

Research Article

Newly Recorded Alien Species of *Ficus* L. (Moraceae) in Java, Indonesia

Peniwidiyanti^{1,2*}, Arifin Surya Dwipa Irsyam³, Asih Perwita Dewi⁴, Muhammad Rifqi Hariri¹, Zakaria Al Anshori⁵, Rina Ratnasih Irwanto⁶

1) Research Center for Plant Conservation and Botanic Gardens, Indonesian Institute of Sciences, Jln. Ir. H. Juanda No. 13 Bogor, West Java, 16003, Indonesia.

2) Department of Biology, Faculty of Mathematics and Natural Sciences, Institut Pertanian Bogor, Jl. Raya Darmaga, Bogor, West Java, 16680, Indonesia.

3) Herbarium Bandungense (FIPIA), School of Life Sciences and Technology (SITH), Institut Teknologi Bandung (ITB), Labtek VC Building, Jl. Let. Jen. Purn. Dr (HC) Mashudi No. 1 Jatinangor, West Java, 45363, Indonesia.

4) Botany Division, Research Centre for Biology, Indonesian Institute of Sciences, Jl. Raya Jakarta-Bogor Km. 46, Cibinong, West Java, 16911, Indonesia.

5) Forest Ecology Laboratory, Department of Silviculture, Faculty of Forestry, Institut Pertanian Bogor, Jl. Raya Darmaga, Bogor, West Java, 16680, Indonesia.

6) School of Life Sciences and Technology (SITH), Institut Teknologi Bandung Labtek XI Building, Jl. Ganesha No. 10 Bandung, West Java, 40132, Indonesia.

* Corresponding author, email: niwidiyan@gmail.com

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ABSTRACT

Ficus is the largest genus in the Moraceae family, with the syconium inflorescence as its characteristic. This genus has a wide distribution worldwide, and about 367 species were found in the Malesia region. There are 74 species have been recorded on Java, and seven species are known as introduced plants. Based on our recent observations in West Java, Central Java, Yogyakarta, and East Java, three newly recorded *Ficus* species were found, namely *F. auriculata* Lour., *F. maclellandii* King, and *F. natalensis* subsp. *leprieurii* (Miq.) C.C. Berg. The species were introduced to Java as an ornamental plant. Descriptions, photographs, and a brief discussion of the three newly recorded species are presented in this manuscript.

Keywords: Alien Flora, *Ficus*, Java, Moraceae

INTRODUCTION

Ficus L. is the largest genus in the Moraceae and it separated taxonomically from other genera into the Ficeae Gaudich tribe. Morphologically, the genus is characterized by its figs. The flowers are both unisexual and bisexual and are located in the receptacle base (Backer & Bakhuizen van den Brink 1965; Berg & Corner 2005). *Ficus* has a wide distribution area in the world, especially in tropical and subtropical regions. The genus consists of 735 species and 367 species found in the Malesia region (Berg & Corner 2005). The information on the diversity of *Ficus* species in Java has been compiled by Backer & Bakhuizen van den Brink (1965) and Berg & Corner (2005). As many as 74 species of *Ficus* are found on the island and seven of them are introduced plants, namely *F. benghalensis* L., *F. callosa* Willd., *F. carica* L., *F. lyrata* Warb., *F. pumila* L., *F. religiosa* L., and *F. rumphii* Blume (Backer &

Bakhuizen van den Brink 1965; Berg & Corner 2005). Since then, the updated information on the genus *Ficus* in Java, including the newly introduced species, has not been provided yet.

In recent years, many non-native species were reported from Java by many authors (e.g. Girmansyah 2014; Mustaqim & Nisyawati 2016; Irsyam & Mountara 2018; Hariri et al. 2019; Irsyam et al. 2019; Anshori et al. 2020; Hariri et al. 2020; Effendi & Mustaqim 2021). It shows that the number of non-native plant species in Java will continue to increase. In this study, we report the occurrence of three newly recorded species, namely *F. auriculata* Lour., *F. maclellandii* King, and *F. natalensis* subsp. *leprieurii* (Miq.) C.C. Berg, for Java. The study was also conducted to provide an updated taxonomic data on the genus *Ficus* in Java.

MATERIALS AND METHODS

Materials

The study was carried out in several locations in West Java (Bandung, Bogor, Sumedang, Subang), Central Java (Kebumen), Jogjakarta, and East Java (Malang, Surabaya, Banyuwangi, Madura Island) from September 2019 to December 2020. The materials used in this study were specimens stored in the Herbarium Bogoriense (BO), field-collected specimens, and non-collected specimens grown in Bogor Botanic Gardens (BBG).

Methods

The field observations used exploring method following Rugayah et al. (2004), while the sampling method following van Balgooy (1987). The syconia were also collected as wet specimens preserved in 70% ethanol. The other data recorded were the locations, names of collectors, collection numbers, coordinate points, morphological features that could be lost during the preservation process (the color of latex, indumentum, leaves, and syconia), vernacular names, and their utilization.

