

## Lectotypification of *Citrus cavaleriei* H.Lév. ex Cavalerie (Rutaceae: Aurantioideae)

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### Abstract

In the context of the elucidation of the ancestry of today's commercial citrus crops, a lectotype is here designated for *Citrus cavaleriei* H.Lév. ex Cavalerie (Rutaceae, subfam. Aurantioideae), a species found in China and India, and one of the putative parents of *C. ×junos* Siebold ex Tanaka, the yuzu.

### Introduction

The history of the domestication of citrus fruits is complicated by extensive hybridity between wild species, brought together by humans, and subsequent selection of apomictic clones, which make up the bulk of today's commercial citrus crops worldwide (Mabberley 1997, 2004, 2013).

The most significant globally are selections from the *Citrus ×aurantium* L. complex, oranges and grapefruit etc., derived from crosses between *C. maxima* (Burm.) Merr., the pomelo, and the mandarin from southern China, generally known as *C. reticulata* Blanco. The lemons and bergamots are derived from crosses between this complex and *C. medica* L., the citron. Even though this is well-established, there are still outstanding issues, in that no unequivocally wild populations of either *C. maxima* or *C. medica* are known. Moreover, the type specimen of *C. reticulata* is from the Philippines, where the mandarin is not native and it is more than likely that this specimen represents part of the *C. ×aurantium* complex, as many so-called mandarins represent hybrids (Mabberley 1997, Wu et al. 2014). If this is so, either *C. reticulata* must be re-typified or the name of a truly wild pure mandarin from China used for this wild parent of the oranges.

The mandarin (*'Citrus reticulata'*) is also a parent, with *C. japonica* Thunb., the kumquat of China, of the calamondin, *C. ×microcarpa* Bunge, itself a parent, with *C. australasica* F.Muell. (eastern Australia) of the sunrise lime, *C. ×oliveri* Mabb., a commercial crop in Australia (Mabberley 2013). Another 'lesser' citrus fruit, becoming increasingly fashionable in 'the west', including Australia, is an ancient Chinese citrus crop, the yuzu, *C. ×junos* Siebold ex Tanaka, which is held (Zhang and Mabberley 2008) to be another cross involving '*C. reticulata*', this time with *C. cavaleriei* H.Lév. ex Cavalerie, a species wild in southwestern China and northeastern India.

*Citrus cavaleriei* was first collected by the French missionary, Pierre Julien Cavalerie (1869–1927), who was born at Roussennac (Aveyron), France, and joined the seminary of the Missions Etrangères de Paris in 1889 (Anonymous 2015). Shortly after being ordained in 1894 he was sent to China, working in the Guizhou Province. Cavalerie collected a large number of plant specimens in China and was made a member of the Académie Internationale de Géographie Botanique, writing many articles in its journal, where *C. cavaleriei* first appeared, though attributed by Cavalerie there to Hector Léveillé. Cavalerie described the locality of

his new tree, “J’ai trouvé dans les bois, loin de toute habitation, dans les environs de Ma-Jo et de Kai-Tchéou [Kai-chou], vers 1700 metres d’altitude”, [some 60 km NNE of Guiyang, the Kweiyang of Swingle (1913)]. In 1919 Cavalerie retired to Kunming, where he was murdered by his servant in 1927. More than 200 allegedly new plant species were named after him.

*Citrus cavaleriei* is a member of *Citrus* subg. *Papeda* (Hassk.) Swingle, a group including the familiar lime-leaves (or ‘kaffir lime’ [an offensive common name to be discouraged]), *C. hystrix* DC. of central Malesia (Mabberley 2002), all of which species are marked by their prominently winged petioles. This group is in need of revision, for example, it is not clear whether *C. cavaleriei* is specifically distinct from *C. latipes* (Swingle) Tanaka of northeastern India (Mabberley and Kodela submitted). There is very little herbarium material available to clarify the status of these taxa.

