





Identifications and typifications of *Ficus pubigera* var. *maliformis* and related names



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Abstract

In *Ficus* subsect. *Plagiostigma*, the identities of *F. pubigera* var. *maliformis* and some other related names are confusing presently, which hinders their precise application. Based on extensive examinations of related specimens, the lectotype of *F. foveolata* var. *maliformis* is designated here. *F. pubigera* var. *maliformis* is proved to be misapplied so far in most floras and herbaria. Furthermore, *F. yunnanensis* is treated as a new synonym of *F. pubigera* var. *maliformis*, and *F. howii* is reinstated to be a separate species, which had been wrongly identified as *F. pubigera* var. *maliformis*.

Keywords: *Ficus*, Himalayan region, lectotypification, new synonym, subsection *Plagiostigma*

Introduction

Ficus Linnaeus (1753: 1059) comprises over 750 species (Berg & Corner 2005, Pederneiras *et al.* 2018a, Zhang *et al.* 2020). A mass of binomials of *Ficus* had been examined and treated systematically in the milestone taxonomic monographs of Corner and Berg (Corner 1960a, b, 1965, Berg & Wiebes 1992, Berg & Corner 2005, Berg 2007) and subsequent studies (Chantarasuwan *et al.* 2013, 2015, Pederneiras *et al.* 2017, 2018b). However, as a group distributed at the northern limit of the range of *Ficus* in Asia, subsect. *Plagiostigma* (Zucc. ex Miquel 1848: 436) Berg (2003: 553) in subgen. *Synoechia* (Miquel 1848: 469) Miquel (1867: 289) is rarely concerned in these studies.

In subsect. *Plagiostigma*, *Ficus pubigera* (Wall. ex Miquel 1848: 76) Brandis (1874: 424) var. *maliformis* (King 1888: 134, t. 168) Corner (1960b: 6) is a species widely distributed in Himalayan region based on the floras (Corner 1965, Zhou & Gilbert 2003) and specimen records. However, its typification remains unclear, leading to its application unstable. Based on its protologue, *F. pubigera* var. *maliformis* has few similarities to the specimens currently identified as “*F. pubigera* var. *maliformis*” in herbaria, indicates that it may be misapplied. Simultaneously, its morphological traits unexpectedly resemble *F. yunnanensis* Chang (1984: 69), whereas the latter was reported as an endemic species in the limestone area in the Southwest China (Chang 1984). Therefore, the present study aims to (1) locate the types of *F. pubigera* var. *maliformis* and related names and fix their applications, (2) clarify the relationship between *F. pubigera* var. *maliformis* and *F. yunnanensis*, and, (3) reinstate the status of the specimens wrongly identified as “*F. pubigera* var. *maliformis*”, if the misapplication is confirmed.

Taxonomic treatment and typification

Ficus pubigera (Wall. ex Miq.) Brandis var. *maliformis* (King) Corner (1960b: 6; 1965: 50). ≡ *F. foveolata* (Wall. ex Miq. 1848: 77) Miquel (1867: 295). var. *maliformis* King (1888: 134, t. 168). **Lectotype (designated here):**—INDIA. Sikkim, August 1875, King G. 2111 (P06845942[image!], Fig. 1a; isoelectotypes CAL0000014425[image!], CAL0000014426[image!]). Remaining original materials INDIA. Sikkim, King G. s. n. (CAL0000014420[image!], CAL0000014421[image!], CAL0000014422[image!], CAL0000014423[image!], CAL0000014427[image!], L1599931[image!]).

= *Ficus foveolata* (Wall. ex Miq.) Miquel var. *oleaeformis* King (1888: 134, t. 168). ≡ *F. sarmentosa* var. *oleaeformis* (King) V. Singh & P. Singh (1991: 705). Type:—INDIA. Sikkim, 1870–1880, *King G. s. n.* (holotype K001328108 [image!], Fig. 1c).
 = *Ficus yunnanensis* S. S. Chang (1984: 69, f. 12). **syn. nov.** Type:—CHINA. Yunnan: Jingdong, 31 December 1939, *M. K. Li* 2747 (holotype IBSC0001255! Fig. 1b, isotypes IBSC0374007!, KUN1206455!, KUN1206456!). The collecting number was misquoted as “2749” in the protologue.