The specimens collected from the field were taken to the Bandungense Herbarium (FIPIA), School of Life Sciences and Technology, ITB, to be processed into herbarium specimens following Djarwaningsih et al. (2000). The samples were also re-identified using Flora Cochinchinensis 2 (Loureiro 1790), Checklist of *Ficus* in Asia and Australasia with keys to identification (Corner 1965), Flora Malesiana Ser. I Vol 17 (2) (Berg & Corner 2005), New Taxa and Combinations in *Ficus* (Moraceae) of Africa (Berg 1988), and Taxonomic treatment of the *Ficus auriculata* complex (Moraceae) and typification of some related names (Zhang et al. 2019).

RESULTS AND DISCUSSION

Field observations reveal the presence of three newly recorded *Ficus* in Java (Figure 1), namely *F. auriculata* Lour., which belongs to *Ficus* subg. *Sycomorus* (Figure 2). Two other species were grouped into *Ficus* subg. *Urostigma*, namely *F. maclellandii* King (Figure 3) and *F. natalensis* subsp. *leprieurii* (Miq.) C.C. Berg (Figure 4).

Taxonomic treatment

Ficus auriculata Lour., Fl. Coch. 2: 660. 1790; Corner, Gard. Bull. Singapore 19: 395. 1962; 21: 82. 1965; Berg & Corner, Fl. Males. Ser I, 17(2): 341-343, t. 56. 2005.

Ficus macrophylla Roxb. & Buch.-Ham. ex Sm. in Rees, Cycl. 14, Ficus, no. 32. 1810, non Desf. ex Pers. 1807; Roxb., Fl. Ind., ed. Carey 3: 556. 1832; Wight, Ic. 2 t. 673. 1843. — *Ficus roxburghii* Wall. ex Steud., Nomencl. Bot. ed. 2, 1: 637. 1840; Burkill, Dict. Econ. Prod. Malay Penins. 1014. 1935; Rehder, J.

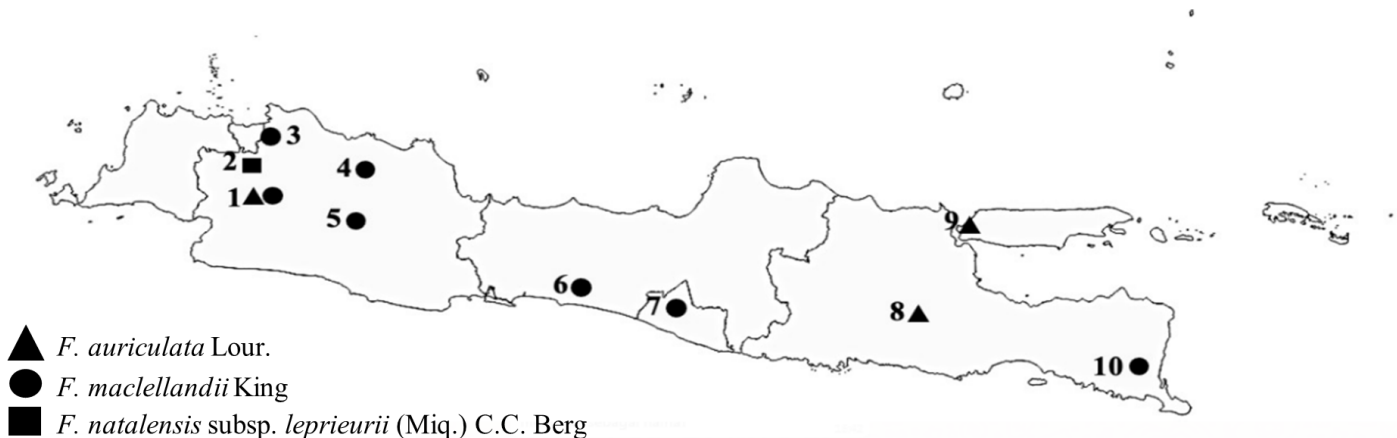


Figure 1. The distributional map of the newly recorded *Ficus* in Java. 1. Bogor; 2. Depok; 3. Bekasi; 4. Subang; 5. Bandung; 6. Kebumen; 7. Jogjakarta; 8. Batu; 9. Bangkalan; 10. Banyuwangi

Arnold Arbor. 17: 81. 1936. — *Covellia macrophylla* (Roxb. ex Sm.) Miq., London J. Bot. 7: 465. 1848.

Ficus sclerocarpa Griff., Notul. Pl. Asiat. 4: 397. 1854; Ic. Pl. Asiat. 4, t. 558. 1854, 'scleroptera'.

Ficus regia Miq., Ann. Mus. Bot. Lugduno-Batavi 3: 230, 296. 1867.

Ficus oligodon Miq., Ann. Mus. Bot. Lugduno-Batavi 3: 234, 297. 1867; Corner, Gard. Bull. Singapore 18: 43. 1960; 19: 395. 1962; 21: 82. 1965; Kochummen, Tree Fl. Malaya 3: 152. 1978.