However, *Citrus cavaleriei* is the oldest binomial to be applicable to this group, so typifying it is important. The name is listed in Lauener’s (1967, p. 268) catalogue of the names attributed to Hector Léveillé but no specimens of *C. cavaleriei* have been found in the Léveillé herbarium (Rehder 1933), which was acquired by the Royal Botanic Garden Edinburgh (E). Although Léveillé had many of Cavalerie’s collections, some appear to have been re-distributed or lost. Lauener and Green (1961) pointed out that, in some cases, type specimens, which had at one time been lodged in the Léveillé herbarium (E), were sent on loan and, during the Second World War, were lost or not returned.

Recent searches to find type material of *Citrus cavaleriei* using *Global Plants* (JSTOR 2015) and various herbarium databases (including that of E) have not revealed any germane specimens. However, during a visit to P in February 2013, James Wearn (K), tracked down a specimen, first seen by the senior author in the 1990s, and which is here designated lectotype (Figs 1, 2). This is original material collected by Cavalerie himself and comprises a branch with spines and the characteristic winged petioles.

*Citrus cavaleriei* has been mistakenly placed in the synonymy of *C. hystrix* (Léveillé 1911) and, more commonly, *C. ichangensis* Swingle (e.g. Swingle 1913). Léveillé (1911) also dissociated himself from *C. cavaleriei* and stated that “c’est un nom provisoire, un vrai nomen nudum” and went on to note that Swingle thought it to be *C. hystrix*. Cavalerie clearly did accept the name however. Rehder (1933, p. 227) wrote “that the name was published without [sic!] description by Cavalerie who states that it is a spiny Orange growing wild at an altitude of 1700 m near Ma-jo and Kai-tchéou in the province of Kweichou”, also considered *C. cavaleriei* a nomen nudum and, following Swingle, treated it as a synonym of Swingle’s later name, *C. ichangensis*. Cavalerie’s description, although brief, satisfies the criteria for valid publication: “...une espèce d’oranger épineux, vivant sous bois, dans les pentes boisées. L’arbre est voûté, tout couvert de mousse. Un sujet a des fruits de la grosseur d’un abricot et des fleurs en même temps. Le fruit est dur et de forme arrondie; l’aile est tellement développée qu’elle prend la moitié de la feuille” [a spiny orange species living in the woods, on the wooded slopes. The tree is arched, covered with moss. One example has fruits of the size of an apricot and flowers at the same time. The fruit is hard and rounded; the wing is so developed that it takes half of the leaf].

## Nomenclature

*Citrus cavaleriei* H.Lév. ex Cavalerie, *Bulletin de Géographie Botanique* 21: 211 (1911).

**Protologue citation:** ‘J’ai trouvé dans les bois, loin de toute habitation, dans les environs de Ma-Jo et de Kai-Tchéou [Kai-Chou], vers 1700 mètres d’altitude.’

**Lectotype (designated here):** China: Guizhou Province, Kai-Chou, [c. 60 km NNE of Guiyang, Kweiyang of Swingle (1913)], *P.J. Cavalerie* 2936 (P5240963; photograph held at NSW).

**Note:** The collection *P.J. Cavalerie* 2936 (P5240963) is designated as the lectotype, rather than considered to be the holotype, because there is no certainty that it was the only specimen used by Cavalerie (see Art. 9.1; ICN, McNeill et al. 2012). This is an uncited specimen rather than a syntype (Art. 9.5), because it is not a specimen cited in the protologue (see Art. 40 Note 2). It is original material because it can be shown to be a specimen upon which the description validating the name was based (Art. 9.3(a)).

*Citrus ichangensis* Swingle, *Journal of Agricultural Research* 1: 1, tt. 1–7 (1913); *Citrus ×aurantium* L. subsp. *ichangensis* (Swingle) Guillaumin, *Les Citrus Cultivés et Sauvages* 28 (1917).

Holotype: China: Western Hupeh, Hsing-shan Hsien [Xingshan Xian], 3000 ft, 7 May 1907, *E.H. Wilson* 2230 (A); isotypes: A, BM, E, K.

### Acknowledgments

We are grateful to James Wearn (K) for re-finding and photographing the Cavalerie specimen at P, and the curators at P for providing access to their collections.



**Fig. 1.** Lectotype of *Citrus cavaleriei* H.Lév. ex Cavalerie (P5240963) showing the distinctive leaves with prominently winged petioles. Photo: J. Wearn.