FIGURE 1. Type images or illustrations. **a)** Lectotype of *Ficus pubigera* var. *maliformis* (P06845942). **b)** Holotype of *F. yunnanensis* (IBSC0001255). **c)** Holotype of *F. pubigera* var. *oleaeformis* (K001328108). **d)** Illustrations of *F. foveolata* var. *oleaeformis* and var. *maliformis* (from Ann. Bot. Gard. Calcutta 1: t. 168. 1888.). (Photos: courtesy of related herbaria)



FIGURE 1 (Continued). Type images or illustrations. **e)** Holotype of *F. howii* (A00034577). **f)** Holotype of *F. pubigera* var. *reticulata* (IBSC0373267). (Photos: courtesy of related herbaria)

Description:—Root-climber, occasionally tree up to 8 m tall when mature. Branchlets 3–4 mm in diameter when mature, 2–3 mm when juvenile, with densely coarse yellowish-brown hairy always. Stipules 2, broadly lanceolate, densely covered with yellow hirtellous, somewhat persistent; bathyphylls distichous, but upper side reverse to all the laminae downward, petiole 0.4–0.8 cm, densely covered with yellow coarse hairs, lamina long ovate, 3–6 × 1.5–3.5 cm, papery, with sparse hirtellous, base narrowly cordate, apex acuminate to caudate with a 1–2 cm cauda, margin entire or with sparse teeth at the apex, veins 4–6 pairs, basal vein extending most to 1/3 of lamina length; acrophylls distichous, petiole 0.5–1.2 cm, densely covered with yellow crown hirtellous, lamina broadly lanceolate (oblique lanceolate sometime), 6–12 × 3–5 cm, chartaceous, base rounded, apex acuminate to long caudate, margin entire, veins 5–7 pairs, abaxially conspicuously raised, basal vein up to 1/2 of lamina length. Figs gynodioecious, axillary, solitary, peduncle 5 mm to subsessile, ovoid-globose to globose, 2–3 cm in diameter, densely covered with yellow stiff hairs, glabrescent when mature, apical bracts ± erect, hairy, inside interface with bristles. Staminate flowers scattered near ostiole, sessile to shortly pedicellate; calyx 4, red, obovate-elliptic. Gall flowers sessile to pedicellate; calyx 4, red, obovate to elliptic, ca. 1 mm, glabrous; ovary sessile, obovoid; style lateral; stigmas funnelform. Pistillate flowers many, ovary ellipsoid; style lateral; stigmas threadlike.

Distribution and habitat:—China: midwest Yunnan. India: Assam, Sikkim (type locality). Myanmar: Kachin. Evergreen forests, climbing on the rocks, ground, or trees sometimes, at an elevation of 1200–2400 m.


Diagnosis:—This taxon is rather distinct from other species in *Ficus* subsect. *Plagiostigma* by its well-developed indumentum on the leaves, branchlets, and juvenile syconia, basal veins up to 1/2 lamina length, and solitary syconium 2–3 cm in diameter.




Note:—To trace the types of *F. pubigera* var. *maliformis*, we checked the collections of George King and located several original materials preserved in CAL, L, and P. They are consistent with what had been described and illustrated in the protologue, especially in the aspects of the number of primary lateral nerves, length of basal veins, and diameter of syconia. Therefore, the most typical specimen is designated here as the lectotype for the precise application (Fig. 1a) based on Art. 9.3 and 9.11 (Turland *et al.* 2018).

Unexpectedly, the types of *F. pubigera* var. *maliformis* are morphologically almost the same as those of *F. yunnanensis* (Fig. 1b). With regard to key traits, such as lamina shape, lateral nerves, size and shape of syconia, and indumentum, we couldn't find any differences between these two taxa (Fig. 1a, b). After an intensive comparison between the types, we concluded that *F. yunnanensis* should be reduced to a synonym of *F. pubigera* var. *maliformis*. However, the specimens identified as "*F. pubigera* var. *maliformis*" in herbaria do not resemble any of the original materials and the types designated here for the name. Corner correctly identified several specimens as *F. pubigera* var. *maliformis* in the 1950s in herbaria (E, K, L, MICH), indicated the misapplication occurred after he established the combination. In subsequent floras of southeast Asia, such as Tree Flora of Malaya (Kochummen 1978), Flora Malesiana (Berg & Corner 2005), and Flora of Thailand (Berg *et al.* 2011), no varieties were recognized under *F. pubigera*, and the morphological descriptions of *F. pubigera* didn't cover the traits of *F. pubigera* var. *maliformis*. Though the varieties were divided in other floras [Flora Reipublicae Popularis Sinicae (Chang *et al.* 1998) and Flora of China (Zhou & Gilbert 2003)], the descriptions of *F. pubigera* var. *maliformis* were also incongruent to its types designated here. The misidentification in herbaria (KUN, NAS, PE, IBK) could be traced back to the 1970s, almost at the same time of the misapplication happened in the flora (Kochummen 1978). So, the origin of the misapplication is difficult to distinguish between from the floras and from the herbaria. Considering the rarity of the specimens of *F. pubigera* var. *maliformis*, it is plausible that the floras of southeast Asia ignored the morphological traits of *F. pubigera* var. *maliformis* without varieties divided in *F. pubigera*.

