A REVISION OF THE GENUS *TETRADIUM* (RUTACEAE)

T. G. HARTLEY

Herbarium Australiense
C.S.I.R.O. Division of Plant Industry
Canberra, Australia 2601

ABSTRACT

The genus *Tetradium*, which has traditionally been placed in the synonymy of the rutaceous genus *Euodia*, consists of nine species and is distributed from the Himalayas east to Japan and south to Java and Sumbawa. The genus is described and its taxonomic history and relationships to other genera are discussed. The nine species are keyed, described, and their interrelationships discussed. New combinations are made for the names of seven species, and one species, *Tetradium sumatranum*, is described as new.

Among the Rutaceae of the southeast Asian-Pacific region is a group of trees and shrubs that is distinctive in having opposite, pinnately compound leaves in combination with terminal inflorescences, follicular fruits, and seeds that remain attached in the dehisced follicle. These plants were first described in 1790 when Loureiro based the genus *Tetradium* on a Vietnamese species, *Tetradium trichotomum* Lour. Although Loureiro's description of this plant was reasonably adequate and a representative specimen was lodged at the British Museum, the identity of *Tetradium* in the Rutaceae was not definitely established until the publication of the first volume of Bentham and Hooker's *Genera Plantarum* (1862). In the meantime, Sprengel (1824) transferred *Tetradium trichotomum* to the simaroubaceous genus *Brucea* J. F. Mill., DeCandolle (1825) recognised *Tetradium* as a distinct genus and placed it between *Brucea* and *Ailanthus* Desf., while Jussieu (1825) and Endlicher (1840) listed it in the Rutaceae as an insufficiently known genus. Also during this period, three additional genera, *Philagonia* Bl., from Java, *Boymia* A. Juss., from mainland China, and *Megabotrya* Hance ex Walpers, from Hong Kong, were based on plants that are congeneric with *Tetradium trichotomum*.

Bentham and Hooker placed *Tetradium*, along with *Philagonia*, *Boymia*, and *Megabotrya*, in the synonymy of the genus *Euodia* J. R. & G. Forst. They were essentially followed in this by Engler (1896, 1931), in the standard major work on the southeast Asian-Pacific Rutaceae, who treated *Tetradium* as a section of *Euodia* and listed *Philagonia*, *Boymia*, and *Megabotrya* in its synonymy. This is a remarkably conservative treatment, considering the morphologic differences between the type species of *Euodia*, *Euodia hortensis* J. R. & G. Forst., from the New Hebrides, and the plants typifying *Tetradium*, *Philagonia*, *Boymia*, and *Megabotrya*, but its correctness has apparently never been questioned.

In connection with the present study I have examined type or otherwise authentic specimens of nearly all of the 200 or so species that have been placed in *Euodia sensu* Engler, and it is evident that those with opposite, pinnately compound leaves and follicular fruits with persistent seeds form a natural group around the type species of *Tetradium* and stand well apart, morphologically, from a group of species centered around the type species of *Euodia*. It is also evident that the majority of the species that have been placed in *Euodia* in this classification are more correctly placed in the genus *Melicope* J. R. & G. Forst. than in either *Tetradium* or *Euodia*.

In view of this, the formulation of a more natural classification of these species reinstating *Tetradium* (including *Philagonia, Boymia,* and *Megabotrya*) at the rank of genus and redefining *Euodia* and *Melicope.* These three genera are thus characterized as follows:

Tetradium. *Leaves opposite, pinnately compound; inflorescences terminal or terminal and from the axils of the uppermost pair of leaves; flowers unisexual, 4–5-merous; stamens the same number as petals; carpels 1- or 2-ovulate; fruits follicular; seeds shiny, smooth, remaining attached in the dehisced follicle.* Nine species; distributed from the Himalayas east to Japan and south to Java and Sumbawa.

Euodia. *Leaves opposite, trifoliolate or unifoliolate; inflorescences axillary; flowers bisexual, 4-merous; stamens the same number as petals; carpels 2-ovulate; fruits follicular; seeds more or less dull and roughened, discharged when the follicle dehisces.* About six species; distributed from New Guinea and northeastern Australia east to Samoa.

Melicope. *Leaves opposite, trifoliolate, unifoliolate, or simple; inflorescences axillary, lateral, or rarely (only in a few species from Madagascar) terminal; flowers bisexual or unisexual, 4-merous; stamens the same number or twice as many as the petals; carpels 2-ovulate; fruits follicular to capsular; seeds shiny, smooth, remaining attached in the dehisced fruit.* Probably about 150 species; distributed from Madagascar to India and southern China, throughout Malesia, Micronesia, Melanesia, and Polynesia to the Society Islands, and south to southeastern Australia and New Zealand.

Of the species that are considered here to belong in the genus *Melicope,* the flowers of those that were misplaced in *Euodia* are 4-staminate whereas those of the type species of *Melicope, Melicope ternata* J. R. & G. Forst., from New Zealand, and the 50 or so species that center around it, morphologically, are 8-staminate. This is the only consistent difference between these plants and it is clearly not a sign of generic distinctness, as has traditionally been thought, because it cuts across many lines of obvious relationships between species.

The main differences between *Tetradium, Euodia,* and *Melicope,* as these genera are interpreted here, are given in the following key:

Seeds more or less dull and roughened, discharged when the follicle dehisces; leaves trifoliolate or unifoliolate; inflorescences axillary. . . . . *Euodia*

Seeds shiny, smooth, remaining attached in the dehisced fruit.

Leaves pinnately compound; inflorescences terminal or terminal and from the axils of the uppermost pair of leaves. . . . . *Tetradium*

Leaves trifoliolate, unifoliolate, or simple; inflorescences axillary, lateral, or rarely terminal. . . . . *Melicope*

(*Euodia* and *Melicope* are being revised. The necessary nomenclatural changes for species of *Melicope* that were originally described in *Euodia* will be made in a future publication.)

Besides the distinguishing characters noted above, *Tetradium* differs from *Euodia* and

Melicope in having strong sexual dimorphism in the gynoecium. In its carpellate flowers the carpels are contiguous, forming a 4- or 5-lobed ovary, whereas in its staminate flowers the rudimentary carpels are divergent, finger-like structures which are about as long as the functional carpels. There is no similar dimorphism in *Euodia* or in *Melicope.* The flowers of the former are always bisexual and, in species of the latter with unisexual flowers, the non-functional gynoecium is merely a reduced replica of the functional gynoecium.

