

## *Ilex inthanonensis* (Aquifoliaceae), a new species from Thailand

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### ABSTRACT

A species of Thai *Ilex* (Aquifoliaceae), *I. inthanonensis*, is reported new to science. *Ilex inthanonensis* is glabrous on most parts except puberulent in the infructescences, leaf blade punctate below, fruiting pedicels shorter than or equalling fruit diameter, calyx 4–5-lobed, pyrenes 4–5 with 3–5(–6)-striae slightly elevated dorsally, not sulcate and laterally smooth. A morphological description is provided, just like photos and a line drawing. The new species is critically compared the most resembling species.

KEYWORDS: *Ilex chevalieri*, *Ilex wilsonii*, Doi Inthanon, *Pseudoaquifolium*, taxonomy.

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### INTRODUCTION

The genus *Ilex* L. is in the monogeneric family Aquifoliaceae with over 600 species recognised (Loizeau *et al.*, 2016), but the numbers are still rising continuously. Many misidentified and unidentified specimens of *Ilex* are often present in herbarium collections and they include quite a number of taxa new to science. During our ongoing revision of Thai *Ilex*, we have already published three new species: *I. depressifructu* Pruesapan & Welzen, *I. phanganensis* Pruesapan & Welzen (Pruesapan & van Welzen, 2021), and *I. pubifructa* Pruesapan, S. Andrews & D.A. Simpson (Pruesapan *et al.*, 2017). In this study, we found a taxon that did not match any known species from the higher elevations of Doi Inthanon National Park in Chiang Mai Province. Interestingly, the five collections were collected by three groups of Japanese botanists in 1984, 1998 and 2012. Only fruiting material was present on the herbarium sheets, however, the presence of the infructescence is always valuable for species identification of *Ilex* as well as the vegetative organs, as the taxonomically useful reproductive organs (e.g. calyx, ovary indumentum and stigma) can be observed from a pistillate inflorescence.

This new species is morphologically very similar to the Himalayan-Chinese species *Ilex wilsonii* Loes. (Hu, 1950; Hong, 2015) and the Vietnamese species *I. chevalieri* Tardieu (Tardieu, 1945, 1948). They share several characters including being evergreen trees with entire leaves, 1-fruited pseudo-racemose inflorescences, red fruits, and 4 or 5 pyrenes with longitudinal striae on the dorsal surface. Yang *et al.* (2023) presented a phylogeny of *Ilex*, which included *I. wilsonii* and was placed within section *Pseudoaquifolium* S.Y.Hu. Based on their close morphology, the three species all fit in this section when using the traditional morphological system of Hu (1949, 1950). The close resemblance with the Himalayan *I. wilsonii* fits a more general biogeographic pattern, species or morphological close species are present in the Himalayas and on Doi Inthanon (e.g., compare *Mercurialis leiocarpa* Sieb. & Zucc., Euphorbiaceae; van Welzen, 2007).

The new taxon is distinct in the presence of punctuation on the lower leaf surface, the length of the fruiting pedicel compared to the fruit diameter and the pyrene pattern; we name it *Ilex inthanonensis*.

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## MATERIALS AND METHODS

The new species described here is based on examination of herbarium specimens at BKF, CMUB, FU, KYO and L (for herbarium abbreviations see Thiers, continuously updated). The measurements in the description below are from dried herbarium material. Online images from JSTOR, GBIF and P were observed for species comparison. The estimated conservation status of the new species follows the IUCN Standards and Petitions Committee (2024).

## TAXONOMIC TREATMENT

*Ilex inthanonensis* Pruesapan, **sp. nov.**

Branches lenticellate. *Leaves* glabrous, punctate below. *Infructescences* fascicles of pseudoracemes and of pseudopanicles, puberulent. *Fruits*: pedicel 2.5–4 mm long, shorter than or equalling fruit diameter of 3–4 mm; prophylls at base or at middle on pedicels; calyx persistent, 4–5-lobed; stigmas persistent, thinly discoid, (slightly) 4–5-lobed. *Pyrenes* with dorsally 3–5(–6)-slightly elevated striae, esulcate, laterally smooth. See Table 1 for comparison with resembling species. Type: Thailand, Chiang Mai, Doi Inthanon, along the trail, 2,233 m alt., 12 Nov. 2012, *Tagane*, *Fuse*, *Toyama* and *Nagamazu T963* (holotype **BKF** [SN228936!], isotype **FU** photo seen). Figs. 1&2.

