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# A reappraisal of the *Acer wilsonii* complex and Related Species in China

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# 중국 *Acer wilsonii* 와 근연분류군의 분류학적 재검토

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**ABSTRACT:** The *Acer wilsonii* complex including *A. wilsonii, A. tutcheri,* and *A. confertifoilum* is distributed in southern China. Morphological variation was examined to delimit the species and to determine whether recognition at the specific level was warranted. Univariate and bivariate statistical methods, based on data taken from herbarium specimens, were used to examine morphological variation between and within species. This study showed that *A. tutcheri* differed from *A. wilsonii* by its rather short inflorescence, small leaf blades, and three leaf lobes with distinctive serrate leaf lobes. In contrast, there was virtually no separation of taxa with respect to the paniculate-corymbose or short paniculate inflorescence between *A. confertifolium* and *A. tutcheri,* suggesting that *A. confertifolium* morphologically resembled *A. tutcheri* and is a rather smaller form of it. Circumscription of *Acer wilsonii* has been quite troublesome, because the important holotype and isotype specimens contained different species under the same number and were misleading with respect to the correct application of the name. Furthermore, lobation is very weak within ser. *Sinensia*, but diversified inflorescences usually occur in China. A three lobed leaves species, *A. wilsonii,* represents the reduction in lobation without any modification of panicle inflorescences and seems to be closely related to *A. sinense*. However, *A. tutcheri*, which shows a reduction in panicle inflorescence with four petals and sepals, may not be closely related to *A. sinense*. Three lobed taxa may not correctly reflect the true relationship within ser. *Sinensia.* The designated lectotype of *A. wilsonii,* line drawings of representative leaves of related species, a key, and distribution maps of these taxa are presented.

**Keywords:** *Acer wilsonii*, *Acer tutcheri*, *Acer confertifolium*, distribution maps, evolution, lectotype

**적 요:** 중국 남부에 분포하는 *Acer wilsonii* 분류군은(*A. wilsonii, A. tutcheri,* and *A. confertifoilum*) 10개의 형태형질을 분석을 통해 종의 실체에 대해 검토하였다. 중국과 외국 표본관에 소장된 표본을 근간으로 단변량과 2개의 변량을 조사한 결과 *A. tutcheri*는 *A. wilsonii*와 화서가 짧으면서 잎맥에 발달한 거치와 좁은 잎의 너비에 의해 구분이 되었다. E. H. Wilson이 호북(湖北)에서 채집하여 기재된 *A. wilsonii*는 2개의 복제표본이 존재하나 이중 한 개는 전혀 다른 분류군으로 인식되며, 또한, A. Rehder가 기재 당시 명확하게 배제한 표본을 Fnag, W. P. 는 포함하여 지금까지 이 종에 대한 실체에 오류가 있었다. 한편, 잎이 소형이고 화서가 단축된 *A. confertifolium*은 *A. tutcheri*의 소형 표본으로 이명으로 처리하였다. *Sinensia*열은 화서 형태의 다양한 분화가 있었던 반면, 잎이 갈라지는 맥수는 비교적 3-5개로 고정된 반면, *Palamta* 열은 잎의 맥수가 많아지면서(7–11개), 화서가 단축된 산방화서의 별다른 변화를 보여주지 않아, 서로 상반된 진화양상을 보였다. *A. wilsonii*은 *Sinensia* 열중 잎과 화서가 모두 단축된 진화된 계열로 판단되지만 꽃잎이 5장으로 4장인 *A. tutcheri*와는 서로 유연관계는 먼 것으로 판단된다. 본 연구결과*A. wilsonii*의 선정기준표본, 분포도, 검색표를 제시하였다.