Strikingly similar sexual dimorphism to that found in *Tetradium* is exhibited by the genus *Phellodendron* Rupr. (Rutaceae), which consists of about eight species and is distributed from southwestern China northeast to southeastern U.S.S.R. and Japan and south, discontinuously, to Taiwan. *Phellodendron* differs rather markedly from *Tetradium* in having a syncarpous functional gynoecium that develops into a drupaceous fruit. Its rudimentary carpels are distinct, however, and otherwise appear to be identical with those produced in *Tetradium.* In other features, as well, these two genera are so alike that were it not for a difference in the position of the axillary bud – which is sunken in the base of the petiole in *Phellodendron* and exposed in the leaf axil in *Tetradium* – it would seem impossible to distinguish one from the other in sterile or staminate herbarium material.

While it may seem unlikely that a genus with syncarpous, drupaceous fruit would be a close relative of one with apocarpous or subapocarpous, follicular fruit – and indeed, on the basis of this fruit difference Engler (1896, 1931) placed *Phellodendron* and *Tetradium* (as a section of *Euodia*) in separate subfamilies of the Rutaceae, the Toddalioideae and Rutoideae, respectively – I think there is little doubt that *Phellodendron* and *Tetradium* are, in fact, closely related. Such a relationship is not unusual in the non-aurantioid Rutaceae. *Acronychia* J. R. & G, Forst., for example, which has syncarpous, drupaceous fruit, appears to be closely related to *Melicope*, most species of which have apocarpous or subapocarpous, follicular fruits (Hartley, 1974), and *Zanthoxylum* L. (including *Fagara* L.), which has apocarpous or subapocarpous, follicular fruit, appears to be the closest relative of *Toddalia* Juss., which has syncarpous, drupaceous fruit (Hartley, unpubl.). A particularly close evolutionary proximity of the apocarpous and syncarpous conditions appears to be evidenced in *Phellodendron* where the presence of separate rudimentary carpels in a genus with a syncarpous functional gynoecium would seem to indicate immediate apocarpous ancestry. I think it is likely that this ancestor was a species of *Tetradium.*

Tetradium also appears to be closely related to *Zanthoxylum,* which consists of about 200 species and is pantropical and ranges north into temperate latitudes of eastern Asia and North America. *Zanthoxylum* differs from *Tetradium* mainly in having alternate leaves. The two genera are consistently similar in having apocarpous or subapocarpous, follicular fruits with smooth, shiny seeds that remain attached in the dehisced follicle. In most other relevant characters *Zanthoxylum* is variable, but many of its species, including several from southeast Asia (see Huang, 1957, and Hartley, 1966) are similar to *Tetradium* in having pinnately compound leaves, terminal inflorescences, unisexual, 4- or 5-merous flowers, and divergent, finger-like, rudimentary carpels, among other characters.

Zanthoxylum, Tetradium, and *Phellodendron* appear to be related to one another in a linear sequence. The following outline shows the apparent interrelationships of the three genera as indicated by various morphologic features.

Leaves alternate; functional gynoecium apocarpous or subapocarpous (or sometimes reduced to a single carpel); fruits follicular. . . . . *Zanthoxylum*

Leaves opposite; functional gynoecium apocarpous or subapocarpous; fruits follicular. . . . . *Tetradium*

Leaves opposite; functional gynoecium syncarpous; fruits drupaceous. . . . . *Phellodendron*

Toddalia, which is mentioned above as probably being a close relative of *Zanthoxylum,* does not seem to be part of this sequence.

This revision is based on herbarium specimens. The contributing herbaria, with abbreviations from Holmgren and Keuken's Index Herbariorum, Part 1, ed. 6 [Reg. Veg. 92 (1974)], are as follows: Arnold Arboretum of Harvard University, Cambridge (A); State Herbarium of South Australia, Adelaide (AD); Auckland Institute and Museum, Auckland (AK); Botanisches Museum, Berlin-Dahlem (B); Bernice P. Bishop Museum, Honolulu (BISH); British Museum (Natural Histroy), London (BM); Herbarium Bogoriense, Bogor (BO); Queensland Herbarium, Brisbane (BRI); Botanical Survey of India, Calcutta (CAL); C.S.I.R.O. Herbarium Australiense, Canberra (CANB); Botany Division, D.S.I.R., Cristchurch (CHR); Forest Research Institute and Colleges, Dehra Dun (DD); Royal Botanic Garden, Edinburgh (E); Conservatoire et Jardin Botaniques, Geneve (G): Gray Herbarium of Harvard University, Cambridge (GH); Royal Botanic Gardens, Kew (K); Rijksherbarium, Leiden (L); Komarov Botanical Institute, U.S.S.R. Academy of Sciences, Leningrad (LE); National Herbarium of Victoria, Melbourne (MEL); University Herbarium, University of Michigan, Ann Arbor (MICH); National Herbarium of New South Wales, Sydney (NSW); New York Botanical Garden, New York (NY); Museum National d'Histoire Naturelle, Paris (P); Institute of Botany, Academia Sinica, Peking (PE); Department of Botany, Academy of Natural Sciences, Philadelphia (PH); Botanic Gardens, Singapore (SING); Department of Botany, University of Tokyo (TI); Botanical Museum and Herbarium, Utrecht (U); Herbarium of the University of California, Berkeley (UC); National Museum of Natural History (Department of Botany), Smithsonian Institution, Washington D. C. (US); Naturhistorisches Museum, Wien (W).

Tetradium Lour., Fl. Cochinch. (1790) 91, non Dulac, 1867. Type species: *Tetradium trichotomum* Lour.

Philagonia Bl., Cat. Pl. Buitenz. (1823) 20. Bijdr. (1825) 250. Type species: *Philagonia sambucina* Bl.

Boymia A. Juss., Mem. Mus. Hist. Nat. 12 (1825) 507,. Mem. Rutac. (1825) 124. Type species: *Boymia rutaecarpa* A. Juss.

Megabotrya Hance ex Walpers, Ann. Bot. Syst. 2 (1852) 258. Type species: *Megabotrya meliaefolia* Hance ex Walpers.

Xanthoxylum subgenus *Oxyactis* Benn., Ann. Mag. Nat Hist. ser. 3, 10 (1862) 201. Type species: *Xanthoxylum daniellii* Benn.

Evodia section *Tetradium* Lour., Engl. in Engler & Prantl, Nat. Pflanzenfam. III: 4 (1896) 121; *ibid.* ed. 2, 19a (1931) 228. Type species: *Evodia trichotomum* (Lour.) Pierre.