Corner (1960b, 1965) considered another variety, *F. foveolata* var. *oleaeformis*, homogeneous to *F. pubigera* var. *maliformis* without any interpretation. We had located one original material (K) of the former (Fig 1c) (maybe additional original materials exist in other herbaria but hard to confirm), and compared it with the lectotype of the later (Fig 1a). Though the difference of the lamina shape between them exists unambiguously, we noted that the illustration (Fig 1d) of *F. foveolata* var. *oleaeformis* in the protologue is extremely similar to that of *F. pubigera* var. *maliformis*. What's more, when considering all the original materials of two varieties, the shape of their laminae is overlapping and indistinguishable. King (1888) differentiated them mainly by the climbing substrate (trees for var. *maliformis* compared with ground and rocks for var. *oleaeformis*). However, at least *F. pubigera* var. *maliformis* can climb up on both rocks and trees based on our filed observations. So, we endorse Corner's treatment of the merging of them (Corner 1960b, 1965).

Additional specimens:—CHINA. Yunnan: Gongshan, Kongdang, 30 December 1990, *Dulongjiang expedition team 1543* (KUN0766343); Lushui, 25 March 1989, *H. Sun 1616* (KUN0766350); Tengchong, 16 October 1983, *Q. Lin 770669* (KUN0766351).—INDIA. Assam: Cherrapunjee, 7 August 1952, W. N. Koelz 31031 (MICH1495675).—MYANMAR. KachIn: Htawgaw, November 1925, *F. George 27674* (E00914096).

Ficus howii Merrill & Chun (1940: 43). Type:—CHINA. Hainan: Baoting, Taipinggang, 18 June 1935, *F. C. How 72944* (holotype A00034577[] Fig. 1e; isotypes IBK00088045!, IBK00088046!, IBSC0001242!, IBSC0373226!, PE00024132!).

= *Pogonotrophe verrucosa* Miquel (1848: 77, tab. II A). ≡ *Ficus verrucosa* (Miq.) Miquel (1867: 295) nom. invalid, pro syn., non Vahl (1805: 192). Type:—INDIA. Khatiga, 1835–1839, *Griffith s. n.* (holotype K001328110[]), Remaining original materials K001328111[], U1425665[]).

= *Ficus pubigera* (Wall. ex Miq.) Brandis var. *reticulata* S. S. Chang (1984: 72). **syn. nov.** Type:—CHINA. Yunnan: Menghai, Manluo, 5 March 1957, *Sino-ross Exped. 7020* (holotype IBSC0373267! Fig. 1f, isotypes PE00024150!, KUN0512905!, KUN0512906!, IBK00088055!).

Description:—Root-climber. Branchlets brownish, glabrous to subglabrous, 2–3 mm in diameter when juvenile, 3–4 mm in diameter when mature, puberulous to tomentose. Stipules 2, lanceolate, ca. 4 mm, caducous, sparse covered with brown tomentose; bathyphylls distichous, petiole 0.8–1.5 cm, subglabrous to puberulous, lamina ovate-oblong, 7–12 × 2.5–4 cm, thinly leathery, glabrous, base roundly with narrowly cordate, apex acuminate to caudate, margin entire, veins 7–11 pairs, basal vein indistinct, often adaxial surface gray-green and abaxial light-green; acrophylls distichous, petiole 1–2.5 cm, sparsely covered with brown tomentose or subglabrous, lamina long ovate to ovate-oblong, 8–15 × 3–5 cm, subcoriaceous to coriaceous, base cuneate, apex acuminate, adaxial surface glabrous, abaxial surface sparsely to densely tomentose, veins 8–12 pairs, abaxially conspicuously raised, basal vein up to 1/5 to 1/3 of lamina length. Fig gynodioecious, axillary on leafless older branchlets, solitary, globose, (sub)sessile to short pedunculate, 1–2 cm in diameter, surface sparsely brown tuberculate, densely covered with brown short pubescence, glabrescent when mature, apical bracts slightly erect, hairy, 0.5 mm, basal bracts 3, 1–1.5 mm, inside surface with bristles. Staminate flowers scattered near ostiole, pedicellate; calyx 4, oblanceolate, pink; stamens 2, filaments very short. Gall flowers sessile

