

Two new Theaceous plants from Malaysia and a proposal to reduce *Tutcheria* to a synonym of *Pyrenaria*

by

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1. Introduction

Late 1960, I examined several specimens, incl. *Elmer* 21628, 21832, and *Wood SAN* 16482 (Plate 1) from North Borneo which is now known as Sabah, a state of Malaysia. These were in the Herbarium of Singapore Botanic Gardens and identified as *Camellia lanceolata* (B1.) Seem. A study of the fruit (a 3-loculate capsule with thin woody wall, partly dehiscent) and the seed (exalbuminous, the embryo with large thin, contorted cotyledons) reminded me of those of *Pyrenaria* and *Tutcheria*. Later, through Professor C.G.G.J. van Steenis, I learned from Mr. J. R. Sealy, that the identification of these specimens as *Camellia lanceolata* was erroneous. Dr W. Meijer, the former Forest Botanist from Sandakan, Sabah, kindly sent all the theaceous specimens belonging to this group on loan to Singapore. But I failed to find any flowering material of this plant. He also informed me that the forest in Tawau area, where the collections were made, had since been felled.

Early 1970, when checking some unidentified theaceous specimens, my attention was drawn to a specimen from the Malay Peninsula (*Corner* s.n., on Sept. 9, 1937, from Sungei Tahan, Pahang) (Plate 2). It had for many years been preliminarily identified as Euphorbiaceae, but Mr. H. K. Airy-Shaw of the Royal Botanic Gardens, Kew, wrote on an annotated sheet "cf. Theaceae", when he worked over the un-named Singapore sheets of Euphorbiaceae in February 1969 in preparation for the chapter in the new Tree Flora of Malaya. The fruit and seed structures of this plant reminded me again of those of *Pyrenaria* and *Tutcheria*. At my request, this specimen together with another old collection from the same area (*Haniff & Nur* 8067) and recognized by Ridley as a new species of *Pyrenaria*, was sent to Mr. Airy-Shaw for further confirmation. He agreed that these two specimens represent a hitherto undescribed species belonging to the *Pyrenaria-Tutcheria* complex.

Originally, I planned to collect at least the flowering material of the Malayan plant. During a recent trip (June, 1971) to Pahang in Malaya with Dr. T. C. Whitmore, we reached the lower end of Sungei Tahan. Unfortunately, our efforts to find this plant failed. I decided then that it would be better to describe these two species of *Pyrenaria* (one from Sabah, one from Malaya) without further delay. A discussion of the reason why *Tutcheria* should be merged with *Pyrenaria* with a special note on their fruit, seed and seedling characters follows the description.