**주요어:** *Acer wilsonii*, *Acer tutcheri*, *Acer confertifolium*, 분포도, 진화, 선정기준표본

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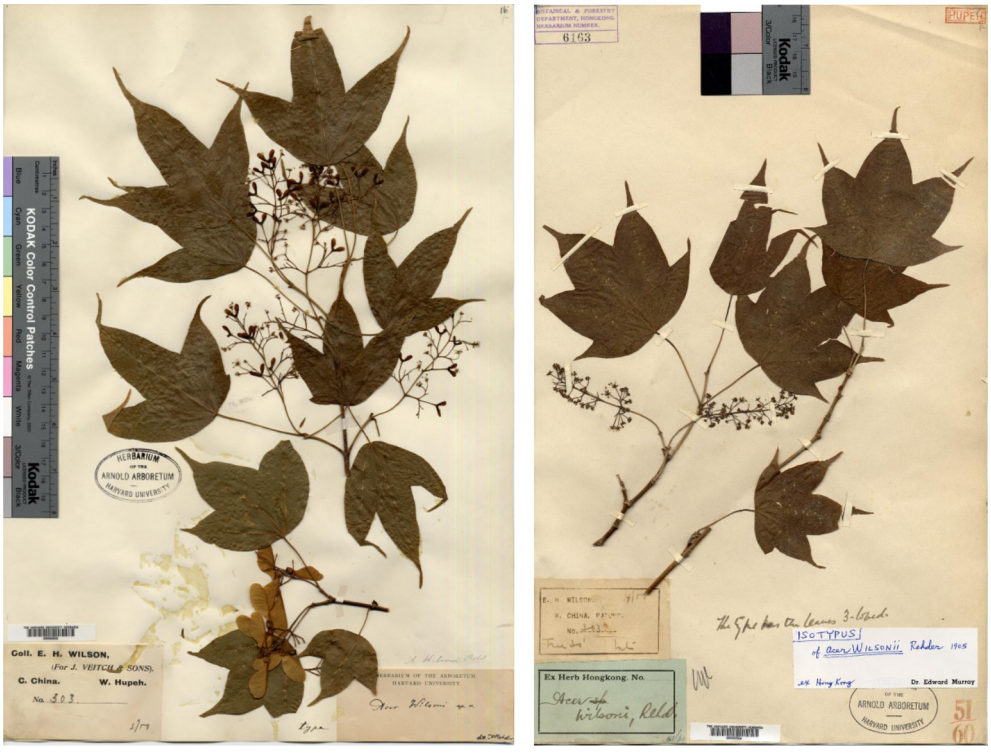
*Acer* is a wide-ranging genus of trees and shrubs comprising up to 250 species worldwide (Ogata, 1967; de Jong 1976; Fang 1981). Sect. *Palmata* Pax, which is characterized by pentamerous flowers with an extrastaminal disc, four pairs of scales, 3–13 lobed or undivided leaves, and corymbose, panicle inflorescence (de Jong, 1976; Delendick, 1990,) is the largest section in the genus, including ca. 40 species (Xu et al, 2008). The taxonomy of sect. *Palmata* was considered difficult and largely ignored until Ogata (1967) and de Jong (1976) proposed three series (*Palmata, Sinensia* Pojark., and *Peninervia* Metc.) within the section. In contrast, Delendick (1990) decided that these three series were unnecessary based on his flavonoid data because they were based primarily on leaf and inflorescence. The current study adopted de Jong's classification. Ser. *Sinensia* comprises ca. 17 recognized species (Xu et al., 2008) but most are confined to China and Taiwan. These species within ser., *Sinensia* can be divided into three major groups based on the number of leaf lobes: 3-lobed (A. *wilsonii* comlex), 5-lobed (*A. sinense* complex), and 7-lobed taxa (*A. campbellii* complex). The taxonomy and flora of the *A. wilsonii* complex has already been treated in previous studies, but most are still insufficiently known with regard to their nomenclature, delimitation, and distribution. De Jong (1976) indicated in his earlier work that future revisional work will strongly reduce the number of species in sect. *Palmata*. The present study considered the two confused species, *A. wilsonii* Rehder and *A. tutcheri* Duthie including *A. confertifolium* Merr. et Metc., all described from southern China.

*Acer wilsonii* is described based on material collected by E. H. Wilson from western Hubei. When Rehder (1905) initially published the name *A. wilsonii*, he clearly designated a holotype specimen (Wilson 303, holotype at A, barcode 50503, Fig. 1A; isotype at E, barcode 318264). Other Wilson's collection (isotype at A, barcode 50504, Fig. 1B; isotype at NY, barcode 337726) of *A. wilsonii* bearing locality, Patung in Hubei with the number "303" was found as an isotype. The original material (barcode 50503) at A with three lobed leaves, which was formerly regarded as a holotype, is different from the five lobed leaves (barcode 50504) at A, currently identified as *A. sinense*. Moreover, in this particular case, the five lobed leaves of Wilson 303 (A, barcode 50504) further complicates matters, because Rehder clearly excluded five lobed leaves in the protologue, indicating that Henry 12044 (at E) is different from *A. wilsonii* due to more serrate leaves and the larger fruits presented in Rehder's original




A B

**Fig. 1.** A. Holotype of *Acer wilsonii* Rehder (E. H. Wilson 303, A, barcode 50503)- sheet that bears the lectotype specimen here, which is the flowering plant in the upper part; B. Isotype of *A. wilsonii* (E.H. Wilson 303, A, barcode 50504)-sheet that shows the different collection of other species, not a duplicate specimen.

description of that name. Unfortunately this was not made clear when Fang (1939) listed this specimen, because he chose Henry 12044, which showed the range of characters he considered represented the inherent variability of this species.

The variation in leaf characters may not have been treated satisfactorily. Widely differing circumscriptions and misapplied names are found in floras and on labels in herbaria. In the present state of knowledge of *A. wilsonii*, the leaf character may be of limited use when unsupported by characteristics that are observable on many specimens.

*Acer tutcheri,* which is clearly a member of the *A. wilsonii* complex, is a variable species centered in southern China, with disjunct populations in Taiwan. *A. serrulataum* Hayata and *A. tutcheri* var. *shimadai* Hayata in Taiwan (de Jong, 1996) and *A. confertifolium* Merr. et F. P. Metcalf in southern China are very close to *A. tutcheri* and can be distinguished based on leaf shape and small fruit. Only one collection of *A. confertifolium* and a limited number of specimens from Taiwan clearly lack these characters. There may be considerable variation in fruit and leaf shape, but few of the observations made so far are reliable.

Recent molecular data including chloroplast psbM-trnD and trnD-trnT noncoding regions support the monophyly of sect. *Palmata* and several other sections (Li, 2006). However, support for phylogenetic relationships within sect. *Palmata* is weak (Li, 2011). Thus, DNA studies have shed little new light on problems within the phylogeny and classification of sect. *Palmata.*

This study tried to characterize patterns of variation in vegetative morphology of *A. wilsonii* and *A. tutcheri* including other related taxa throughout their range in southern China. Morphological variation was examined to delimit the species and to determine whether recognition at the specific level is warranted. The specic objectives of this study were (1) to quantitatively evaluate the extent and patterns of morphological variability of the two species and to determine the degree of their differences using univariate and bivariate statistical approaches, (2) to search for and designate types, and (3) to conduct complementary herbarium studies for distribution maps. Here we reported on the typification of *A. wilsonii* and some nomenclatural problems associated with the application of these names.