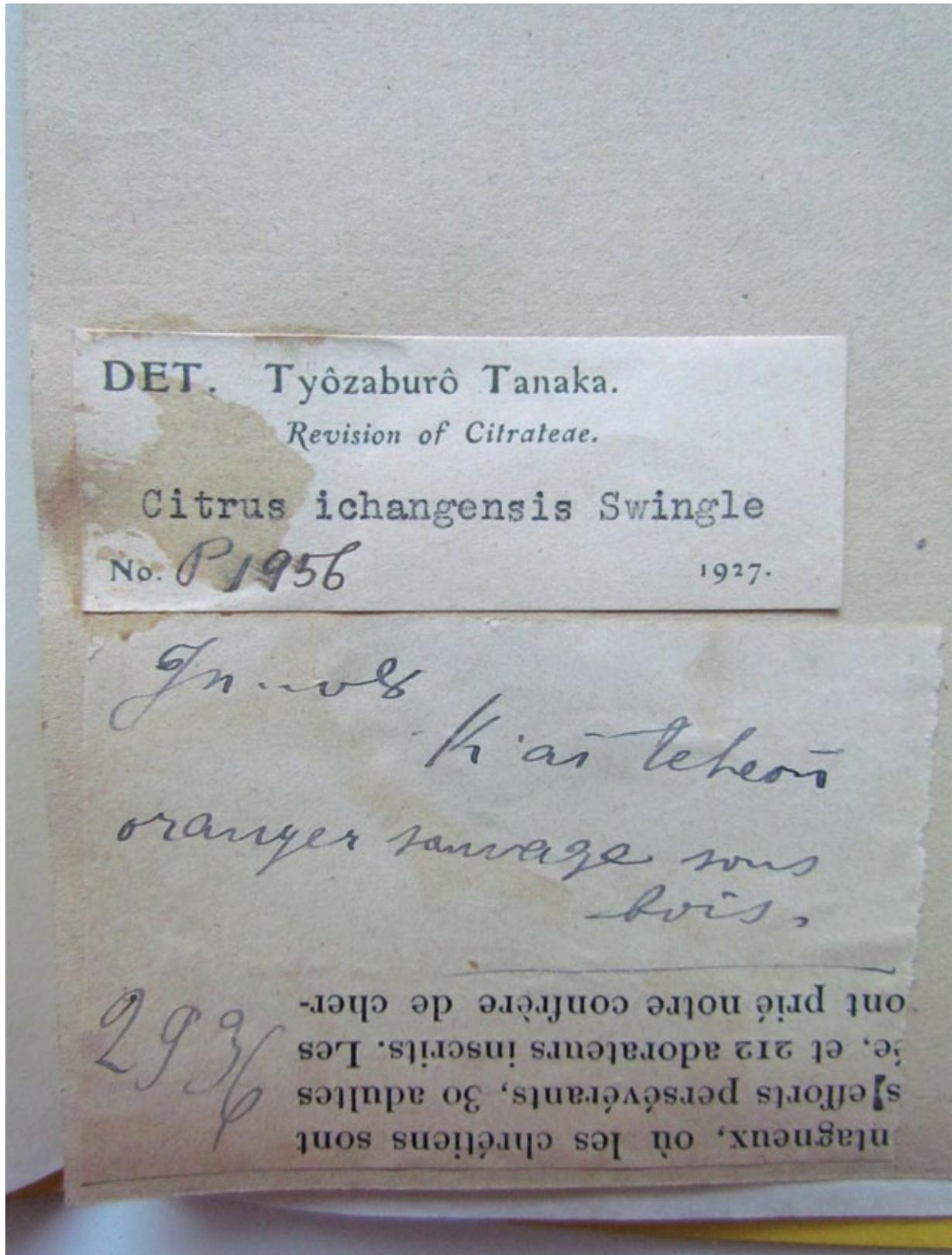


Fig. 2. Left hand label and determinavit slip (Tanaka wrongly placed *Citrus cavaleriei* in the synonymy of *C. ichangensis* Swingle) on lectotype sheet of *C. cavaleriei*. Photo: J. Wearn.

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