to pedicellate, calyx 4, narrowly oblanceolate, pink; style subapical; stigmas funnelform. Pistillate flowers sessile to pedicellate; calyx 4; style subapical; stigma threadlike.

Distribution and habitat:—China: Guangxi, Guizhou, Hainan (type locality), Yunnan, Xizang. India: Assam, Khatiga. Laos: Boualapha. Myanmar: Kachin. Thailand: Chiangmai, Lampang. Evergreen forests, climbing on the rocks, the ground, or the trunks, at an elevation of 600–2000 m.

Diagnosis:—This species is similar to *F. sarmentosa* Buch.-Ham. ex Smith (1810: n. 45), differing from the latter by laminae brown when dry, young branchlets often glabrous, and figs with sparse tuberculate. It is also similar to *F. pubigera* var. *pubigera* but with glabrous and smaller mature syconia.

Note:—Because the misapplication of *F. pubigera* var. *maliformis*, the real status of the specimens identified as it remains unconfirmed. Through literature review and specimen examination, *F. howii* Merrill & Chun (1940: 43), a synonym of *F. pubigera* (Corner 1965, Berg 2003), is confirmed to be coherent with these doubtful specimens in morphology (Fig. 1e). Therefore, *F. howii* is reinstated to cover the specimens wrongly identified as “*F. pubigera* var. *maliformis*”.

Another variety *F. pubigera* var. *reticulata* Chang (1984: 72) was established based on its reticulate surface of syconia. However, this key trait couldn't be verified by the type (Fig. 1f). Other characteristics also couldn't distinguish from *F. howii*, thus *F. pubigera* var. *reticulata* should be a synonym of *F. howii*.

Pogonotrophe verrucosa Miquel (1848: 77) was described from Nepal. Later, Miquel (1867) treated it as a synonym of *Ficus nemoralis* Miquel (1848: 453) with citation “*F. verrucosa* Miq. Lond. Journ. l.c. sub. *Pog.*” in the synonym. His citation indicates that he proposed a new combination *Ficus verrucosa*, but, it was not validly published because it was merely cited in the synonym according to Art. 36.1(b) (Turland *et al.* 2018). However, *Pogonotrophe verrucosa* differs from *F. nemoralis* by its climbing habit, coriaceous lamina, and tuberculate syconia, thus it should be a different species. It was later treated as a synonym of *F. pubigera* (Corner 1965, Berg & Corner 2005, Berg 2011). Based on the shape and size of the lamina as well as the diameter and indumentum of syconia, *P. verrucosa* consists of the specimens wrongly identified as “*F. pubigera* var. *maliformis*”, i.e. *Ficus howii* here. However, the final epithet of *P. verrucosa* is not appropriate to designate a new combination “*Ficus verrucosa*”, because *F. verrucosa* Vahl (1805: 192) already exists.

This species was usually misidentified as *F. pubigera* (Wall. ex Miq.) Brandis var. *maliformis* (King) Corner, but could be distinguished by the base of lamina cuneate, secondary veins 7–10 pairs, and syconia surface sparsely tuberculate.