Evodia section *Evodioceras* Dode, Bull. Soc. Bot. France (1908) 55, (1909) 706. Type species: *Evodia daniellii* (Benn.) Hemsl.

Evodia section *Oxyactis* (Benn.) Rehd. & Wils. in Sargent, Pl. Wils. 2 (1914) 133, *nomen illegit.*, based on the same type as *Evodia* section *Evodioceras* Dode.

Evodia section *Subtrigonospermum* Huang, Acta Phytotax. Sin. 6 (1957) 116. Type species: *Evodia subtrigonosperma* Huang.

Small to large trees or occasionally shrubs; dioecious or rarely occasional plants monoecious; evergreen or deciduous; indumentum of simple trichomes. Buds naked, pubescent, the lateral buds axillary. Leaves opposite, imparipinnate or rarely occasional leaves paripinnate; lateral leaflets mostly petiolulate; terminal leaflet on an extension of the rachis; leaflet blades usually oil dotted, venation pinnate, margin often crenulate with an oil dot at the sinus of each crenulation. Inflorescences corymbose or subcorymbose or occasionally grading to paniculate, spreading or rarely rather compacted, several- to many-flowered, terminal or terminal and from the axils of the uppermost pair of leaves. Flowers unisexual or rarely occasional flowers bisexual, 5- or 4-merous, globose, broadly ellipsoid, or obovoid in bud; sepals 5 or 4, ovate to triangular, basally connate, valvate, persistent in fruit; petals 5 or 4, elliptic to ovate-elliptic, usually hooked adaxially at the apex, distinct, erect, narrowly imbricate in bud, deciduous in fruit; stamens the same number as petals, distinct, opposite the sepals; functional stamens elongating to about 1.5 times the length of the petals, filaments usually more or less villous from about the middle to the base, adaxially, otherwise glabrous, linear-subulate, curved inward basally, otherwise straight and more or less erect, anthers ovoid, obtuse, dorsifixed; rudimentary stamens (produced in carpellate flowers) much shorter than the petals or sometimes obsolete, ligulate, persistent in fruit; disc intrastaminal, in staminate flowers conical to cylindrical or occasionally barrel-shaped, in carpellate flowers pulvinate to barrel-shaped, persistent in fruit as a short stipe; gynoecium 5- or 4-carpellate, together with the subtending disc about as long as the petals; functional carpels free to the base or connate toward the base, otherwise contiguous and forming a 5- or 4-lobed, 5- or 4-loculate, subglobose to obovoid ovary, placentation axile, ovules 2 or 1 per locule, style apical, straight, composed of 5 or 4 more or less contiguous stylar elements; stigma 1, peltate and usually shallowly 5- or 4-lobed; rudimentary carpels (produced in staminate flowers) finger-like, free to the base or connate toward the base, divergent and sometimes contorted. Fruits of 1-5 or 1-4 1- or 2-seeded follicles, carpels not developed into follicles, persistent; follicles free to the base or connate toward the base, dehiscing adaxially, apically, and partially down the abaxial surface, epicarp dry at maturity, subwoody, the outer surface more or less glandular-punctate, endocarp cartilaginous abaxially grading to pergamentaceous adaxially, persistent in the dehisced follicle. Seed(s) shiny, smooth, black to dark reddish brown, persistent in the dehisced follicle; endosperm copious, fleshy; embryo straight, cotyledons broadly elliptic, plano-convex, hypocotyl terminal.

Trichomes are uniformly simple and unicellular in *Tetradium* and in all species the new growth of vegetative and floral shoots is clothed with fine, short indumentum. As these shoots mature, this juvenile vestiture may be partially or entirely lost or may be retained and is often further developed. As a result, mature leaves, branchlets of the present year's growth, and axes and branches of inflorescences vary from glabrous to densely pubescent. For the most part this variability is taxonomically insignificant.

A rather unusual surface feature occurs in *Tetradium austrosinense* and *T. sumatranum*, and to a lesser extent in a few specimens of *T. fraxinifolium*. The lower surface

of the leaflets of these plants is glaucous and minutely papillate. The papillae appear to be globules of wax.

The terminal inflorescence in *Tetradium* originates from the middle bud of the three found between the uppermost pair of leaves of the shoot. The two lateral buds of the three may form upper axillary inflorescences or they may remain dormant during the flowering period and later form vegetative shoots.

Inflorescences range from corymbose to subcorymbose to paniculate and from spreading to rather compacted. This variability is not taxonomically significant.

Tetradium is remarkably variable (for a rutaceous genus) in ovule number and in several characteristics of the seeds and their mode of attachment in the dehisced follicle. This variability, summarized in the following outline, provides a basis for a natural classification of the species.

A. Carpels 2-ovulate.

B. Seeds 2 per follicle (follicles appearing to be 1-seeded in *T. sambucinum*).

C. Both seeds functional; outer testa spongy, bounded externally by a shiny, crustaceous pellicle; inner testa bony.

D. Seeds hemispheric, the two coherent and appearing to represent a single, globose or subglobose seed, attached in the dehisced follicle to an adaxial strip of pergamentaceous endocarp tissue.

1. *T. sambucinum.*

D. Seeds subtrigonous, separate, attached in the dehisced follicle to a funicular aril.

2. *T. fraxinifolium.*

C. One seed sterile (of almost normal size – containing what appears to be endosperm but lacking an embryo); seeds ovoid to ellipsoid, coherent, attached in the dehisced follicle to an adaxial strip of pergamentaceous endocarp tissue; testa bony in the fertile seed, thin and brittle in the sterile seed, bounded externally by a shiny pellicle, without spongy tissue.

3. *T. daniellii.*
4. *T. calcicolum.*

B. Seed 1 per follicle (paired with an aborted seed). subglobose to ovoid to broadly ellipsoid, attached in the dehisced follicle to an adaxial strip of pergamentaceous endocarp tissue; outer testa spongy, bounded externally by a shiny, crustaceous pellicle; inner testa bony.

5. *T. glabrifolium.*
6. *T. trichotomum.*
7. *T. ruticarpum.*

A. Carpels 1-ovulate.

E. Seed ellipsoid to subreniform, attached in the dehisced follicle to an adaxial strip of pergamentaceous endocarp tissue; outer testa spongy, bounded externally by a shiny, crustaceous pellicle; inner testa bony.