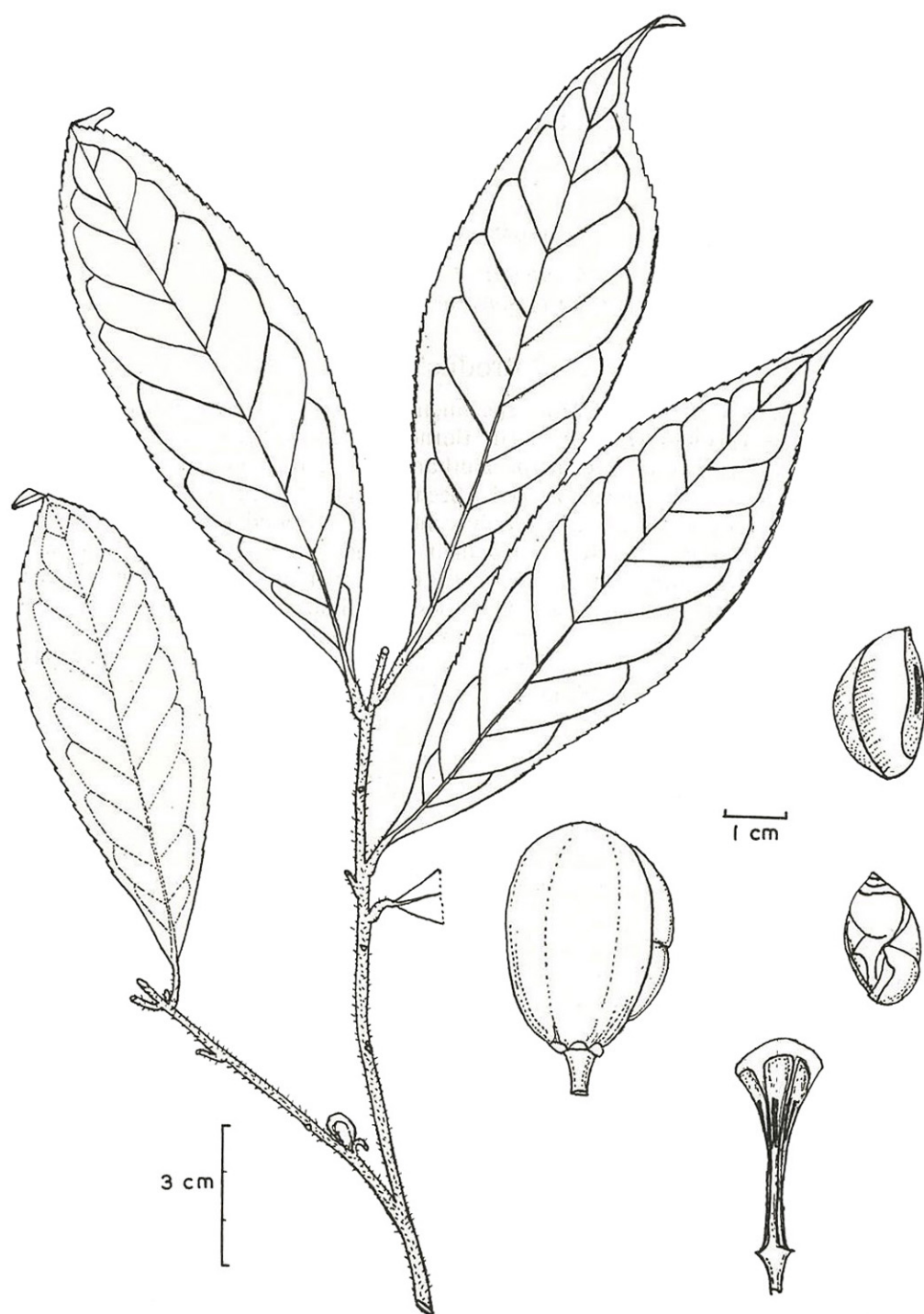


Fig. 1 *Pyrenaria tawauensis* H. Keng, *sp. nov.*

Habit sketch, fruit and seed (based on *Wood SAN 16482*, Supplemented by *Elmer 21628*)

2. Two new species of *Pyrenaria* from Malaysia1. *Pyrenaria tawauensis* H. Keng sp. nov. (Plate 1, figure 1)

Arbor ad 10 m alta. Ramuli puberuli. Folia disticha, subcoriacea, anguste elliptica vel anguste ellipto-lanceolata, 10–19 cm longa, 4–4.5 cm lata, apice acuta vel caudata, basi acuta, supra glabra, subtus verrucosa vel fere glauca, margine repanda, nervis lateralibus 8–12, bene intra marginem anastomosantibus; petiolo ca. 1 cm longo. Capsula ovoidea vel subglobosa, 3–3.5 cm longa, 2.5–3.5 cm in diametro; pericarpio tenuiter lignoso. Semina atropurpurea, 1.2–2.5 cm longa.

A small or medium-sized tree, 10 m tall. Branches slender, puberulous. Leaves alternate, distichous, thin coriaceous, narrowly elliptic or narrowly elliptic-lanceolate, 10–19 cm long, 4–4.5 cm wide, acute or shortly to long-caudate at the apex and gradually or abruptly narrowed to the acute base, shining glabrous above, verrucous, puberulent or sub-glaucous beneath; lateral veins 8–12 pairs, oblique, curved and merged into the submarginal vein, slightly depressed above, elevated beneath; margin remotely serrulate or repandous; petiole about 1 cm long, slender, puberulent. Flowers not seen. Fruit broadly ovoid to depressed globose, 3–3.5 cm long, 2.5–3.5 cm across, verrucous, puberulous or glabrescent, usually 3-loculate. Pericarp thin woody (2–3 mm in thickness in mature specimen) eventually partly dehiscent along the sutures. Seeds usually 2 (rarely 3) in each locule, dorsally convex-rounded, the other surfaces variously angulate due to mutual compression, 1.2–2.5 cm long, 1.2–1.4 cm broad, dark purple, shining.

Specimens examined:

Sabah (North Borneo), Malaysia: Tawau, alt. 100 m, *G.H.S. Wood SAN 16482* (Type, Sing.) Oct. 28, 1955; *A.D.E. Elmer 21628, 21832* (Sing.), Oct. 1922 to March 1923; *C.E. Carr 26387* (Sing.) March 5, 1933.

This species is characterized by the fruit with thin, woody, partly dehiscent pericarp.

2. *Pyrenaria pahangensis* H. Keng sp. nov. (plate 2, figure 2)

Arbuscula c. 4 m alta. Ramuli glabrescenti. Folia pseudo-verticillata, membranacea, elliptica vel anguste oblongo-oblancoolata, 25–38 cm longa, 8–15 cm lata, apice acuta vel breviter caudata, basi cuneata, imo subcordata, supra glabra, subtus glabrata, margine serrulata vel subintegra, nervis lateralibus 7–8, bene intra marginem anastomosantibus; petiolo 0.25–0.5 cm longo. Capsula ovoidea vel subglobosa, 3–4.5 cm longa, 2.5–4 cm in diametro; pericarpio cartilagineo. Semina badia, 1.5–2 cm longa.