Trees, 15–20 m tall, ca 40 cm DBH. *Twigs* green-black, grey-brown on branchlets, glabrous; lenticels orbicular to ovate, up to 2 mm long, scattered, conspicuous. *Stipules* minute, linear-triangular, glabrous, caducous. *Leaves* alternate; blades oblong, obovate-oblong or elliptic, 4–9 × 2–3.4 cm, subcoriaceous, base cuneate, margin entire, apex acuminate with acumen 5–10 mm long, glabrous, above green, below paler and punctate; midrib glabrous, flat or slightly sunken above and prominent below, lateral veins 7–9 pairs, subopposite to alternate, relatively narrowly spaced, ± parallel, ascending and looping before leaf margin, subobscure on both sides; intercostal venation obscure on both sides; petioles 7–10 mm long, channelled above, glabrous. *Inflorescences* and flowers not seen. *Infructescences* axillary, fasciculate pseudoracemes or pseudopanicles; peduncles 0–9 mm long, puberulent; bracts triangular-ovate, puberulent on outside surface. *Fruits* globose, 3–4 mm

in diameter, unripe fruit green, ripe fruit red, glabrous; calyx persistent, explanate, subcircular, 4–5-lobed, 2–3 mm in diameter, puberulent, margin ciliate; stigmas persistent, thinly discoid, (slightly) 4–5-lobed, ca 1 mm wide, glabrous; fruiting pedicel 2.5–4 mm long, shorter than or equalling fruit diameter, puberulent; 2 prophylls at base or at middle on pedicels, puberulent. *Pyrenes* 4–5, ellipsoid, ca 3 × 2 mm, dorsally 3–5(–6)-slightly elevated striae, esulcate, laterally smooth; endocarp woody.

Thailand.—NORTHERN: Chiang Mai Province, Doi Inthanon, 2,300 m alt., 5 Dec. 1984, *Mitsuta et al. T-43160* (**KYO, L**); *ibid.*, along the trail, 2,233 m alt., 12 Nov. 2012, *Tagane et al. T963* (**BKF, FU**) and *Tagane et al. T964* (**BKF, FU**); *ibid.*, Mae Chaem, Kew Mae Pan trail, 2,230 m alt., 7 Dec. 1998, *Kanzaki et al. C579* (**CMUB**) and *Kanzaki et al. C580* (**BKF**).

Distribution.—Doi Inthanon; only known from the type locality with five collections.

Ecology.—In evergreen oak forest, hill forest, along the trail; 2,200–2,300 m altitude. Flowering unknown; fruiting in November–December.

Vernacular name.—Kliang inthanon (เกลี้ยงอินทนนท์) (Proposed here). ‘Kliang’ indicates the glabrousness of the plant, and ‘inthanon’ the collecting locality.

Conservation status.—Data Deficient (DD) (IUCN Standards and Petitions Committee, 2024). The exact distribution is still unknown, just as the population size. A further assessment should be carried out when more data is available.

Notes.—1. For comparison with *Ilex wilsonii*, we studied the type specimens (*Wilson 2101* [A00049552, K000669296, K000669297 & P02142099], *Wilson 2101A* [US00096031]) along with the description for China by Hu (1950) and Chen *et al.* (2008) and the description for the Himalayan specimens by Hong (2015). See Table 1 for differences and similarities. *Ilex inthanonensis* can be confused with *I. wilsonii* in the leaf characters (size, shape, texture), but they can be separated by the leaf bases as cuneate and obtuse or rounded, respectively, as well as the punctuation on the lower leaf surface, present only in *I. inthanonensis*. Other differences are absence of lenticels in *I. wilsonii*, present in *I. inthanonensis*, 4 calyx lobes in



Figure 1. *Ilex inthanonensis* Pruesapan: A. Fruiting twig showing upper surface of leaves, the colour and lenticels of branchlet (a1) and twig (a2); B. Fruiting twig showing lower surface of leaves and the colour of unripe fruit; C. Punctuation on lower surface of leaf; D. Twig with ripe fruits; E. Inflorescence showing lobes of stigmas (st); F. Inflorescence showing the character of bracts (f1), prophylls (f2) and pedicel (f3); G. Inflorescence showing lobes of calyx; H. Fruiting calyx with hairs on surface and margin; I. Prophylls at middle of pedicel; K. Pyrenes. A–B photos of *Tagane et al. T963*; a1, a2 & C from *Tagane et al. T963* (FU); D photo of *Tagane et al. T963*; E & G from *Tagane et al. T964* (FU); F, H, J–K from *Tagane et al. T963* (BKF). Field photos by Hironori Toyama (A–B, D) and specimen photos by Shuichiro Tagane (a1, a2, C, E & G).

*I. wilsonii* and 4 or 5 lobes in *I. inthanonensis*, 4 pyrenes in *I. wilsonii* and 4 or 5 pyrenes in *I. inthanonensis*, and the pattern on the dorsal side of the pyrenes, always 3-striate in *I. wilsonii* whereas in *I. inthanonensis* 3 or 4 and 5 or rarely 6 striae are found.

2. We studied the type specimens of *Ilex chevalieri* (*Chevalier 38688* [P02142080, P02142081 & P02142082] and *Poilane 6813* [P03274028, P03274029 & P04420193]) along with the description for Vietnam by Tardieu (1945, 1948) and the study of Thai specimens (*CharoENCHAI 171* [BKF], *Maxwell 00-216* [CMUB], *Maxwell 09-274* [CMUB]) for species comparison with *I. inthanonensis* (Table 1). At first sight, *I. inthanonensis* can be confused with *I. chevalieri* in the leaf characters (size, shape, texture) as well, but they differ in the absence and presence of hairs on petioles, respectively, as well as the absence of punctuation on

the lower leaf surface in *I. chevalieri*, and as with the comparison to *I. wilsonii*, differences in the number of pyrenes (Table 1). However, the pattern on the pyrenes of *I. chevalieri* is clearly distinct from *I. inthanonensis* by being sulcate-striae on both surfaces (see Table 1).