Ficus pomifera Wall. ex King, Ann. Roy. Bot. Gard. (Calcutta) 1(2): 171, t. 215. 1888, non Kurz 1873; Fl. Malay Penins. 3: 350. 1924; Corner, J. Malayan Branch Roy. Asiat. Soc. 11: 46, f. 24. 1933.

Ficus macrocarpa H. Lév. & Vaniot, Mem. Real Acad. Ci. Barcelona 3: 152. 1907, non Blume 1823; Rehder, J. Arnold Arbor. 17: 81. 1936.

F. hainanensis Merr. & Chun, Sunyatsenia 2(3-4): 215, pl. 40. 1935.

F. beipeiensis S. S. Chang, Acta Phytotax. Sin. 22(1): 69, pl. 11. 1984.

Tree, up to 20 m tall, with milky latex. **Bark** greyish brown, lenticelled; leafy twigs puberulous to subtomentose or glabrous, internodes hollow or solid.

Stipules 1.5–2.5 cm long, puberulous, caducous. **Leaves** simple, spirally arranged to subdistichous; petioles 4.5–12 cm long, with brownish or whitish hairs or glabrous; lamina cordate to suborbicular, 14.5–28 × 10.5–25.5 cm, base cordate to rounded, margin subentire or coarsely dentate to denticulate, apex acute to acuminate, upper surface glabrous, lower surface puberulous, lateral veins 3–7 pairs, tertiary venation scalariform, waxy glands in the axils of the basal lateral veins. **Figs** cauliflorous or stoloniflorous; peduncle 4–8 cm long, hairy; basal bracts 3, deltoid, 7–8 mm long, persistent; receptacle pyriform, globose to depressed-globose, 4.8–4.9 cm diam., velutinous, reddish-brown, with white or greenish blotches, wall 6–7 mm thick; ostiole 6 mm diam., with a prominent rosette of ostiolar bracts; flowers unisexual; tepals connate. **Staminate flowers**: ± 2 mm long, stamens 2, connate at base. **Pistillate flowers**: dimorphic, ± 2–5 mm long; ovary superior, the ovary of the short-styled flowers differentiated into a gall, style 1.

Distribution: The species native to India (Himalayas), Bhutan, Nepal, Sikkim, Myanmar, Thailand, and Southern China (Berg & Corner 2005; Lim 2012). In the Malesia Region, *F. auriculata* was only recorded from Selangor and Pahang, Malaysia (Corner 1965; Berg & Corner 2005; Zhang et al. 2018). However, in this study, this species has been planted in Java and Madura.

Habitat: Mixed forest and secondary forest at an altitude of 100–1,700 m (Berg & Corner 2005; Lim 2012). *F. auriculata* is planted at the observation site in gardens, open places, and public spaces at an altitude of 5–271 m.

Examined specimens: WEST JAVA. Cult. in Bogor Botanic Gardens, VI

I.H.9A, 13-3-1956, L.L. Forman 59 (BO); Budi Mulia, Paledang, Bogor Tengah District, Bogor, 2 January 2020, *Peniwidiyanti* & MR Hariri 05 (FIPIA); Jl. Malabar Park, Babakan, Bogor Tengah District, Bogor, 2 January 2020, *Peniwidiyanti* & MR Hariri 06 (FIPIA); Bogor Botanical Gardens, 2 January 2020, *Peniwidiyanti* & MR Hariri 07 (FIPIA). **EAST JAVA.** Batu, Malang, 16 December 2019, *Peniwidiyanti*, PNW 30 (FIPIA); Telang Asri, Kamal, Bangkalan Regency, Madura Island, 26 December 2019, *ASD Irsyam* & MR Hariri 27 (FIPIA).

Vernacular name: *Tin afrika* (Indonesian).

Uses: The ripe syconia have a sweet taste and it can be eaten fresh or processed into sweets, jams, juices, and curry ingredients (Jansen et al. 1991; Lim 2012). The species is also planted as a shade tree and ornamental plant.

Ficus maclellandii King, Sp. Ficus 1: 52, t. 64. 1887; Fl. Brit. India 5: 512. 1888; Corner, Gard. Bull. Singapore 21: 19. 1965; Kochummen, Tree Fl. Malaya 3: 150. 1978; Berg & Corner, Fl. Males. Ser. I, 17(2): 665. 2005; Berg, Pattharahirantricin, & Chantarasuwan, Fl. Thai. 10(4): 360. 2011.

Ficus thorelii Gagnep., Notul. Syst. (Paris) 4: 97. 1927; Fl. Indo-Chine 5: 781. 1928.

Urostigma rhododendrifolium Miq., London J. Bot. 6 (1847) 579. — *Ficus rhododendrifolia* (Miq.) Miq., Ann. Mus. Bot. Lugd.-Bat. 3: 286. 1867, non Kunth & C.D. Bouché 1847; King, Sp. Ficus 1: 57, t. 58. 1887 — *Ficus maclellandii* King var. *rhododendrifolia* (Miq.) Corner, Gard. Bull. Singapore 17: 392. 1960.