## Materials and Methods

Analysis of the morphological characters was performed on materials from Harvard University (A), Missouri Botanic Garden (MO), Chinese Academy of Sciences, Beijing (PE), and the California Academy of Sciences (CAS).

Herbarium specimens were selected to represent the entire geographical range and to encompass the morphological variability present within each taxon. Additional individuals from specimens (accessed through Chinese Virtual Herbarium Data Portal; http://www.cvh.org.cn/cms/) deposited at other Chinese institutes (HTBC, IBK, KUN, LBG, and PE) were measured for these characters.

Fifty-one *A. wilsonii* and *A. tutcheri* individuals including a type of *A. confertifolium* were measured for the various characters. Ten characters (petiole length, pedicel length, leaf length, leaf width, inflorescence length, fruit length, nutlet length, number of leaf lobes, number of serrate in half midlobe, and middle lobe width) were selected for analyses included those most frequently used in keys and diagnoses of the two taxa (Xu et al., 2008). Morphological variation within and among taxa was assessed using univariate statistics (mean, maximum, minimum). The univariate statistics were produced with the XLSTAT (2010). Bivariate scatter diagrams were prepared, and three characters associated with individuals in the three taxa were plotted (XLSTAT, 2010).

## Results

Among the ten characters examined, only three characters such as the number of serrations in the middle lobe, inflorescence length, and leaf width showed interspecific variation (Fig. 2).

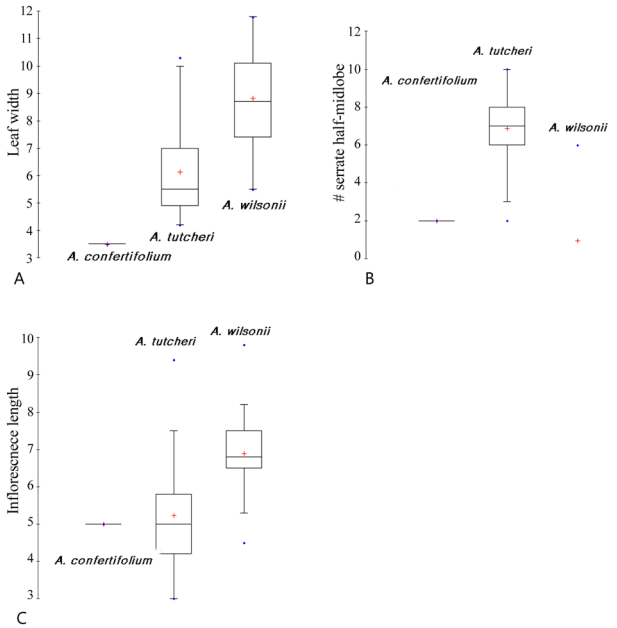
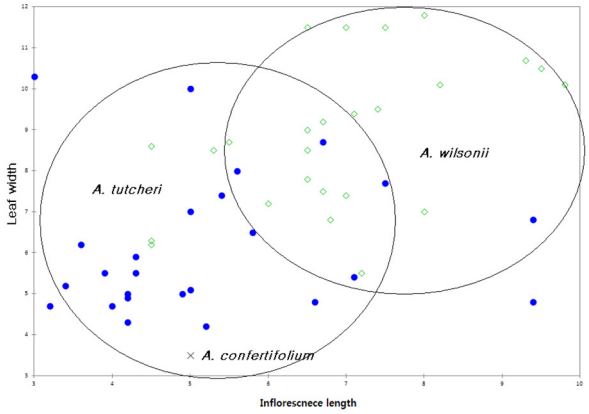


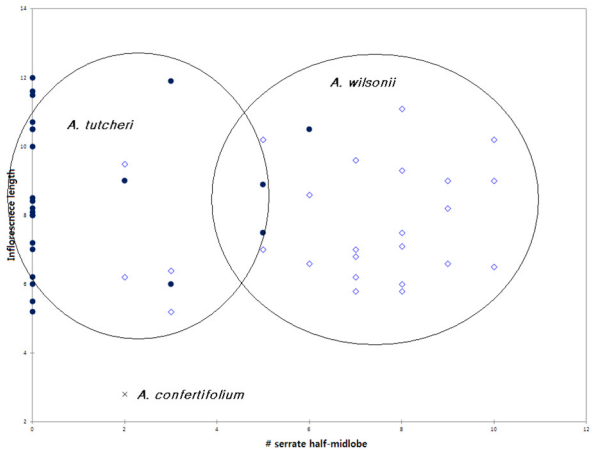

**Fig. 2.** Morphological variation in leaf width (A), the number of serration in mid lobe (B) and inflorescence length (C). In all box-and-whisker plots, the black square is the median and the line is the range. Only three significant characters are presented as examples of variation patterns in *A. confertifolium, A. tutcheri,* and *A. wilsonii*.

Several bivariate plots using these characters were assessed to find the relationship between *A. wilsonii* and *A. tutcheri,* and two plots (Fig. 3) such as inflorescence length vs. leaf width and the number of serrations in half midlobe vs. inflorescence length clearly separated the two taxa into more distinguished groups.

Generally *Acer wilsonii* and *A. tutcheri* are distinct with respect to morphology of leaf size and inflorescence length in addition to the numbers of petals and sepals (4 vs. 5), although some individuals were interspersed in two major entities. The differences between these species are listed in Table 1. With respect to morphology, *A. tutcheri* differed by its rather short inflorescence, small leaf blades, and three leaf lobes with distinctive serrate leaf lobes. *A. confertifolium* morphologically resembled a rather smaller form of *A. tutcheri*.