3. In this study, we propose a new species without having seen the flowers at anthesis. However, the inflorescences and fruits already show many of the characters of the pistillate flowers, the inflorescences are similar to the pistillate inflorescence, the type of which is mostly used for species identification in *Ilex*. On the fruits the number of calyx lobes can be seen, as well as ovary characteristics and stigma morphology. In addition, the comparison with the two most morphologically similar species clarifies the necessity to describe a new species. However, we do acknowledge the lack of the corolla characters of pistillate flowers and the



Figure 2. *Ilex inthanonensis* Pruesapan: A. Leafy twig with infructescences; B–C. infructescences; D. Pyrene showing dorsal side; E. Pyrene showing lateral side. A–B from Tagane *et al.* T963 (BKF), C–E from Tagane *et al.* T964 (BKF). Drawn by Orathai Kerdkaew.

Table 1. Comparison of morphological characters of *Ilex inthanonensis* sp. nov., *I. wilsonii* Loes. and *I. chevalieri* Tardieu. Information of *I. wilsonii* collected from Hu (1950), Chen *et al.* (2008) and Hong (2015); *I. chevalieri* collected from Tardieu (1945, 1948) and three Thai specimens: *Charoenchai 171* (BKF), *Maxwell 00-216* (CMUB) and *Maxwell 09-274* (CMUB).

Characters	<i>Ilex inthanonensis</i>	<i>Ilex wilsonii</i>	<i>Ilex chevalieri</i>
Branchlets	glabrous	glabrescent	puberulent (when young) to glabrous
Lenticels	present	absent	present
Petiole	glabrous	glabrous	pubescent-puberulent
Leaf size and shape	4–9 × 2–3.4 cm, oblong, obovate-oblong or subelliptic	3–7(–8) × (1–)1.5–3.5(–4) cm, ovate or obovate-oblong	3.5–9.5 × 2–3.5 cm, elliptic or ovate-elliptic
Leaf blade texture	subcoriaceous	thickly coriaceous	thickly coriaceous
Leaf blade below	punctate	not punctate	not punctate
Leaf base	cuneate	obtuse to rounded	cuneate
Leaf apex	acuminate, acumen 5–10 mm long	abruptly caudate- acuminate, acumen 6–13 mm long	acuminate, acumen 5–15 mm long
Midrib	glabrous	glabrous	glabrescent
Infructescence style	fasciculate pseudoraceme or pseudopanicle	fasciculate pseudoraceme	fasciculate pseudoraceme
Fruiting pedicel	2.5–4 mm long, shorter than or equalling fruit diameter, puberulent	4–7 mm long, longer than or equalling fruit diameter, glabrous	4–5 mm long, longer than or equalling fruit diameter, puberulent
Prophylls on fruiting pedicels	at base or at middle of pedicels	at middle of pedicels	above base of pedicels
Fruiting calyx	4–5-lobed, ciliate, puberulent	4-lobed, ciliate, glabrous	4–5-lobed, ciliate, puberulent
Fruiting stigma	thinly discoid and lobed, glabrous	thickly discoid and slightly lobed, puberulent	discoid, glabrescent
Pyrene numbers	4–5	4	4
Pyrene pattern	dorsal side: 3–5(–6)-striate and not sulcate; lateral side: smooth	dorsal side: 3-striate and not sulcate; lateral side: smooth	dorsal side: 3–5-sulcate-striae; lateral side: 2–3-sulcate-striae or irregularly sulcate-striae
Flowering and fruiting time	flowering unknown; fruiting in November–December	flowering in May–June; fruiting in August	flowering in February; fruiting in March–October
Elevation	2,200–2,300 m	400–1,900 m	750–1,700 m

data from the staminate flowers (which are used less for species identification in *Ilex*), but these can be added in the future to create a complete description.

4. Our study is based on several collections from the same locality, Doi Inthanon, collected in November and December in three very different years, 1984, 1998 and 2012. This shows that the population of *Ilex inthanonensis* is stable enough to survive at least 28 years. Doi Inthanon is a big mountain and the specimens were collected from various spots with likely a somewhat different ecology. Moreover, *I. inthanonensis* occurs on slightly higher elevations (higher than 2,000 m alt.) compared to *I. wilsonii* (400–1,900 m alt.) and *I. chevalieri* (750–1,700 m alt.). The flowering time of *I. chevalieri* starts early in February and fruiting is in March to October, whereas *I. wilsonii* flowers in May and its fruiting is reported in August, while *I. inthanonensis* is known to fruit in November to December. This indicates differences in flowering and fruiting times between the species, though it may be that they or some flower and fruit all year round.

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