A shrub or small tree, 3–4 m tall. Branches stout, glabrescent. Leaves pseudo-verticillate (i.e., 3–5 spirally congested to form a false whorl), membranaceous, elliptic to narrowly oblong-oblancoolate, 23–38 cm long, 8–15 cm wide, acute or shortly caudate at the apex and gradually narrowed to the cuneate and subcordate base, shining, glabrous above, puberulent or glabrescent beneath; lateral veins 7–9 pairs, oblique to nearly perpendicular, curved and merged into the submarginal vein, rather faint above, distinct and slightly elevated beneath; margin remotely serrulate, nearly entire below the middle; petiole short, pulvinoid, 0.25–0.5 cm long. Flowers not seen. Fruit broadly ovoid or subglobose, 3–4.5 cm long and 2.5–4 cm across, normally 3-loculate. Pericarp very thin, cartilaginous, (1–2 mm in thickness in the mature specimen), eventually partly dehiscent along the sutures. Seeds usually 2 in each locule, dorsally convex-rounded, the other surfaces variously angulate due to mutual compression, 1.5–2 cm long, 1.2–1.8 cm broad, chestnut brown, shining.

Specimens examined:

Pahang, Malaysia: Sungei Tahan, *E.J.H. Corner* s.n. (Type, Sing.) Sept. 9, 1937 (Common shrub or treelet, in streams, off the main river); Teku, Gunong Tahan, *Mohamad Haniff & Mohamad Nur S.F.N.* 8067 (Sing.) June 21, 1922 (Small tree, 10–12 ft. high).

This species is characterized by its sub-verticillate, short-petiolate leaves with a subcordate base and especially by its fruit with thin cartilaginous and partly dehiscent pericarp.

3. A proposal to reduce *Tutcheria* to a synonym of *Pyrenaria* with a special note on their fruit, seed and seedling characters

The genus *Pyrenaria* was established by C. L. Blume (in Bijdr. 1119) in 1827, based on the Javanese species, *P. serrata* Bl. It is interesting to note from the original description, ("Pomum subglobosum, depressum, carnosum, guinqueloculare, loculis 2 pyrenis. Pyrenae 1-spermae...") that Blume recognized the fruit as a pome, with 2 pyrenes in each of the 5 locules. From this character, the generic name *Pyrenaria* was derived. Most authors today, however, generally described the fruit as succulent, baccate or drupaceous. About twenty binomials have since been described, they were from E. India, Burma, Malay Peninsula, Borneo, Sumatra, Indo-China, Thailand and S.W. China (Yunnan). Some of them would probably be merely synonyms after critical revision; for example, out of 4 species described from Java only Blume's original species stands (cf. Backer & Bakhuizen, Fl. Java, 1: 321, 1963).

The genus *Tutcheria*, on the other hand, was established by S. T. Dunn (in Jour. Bot. 46: 324) in 1908, based on a Hongkong species, *T. championi* Nakai (formerly as *T. spectabilis* (Champ.) Dunn). Dunn clearly pointed out that the systematic position of *Tutcheria* is closely next to *Pyrenaria* which it resembles in flower and seed and from which it is distinguished by the dehiscence of its capsule and by its multiovulate locules. About ten species of *Tutcheria* were described, mostly from Southern China, one from Formosa, and one from the Riukiu Islands.

In Melchior's monographic study of Theaceae in Engler's *Pflanzenfamilien* (2nd ed. 21: 126, 1925), *Pyrenaria* and *Tutcheria* were treated separately as belonging to two different subtribes. Recently, in Sealy's Rev. Gen. *Camellia* (p. 13, 1958) brief discussion on the classification of the subfamily Camellioideae (as Tribe Camellieae), *Pyrenaria*, *Tutcheria*, *Camellia* and *Yunnanica* were treated together under a subtribe, Camelliinae.

Since *Yunnanica* is rather imperfectly known, the following brief discussion on flower, fruit, seed and seedling characters is concentrated on those of *Camellia*, *Pyrenaria* and *Tutcheria*.

1. On flowers

In general, the flowers of *Pyrenaria* and *Tutcheria*, like those of *Camellia*, are variable to a certain extent. Whereas the subdivision of *Pyrenaria* into two sections for instance was based on the number and degree of fusion of the styles (Melchior, l.c. 138); the classification of *Camellia* into 12 sections (Sealy l.c. p. 28) was primarily based on a pair of characters: styles united or free, and bracteoles and sepals clearly differentiated or not. A full range of variation in flower parts of *Camellia* was also given by Sealy (l.c. pp. 16–18). No attempt has been made to subdivide *Tutcheria*.