Tree, up to 25 m tall, hemi-epiphytic or terrestrial, with milky latex. **Bark** greyish, lenticelled; leafy twigs glabrous or hairy on the upper scars of the stipules, angular to subterete, internodes solid. **Stipules** 5–10 mm long, with yellowish hairs, caducous. **Leaves** simple, spirally arranged; petioles 2–2.5 cm long, glabrous, drying blackish; lamina lanceolate to oblong, 8–20 × 2.1–5.2 cm, base cuneate to rounded, margin entire, apex acuminate to caudate, upper and lower surfaces glabrous, tertiary venation parallel to the lateral veins, lateral veins 8–14 pairs, waxy gland at the base of the midrib. **Figs** axillary, paired or solitary; sessile; basal bracts 3, 1–3 mm long, persistent; receptacle subglobose, 1.5–2 cm diam., glabrous, yellow; ostiole 1.5 mm wide, with ostiolar bracts; flowers unisexual; tepals connate, reddish.

Staminate flowers: ± 1 mm long, stamens 2, connate at base. **Pistillate flowers:** dimorphic, ± 1 mm long; ovary superior, the ovary of the short-styled flowers differentiated into a gall, style 1.

Distribution: The species is distributed from India, Southern China (Yunnan), Laos, Thailand to Peninsular Malaysia (Berg & Corner 2005).

Habitat: *F. maclellandii* is naturally found in lowland forests (Berg & Corner 2005). In our study, the species was cultivated in open areas at an altitude of 74 to 269 m.

Examined specimens: **WEST JAVA.** Jl. P.H.H. Mustofa, Bandung, 22 Februari 2020, *ASD Irsyam* 347 (FIPIA); Dawuan, Subang, 9 Maret 2020, *Peniwidiyanti*, PNW 32 (FIPIA); Taman Ade Irma Suryani, Bogor, 22 September 2020, *Peniwidiyanti*, PNW 44 (FIPIA); PT PJB UP Muara Tawar, Bekasi, 6°05'18.6"S 106°59'49.3"E, 28 September 2019, *Zakaria Al Anshori*, *PJBMTW0919-005* (FIPIA); **CENTRAL JAVA.** Alun-alun Prembun, Jl. Nasional 3, Pejaten, Bagung, Kecamatan Prembun, Kebumen, 27 Desember 2020, *Peniwidiyanti*, PNW 224 (FIPIA); **JOGJAKARTA.** Areal taman masjid kampus UGM, 23 Oktober 2020, *A Nugrobo* 23 (FIPIA); **EAST JAVA.** Resto Pondok Indah, Jl Raya Ijen Km 8.7, Desa Glagah, Banyuwangi, 8 Januari 2020, *Peniwidiyanti*, PNW 31 (FIPIA).

Vernacular name: *Beringin jepang* (Indonesian).

Uses: The beautiful crown shape makes *F. maclellandii* used as an ornamental

plant (Berg 2007). It has also been cultivated as a shade tree, and its leaves can be used for party decorations by the Javanese people. The previous pharmacological studies reveal that the leaves, twigs, and fruit extracts of *F. maclellandii* can be a natural source of antioxidants (Tamuly et al. 2015; Raza et al. 2016).

Ficus natalensis* subsp. *leprieurii (Miq.) C.C. Berg, Kew Bull. 43(1): 88. 1988. — *Ficus leprieurii* Miq., Ann. Mus. Bot. Lugd. - Bat. 3: 219. 1867.

Ficus chrysocerasus Warb. in Bot. Jahrb. 20: 167. 1894.

Ficus excentrica Warb. in tom. cit. 168.

Ficus furcata Warb. in tom. cit. 173.

Ficus triangularis Warb. in tom. cit. 174.

Ficus leprieurii var. *intermedia* Hutch. in Prain, Fl. Trop. Afr. 6 (2): 159. 1916.

Ficus brevipedicellata De Wild. in Ann. Soc. Sci. Brux. 40: 279. 1921.

Small tree or shrub, with milky latex. **Bark** brownish, greenish or greyish, lenticelled. **Stipules** 4–6 mm long, dark purplish. **Leaves** simple, spirally arranged; petioles 4–11 mm long, brownish-green to purplish; lamina obdeltoid, 3.7–6.7 × 2.9–5.2 cm, base cuneate, margin entire, apex truncate to emarginate, upper surface green to variegated, glabrous, lower surface green to white, midrib on the lower surface purplish brown to brownish, lateral veins 4–8 pairs. **Figs** axillary, paired; peduncle 0.6–0.7 cm long; receptacle globose, 7.5–8.4 cm diam., yellow to orange, wall 0.4–0.8 mm thick; ostiole 0.5–0.7 mm diam.; tepals connate, reddish. **Staminate flowers:** ± 1.5 mm long, stamens 2, connate at base. **Pistillate flowers:** dimorphic, ± 1.5 mm long; ovary superior, the ovary of the short-styled flowers differentiated into a gall, style 1.