8. *T. austrosinense.*

E. Fruits and seeds not known.

9. *T. sumatranum.*

Regarding the relative evolutionary levels of these characters, it is probable that the one-ovulate condition is more highly derived than the two-ovulate and that in the two-ovulate species the one-seeded condition is more highly derived than the two-seeded. The levels of the other characters are more difficult to judge, but it seems likely, mainly because of dissimilarity to *Zanthoxylum,* the supposed ancestor of *Tetradium,* that the arillate condition in *T. fraxinifolium* and the absence of spongy outer testa in *T. daniellii* and *T. calcicolum* represent derived states from the non-arillate condition and presence of spongy outer testa.

Regarding the interrelationships of the species, *Tetradium daniellii* and *T. calcicolum* are very closely related and stand well apart from the other species of the genus. The same is true of *T. austrosinense* and *T. sumatranum. Tetradium glabrifolium, T. trichotomum,* and *T. ruticarpum* are less closely interrelated, but clearly comprise a natural, fairly isolated group. The remaining two species, *T. sambucinum* and *T. fraxinifolium,* are not at all closely related and are markedly distinct (especially the latter) from the other species of the genus.

As is noted in the generic synonymy, three sections of *Euodia* have been based on species of *Tetradium,* namely, section *Tetradium,* based on *Euodia trichotoma* (= *Tetradium trichotomum);* section *Evodioceras,* based on *Euodia daniellii* (= *Tetradium daniellii);* and section *Subtrigonospermum,* based on *Euodia subtrigonosperma* (= *Tetradium fraxinifolium*). In view of the interrelationships of the species, these sectional names could be used to designate natural species groupings: section *Tetradium* for *T. glabrifolium, T. trichotomum,* and *T. ruticarpum;* section *Evodioceras* for *T. daniellii* and *T. calcicolum;* and section *Subtrigonospermum for T. fraxinifolium.* I prefer not to use them, however, because of the small size of the genus and also because doing so would necessitate describing two additional sections, one for *T. sambucinum* and one for *T. austrosinense* and *T. sumatranum.*

Economically, *Tetradium* is of rather minor importance as an ornamental tree (notably *T. daniellii,* which is hardy at cold temperate latitudes) while the fruit of one species, *T. ruticarpum,* is reported (as *Boymia ruticarpa* and *Euodia officinalis*) to have medicinal properties (Siebold and Zuccarini, 1837; Rehder and Wilson, 1914).

Chemically, *Tetradium* is reported to yield a variety of secondary metabolites, and from this standpoint the genus may have as yet unrealized economic value. These reports are as follows:

1. The isoquinoline alkaloid berberine is reported from *Tetradium glabrifolium* (as *Euodia glauca* and *E. meliifolia*) by Price (1963) and Hegnauer (1973).

2. Several quinazoline alkaloids are reported from *Tetradium ruticarpum* (as *Euodia ruticarpa*) by Price (1963), Hegnauer (1973), and Waterman (1975).

3. An amide is reported from *Tetradium daniellii* (as *Euodia hupehensis*) by Waterman (1975).

4. The flavanoids diosmin and hesperidin are reported from *Tetradium daniellii* (as *Euodia daniellii, E. hupehensis,* and *E. velutina*) and *T. ruticarpum* (as *Euodia officinalis* and *E. ruticarpum*) by Hegnauer (1973).

5. Three limonoids are reported from *Tetradium ruticarpum* (as *Euodia ruticarpa*) by Hegnauer (1973).

6. Two triterpenes are reported from *Tetradium fraxinifolium* (as *Euodia fraxinifolia*) by Hegnauer (1973).

The reports of the isoquinoline alkaloid berberine from *Tetradium glabrifolium* were based on earlier studies and are considered to be doubtful by Hegnauer (1973) and Waterman (1975); both of these authors point out that isoquinoline alkaloids, which are of wide occurrence in families of the Ranales *sensu lat.*, are probably restricted, in the Rutaceae, to *Zanthoxylum* (including *Fagara*), *Phellodendron,* and *Toddalia.* The close mutual relationship between *Zanthoxylum, Tetradium,* and *Phellodendron,* proposed in the present study, suggests that species of *Tetradium* may well synthesize these compounds. It would thus be of interest to re-examine material of *T. glabrifolium.*

KEY TO FLOWERING MATERIAL

1. Perianth, androecium, and gynoecium predominantly 5-parted (4-parted in occasional flowers). . . . . 2.

2. Leaflets minutely papillate below; ovules 1 per carpel. . . . . 3.

3. Leaflets below sparsely to densely pubescent with spreading or ascending hairs, main veins 9-12 pairs; petals 2.5-3 mm long. . . . 8. *T. austrosinense.*

3. Leaflets below puberulent with minute, appressed hairs, main veins 13-16 pairs; petals 3.2-3.5 mm long. . . . . 9. *T. sumatranum.*

2. Leaflets not papillate; ovules 2 per carpel. . . . . 4.

4. Petals purple, drying dull purplish red, sparsely to rather densely appressed pubescent abaxially. . . . . 4. *T. calcicolum.*

4. Petals green to yellow to white, drying brown or whitish, glabrous or nearly so abaxially. . . . . 5.

5. Lower surface of leaflets usually conspicuously (10x) oil-dotted, usually pubescent over the entire surface; ovary and rudimentary carpels usually glabrous. . . . . 7. *T. ruticarpum.*

5. Lower surface of leaflets usually inconspicuously oil-dotted, usually entirely glabrous or with pubescence restricted to the

midrib toward the base (rarely pubescent over the entire surface); ovary pubescent between the carpels and often on the exposed surface; rudimentary carpels usually pubescent, at least toward the base. . . . . 6.

6. Leaflets below usually obviously glaucous (dried material), ultimate veinlets clearly visible (10x), densely reticulate; sepals about 0.5 mm long; ovules collateral or subcollateral; rudimentary carpels usually pubescent toward the base and glabrous toward the apex (rarely entirely glabrous). . . . . 5. *T. glabrifolium.*

6. Leaflets below seldom obviously glaucous, ultimate veinlets usually inconspicuous; sepals 0.5-1.5 mm long; ovules superposed; rudimentary carpels uniformly villous. . 3. *T. daniellii.*

1. Perianth, androecium, and gynoecium predominantly 4-parted (5-parted in occasional flowers). . . . . 7.

7. Petals 2.5-3 mm long; disc sparsely to rather densely pubescent; main veins of leaflets departing from the midrib at an angle of 45-50 degrees. . . . . 1. *T. sambucinum.*

7. Petals 3-6.5 mm long; disc glabrous; main veins of leaflets departing from the midrib at an angle of 65-80 degrees. . . . . 8.