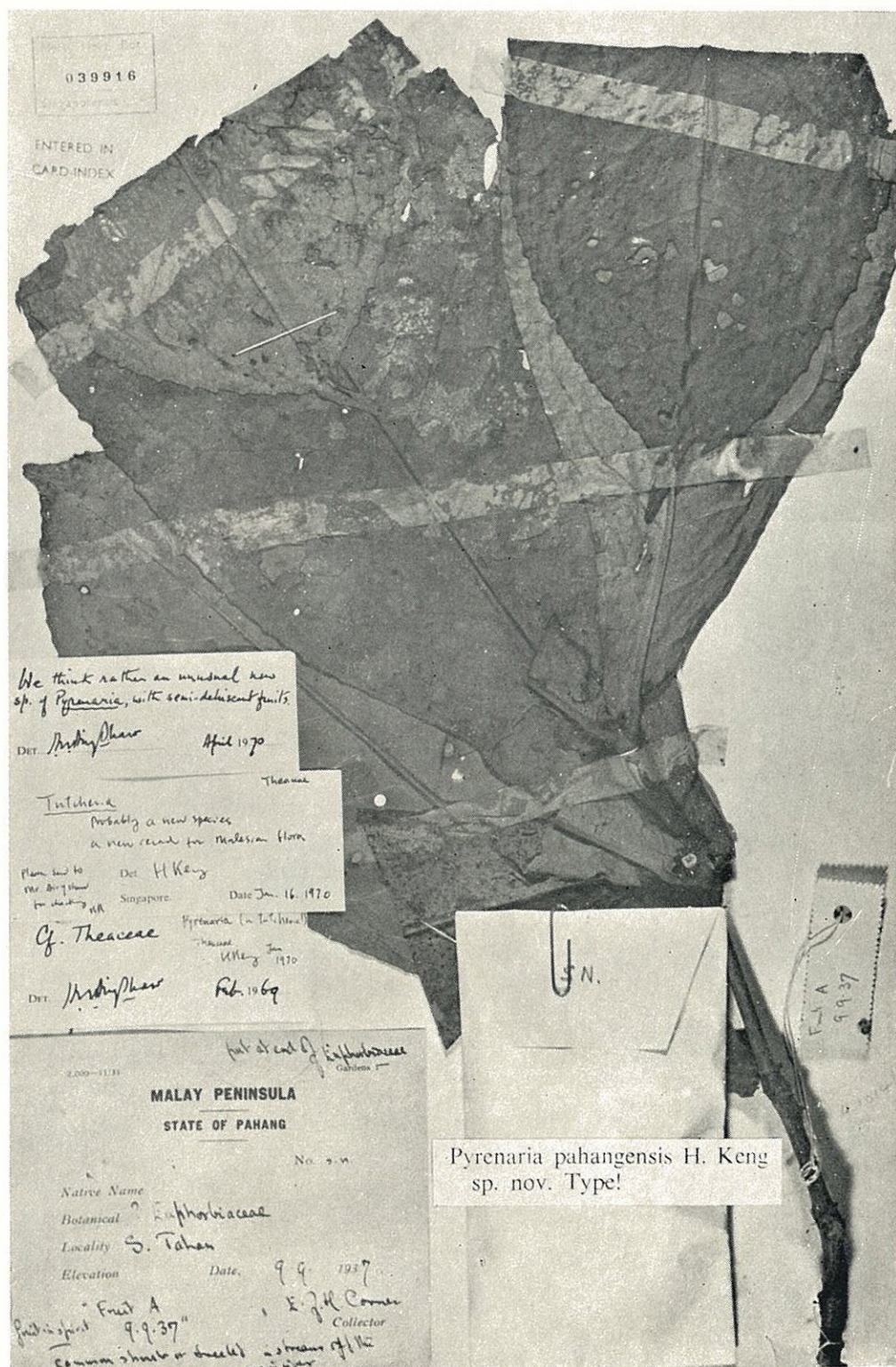


Plate 2. Type specimen of *Pyrenaria pahangensis* H. Keng

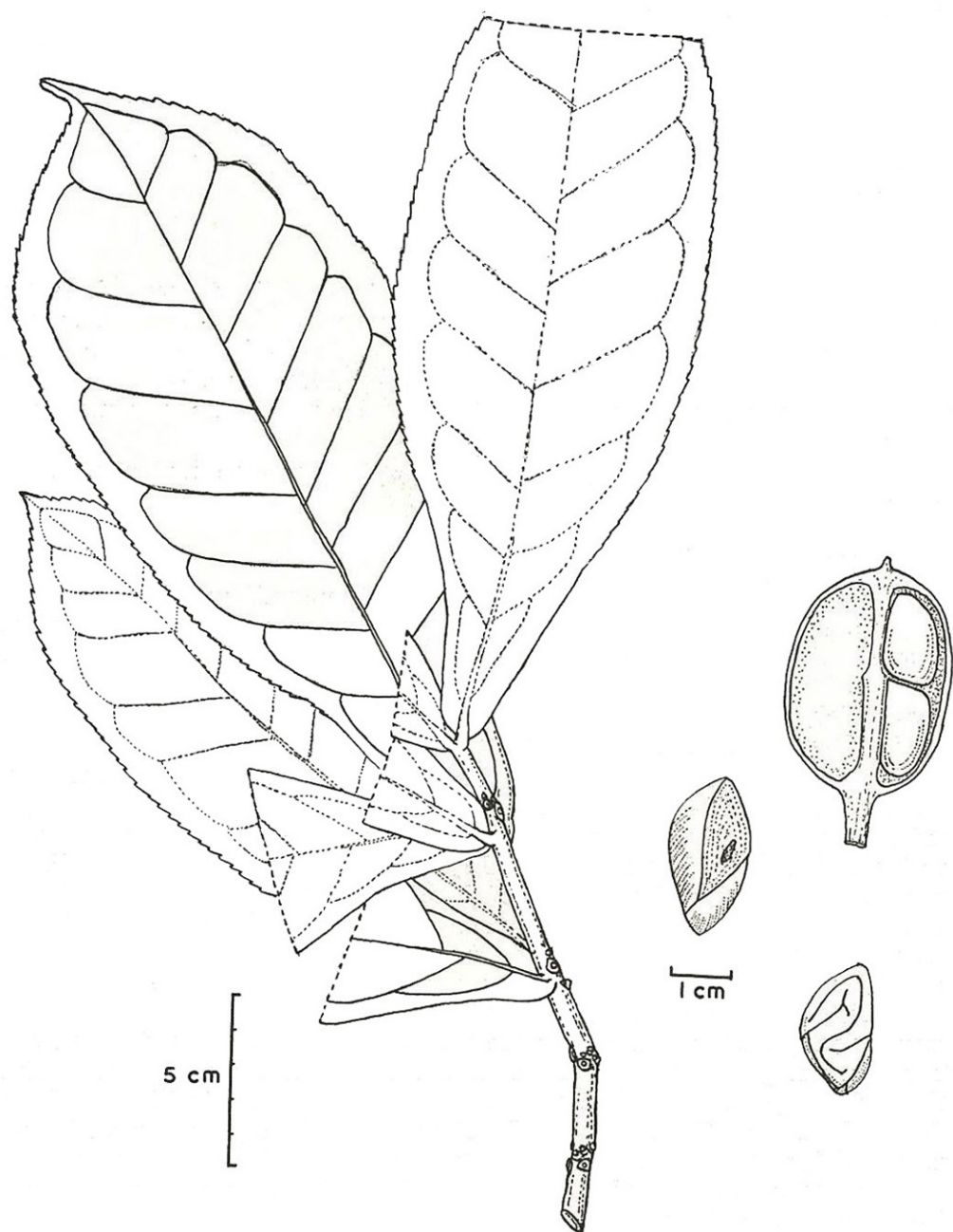


Fig 2. *Pyrenaria pahangensis* H. Keng *sp. nov.*

Habit sketch, fruit and seed (based on *Corner* s.n. [Sept. 9, 1937], supplemented by *Haniff & Nur SFN 8067*).

The number of locules in an ovary in all these three genera varies from 3–5. One particular point is the number of ovules per locule. Sealy mentioned (l.c. p. 18) that in *Camellia*, each locule contains 3–4 (very rarely 8) axile ovules attached near the apex. Dunn gave the number of ovules in each ovary in *Tutcheria* as '2–5'. Although Blume's original description states that there are two ovules per locule in *Pyrenaria*, the occurrence of three or four ovules in each locule in this genus is in fact not uncommon. Therefore, there is no real difference between *Pyrenaria* and *Tutcheria* in the number of ovules per ovary-locule as Dunn once unduly stressed.

2. On fruit

The fruit in *Camellia* is a woody capsule, loculicidally dehiscent from the apex downwards (Sealy, l.c. p. 18). A typical form of the fruit of *Pyrenaria* (e.g. *P. acuminata*, plate 3, c) is baccate, the pericarp fleshy or soft woody, indehiscent, 3–5-loculate. On the other hand, that of *Tutcheria*, like *Camellia*, is a woody capsule, loculicidally dehiscent into 3–6 valves, the latter often deciduous and falling from the base.

The fruit characters of *Pyrenaria* and *Tutcheria* will be further discussed below.