Distribution: The species is naturally distributed from Senegal, Southern Sudan, Zaire to Northern Angola (Berg 1988). The presence of *F. natalensis* subsp. *leprieurii* was also recorded in Pakistan (Ajaib & Khan 2012).

Habitat: In its native distributional area, *F. natalensis* subsp. *leprieurii* grows in forests and around streams at an altitude of 0–1,200 m asl.

Examined specimens: WEST JAVA. Depok, 7 September 2020, *Peniwidiyanti*, PNW 33 (FIPIA); Bogor, 7 April 2021, *Peniwidiyanti*, PNW 324 (FIPIA).

Vernacular name: Natal fig.

Uses: The species is currently cultivated as a bonsai plant in Java. The previous study revealed the potential of *F. natalensis* subsp. *leprieurii* as a source of natural antibacterial compounds (Tkachenko et al. 2019).

Taxonomically, *Ficus* is divided into 6 subgenera, namely *Ficus*, *Pharmacosycea* (Miq.) Miq., *Sycidium* (Miq.) Mildbr. & Burret, *Sycomorus* (Gasp.) Miq., *Synoecia* (Miq.) Miq., and *Urostigma* (Gasp.) Miq (Berg 2003). Based on its morphological characteristics, *F. auriculata* belongs to the subg. *Sycomorus*, while *F. maclellandii* and *F. natalensis* subsp. *leprieurii* comes from subg. *Urostigma*. These three species are commonly found on the island of Java as ornamental plants because they have beautiful stature and canopy shapes.

F. auriculata has a gynous flowering system (Zhang et al. 2019), without adventitious roots, syconium grows cauliflory or on specialized branches and is also found in the root (stoloniflory), 2 stamens, and 1 the stretching of the pistil (Figure 2). Previous research has shown that subg. *Sycomorus* found in Java consisted of 8 species, namely *F. fistulosa* Reinw. ex Blume, *F. hispida* L.f., *F. lepigarpa* Blume, *F. racemosa* L., *F. ribes* Reinw. ex Blume, *F. septica* Burm.f., *F. variegata* Blume, and *F. vrieseana* Miq. (Backer & Bakhuizen van den Brink 1965; Berg & Corner 2005). Field observations have been carried out at several locations in Java, and however, *F. auriculata* was only found from Bogor, Malang, and Madura Island. The existence of this species in Java has

