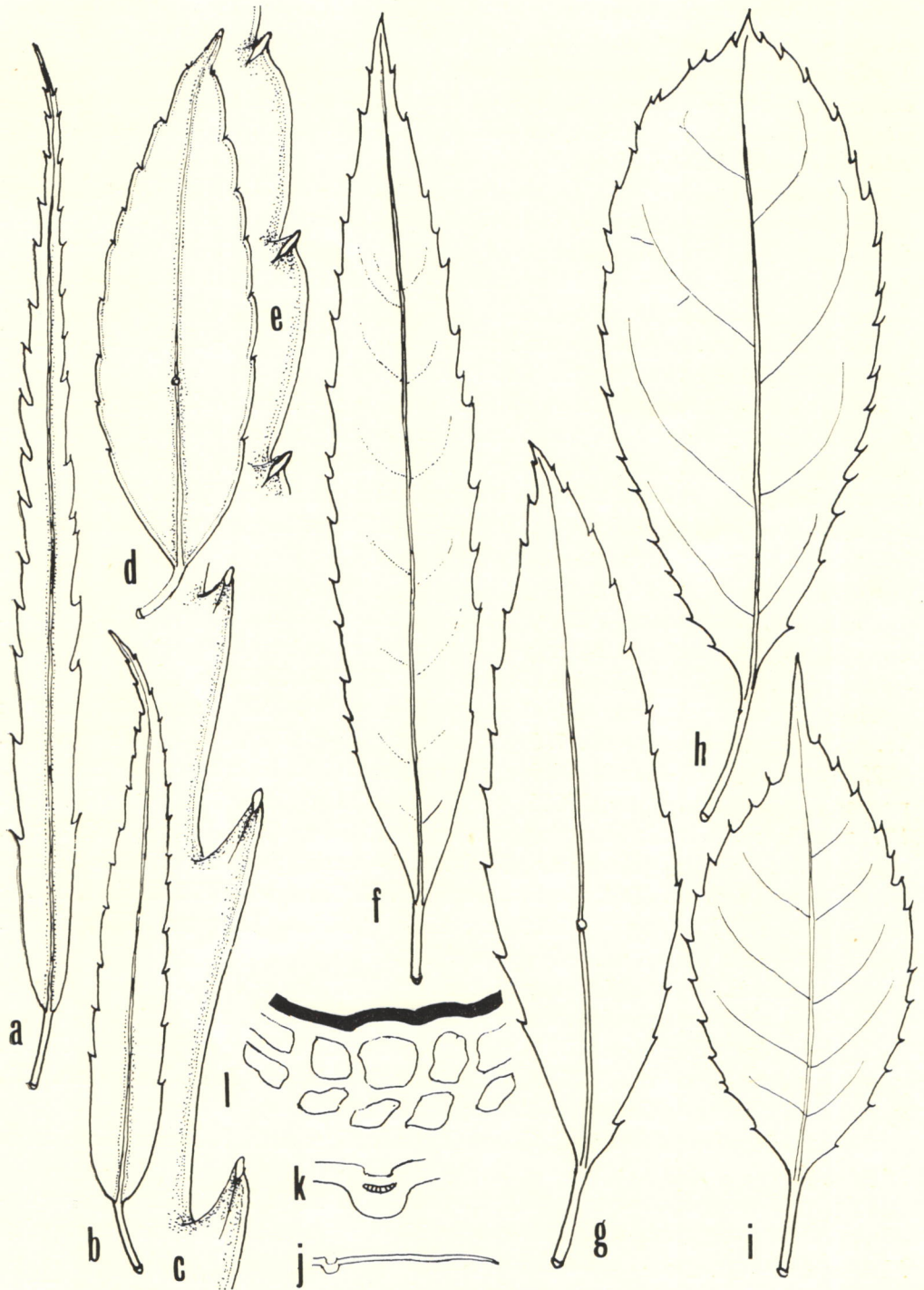


Fig. 77. *Helwingia chinensis* Batalin (a-c, f, g, j-l) and its var. *crenata* (Lingelsh.) Fang (d, e, h, i). Leaves,  $\times 1$ . a. Mt. Omei (Chow no. 8295). b, c. Mt. Omei (Chow no. 9924). d, e. Hupeh (Chun no. 3741). f, g. Hupeh (Chow no. 133, E). h, i. Kwangsi (Steward & Cheo no. 382). j. Cross section of leaf (Chow no. 9924),  $\times 3$ . k. Cross section of midrib of leaf. l. A part of the upperside of k, mag.



of *H. chinensis* as black. However, typical *H. chinensis* has red fruits, as clearly noted on the specimens Henry no. 6719.