A




B

**Fig. 3.** A-B. Bivariate analyses of two variables (A: inflores nce length vs leaf width; B. number of serration in mid lobe vs inflores ence length) in three species, *A. wilsonii, A. tutcheri,* and *A. confertifolium*. Two major entities showed significant differences except a few individuals.

**Table 1.** Character comparisons between *Acer wilsonii* and *A. tutcheri* in terms of leaf, fruit, and flower characers.

| | *Acer wilsonii* | *Acer tutcheri* |
|---|---|---|
| Leaf | | |
| length | (5)7–12 cm (mean 8.5 cm) | 4–10 cm (mean 5.8 cm) |
| width | 6–12 cm (mean 8.9 cm) | 6–11 cm (mean 7.6 cm) |
| serration in the mid lobe | 0–10(20) | (6)14–20 |
| # of lobe | 3(5) | 3 |
| Petiole length | 3–6 cm | 2–5cm |
| Inflorescence length | (3)5–8(9) cm | 3–6(6.5) cm |
| Petals and Sepals | 5 | 4 |

## Discussion

### Taxonomic interpretation of the type of *Acer wilsonii*

The status and relationships of *A. wilsonii* are unclear, but it is similar to *A. sinense* in terms of inflorescence. The typification of *A. wilsonii* is discussed below, and some specimens cited by Fang as *A. wilsonii* should be included in *A. sinense* without much hesitation, although there seems to be some confusion over the number of leaf lobes.

The circumscription of *Acer wilsonii* has been quite troublesome, because the important holotype and isotype specimens contain different taxa under the same number. *A. wilsonii* is based on material collected by E. H. Wilson from western Hubei. The complexities of the typified names based on this collector's material are summarized, emphasizing that material bearing the name "Wilson 303" cannot be considered duplicate type material. Wilson's numbers were distribution not collection numbers based on two separate specimens.

The original *A. wilsonii* material at A (barcode 50503), the three lobed leaves (Fig. 4A), formerly regarded as a holotype, consisted of two shoots of different trees, i.e., one large inflorescence with many flowers and leaves and one small fruit element with leaves on the mounted sheet. These elements must be regarded as syntypes according to article 9.4. Therefore, the name *A. wilsonii* Rehder is lectotypified by the flower element, and a supporting epitype was designated to fix the application of the name (Art. 9.7, 9.15, McNeill et al., 2006). Moreover, in this particular case, the five lobed leaves of Wilson 303 (A, barcode 50504) further complicated matters, because Rehder clearly excluded five lobed leaves in the protologue, indicating that Henry 12044 at E is different from *A. wilsonii* due to more serrate leaves and the larger fruits presented in Rehder's original description of that name (Fig. 4C). Thus, the latter Wilson's collection was originally not

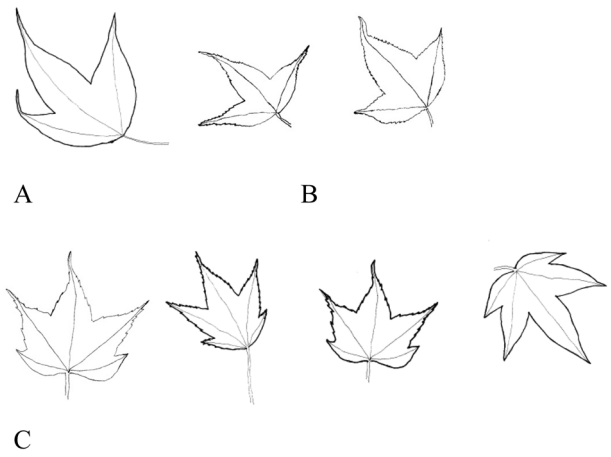



**Fig. 4.** Diverse leaf forms of the *A. wilsonii* complex. A. A typical form of *A. wilsonii*; B. a leaf form of *A. tucheri*; C. Diverse forms of *A. sinense* in southern China.

associated with *A. wilsonii. A. wilsonii* was partly based on the Wilson 303 type (A, barcode 50504, Fig. 1A) and Fang and other researchers (e.g., Xu et al., 2008) apparently interpreted *A. wilsonii,* at least in part, as *A. sinense* (Fig. 1B), through a specimen so identified by them. Therefore, *A. wilsonii* has been consistently applied to a taxonomically different entity from southern China and its subsequent misapplication as *A. sinense*. The leaves of *Acer wilsonii* are occasionally five lobed with rather prominent three lobed leaves in the same shoot, but can be fairly easily recognized by the three deep lobes without serration, compared with *A. sinense* with five shallow and serrated lobed leaves. An interpretative lectotype and epitype, which conforms closely to current usage, is designated here to fix this application effectively.

A newly described taxon, *Acer pseudowilsonii* Y. S. Chen (Chen, 2010) in Thailand is closely related to *A. wilsonii*, as the two have 3(5) lobed halfway leaves and panicle inflorescence, but *A. pseudowilsonii* differs in having large fruits, and a late flowering season (November). In contrast, *A. sichourense* in Yunnan has been confused with *A. wilsonii*. We have examined the holotype, isotype [Yunnan: Xichou, Shiang-pyng Shan, Aug. 30, 1947, K. M. Feng 11514(KUN, PE)], and paratypes of *A. angustilobum* var. *sichourense* W. P. Fang et M. Y. Fang, and it is clear that this taxon is reduced to synonymy under *A. sinense*. Details of the taxonomic view of *A. angustilobum var. sichourense* will be discussed under *A. sinense* in a separate study.