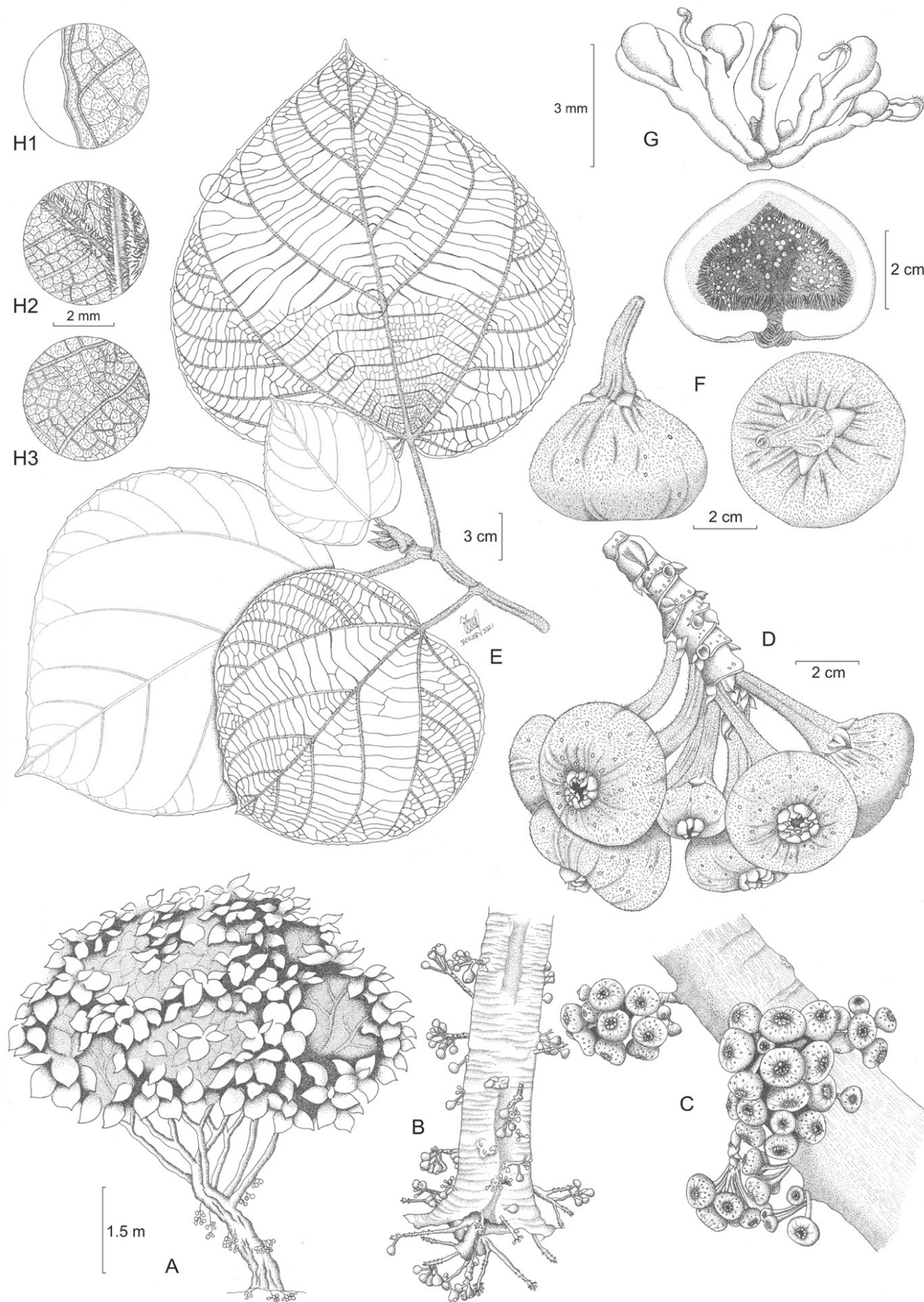


Figure 2. *Ficus auriculata* Lour.: A. Habit, B & C. Syconia emerged from the main stem, D. Syconia, E. Leaf, F. Side view, top view showing the inflorescence stalk and transversal section of Syconium, G. Female flowers and galls (showing style), H. Abaxial leaf (H1 side, H2 angles on the primary and secondary leaf vein, H3 middle part of the plate showing secondary and tertiary leaf veins). Illustration by Zakaria Al Anshori.

never been registered before. Therefore, this finding will increase the number of *Ficus* subg. *Sycomorus* members for Javanese flora information to be nine species. *Ficus auriculata* is an introduced plant originating from India and mainland Southeast Asia, while the remaining eight species are naturally distributed in the Malesia region (Berg & Corner 2005).

Ficus auriculata was introduced to Java through the Bogor Botanical Gardens in 1823, under the name *F. macrocarpa* H.Lév. & Vaniot. Data on the dynamics of *F. auriculata* in the Bogor Botanical Gardens are shown in Table 1. Traceable collections of *F. auriculata* in the Bogor Botanical Gardens, namely collections in plot VII.G.139 collection. The collection originated from the Himalayas, India, and was planted from grafts from June 1956 to 1985. Currently, the collection is dead. However, field observations indicate the existence of one non-collected *F. auriculata* individual in plot VII.G. This non-collected plant species is thought to have grown spontaneously from the dead vegetative part (stem) of the previous collection.

Table 1. The dynamics of *F. auriculata* collection in Bogor Botanical Gardens based on catalogs.

No.	Year	Species Name	Collection Locations
1	1823	<i>Ficus macrocarpa</i> H. Lév. & Vaniot	Unknown
2	1855; 1866	<i>Covellia macrophylla</i> Miq.	Unknown
3	1914; 1916; 1930	<i>Ficus roxburghii</i> Steud.	VII.H.9
4	1930	<i>Ficus roxburghii</i> Steud.	VII.H.9a
5	1957; 1973; 1985	<i>Ficus auriculata</i> Lour.	VII.G.139

Source: Blume (1823); Binnendijk & Teysmann (1855); Binnendijk & Teysmann (1866); Boldingh (1914); Boldingh (1916); Dakkus (1930); Setyodiwiryo (1957); Sastrapradja (1973); Danimihardja & Notodihardjo (1985).

In general, *F. auriculata* is known by the community as the African tin trade name. However, this species is different from the true tin, namely *F. carica* L. Both species are taxonomically assigned to two different subgenera. *Ficus auriculata* is a member of the subg. *Sycomorus*, while *F. carica* belongs to the subg. *Ficus*. Morphologically, both have distinguishable characteristics (Table 2).

Table 2. Morphological characters comparison of *F. auriculata* and *F. carica*.

Morphological characters	<i>Ficus auriculata</i>	<i>Ficus carica</i>
Habit	Tree	Shrub
Bark	Greyish brown	Grey
Leaf sheet	With no lobe or palmatifid	3–5 lobed to palmatifid
Leaf margin	Dentate, serrate, or rather flat	Crenate to serrate
Adaxial leaf surface	Smooth	Scabrous
Young leaf color	Brownish red	Yellowish green
The location of syconium grows	Stem or specialized branch	Axilar or on the leaf marks (scar)
Inflorance stalk	1–8 cm	0.2–1.5 cm
Shape of flower base	Pyriform to appressed round	Pyriform
Outer surface of flower base	Puberulous, subtomentose, velutinous, or subglabrous	Glabrous
Flower base color when ripe	Orange to brownish red	Red to dark purple
Number of stamen	2	1 or 3(–5)

Ficus maclellandii and *F. natalensis* subsp. *leprieurii* are a monoecious plant (Zhang et al. 2019), which include to subg. *Urostigma*. However, they both from different sections, where *F. maclellandii* in the sect. *Urostigma*, which distributed from Africa to the Pacific, while *F. natalensis* subsp. *leprieurii* in the sect. *Galoglyphic*, which is indeed the endemic section of Africa (Berg & Corner 2005).