8. Leaflets with large oil dots at the margin and smaller dots scattered elsewhere on the blade, margin crenulate or rarely entire, main veins 13-22 pairs. . . . . 2. *T. fraxinifolium.*

8. Leaflets with oil dots all of approximately the same size, margin entire, main veins 11-14 pairs. . . . . 6. *T. trichotomum.*

KEY TO FRUITING MATERIAL

1. Follicles 2-seeded (appearing to be 1-seeded in *T. sambucinum*). . . . . 2.

2. Seeds 4-4.5 mm long, separate, firmly attached in the dehisced follicle to a rather thick, fleshy aril. . . . . 2. *T. fraxinifolium.*

2. Seeds 1.5-4 mm long, coherent, loosely attached in the dehisced follicle to an adaxial strip of pergamentaceous endocarp tissue. . . . . 3.

3. Fruits 4-carpellate,[1] all four carpels usually developing into follicles; follicles 3-4 mm long and about as wide; seeds collateral, hemispheric, the two together appearing to represent a single globose or subglobose seed. . . . . 1. *T. sambucinum.*

1. In all species of *Tetradium* the carpel number can be determined in fruiting material since carpels that do not develop into follicles are persistent.

3. Fruits predominantly 5-carpellate (occasional fruits 4-carpellate), 2-5 of the carpels developing into follicles; follicles 5-11 mm long, definitely longer than wide; seeds superposed, ovoid to ellipsoid. . . . . 4.

4. Follicles beaked, sparsely to rather densely pubescent with spreading hairs, 5-11 mm long. . . . . 3. *T. daniellii.*

4. Follicles not beaked, sparsely to densely appressed-pubescent, about 5 mm long. . . . . 4. *T. calcicolum.*

1. Follicles 1-seeded. . . . . 5.

5. Follicles about 3.5 mm long, developed from 1-ovulate carpels and thus not containing an aborted seed; leaflets minutely papillate below. . . . . 8. *T. austrosinense.*[2]

5. Follicles 3.5-7 mm long, developed from 2-ovulate carpels and thus containing an aborted seed (usually flattened against the upper adaxial surface of the developed seed); leaflets not papillate. . . . 6.

6. Fruits predominantly 4-carpellate (occasional fruits 5-carpellate), each composed of 1-4(-5) follicles. . . . . 6. *T. trichotomum.*

6. Fruits predominantly 5-carpellate (occasional fruits 4-carpellate), each composed of 1-5 follicles. . . . . 7.

7. Follicles densely appressed-pubescent laterally, glabrous abaxially; endocarp sparsely to rather densely pubescent; leaflets usually glabrous or nearly so, ultimate veinlets clearly visible (10x) on the lower surface, densely reticulate . . . . . 5. *T. glabrifolium.*

7. Follicles glabrous or occasionally with sparse hairs laterally and/or abaxially; endocarp glabrous; leaflets sparsely to densely pubescent below, ultimate veinlets usually inconspicuous . . . . . 7. *T. ruticarpum.*

1. **Tetradium sambucinum** (Bl.) Hartley, *comb. nov.*

Philagonia sambucina Bl., Cat. Pl. Buitenz. (1823) 21; Bijdr. (1825) 250. Lectotype (chosen here): *Blume*, October 1822 (carpellate flowering material), Java, Salak.

Philagonia procera Bl. ex Nees, Flora 8 (1825) 125, *nomen illegit.*, based on *Philagonia sambucina* Bl.

2. *Tetradium sumatranum*, for which fruits are not known, is closely related to *T. austrosinense* (both species have 1-ovulate carpels and minutely papillate leaflets). Vegetative differences between the two are given in the key to flowering material.

Evodia sambucina (Bl.) Hook. f. ex Koorders & Valeton, Meded. Lands Plantentuin 17 (1896) 216.

Philagonia sambucifolia Dode, Bull. Soc. Bot. France (1908)55, (1909)701, *sphalm.*, = *Philagonia sambucina* Bl.

Evodia sambucifolia Dode, *ibid., sphalm.*, = *Philagonia sambucina* Bl.

Medium to large tree to 34 m high; branchlets puberulent to finely pubescent when young, becoming glabrous or nearly so. Leaves 17-36 cm long; rachis puberulent, especially adaxially; leaflets (3-)4-5(-6) pairs; petiolules of lateral leaflets obsolete to 10 mm long, terminal leaflet on an extension of the rachis 10-20 mm long; blades of leaflets chartaceous to subcoriaceous, inconspicuously oil-dotted, below drying pale green to brown, usually with appressed puberulence or short spreading hairs on the midrib and main veins, otherwise glabrous or nearly so; above usually with appressed puberulence or short spreading hairs on the midrib, otherwise glabrous or nearly so; elliptic-oblong or less often elliptic, ovate, lanceolate, or oblanceolate, 6-18 cm long, 2-5 cm wide, base in lateral leaflets acute to obtuse, usually rather oblique, in terminal leaflet cuneate, main veins 13-16 pairs, departing from the midrib at an angle of 45-50 degrees, ultimate veinlets usually rather conspicuous (10x), rather loosely reticulate, margin crenulate, at least toward the apex, inconspicuous oil dots associated with the crenulations, apex acuminate, the acumen 10-20 mm long. Inflorescences 13-25 cm long, rachis puberulent, branches puberulent to finely pubescent, pedicels puberulent to finely pubescent, obsolete to 1.5 mm long. Flowers 4-merous; sepals puberulent to glabrous, usually ciliolate, 0.5-0.8 mm long; petals yellowish green, drying brown, abaxially glabrous or rarely sparsely puberulent, adaxially sparsely to rather densely villous, 2.5-3 mm long; disc sparsely to rather densely pubescent; ovary appressed pubescent, carpels free to the base abaxially, connate toward the base adaxially, ovules 2 per carpel, collateral; rudimentary carpels more or less villous toward the base, otherwise glabrous, free to the base. Fruits 4-carpellate, all four carpels usually developing into follicles; follicles puberulent, trigonous, not beaked, 3-4 mm high and about as wide, free to the base abaxially, connate toward the base adaxially, endocarp sparsely hairy. Seeds black, 2 per follicle, collateral, hemispheric, coherent and appearing to represent a single globose or subglobose seed, 1.5-2 mm long, attached in the dehisced follicle to an adaxial strip of pergamentaceous endocarp tissue; outer testa spongy (bounded externally by a crustaceous, shiny pellicle); inner testa bony.

Distribution. W. Malaysia, Sumatra, Java, and Sumbawa; recorded from primary and secondary, usually poorly-drained, rain forests, 30-1400 m.