3. On seeds and seedlings

The seeds of *Camellia*, *Pyrenaria* and *Tutcheria* are uniformly ex-albuminous. They are generally globose, hemispheric or plano-convex in *Camellia*, and much flattened, often irregularly angulate (due to mutual pressure) in *Pyrenaria* and *Tutcheria*. The most noticeable fact is that in *Camellia*, the embryo possesses a pair of thick, hemispheric cotyledons, while in *Pyrenaria* and *Tutcheria*, it possesses a pair of very thin and large, but contorted and twisted cotyledons.

Following Martin's phylogenetic classification of seeds (Amer. Midl. Nat. 36: 513–660, esp. 519–523, 1946), *Camellia* seed belongs to the 'investing' type, and *Pyrenaria* and *Tutcheria* seed, the 'folded' type, both types are classified in his 'axile' division, and both represent the zenith of seed evolution (see his Fig. 3 on p. 523). Morphological differences of these two types are obvious, nevertheless, their selective advantages are probably even more striking. In the 'investing' type, the two thick cotyledons generally remain in the seedcoat and embedded in the ground, serving as a food storage organ for the initial growth of a seedling. In the 'folded' type, in contrast, the two thin cotyledons, during the process of germination, gradually emerge from the seedcoat, rapidly unfold and spread out, thus performing the function of photosynthesis. Previously the present writer observed the germination of species of *Camellia* and *Tutcheria* (Keng in Univ. Calif. Publ. Bot. 33: 276, Fig. 3 A & B). Photographs of seedlings of two Malayan species of *Pyrenaria* are presented in Plate 3 (e to h) of this paper. As expected, the germination processes of *Pyrenaria* and *Tutcheria* so far as it concerns the few species observed, are identical.

From the above discussion, it can be concluded that *Pyrenaria* and *Tutcheria*, as Dunn (l.c.) pointed out, are in fact, closely related. This can be further emphasized by their peculiar seed and seedling characters which are unique among the family Theaceae (cf. Keng, l.c. p. 280). It is also clear that their only substantial difference lies in their fruit character i.e. baccate, indehiscent, in the typical forms of *Pyrenaria*, and capsular in the typical form of *Tutcheria*. Is this fruit character so vital that demarcation of these two genera can be based on it alone? A negative answer could emerge from the following four examples.