Additional specimens:—CHINA. Guangxi: Shangsi, 3 July 1933, *H. D. Zeng* 22623 (IBK00088038); Ningming, 20 November 1959, *X. F. Deng* 10624 (IBK00088037); Guizhou: Xingren, 28 August 1960, *Guizhoudui* 8712 (NAS00292438); *Y. Tsiang* 4547 (NAS00292436); Hainan: Baisha, 20 April 1936, *X. Q. Liu* 26366 (IBK00088048); Yunnan: Jinghong, 2 March 1957, *Zhongsudui* 5453 (NAS00292425); Jinghong, September 1936, *C. W. Wang* 78632 (NAS00292431); Lincang, 3 November 1938, *D. J. Yu* 18165 (PE00641828).—LAOS. Khammouane: Boualapha, Nong Seng, 4 May 2018, *L. Averyana et al.* AL623 (LE01048182).—MYANMAR. KachIn: Putao, 13 December 2017, *Y. H. Tan et al.* M3495 (HITBC).—THAILAND. Chiangmai: Muang, 15 September 1988, *J. F. Maxwell* 88-1080 (L1599932); Lampang: Wahng Nua, 25 March 1997, *J. F. Maxwell* 97-221 (L1615618).—VIETNAM. Tonkin, 9 January 1931, *E. Poilane* 18799 (L3918522).

Key to *F. pubigera* var. *maliformis* and allies

1. Basal veins over 1/2 length of lamina, lateral veins 5–7 pairs, indumentum developed on the petiole and branchlet, petiole often less than 0.8 cm, syconia 2–3 cm in diameter *F. pubigera* var. *maliformis*
1. Basal veins less than 1/3 length of lamina, lateral veins 8–12 pairs or more, glabrous or sparse hairy on the petiole and branchlet, petioles often longer than 1 cm, syconia often less than 2 cm in diameter 2
2. Lamina not brown when dry, surface of the syconia not tuberculate *F. sarmentosa*
2. Lamina brown when dry, surface of the syconia sparsely tuberculate 3
3. Syconia 1.8 cm or more in diameter, surface densely brown pubescent *F. pubigera* var. *pubigera*
3. Syconia less than 1.5 cm in diameter, surface glabrous *F. howii*

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References

- Berg, C.C. (2003) Flora Malesiana precursor for the treatment of Moraceae 4: *Ficus* subgenus *Synoecia*. *Blumea* 48: 551–557.
<https://doi.org/10.3767/000651903X489546>
- Berg, C.C. (2007) Precursory taxonomic studies on *Ficus* (Moraceae) for the Flora of Thailand. *Thai Forest Bulletin (Botany)* 35: 4–28.
- Berg, C.C. & Corner, E.J.H. (2005) Moraceae (*Ficus*). In: Nooteboom, H.P. (Ed.) *Flora Malesiana*. National Herbarium Nederland, Leiden, pp. 1–730.
- Berg, C.C. & Wiebes, J.T. (1992) African fig trees and fig wasps. *Koninklijke Nederlandse Akademie van Wetenschappen Verhandelingen Afdeling Natuurkunde, Tweede Reeks* 89: 1–298.
- Berg, C.C., Pattharahirantricin, N. & Chantarasuwan, B. (2011) Moaceae. In: Santisuk, T. & Larsen, K. (Eds.) *Flora of Thailand*. Prachachon Co. Ltd., Bangkok, pp. 585–587.
- Brandis, D. (1874) *The Forest Flora of North-West and Central India*. Wm. H. Allen & CO., London, 424 pp.
- Chang, S.S. (1984) New Taxa of Moraceae from China and Vietnam. *Acta Phytotaxonomica Sinica* 22 (1): 64–76. [in Chinese]
- Chang, S.S., Wu, C.Y. & Cao, Z.Y. (1998) Moraceae (*Ficus*). In: Chang, S.S. & Wu, C.Y. (Eds.) *Flora reipublicae popularis Sinicae*. Science Press, Beijing, pp. 66–169. [in Chinese]
- Chantarasuwan, B., Berg, C.C., Kjellberg, F., Ronsted, N., Garcia, M., Baider, C. & van Welzen, P.C. (2015) A New Classification of *Ficus* Subsection *Urostigma* (Moraceae) Based on Four Nuclear DNA Markers (ITS, ETS, *G3pdh*, and *ncpGS*), Morphology and Leaf Anatomy. *PLoS ONE* 10 (6): e0128289.
<https://doi.org/10.1371/journal.pone.0128289>
- Chantarasuwan, B., Berg, C.C. & van Welzen, P.C. (2013) A Revision of *Ficus* Subsection *Urostigma* (Moraceae). *Systematic Botany*. 38 (3): 653–686.
<https://doi.org/10.1600/036364413X670241>
- Corner, E.J.H. (1960a) Taxonomic notes on *Ficus* L., Asia and Australasia. *Gardens' Bulletin Singapore* 17 (3): 368–485.
- Corner, E.J.H. (1960b) Taxonomic notes on *Ficus* L., Asia and Australasia. *Gardens' Bulletin Singapore* 18 (1): 1–69.
- Corner, E.J.H. (1965) Check-list of *Ficus* in Asia and Australasia with keys to identification. *Gardens' Bulletin Singapore* 21 (1): 1–186.
- King, G. (1888) *Annals of the Royal botanica garden, Calcutta* 1. Bengal Secretariat Press, Calcutta; L. Reeve & Co., London, pp. 133–135.
- Kochummen, K.M. (1987) Moraceae (*Ficus*). In: Ng, F.S.P. (Ed.) *Tree Flora of Malaya, A Manual for Foresters*. Longman Group Limited, London, pp. 153.
- Linnaeus, C. (1753) *Species Plantarum* 2. Impensis Laurentii Salvii, Holmiae [Stockholm], 1059 pp.
<https://doi.org/10.5962/bhl.title.669>
- Merrill, E.D. & Chun, W.Y. (1940) Additional to our knowledge of the Hainan flora, III. *Sunyatsenia* 5 (1–3): 43–44.
- Miquel, F.A.G. (1848) *The London Journal of Botany* 7. Reeve, Benham, and Reeve etc, London, pp. 76–77, 436, 453, 469.
- Miquel, F.A.G. (1867) *Annales Musei Botanici Lugduno-Batavi* 3. C. G. van der Post, Amstelodami; C. van der Post JM., Traiecti ad Rhenum, pp. 289–295.
- Pederneiras, L.C., Dussán, C.M., Romaniuc-Neto, S., Costa, A.F.D. & Mansano, V.D.F. (2018b) Nomenclatural revision of *Ficus* sect. *Americanae* (Moraceae): typification of *Ficus americana* and allied species. *Phytotaxa* 414 (5): 262–268.
<https://doi.org/10.11646/phytotaxa.361.2.9>
- Pederneiras, L.C., Gaglioti, A.L., Romaniuc-Neto, S. & Mansano, V.D.F. (2018a). The role of biogeographical barriers and bridges in determining divergent lineages in *Ficus* (Moraceae). *Botanical Journal of the Linnean Society* 187 (4): 594–613.
<https://doi.org/10.1093/botlinnean/boy036>
- Pederneiras, L.C., Mansano, V.D.F. & Romaniuc-Neto, S. (2017) Taxonomic synopsis of the *Ficus* sect. *Pharmacosycea* (Moraceae) from Colombia. *Phytotaxa* 313 (1): 1–22.
<https://doi.org/10.11646/phytotaxa.313.1.1>