## Circumscription of *Acer tutcheri*

Only one collection of *A. confertifolium* Merr. et F. P. Metcalf, which has corymbose inflorescence, was based on a specimen (Tsang W.T # 21407) collected from Mexian of eastern Guangdong. Some individuals [often identified as *A. confertifolium* var. *serrulatum* (Dunn) W. P. Fang] that come from locations in Fujian of eastern China have the same characteristics as *A. confertifolium* (Fang, 1979). *A. confertifolim* var. *serrulatum,* which has no white hairs on twigs and has larger leaves and fruits, was treated as a synonym of var. *confertifolim* by Xu et al.(2008). *A. johnedwardianum* Metc. is a substitute name because of the homonymy due to the existence of an earlier name, *A. serrulatum* Hayata (1911) if *Acer wilsonii* var. *serrulatum* Dunn was changed in rank as a species (Metcalf, 1942). Xu et al. (2008) insisted that *A. confertifolium* can be distinguished from both *A. tutcheri* and *A. wilsonii* by the paniculate-corymbose inflorescence, although the inflorescence of *A. confertifolium* was not described by Metcalf (1942). The characteristic inflorescences in many species of ser. *Sinensia,* such as *A. sinense* are usually very variable. There is considerable variation in inflorescence within *A. wilsonii* and *A. tutcheri* (Fig. 4B), but the extremes are linked by intermediates such as *A. confertifolium* (Fig. 2). There was virtually no separation of taxa with respect to the paniculate-corymbose or short paniculate inflorescence. Therefore, *A. confertifolium* and *A. tutcheri* overlapped considerably for this character and should be treated as one species.

A limited number (3-4) of specimens from Fujian deposited at PE and determined to be *A. confertifolium* have five-lobed leaves with corymbose or short panicle inflorescence. It is not difficult to find typical forms of *A. pauciflorum* with five-lobed leaves and corymbose inflorescence in Zhejiang of eastern China. The most cohesive vegetative morphology is largely due to the high level of variability expressed in leaf lobation. Therefore, many taxonomists in China misapplied *A. tutcheri* and *A. pauciflorum* in Fujian to *A. confertifolium* (Xu et al., 2008), and *A. confertifolium* seemed best reduced to synonymy under *A. tutcheri.*

The type specimen of the three-lobed Taiwanese maple, *A. tutcheri* var. *shimadai* (no information on location, Sept 1907, T. Kawakami and Y. Shimada 5657, TI, holotype, Hayata, 1911), which has a panicle-compound corymbose with many fruits, is good agreement with *A. serrulatum* Hayata in Taiwan (see Evolution below). Three- lobed leaves of specimens are occasionally found in peripheral populations of five lobed taxa such as *A. serrulatum, A. sinense* Pax, and *A. oliverianum* Pax. Therefore, in terms of inflorescence and distribution pattern, var. *shimadai* apparently approaches *A. serrulatum,* rather than *A. tutcheri,* although further collections may be required to confirm this treatment.

## Evolution

The most primitive species within genus *Acer*, *A. tonkinense*, is represented by long panicle inflorescence with many small

flowers and large three-lobed leaves. A division into two advanced series, *Palmata* and *Penninervia*, which has the most specialized taxa of this section, results in a reduction in the inflorescences with many lobed leaves or unlobed leaves (de Jong, 1976).

The large panicle inflorescences (e.g. *A. sinense*) of ser. *Sinensia* were reduced into short panicles or corymbose inflorescences (e.g. *A. oliverianum*) through a strong reduction in the rachis and secondary branching (*A. erianthum* Schwer.). Besides this reduction the portion of lateral inflorescences increased, such as *A. serrulatum* Hayata in Taiwan. Most taxa in ser. *Sinensia* with predominantly 5- or 7-lobed leaves with long panicle inflorescence develop 3-lobed leaves with reduced panicle inflorescence or 5-lobed leaves with a diverse modified inflorescence. Although deeply lobed and further lobation is very weak within ser. *Sinensia*, diversified inflorescences usually occur, particualrly in *A. sinense* in China. In contrast, an increase in the number of leaf lobes in ser. *Palmata* are a predominant evolutionary advancement, but modified inflorescences (= all corymose) do not occur at all. Three- lobed leaf taxa such as *A. wilsonii* and *A. tutcheri*, which represent a reduction of lobation and/or shorten panicle inflorescences, shows specialization in this series.

### Variation within *Acer sinense*

The greatest variation within *A. sinense* is in the Guangxi, Guangdong, and Quizhou. Many species have been described using leaf, fruit, and/or inflorescence from a few specimens: *A. sunyiense* Fang (western Guangdong), *A. bicolor* F. Chun (eastern to western Gungxi), *A. yaoshanicum* Fang (eastern Guangxi), *A. kuomei* Fang et Fang f (western Guangxi), *A. chingii* Hu (southern Guizhou and northern Guangxi), *A. kweilinense* W. P. Fang et M. Y. Fang (southeastern Quizhou and northern Guangxi), and *A. miaoshanicum* W. P. Fang (northern Guangxi) (Fang, 1981). Among these taxa *A. sunyiense, A. bicolor,* and *A. yaoshanicum* have been reduced to synonymy under *A. sinense* or *A. elegantulum* W. P. Fang & P. L. Chiu (Xu et al., 2008), and the other four species, *A. chingii, A. kuomeii, A. kweilinense*, and *A. miaoshanicum* are still maintained by Xu et al. (2008). Some of this variation is rather trivial and is neither correlated with other characters nor always constant within a collection. More substantial variation occurs in the leaf form, number of leaf lobes, and samara size, and some of these taxa are often assigned to *A. wilsonii*. The ambiguous and incorrect typification is misleading with respect to the correct application of the name. Details of the synonymy of *A. sinense* are another matter and will be discussed in a separate study.