W. Malaysia. Trengganu: G. Mandi Angin, *Whitmore FRI 12139* (L).

Sumatra. Res. Atjeh: Simaloer Island, *Achmad 607* (BO), *775* (BO, L), *1022* (BO, L), *1142* (BO, L, SING), *1662* (BO, L), *1736* (BO, L); Gajo Loeëus, Penosan (G. Geroepal), *Anonymous bb 22358* (BO, L, SING); Gajoe Loeëus, G. Agosan, *Anonymous bb 22426* (A, BO, BRI, L, NY, SING). West Coast: Soeliki, *Anonymous bb 6536* (BO, L), *de Boer 25 (bb 7428)* (BO); Fort de Kock, *Theunissen 2* (BO, L); Mt. Sago, near Pajakoemboeh, *Maradjo 25* (L); Malalak, *Anonymous bb 7421* (L); Pariaman, *Diepenhorst HB 1399* (BO, U), *HB 2560* (BO), *HB 2917* (BO, L, U); Sawahloento, *Ham*, 29 May 1911 (BO, L); Lasi, *Anonymous bb 13104* (BO); without definite locality, *Anonymous bb 6621* (BO). East Coast: Sibaulangit, *Lörzing 4351* (BO), *5282* (BO); Langkat, Timbang, *Lesger 255* (L, SING).

Java. West: G Kendeng, *Backer 25908* (BO, L); G. Salak, *Blume*, October 1822 (L, lectotype of *Philagonia sambucina* Bl.; L. PR, duplicates of lectotype), *Koorders 24156β* (BO); G. Batoe, *Backer 25786* (BO); Sanggrawa, *Koorders 6908β* (BO), *6909β* (BO), *6910β* (BO, P); Preanger, *Koorders 26356β* (BO); G. Kapal, *Koorders 11096β* (BO). Central: Pringombo, *Koorders 6911β* (BO), *37906β* (BO). Without definite locality: *Blume* (A, BO, CANB, GH, L, NSW, U, US).

Lesser Sunda Islands. Sumbawa: Mt Batulante, *Kostermans 18864* (A, BO); without definite locality, *Kostermans 18716a* (L).

Blume's original description of *Philagonia sambucina* was based on staminate and carpellate material. The lectotype is chosen from the latter.

2. **Tetradium fraxinifolium** (Hook.) Hartley, *comb. nov.*

Philagonia fraxinifolia Hook., Ic. Pl. (1845) *t. 710.* Lectotype (chosen here): *Wallich*, 1821 (carpellate flowering material), Nepal.

Evodia fraxinifolia (Hook.) Benth., Fl. Hongkong (1861) 59.

Evodia impellucida Hand.-Mazz., Symb. Sin. 7 (1933) 626. Type: *Handel-Mazzetti 9393*, China, Yunnan Province, prope fines Tibeto-Birmanicas, in faucium Naiwanglong.

Evodia poilanei Guill., Bull. Soc. Bot. France (1944) 91, (1945) 214. Syntypes: *Poilane 12927*, Vietnam, Tonkin, O. de Chapa; *Poilane 26800*, Tonkin, N. de Phong-ho.

Evodia subtrigonosperma Huang, Acta Phytotax. Sin. 6 (1957) 118. *t. 31.* Type: *Yu 20510*, China, Yunnan Province, in silvis ad Muhconga, Kiukiang.

Evodia impellucida var. *macrococca* Huang, *ibid.* 117. *t. 30.* Type: *Tsai 56591*, China, Yunnan Province, Shang-pa-hsien (not seen).

Evodia robusta Huang, *ibid.* 119, non Hook. f., 1875. Type: *Tsai 56776*, China, Yunnan Province, Lu-si-hsien (not seen).

Small to medium tree to 12 m high; branchlets glabrous, glabrate, or occasionally finely pubescent. Leaves 23–67 cm long; rachis glabrous, glabrate, or occasionally finely pubescent; leaflets 2–7 pairs; petiolules of lateral leaflets obsolete to 10 mm long, terminal leaflet on an extension of the rachis 12–35 mm long; blades of leaflets chartaceous to subcoriaceous, usually conspicuously oil-dotted, below drying whitish, green, or brown, often glaucous and sometimes minutely (10x) subpapillate, glabrous to sparsely or rarely densely pubescent, above glabrous to puberulent, lanceolate or occasionally ovate, elliptic-oblong, or elliptic, 9–25 cm long, 3.5–8.5 cm wide, base in lateral leaflets acute to rounded, often oblique, in terminal leaflet cuneate, main veins 13–22 pairs, departing from the midrib at an angle of 65–80 degrees ultimate veinlets usually inconspicuous, margin crenulate or rarely entire, marginal oil dots larger than those scattered elsewhere on the blade, apex acuminate, the acumen 7–25 mm long. Inflorescences 7–24 cm long, rachis, branches, and pedicels puberulent to pubescent, pedicels 1–6 mm long. Flowers predominantly 4-merous (occasional flowers 5-merous); sepals finely pubescent to glabrous, ciliolate, 0.5–1.5 mm long; petals pale yellow to green,

drying brown, abaxially glabrous, adaxially villous to glabrous, 3.5–6.5 mm long; disc glabrous; ovary appressed-pubescent to glabrous, the carpels connate toward the base abaxially, free to the base adaxially, ovules 2 per carpel, subcollateral; rudimentary carpels sparsely to rather densely appressed-pubescent toward the base, otherwise glabrous, connate toward the base. Fruits predominantly 4-carpellate (occasional fruits 5-carpellate), 1–4 of the carpels developing into follicles; follicles sparsely pubescent to glabrous, compressed-subglobose, not beaked, 5.5–10 mm long, connate toward the base abaxially, free to the base adaxially, endocarp sparsely pubescent or glabrous. Seeds reddish-brown to brownish-black, 2 per follicle, subcollateral, separate, subtrigonous, equal or slightly unequal in size, 4–5 mm long, firmly attached in the dehisced follicle to a rather thick, fleshy, funicular aril; outer testa spongy (bounded externally by a shiny, crustaceous pellicle); inner testa bony.

Distribution. Nepal east to northern Vietnam and southwestern China; recorded from well-drained forests and thickets, 750–3000 m.