- Singh, V. & Singh, P. (1991) Some new combinations in the flora of Sikkim. *Journal of Economic and Taxonomic Botany* 15 (3): 705–706.
- Smith, J.E. (1810) *FICUS*. In: Rees, A. (Ed.) *The Cyclopaedia; universal dictionary of Arts, Sciences, and Literature* 14 (28). Longman, Hurst, Rees, Orme & Brown etc., London. n. 45.
- Turland, N.J., Wiersema, J.H., Barrie, F.R., Greuter, W., Hawksworth, D.L., Herendeen, P.S., Knapp, S., Kusber, W.-H., Li, D.-Z., Marhold, K., May, T.W., McNeill, J., Monro, A.M., Prado, J., Price, M.J. & Smith, G.F. (2018) International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code): Adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. *Regnum Vegetabile* 159. Koeltz Botanical Books, Glashütten, pp. 21, 23, 85.
<https://doi.org/10.12705/Code.2018>
- Vahl, M. (1805) *Enumeratio Plantarum* 2. Anlae Regiae et Universitatis Typographorum, Hauniae, 192 pp.
<https://doi.org/10.5962/bhl.title.272>
- Zhang, Z., Wang, X.M., Liao, S., Zhang, J.H. & Li, H.Q. (2020) Phylogenetic reconstruction of *Ficus* subg. *Synoecia* and its allies (Moraceae), with implications on the origin of the climbing habit. *Taxon*. [Online version]
<https://doi.org/10.1002/tax.12282>
- Zhou, Z.K. & Gilbert, M.G. (2003) Moraceae. In: Wu, Z.Y. & Raven, P.H. (Eds.) *Flora of China*. Science Press, Beijing; Missouri Botanical Garden Press, St. Louis, pp. 21–73.