Currently, *F. maclellandii* is widely cultivated and planted as a road-shading tree. The tree canopy is rounded and a thick canopy, so, it is potential as a noise damper and pollution absorber. Recent studies show that *F. maclellandii* have important ecological roles, such as providing habitat and nesting sites of birds in urban areas (Sulaiman et al. 2013). Naturally, this species is only distributed in India, China, and mainland Southeast Asia but it has been introduced to other tropical regions, including Indonesia. Most of the *F. maclellandii* specimens collected in Java did not produce generative organs, except for the PJBMTW0919-005 specimens from Bekasi. Following previous research, the species is sterile and rarely produces flowers, so, propagation is prepared through the stem cutting method (Berg 2007). *Ficus maclellandii* belongs to *Ficus* subg. *Urostigma*, because of air roots on its branches (Figure 3), its closely related to *F. binnendijkii* (Miq.) Miq. (Berg & Corner 2005; Berg 2007). All of the *F. maclellandii* specimens collected from Java hairy on its leaf base and have pinnate venation. These two are the main different characteristics between *F. maclellandii* and *F. binnendijkii* (Berg & Corner 2005; Berg 2007).

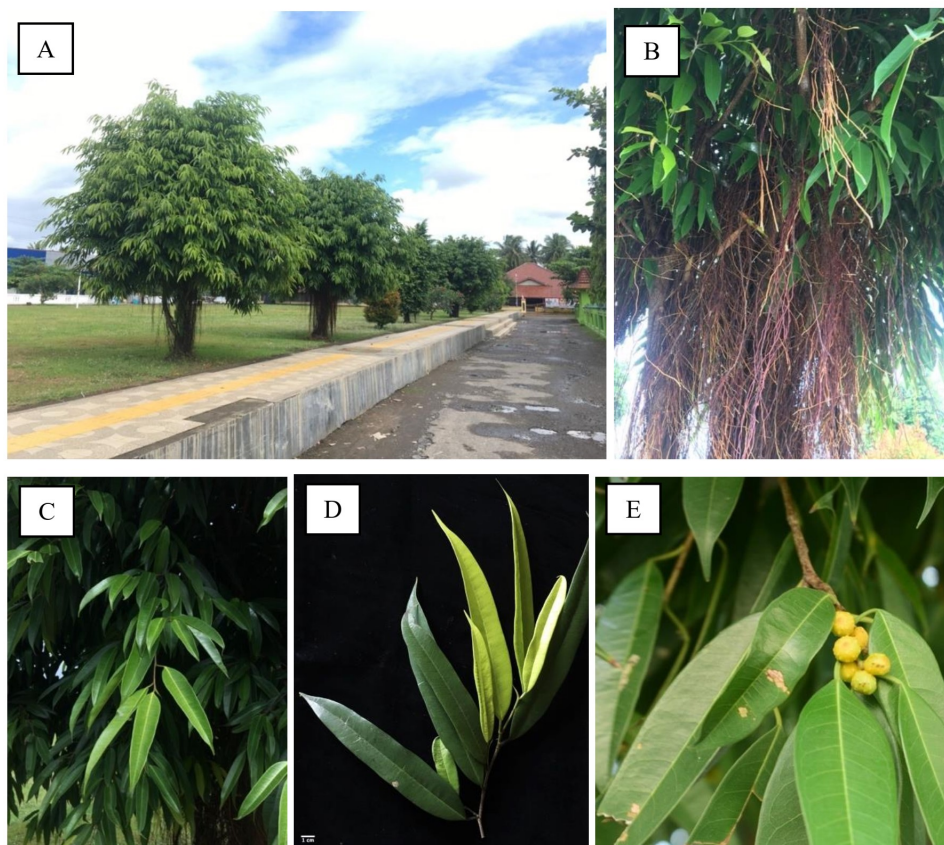


Figure 3. *Ficus maclellandii* King: A. Habit; B. Air roots; C & D. Variation of young leaves; and E. Syconia in the axillary leaf.

Three species of exotic *Ficus* originating from Africa, namely *F. cyathistipula* Warb., *F. lyrata* Warb., and *F. natalensis* Hochst., have been introduced to the Malesia region as ornamental plants (Berg & Corner 2005). However, records of herbarium specimens of these three species are not available yet (Berg & Corner 2005). During the study specimens of

F. natalensis subsp. *leprieurii* was not found at the Bogorinese (BO) Herbarium. Therefore, *F. natalensis* subsp. *leprieurii* was collected from Java for the first time. Morphologically, this species has flattened and shiny leaflets and is similar to *F. deltoidea* Jack. The two species can be distinguished based on the presence of wax glands on the leaves. The abaxial surface of *F. deltoidea* leaves has black wax glands in the axillary part of the vein (Figure 4-I). Meanwhile, the wax gland structure was not found in the leaves of *F. natalensis* subsp. *leprieurii* (Figure 4-H).