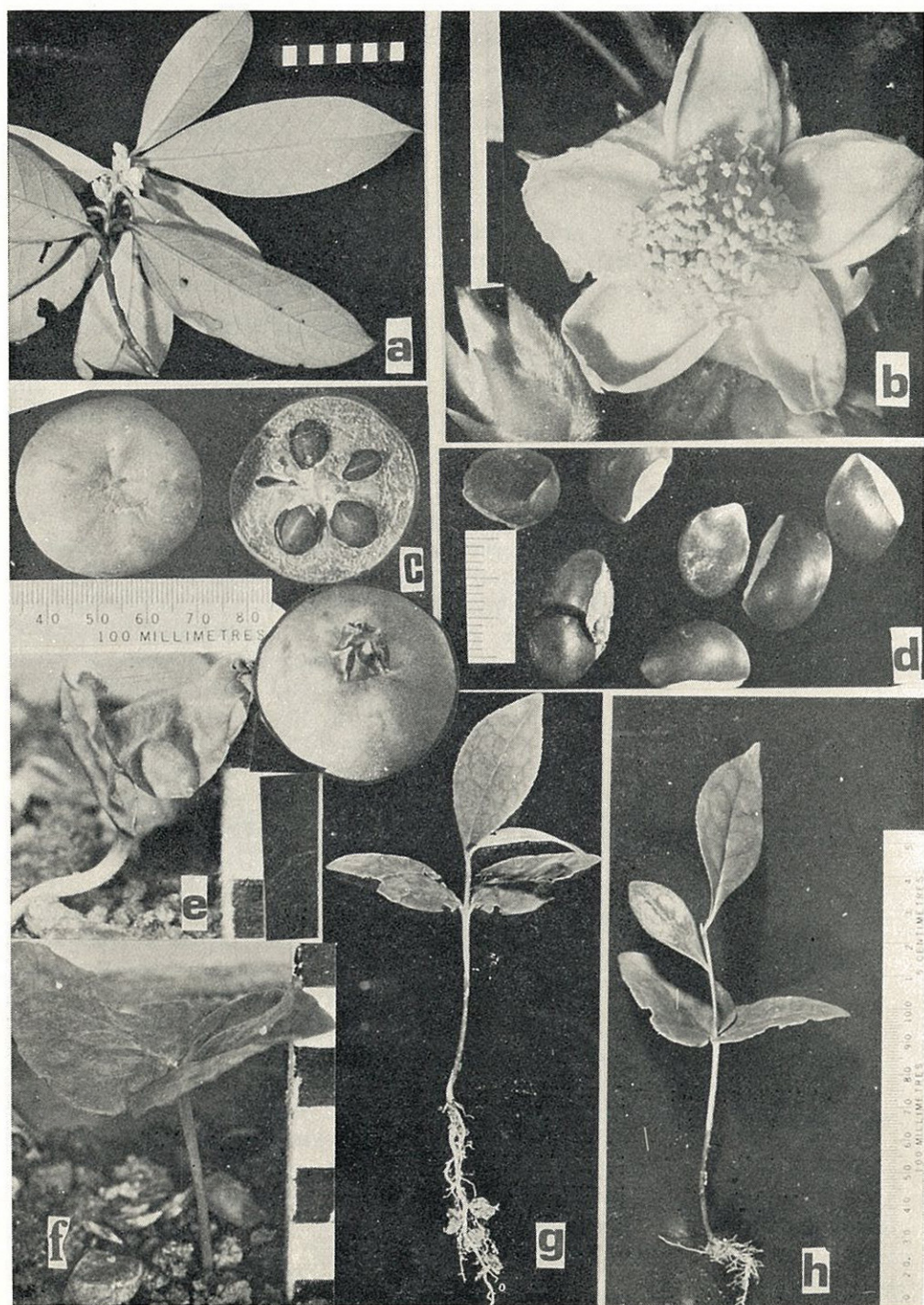


Plate 3. Two species of *Pyrenaria*

P. acuminata Planch.: a-flowering branch; b-flower and flower-bud; c-fruits; d-seeds; e & f-seed germination; g-seedling.

P. kunstleri King: h-seedling.

a. *Lobelia-Pratia* (Campanulaceae or Lobeliaceae).

Traditionally, these two were treated as two separate genera merely on fruit characters alone: apically 2-valved capsule in *Lobelia* Linn. and baccate in *Pratia* Gaudich. Moeliono & Tuyn (Fl. Mal. I, 6(1):122, 1960) recently fused them into one genus.

b. *Buddleja-Nicodemia* (Loganiaceae).

Likewise, the fruit of *Buddleja* Houst. ex Linn. is a septicidal, 2-valved capsule, and *Nicodemia* Tenore, a berry. The latter was reduced into a subgenus of the former by Leenhouts (Fl. Mal. I, 6(2):336-337, 1962).

c. *Euphorbia-Elaeophorbia* (Euphorbiaceae).

The fruit is drupaceous in *Elaeophorbia* Stapf., and capsular in *Euphorbia* Linn. Recently Webster (Jour. Arnold Arb. 48:397, 1967) reverts *Elaeophorbia* to *Euphorbia*, but makes a separate section of the genus for it.

d. *Lomatophyllum-Aloe* (Liliaceae).

Fruit of *Lomatophyllum* Willd. is a large fleshy berry, whereas that of *Aloe* Linn. is a dehiscent capsule. Based on "Phenetic diagrams" from the use of a computer, Rowley (in Taxon 18:625-7, 1969) strongly queried the validity of keeping the status of *Lomatophyllum* as a genus merely on a single character basis.

Undeniably, in a number of taxa (such as Leguminosae, Umbelliferae, Ulmaceae, Juglandaceae, to mention only a few), the fruit is a paramount diagnostic character. However, in the four examples cited above, and also in case of *Pyrenaria* and *Tutcheria*, the present writer tends to believe that the fruit character, in these instances, is probably merely of ecological or physiological, rather than of phylogenetic importance.

To strengthen the argument that *Pyrenaria* and *Tutcheria* should be merged, the present writer would like to supply the description of two types of fruits from *Pyrenaria* species which appear to bridge the gap between baccate and capsulate fruits.

The first type of fruit can be found in the two new species of *Pyrenaria* described in this paper, both from the Malaysian region. Their fruit walls are thin woody or crustaceous, partly dehiscent along one or few sutures in a rather irregular way when fully matured. The second can be found in a Chinese species, *Pyrenaria camellioides* Hu from Yunnan which is characterised by the fruit with spongy pericarp partly dehiscing septicidally from above, and partly dehiscing loculicidally from below. The apex of this fruit is slightly concave, with 5 bosses (which represent the style bases) around the depression, a situation extremely similar to the Thai species, *P. garrettiana* Craib. The fruit of the latter, however, is succulent and not dehiscent.

Incidentally, *Pyrenaria garrettiana* Craib, together with two other species from Yunnan, has been segregated into a new genus, *Sinopyrenaria* Hu (in Act. Phytotax. Sin. 5:281, 1956) and *Pyrenaria camellioides* Hu, into another new genus, *Glyptocarpa* Hu (in Act. Phytotax. Sin. 10:25, 1965). Meanwhile, a third new genus, *Parapyrenaria* H. T. Chang (in Act. Phytotax. Sin. 8:287, 1963), was proposed based on *P. hainanensis* H. T. Chang, from Hainan, China. All these three are probably superfluous, if we accept a reasonably broader generic concept of *Pyrenaria*, comparable to that of *Camellia* as recently defined by Sealy (l. c. pp. 14-32).