Nepal. Annapura Himal, Lati Khola, *Stainton, Sykes, & Williams 6679* (BM); north of Pokhara, *Stainton, Sykes, & Williams 5064* (A, BM); Ganesh Himal, *Stainton 3685* (BM); Likhu Khola, *Stainton 4546* (BM); Tamur Valley, southeast of Terhathum, *Williams & Stainton 8465* (BM); Mewa Khola, *Stainton 6838* (BM); Pha Khola, *Williams 1019* (BM); Yampodin-Ghatte, *Kanai, Murata, & Togashi 6301109* (BM); without definite locality, *Wallich Cat. No. 8521* (BM, GH, L, P, W), *Wallich,* 1820 (BM), *Wallich,* 1821 (K, lectotype of *Philagonia fraxinifolia* Hook.).

Sikkim. Suriel, *Wilson,* 8 September 1921 (A); without definite locality, *Clarke 26635B* (L), *Hooker* (BRI, GH, L, MEL, NY, US, W), *King 4868* (CAL), *Herb. Kuntze 6930* (NY), *Thomson,* 3 May 1857 (L, US), *Treuther 139* MEL).

Bhutan. Shali, *Cooper 4473* (BM).

India. West Bengal: Darjeeling, *Clarke 27327* (BM), *35229C* (BM); Darjeeling District, Takdah, *Chakrabutti 132D* (DD), *Lace 2205* (CAL). Assam: Garo Hills, *Panigrahi 22427* (L); Shillong, *Clarke 44335* (US); Khasi Hills, *Chand 5377* (L), *6160* (MICH), *8294* (L, MICH), *Clarke 7312* (BM), *45921B* (US), *Hooker & Thomson* (BRI, GH, L, MEL, NY, U, W), *Kanjilal 2634* (DD), *Koelz 23190* (MICH), *28383* (MICH), *29441* (MICH), *30358* (MICH), *33721* (MICH); Khasi and Jaintia Hills, *Kanjilal 4553* (CAL, DD); Khasi Hills and Bhramaputra Plains, *Herb Kurz* (BM); Subansiri Frontier Division, Palin to Amji, *Sastry 40950* (L); Naga Hills, *Koelz 25374* (MICH), *26051* (L, MICH), *26118* (MICH), *Prain's Collector 953* (A, W); Lushai Hills, *Koelz 27485* (MICH); without definite locality, *Biswas 4060* (A), *King's Collector* (L).

Burma. Valley of the Nam Tamai, *Kingdon-Ward 13088* (BM); North Triangle, *Kingdon-Ward 21150* (A); hills around Htawgaw, *Forrest 25070* (E); Hkamhkam-Htawgaw Road, *Kermode 17346* (DD); Kachin Hills, *Mokim,* March 1898 (A); without definite locality, *Rodger 139* (CAL).

Thailand. Northern: Doi Angka, Pa Ngein, *Garrett 644* (L), *Kerr 644* (L).

Vietnam. Tonkin: N. de Phong-ho, *Poilane 26800* (P, holosyntype of *Euodia poilanei* Guill.); O. de Chapa, *Poilane 12927* (P, holosyntype of *Euodia poilanei* Guill.).

China. Yunnan Province: Prope fines Tibeto-Birmanicas in convalle fluvii Djeoudjian in pluviisilva frondosa subtropica faucium Naiwanglong, *Handel-Mazzetti 9393*

(W, holotype of *Euodia impellucida* Hand.-Mazz.; A, isotype); Shweli-Salween Divide, *Forrest 24115* (BM, K); Shweli Valley, *Forrest 8687* (E); three days south of Teng-yueh [Teng-chung], *Forrest 26470* (E, US); Kiukiang Valley north of Muhconga, *Yu 20510* (PE, holotype of *Euodia subtrigonosperma* – only a photograph seen; E, isotype); Kiukiang, Taron, Chiengen, *Yu 19451* (E); without definite locality, *Forrest 15803* (K), *16079* (K), *17743* (K), *17859* (K), *18592* (K), *25250* (K).

Cultivated. India: Madras, Nilgiri Hills, *Brandis 1855* (A).

The type sheet of *Philagonia fraxinifolia* consists of two flowering branchlets, one staminate and one carpellate, and one separate carpellate inflorescence. Because the species is dioecious with unisexual flowers, these specimens would have been taken from two or perhaps three different plants. The carpellate flowering branchlet is chosen as the lectotype.

In the plate accompanying the original description of *Philagonia fraxinifolia,* figure 1 depicts a bisexual flower, although in the legend it is referred to as a female flower. The same drawing is on the type sheet. This is obviously an error because the female flowers in this species have ligulate staminodes rather than fully developed stamens as are shown in the drawing.

In the original description of *Philagonia fraxinifolia,* Hooker gives the following synonymy:

Tetradium? fraxinifolium Wall. in Herb. Hook. 1821 [Wallich's question mark].

Rhus fraxinifolium? Don, Prodr. Fl. Nep. p. 248 [Hooker's question mark].

The Wallich name, which also appears (with the question mark) on the label of the type sheet of *Philagonia fraxinifolia,* was never published, and Hooker merely questions the conspecificity of *Rhus fraxinifolium* and *Philagonia fraxinifolia.* In a short discussion following the description he states: "It *[Philagonia fraxinifolia]* may be the *Rhus* above quoted of the late Mr. Don, though assuredly the style and stigma do not correspond with that genus." I have not seen the type of the Don plant (it is apparently not in the British Museum – R. J. Henderson, pers. comm.), but it was described as having hermaphroditic flowers and serrate leaves, neither of which characters agrees with material I have seen of *Tetradium fraxinifolium.*

The type collections of *Euodia impellucida, E. poilanei,* and *E. subtrigonosperma,* and a paratype *(Forrest 8687)* of *E. impellucida* var. *macrococca,* the type of which I have not seen, all fall well within the range of variability of the Himalayan and Indian collections that center, morphologically, around the type of *Philagonia fraxinifolia.* None of the authors of the former taxa mention a possible relationship with the latter species, and I suspect they did not compare it with their new taxa.

I have not seen any authentic material of *Euodia robusta* Huang (a later homonym of *E. robusta* Hook. f., described from Malaya), but judging from the description of its seeds (two per locule, subtriangular, reddish-brown, 4–5 mm long), it is certainly allied to *Tetradium fraxinifolium,* and on other characters falls reasonably well within its range of variability.

In the original description of *Euodia impellucida,* Handel-Mazzetti described the leaflets as " . . . *glandulis pellucidis marginalibus tantum.*" In the type collection of this

species the leaflets are glaucous and minutely subpapillate below with conspicuous marginal oil dots. Smaller oil dots are, in fact, present elsewhere on the blade but are mostly obscured by the waxy bloom.