The leaves are especially variable in *H. chinensis*. Some specimens cited above marked with \* have lanceolate leaves, but branches with linear-lanceolate and lanceolate leaves are sometimes mixed in the same collection, for example E. H. Wilson no. 172 (Pl. 24a). While some others such as Hupeh (Chow no. 133) (Pl. 24b), Yunnan (Ten no. 126), and Szechuan (Fang no. 1334), have longer narrow lanceolate leaves 7–15 cm long and 11–22 mm wide.

3a) *H. chinensis* f. **megaphylla** Fang in Act. Phytotax. Sin. **1**: 172 (1951).  
[Pls. 21b, 26a]

Leaves larger broad lanceolate 10–17 cm long 2.5–5 cm wide thinner herbaceous, lateral veins 6–7-pairs visible, teeth small. Fruits 1 cm in diameter.

Specimen examined:

China. Kiangsi: Hong Shan, 900 m (L. Gressitt no. 1514, fr. green-type, A, BM, E).

This form has much larger and thinner leaves with many small teeth and distinct lateral veins. This interesting entity needs further studies at the habitat.

A specimen from Yunnan (T. T. Yü no. 19402, E) resembles this form in leaves, but it will be a form of *H. himalaica*. Another specimen from N. Burma (Forrest no. 29726, E) (Pl. 26b) also has large leaves attaining 20 cm long and 4 cm wide, but its leaves are more elongate with more sharp teeth, and can be considered as an extreme form of *H. chinensis*.

3b) *H. chinensis* var. **crenata** (Lingelsh.) Fang in Act. Phytotax. Sin. **1**: 171 (1951).  
[Pl. 25. Fig. 77d, e, h, i]

*H. crenata* Lingelsheim ex Limpricht in Fedde, Rep. Beih. **12**: 453 (1922)—Hand.-Mzt., Symb. Sin. **7**: 688 (1933)—Chun in Sunyats. **4**: 246 (1940).

*H. himalaica* var. *crenata* (Lingelsh.) Li in Journ. Arnold Arb. **25**: 310 (1944).

Leaves lanceolate-ovate-lanceolate rarely elliptic 5–8(–10) cm long 1.2–3(–4) cm wide, acute or acuminate at the apex, obtuse or roundish at the base, *remotely serrate*, teeth short depressed or sometimes coarse and sharp, smooth beneath, lateral veins 5–7-pairs *obscure*; petioles 5–15 mm long. Fruits *red* when ripe.

Representative specimens:

China. Szechuan: Yangtse ling, Kwan Hsien, 1400 m (Limpricht no. 1286A-type, photo in A); Kuan Hsien (S. S. Chien no. 5682, BM, E); Kuan Hsien (Fang no. 1339, E; no. 2022, K, E).

Yunnan: Mekong-Salwin Divide (Forrest no. 14686, fr. scarlet, E); Szemao (Henry no. 11992B, fr. red, E).

Kwangsi: Lao Shan, Ling-yun Hsien (Steward & Cheo no. 382, fl., BM).

Hupeh: Liang Aung Gon, 4500 ft. (Chun nos. 3741 & 3869A, fr. bright red, A); Ichang (Henry no. 4504, K); Nanto (Henry no. 5282A, K); S. Wushan (Henry no. 5282B, K); without precise locality (E. H. Wilson no. 635, K, E).

Distr. W. & C. China (Szechuan, Yunnan, Kwangsi, Hunan, Hupeh).

We have examined only a photograph of the type of *H. crenata*. It seems to be a broad-leaved race of *H. chinensis*, as suggested by Fang. But it also seems to be related to *H. omeiensis* var. *oblanceolata*.