For the reasons given above, the present writer therefore formally proposes to merge *Tutcheria* Dunn with *Pyrenaria* Blume, and to reduce the following known species of *Tutcheria* to *Pyrenaria*.

Pyrenaria Blume, Bijdr. 1119, 1827; Miq. Fl. Ind. Bat. 1:493, 1855, et Suppl. 1:484, 1861; Hook. f. Fl. Brit. Ind. 1:289, 1872; Melch. in Engl. & Prant. Nat. Pflanzenfam. ed. 2, 21:138, 1925; Back. & Bakh. f. Fl. Java 1: 321, 1963.

Synonym: *Tutcheria* Dunn in Jour. Bot. 46: 324, 1908, 47: 197, 1909; Nakai in Jour. Jap. Bot. 16: 708, 1940; Li, Wood. Fl. Taiwan, 597, 1963; Hu & Chang in Chun, Chang & Chen, Fl. Hainan. 1:495, 1964. **Syn. nov.**

A list of new combinations follows.

1. **Pyrenaria championi** (Nakai) H. Keng **comb. nov.**

Basionym: *Tutcheria championi* Nakai in Jour. Jap. Bot. 16:708, 1940.

Synonyms: *Camellia spectabilis* Champion ex Benth. in Jour. Bot. 3:310, 1851 (*non* Berlese 1843).

Tutcheria spectabilis (Champ.) Dunn in Jour. Bot. 46:324, 1908.

Distribution: Hongkong.

2. **Pyrenaria greeniae** (Chun) H. Keng **comb. nov.**

Basionym: *Tutcheria greeniae* Chun in Jour. Arnold Arb. 9:129, 1928.

Distribution S. China (Kwangtung).

3. **Pyrenaria hirta** (Hand.-Mazz.) H. Keng **comb. nov.**

Basionym: *Gordonia hirta* Hand.-Mazz. Anz. Akad. Wiss. Wien. 58:180, 1920.

Synonyms: *Tutcheria hirta* (Hand.-Mazz.) Li in Jour. Arnold Arb. 26:64, 1945.

Tutcheria villosa Wu in Engler, Jahrb. 71:192, 1940.

Distribution: S.W. China (Hupeh, Kweichow, Kwangsi).

4. **Pyrenaria microcarpa** (Dunn) H. Keng **comb. nov.**

Basionym: *Tutcheria microcarpa* Dunn in Jour. Bot. 47:197, 1909.

Distribution: S. China.

5. **Pyrenaria multisepala** (Merr. & Chun) H. Keng **comb. nov.**

Basionym: *Tutcheria multisepala* Merr. & Chun in Sunyetsenia 2:41, 1934.

Distribution: S. China (Hainan).

6. **Pyrenaria ovalifolia** (Li) H. Keng **comb. nov.**

Basionym: *Tutcheria ovalifolia* Li in Jour. Arnold Arb. 25:209, 1944.

Distribution: S. China (Hainan).

7. ***Pyrenaria shinkoensis* (Hayata) H. Keng comb. nov.**

Basionym: *Thea shinkoensis* Hayata in Jour. Coll. Sci. Tokyo 30 (1):45, 1911.

Synonyms: *Camellia shinkoensis* (Hayata) Cohen-Stuart in Meded. Proefst. Thee 40:68, 1916.

Tutcheria shinkoensis (Hayata) Nakai in Jour. Jap. Bot. 16:708, 1940.

Distribution: China (Taiwan).

8. ***Pyrenaria symplocifolia* (Merr. & Metcalf) H. Keng comb. nov.**

Basionym: *Tutcheria symplocifolia* Merr. & Metcalf in Lingnan Sci. Jour. 16:172, 1937.

Distribution: S. China (Kwangtung).

9. ***Pyrenaria virgata* (Koidz.) H. Keng comb. nov.**

Basionym: *Thea virgata* Koidz. in Bot. Mag. Tokyo 32: 252, 1918.

Synonyms: *Camellia virgata* (Koidz.) Makino & Nemoto, Fl. Jap. (ed. 2): 740, 1931.

Tutcheria virgata (Koidz.) Nakai in Jour. Jap. Bot. 16:708, 1940.

Distribution: The Riukiu Islands.

The geographic range of *Pyrenaria*, after the merging of *Tutcheria* species into it, thus covers from E. India, Burma, Thailand, Indo-China to S. China, the Riukiu Islands, Taiwan and to Malesia (Malaya, Borneo, Sumatra, Java), and conforms closely to those of *Camellia* (Sealy, l. c.), *Coptosapelta* (Steenis, in Amer. Jour. Bot. 56: 806, 1969) and a host of other genera.

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