CONCLUSION

The additional notes, three species of the *Ficus* as introduced plants in Java can increase the number of species diversity of *Ficus* spp. Besides having potential as ornamental plants, *F. auriculata*, *F. maclellandii*, and *F. natalensis* subsp. *leprieurii* have other prospects that can be studied further in the future.

AUTHORS CONTRIBUTION

All authors had an equal contribution to this manuscript since they designed the research concept, collected data, analyzed it until they wrote all the manuscript sections. All authors read and approved the final manuscript.

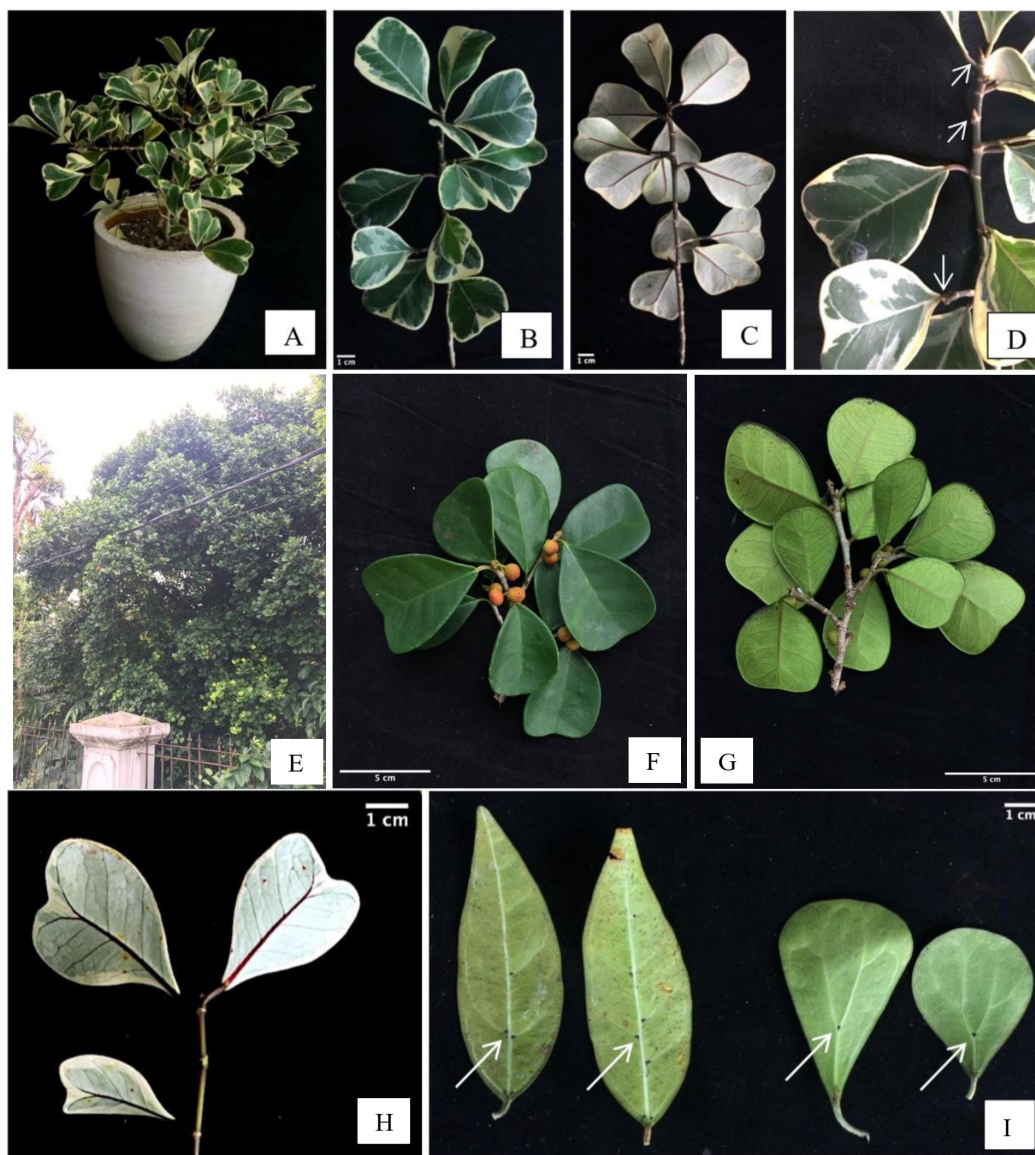


Figure 4. Variegated form of *F. natalensis* subsp. *leprieurii* (Miq.) C.C. Berg: A. Habit; B. Adaxial surface of the leaf; C. Abaxial surface of the leaf; D. Stipules position (arrows). Common form of *F. natalensis* subsp. *leprieurii*: E. Habit; F. Adaxial surface of the leaf; G. Abaxial surface of the leaf; H. Abaxial leaf surface of *F. natalensis* subsp. *leprieurii* without wax gland; I. Abaxial leaf surface of *F. deltoidea* showing blacks wax glands (arrow).

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this article.

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