The flavonoid complement of *A. wilsonii, A. tutcheri, A. sinense,* and other related species were common due to the presence of flavonol-O-glycosides like the japonicum type dominated. Therefore, flavonoid chemistry was not useful to define these taxa unlike the *A. oliverianum, A. anhweisense*, and the *A. campbellii* complex in China.

## Taxonomic Treatments

In the following key, characters are given that will allow the reader to separate members of the *A. wilsonii* complex from other Chinese species and to distinguish the other species in the alliance from those treated here as part of the *A. sinense* complex.

1a. Leaves 3 (5) lobed; inflorescence paniculate
  2a. Inflorescence (3)5–8(9) long; leaf 3(5)-lobed, leaf size (5) 7–12 cm × 6–12 cm (length × width), margin entire (0–10 serration in the mid lob); sepals and petals 5 ··· ····· 1. *A. wilsonii*
  2b. Inflorescence 3.0–6.5 cm long; leaf 3-lobed, leaf size 4–10 cm × 6–10 cm, margin serrate [(6)14-20]; sepals and petals 4 ····· 2. *A. tutcheri*
1a. Leaves 5 lobed; inflorescence corymbose, panicle-corymbose or- racemose
  3a. Inflorescence corymbose or panicle-compound corymbose; petiole, pedicel, and ovary glabrous; leaves glabrous
    4a. Infloresence corymbose with 10(15) flowers, 4–5 cm × 4 cm (length × width); nutlet and wing 2.5-3.0 cm long, seed 5mm long; Yunnan to Zhejiang ····· ····· 3. *A. oliverianum*
    4b. Inflorescenece panicle-compound corymbose with 20–40 flowers, 6–7 cm × (5)7–8 cm; nutlet and wing 1.5–2.0 cm long, seed 4–5 mm long; Taiwan ····· ····· 4. A. *serrulatum*
  3b. Inflorescence panicle or paniculate-racemose; petiole, pedicel, and ovary pubescent; leaves pubescent or so
    5a. Infloresence panicle-racemose with 40–50 flowers, 8–9 cm × 1.5–2 cm (length × width), short pedicel (2–4 mm); ovary densely villous with yellowish hairs, nutlet pubescent and strong convex with many veines ····· ·····5. A. *erianthum*
    5b. Inflorescenece panicle-compound corymbose with 60–70 flowers, 5–8(9) cm × 2–3 cm, long pedicel(5–6 mm); ovary white pillose, nutlet nearly glabrous and convex without veine ····· 6. A. *sinense*

***Acer wilsonii* Rehder**, Pl. Wilson. 1: 89, 1911. **Type:** China, Hubei, Fang Hsien, alt. 5000 feet (ca.1524 m), 10 Jul., 1907, E. H. Wilson 303 (Lectotype, designated here, A!, barcode 50504, upper plant with flower, see Fig. 1); isolectotype E!; 10 Jul., 1907, Wilson, E. H. 303(Epitype, designated here to support