4) **Helwingia omeiensis** (Fang) Hara et Kurosawa, stat. nov.

[Pls. 27, 29a, b. Fig. 78a-f]

*H. himalaica* f. *omeiensis* Fang in Act. Phytotax. Sin. **1**: 169 (1951).

Shrubs 1–4 m high. Leaves *broad oblanceolate*–oblong 5–14 cm long 1.5–4.5 cm wide, acuminate at the apex, *cuneate* and entire at the base, serrate, teeth cuspidate *callose-tipped* often *small* and depressed, semipersistent *thick* and *coriaceous*, whitish and *smooth beneath*, lateral veins 5–6-pairs visible when dry but *not distinctly elevated* nor impressed, petioles 0.5–4 cm long. Pedicels 2–8 mm long. Ripe fruits globose *black* 7–10 mm across.

Specimens examined:

China. Szechuan: Mt. Omei, 1200 m (Fang no. 12621, Jul. 28, 1938, fr.–isotype, A, BM); *ibid.* 4500–5000 ft. (Fang no. 2620, fr., κ, ε); *ibid.* 4000 ft. (Faber no. 159, ann. 1887 & 1888, fr., κ); *ibid.* (E. H. Wilson no. 4942, fl., κ, BM); *ibid.* 900–1800 m (Chow no. 8236, Aug. 25, 1938, fr. black; no. 9934, fl. ♀ & no. 11683, fl. ♂, A); *ibid.* 900 m (Chiao & Fang no. 405, Aug. 24, 1938, fr. purplish black A).

Distr. China (Szechuan: Mt. Omei).

The fruits are noted as black on the labels of the specimens, Chow no. 8236 and Chiao & Fang no. 405, and those of Fang no. 2620 and Faber no. 159 also seem to be black. As compared with *H. himalaica* and *H. chinensis* var. *crenata*, the leaves are much thicker and coriaceous, cuneate at the base, with obscure lateral veins, and the fruits are black when ripe. The petals of female flowers of the specimen, Chow no. 9934, are narrow and oblong, but it is doubtful if this character is stable in this species.

4a) *H. omeiensis* var. **oblanceolata** (S. S. Chien) Hara et Kurosawa, stat. nov.

[Pls. 28, 29c–e. Fig. 78g]

*H. chinensis* f. *oblanceolata* S. S. Chien in Sinensia **2**: 102 (1932)–Fang in Act. Phytotax. Sin. **1**: 172 (1951).

Leaves *broad oblanceolate* 5–11 cm long 1.5–4 cm wide, caudate-acuminate at the apex, *cuneate* at the base, serrate with *small* obliquely ascending or depressed *pointed teeth*, *thinner*, lateral veins 6–7-pairs *distinct beneath* when dry, petioles 0.5–2.5 cm long. Fruits *black*.

Specimens examined:

China. Yunnan: Lunguan, Taron–Taru Divide, 2300 m (T. T. Yü no. 20017, ε).

Kweichou: Tungtze, 400 m (Y. Tsiang no. 4966, May 19, 1930, young fr.–isotype, κ, ε, A, US, NY); Liang Fang Yah (Steward, Chiao & Cheo no. 23, fr. black, BM).

Kwangsi: without special locality (C. Wang no. 41043, fr., A).

Hunan: Yun-shan (T. H. Wang no. 121, fl., ε, A); Ma-ling-tung (Fan & Y. Y. Li no. 610, BM).

Distr. West China.

This variety shows some intermediate characters between *H. omeiensis* and *H. chinensis* var. *crenata*.

W. Szechuan (E. H. Wilson no. 4472, A) is a doubtful specimen, and its fruits are black but its leaves are similar to those of *H. chinensis* var. *crenata*.