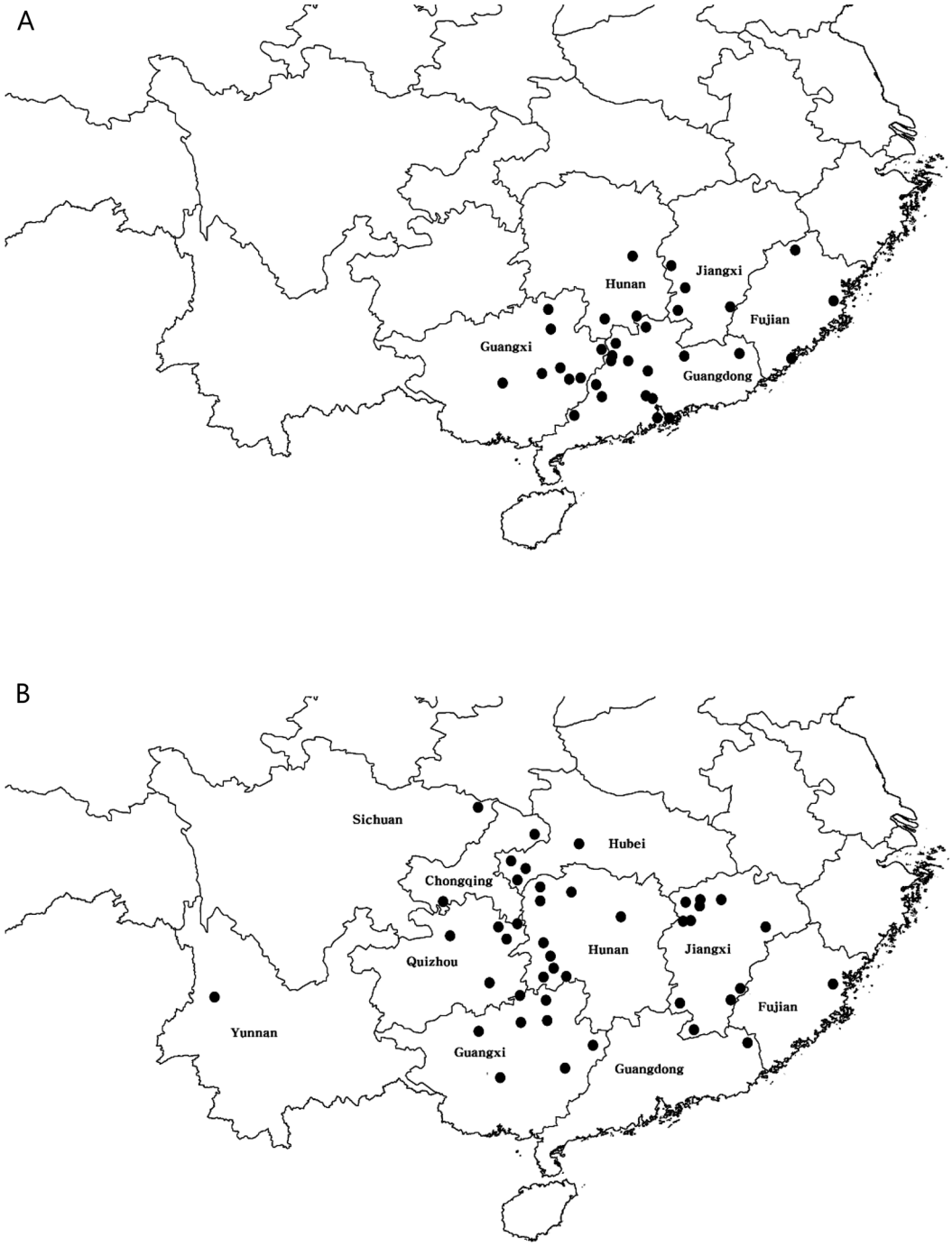



**Fig. 5.** Distribution maps of *Acer wilsonii* (A) and *A. tutcheri* (B) in southern China.

the lectotype, A! barcode 50504, lower plant with fruit, see Fig. 1.; *Acer compbellii* subsp. *wilsonii* (Rehder) de Jong, Maples of the World, 129, 1996.

*Acer angustilobum* Hu, J. Arnold Arbor. 12:154, 1931. **Type:** China, Guangxi, North of Luchen Hsien, Chufengshan, alt. 630 m, common in woods, June 8, 1928, Ching, R. C. 5802 (Holotype, PE, seen as a photo!)

*Acer taipuense* W. P. Fang, Acta Phytotax. Sin. 11:163, 1966. **Type:** China, Guangdong, Taipu (= Dabu), Aug. 16, 1958, Li, S. K. 202503 (Holotype, SZ!); (Isotype, IBK, PE, seen as a photo!)

*Acer wilsonii Rehder var. obtusum* W. P. Fang et Y.T. Wu, Acta Phytotax. Sin. 17:77, 1979. **Type:** China, Jiangxu, Xiushui,

Songjialing, July 13, 1959, Hsiung, Y. K. 05064 (Holotype, LBG, not seen).

*Acer lanpingense* W. P. Fang et M. Y. Fang, Acta Phytotax. Sin. 11: 162, 1966. **Type:** Yunnan Lanping, Shangcun, Sept. 13, 1956, Mao, P. I. 00272 (Holotype SZ!); (PE, Isotype, seen as a photo!)

Specimens examined. **China Hubei:** Lichuan, Xingdoushan, May 27 1980, Tang, G. G. & Song, X. H. 435 (IBK 153438). **Guangxi:** Longsheng, Pingshui, June 03 1955, Guangfu Forest group 449 (HITBC 29377); Pingnam, Pingzhu, Nov. 22 1948, Zhong, J. X 84928 (IBK 152600), Li, Y. K 401160, Aug. 30 1958, Hezhou, Guposhan (IBK 153446); Yongfu, Longyincun, Aug. 12 1951, Li, Z. J. 108 (IBK 153462); Lingui, Huangsha, Diaopeng, June 17 1958, Chen, Z. Z. 50996 (IBK 153463); Liuzhoushi, Rongshuimiaozuzizhi, Liuzhou, Huanjiang, May 30 1958, Chen, S. Q 14148 (IBK153469); Liuzhoushi, Rongshuimiaozuzizhi, Liuzhou, Huanjiang, Aug. 02 1958, Chen, S. Q. 15993 (KUN193726); Xingan, Shengping Xiangcaoping, June 8, 1953, Guangxi Exped. team 2548 (KUN 194258). **Hunan:** Hengyang, Nanyuezhen, Shizishan, May 24, 1963, Liu, L. H. 15810 (KUN 193748); Shaoyang, Wugang, Sept. 28 1968, Liu, L. H. et al. 16051 (KUN193751); Yongshun, Xiaoxixiang, Oct. 23, 1982, Li, H. D. 1906 (KUN193754); Zhangjiajie, Sangzhi, Hefengshan, no data, unknown 84263 (KUN193755). **Quizhou:** Leishan, Leishan, Aug. 26, 1959, Qiannan Exped. team 3616 (KUN193719), Zunyi, Liangfenya, Nov. 22 1927, Zhong, B. Q. 314 (KUN193722); Jiangkou, Niuweihe, June 06, 1964, Zhang, Z. S. et al. 401964 **(**PE1821149); Zunyi Jinsingshan, Puning, Sept. 03 1956, Chuanqian Exped. team 1458 (PE1804382); Yinjinag, Huguoshi, in the valley above Zhangjiaba on the W side of the Fanjing Shan mountain range, Sept. 24 1986, Bartholomew, B. et al. 1592 (PE932983). **Jiangxu:** Wuning Juchiling, no date, 1939, Xiong, Y. G. 4075 (LBG49743); Yifeng, Huanggangshan, Sept. 05, 1975, Lai, S. S. et al. 373 (LBG49747); Xiushui, Jiujiangshan, July 24 1959, Xiong, J. 5504 (LBG49754); Guixi, Yanshan, Oct. ? 1979, Shen, H 192 (LBG49783); Wuyishan, Huanggangshan, Oct. 15 1947, Xiong, Y. G. 6408 (LBG49785); Xiushui, Huangshagang, Sept. 04 1963, Lai, S. S 63424 (KUN190098). **Guangdong:** Meizhou Dabu, Hushan, Aug. 16 1958, Li, X. G. 202503 (IBK153470).

**Distribution (Fig. 5A)** *Acer wilsonii* occurs mainly in Quizhou, Hunan, Guangxi, and Jiangxi. Although several other species, such as *A. flabellatum, A. erianthum,* and *A. oliverianum* have distribution patterns like *A. wilsonii*, *A. sinense* seems to be more closely related to three species. There are other specimens of *A. wilsonii* from Henan, Jiangsu, Shaanxi, and Zhejiang (Chen, 2010; Fu et al., 2001) that seem to be neither *A. wilsonii* nor *A. tutcheri*, with which *A. sinense* has been confused.

Note: Of the type specimens cited in the original description of *A. augustilobum* f. *longicaudadum* W. P. Fang, (Guangxi, Rongshuixiang, Maanshan, Aug. 7, 1958, Chen, S. Q. 16115, KUN193723, holotype) was recognized as *A. sinense*, while paratypes belonged to *A. wilsonii*.

***Acer tutcheri* Duthie**, Kew Bull. (1908):16, 1908. **Type:** Guangdong Lantau Island, April 5, 1894, Tutcher, W. J. 588 (Holotype, K, not seen).

*Acer wilsonii* var. *serrulatum* Dunn, J. Linn. Soc. Bot. 38:358, 1908; *Acer oliverianum* var. *serrulatum* (Dunn) Rehder in Sargent, Pl. Wilsonineae, 1:90, 1911; *Acer confertifolium* var. *serrulatum* (Dunn) W. P. Fang, Acta Phytotax. Sin. 17:78(1979). **Type:** Fujian, Yuen-Fa Gorge, June, 1905, Dun, S. T. s.n. Hongkong 2545 (Isotype, A, seen as a photo!).

*Acer johnedwardianum* Metc. Lingnan Sci. J. 20: 221, 1942. **Type:** Fujian, Yuen-Fa Gorge, June, 1905, Dun, S. T. s.n. Hongkong 2545 (Isotype, A, seen as a photo!).

Specimens examined. China **Jiangsu:** Wuyishan, Huanggangshan, Oct. 15, 1947, Xiong, Y. G. 6408 (LBG 49777); Ganzhou, Ruijin, Lishupai, Aug. 9, 1958, Huang, Q. M. 4151 (LBG 49781); Lianhua, Miaoqian, Aug 1, 1959, Lai, S. S. 1607 (LBG 49787); Suichuan, Qilingxiang, Apri. 28, 1959, Lai, S. S. 288 (LBG 49789); **Guangdong:** Xinyi Hualoshan, March 22, 1932, Huang, Z. 31773 (KUN 193643), Yingde Shakouzhen Huashuishan, May 9, 1943, Liang, B. H. 84505 (IBK00153391); Zhaoqing Dinghushan to Jilongshan, June 21, 1956, Tan, H. F. 700349 (HITBC 98774); Zengcheng Nankunshan, Apr. 14, 1932, Tsang W.T. 20239 (PE 00926167); Hongkong, Landtaushan, Oct. 5, 1930, Chen, N. Q. 41893 (IBK00153393). **Hunan:** Hengyang, Nanyuezhen, Apr. 8, 1944, Liang, B. H. 84822 (IBK00153396); Hengyang, Ningyuan, Jiuning, July 12, 1959, Tan, P. X. 62424 (IBK00153403); Yizhang, Mangshan, Sept.12, 1980, Liao, H. S. 90 (PE 00926522). **Guangxi:** Longsheng, June 25, 1957, Tan, H. F. & Li, Z. T. 70478 (IBK00153389); Cangwu, Tengzhen, Tongghu, Apr 3, 1941, Zhong, J. X 84912 (IBK 00153398); Yongfu, Chaoshang, Chaliao, July 26, 1956, Tan, H. F 700384 (IBK00153419); Jinxiu, Dazhang, Apr. 25, 1982, Daiyaoshan research team 14424 (IBK00153421); Longsheng, Sanmen, Nov 13, 1957, Tan, H. F. 700897 (HITBC 98780). **Fujian:** Yongtai, Fangguangyan, May 23, 1931, Lin, Y. 304 (PE 00899365); Yongtai, Xiamen, June 01, 1923, Zhong, X. X. 1696 (00899362).

**Distribution (Fig 5B)** This species occurs in mountain regions of Guangdong, Guangxi, Jiangsu, Hunan, extending into the west of Fujian. As is clear from this distribution pattern,

*A. tutcheri* and *A. wilsonii* are depauperate except east Guanxi, South Jiangxi and east Fujian and *A. tutcheri* occurs mainly in southern China.

*Acer confertifolium* Merr. et Metc., Lignan Sci. J. 16:167, 1934. **Type:** Guangdong, Meixian, Jiaying, Yinnashan(= Yamnashan), steep slope, Aug. 4, 1932, Tsang, W.T 21407 (Holotype, A!); (Isotype, PE, NAS, seen as a photo!)

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