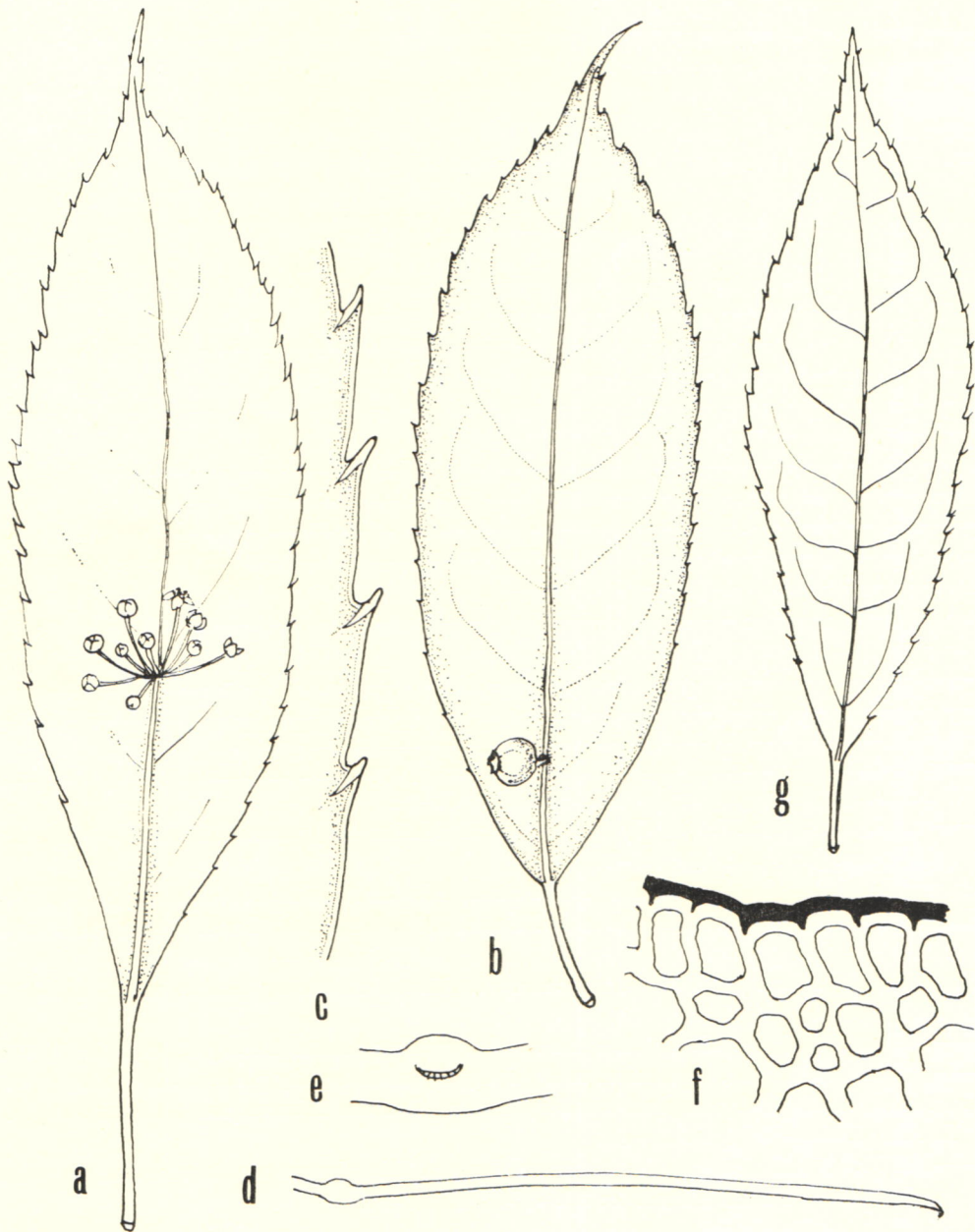


Fig. 78. *Helwingia omeiensis* (Fang) Hara et Kurosawa (a-f) and its var. *ob-lanceolata* (Chien) Hara et Kurosawa (g). a, b, g. Leaf,  $\times 1$ . c. Leaf-margin,  $\times 5$ . a, c. Mt. Omei (Chow no. 11683). b. Mt. Omei (Chow no. 8236). g. Kweichou (Tsiang no. 4966). d. Cross section of leaf,  $\times 3$ . e. Cross section of midrib of leaf. f. A part of the upperside of e, mag.

## Excluded species

*Helwingia Argyi* Léveillé et Vaniot in Bull. Herb. Boiss. ser. 2, **6**: 506 (1906)  
= *Stemona japonica* (Blume) Miquel.

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