3. **Tetradium daniellii** (Benn.) Hartley, *comb. nov.*

Xanthoxylum daniellii Benn., Ann. Mag. Nat. Hist. ser. 3:10 (1862) 201, *t. 5.* Type: *Daniell,* 1861, China, Liaoning Province, Talien-whan.

Zanthoxylon bretschneideri Maxim., Bull. Acad. Imp. Sci. Saint-Petersbourg 29 (1884) 73; Melanges Biol. Bull. Phys.-Math. Acad. Imp. Sci. Saint-Petersbourg 9 (1884) 655. Type: *Bretschneider 1328,* China, Hopeh Province, Shang-fang-shan.

Evodia daniellii (Benn.) Hemsl., J. Linn. Soc. Bot. 23 (1886) 104.

Ampacus daniellii (Benn.) Kuntze, Rev. Gen. Pl. 1 (1891) 98.

Evodia delavayi Dode, Bull. Soc. Bot. France (1908) 55, (1909) 707. Type: *Delavay 4526,* China, Yunnan Province, Ta long tan près de Ta pin tze.

Evodia henryi Dode, *ibid.* 706. Syntypes: *Farges 413,* China, Szechwan Province, distr. de Tchen-kéou-tin; *Henry 6712,* China, Hupeh Province, Ichang; *Wilson 3183,* China, Hupeh Province, Hupeh occidental (not seen).

Evodia hupehensis Dode, *ibid.* 707. Type *Henry 2939,* China, Hupeh Province, Ichang.

Evodia labordei Dode, *ibid.* 707. Type: *Laborde & Bodinier 2729,* China, Kweichow Province, Mt. de Kaopo (not seen).

Evodia sutchuenensis Dode, *ibid.* 705. Type: *Farges 1284 p.p.* staminate, China, Szechwan Province, distr. de Tchen-kéou-tin.

Evodia baberi Rehd. & Wils., *p.p.,* in Sargent, Pl. Wils. 2 (1914) 131. Syntypes: *Wilson 1164,* July 1908 (staminate), China, Szechwan Province, Wa-shan (= *Tetradium daniellii*); *Wilson 1164,* October 1908 (carpellate), China, Szechwan Province, Wa-shan (= *Tetradium ruticarpum*).

Evodia henryi var. *villicarpa* Rehd. & Wills., *ibid.* 134. Type: *Wilson 3571,* China, Szechwan Province, west of Romi-chango.

Evodia velutina Rhed. & Wils., *ibid.* 134. Type: *Wilson 994,* China Szechwan Province, west and near Wen-chuan Hsien.

Evodia vestita W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 10 (1917) 38. Type: *Forrest 11091,* China, Yunnan Province, on the Tong Shan in the Yangtze bend.

Evodia daniellii var. *delavayi* (Dode) Huang, Acta Phytotax. Sin. 6 (1957) 128, *t. 36, fig A*

Evodia daniellii var. *henryi* (Dode) Huang, *ibid.* 129; *t. 36, fig. C.*

Evodia daniellii var. *hupehensis* (Dode) Huang, *ibid.* 131; *t. 36, fig. H.*

Evodia daniellii var. *labordei* (Dode) Huang, *ibid.* 130; *t. 36, fig. B.*

Evodia daniellii var. *villicarpa* (Rehd. & Wils.) Huang, *ibid.* 128; *t. 36, fig. G.*

Shrub or small to rather large tree to about 20 m high; branchlets puberulent to finely pubescent, becoming glabrous or nearly so. Leaves 15–44 cm long; rachis pubescent to glabrous; leaflets 2-4(-5) pairs; petiolules of lateral leaflets obsolete to 8 mm long, terminal leaflet on an extension of the rachis 6–35 mm long; blades of leaflets chartaceous to subcoriaceous, sparsely and usually inconspicuously oil-dotted, below drying pale grey-green and occasionally somewhat glaucous, usually glabrous except for rather long hairs along the midrib toward the base (often restricted to the axils of main veins toward the base) grading to entirely glabrous or rather densely pubescent, above glabrous or nearly so, broadly ovate to lanceolate or rarely elliptic or elliptic-oblong, 5–18.5 cm long, 2.5–10.5 cm wide, base in lateral leaflets acute to subtruncate, subrounded, or subcordate, usually slightly oblique, in terminal leaflet acute to cuneate or occasionally rounded, main veins 7–14 pairs, departing from the midrib at an angle of 45–75 degrees, ultimate veinlets usually inconspicuous, margin subentire to crenulate, often with rather large oil dots associated with the crenulations, apex acuminate, the acumen 3–20 mm long. Inflorescences 3.5–19 cm long, rachis, branches, and pedicels puberulent to pubescent, pedicels obsolete to 5 mm long. Flowers predominantly 5-merous (occasional flowers 4-merous); sepals pubescent to glabrate, ciliolate, 0.5–1.5 mm long; petals white or whitish, drying whitish or pale brown, abaxially glabrous, adaxially sparsely or occasionally densely pubescent or villous, (2.5–)3–5 mm long; disc glabrous; ovary pubescent between the carpels, otherwise rather densely hairy to glabrous, the carpels free to the base, ovules 2 per carpel, superposed; rudimentary carpels densely or occasionally rather sparsely hirsute, free to about the base. Fruits predominantly 5-carpellate (occasional fruits 4-carpellate), 2–5 of the carpels developing into follicles; follicles sparsely to rather densely pubescent with spreading hairs, narrowly pyriform, tapering apically-adaxially into a narrow beak 0.7–4.5 mm long, including the beak 5–11 mm long, free to the base, endocarp glabrous. Seeds black, 2 per follicle, superposed, ovoid to ellipsoid, coherent, the upper seed fertile, 2.5–4 mm long, the lower seed sterile (containing what appears to be endosperm but no embryo), usually 1.5–3.5 mm long, the pair of seeds attached in the dehisced follicle to an adaxial strip of pergamentaceous endocarp tissue; testa in fertile seed bony, without spongy outer testa, in sterile seed thin, brittle, also without spongy outer testa.

Additional illustrations. Huang, Acta Phytotax. Sin. 6 (1957) *t. 35 & t. 37, figs. D, E, & F* (as *Euodia daniellii); ibid. t. 34* (as *Euodia sutchuenensis); ibid. t. 33* (as *Euodia vestita*).

Distribution. Southwestern China (extreme south-eastern Tibet and Yunnan Province) northeast to Korea; recorded from woods, margins, and open slopes; sea level to 3200 m.

China. Southeastern Tibet: Mekong-Salween Divide, *Forrest 14299* (E, K). Yunnan Province: Mekong-Salween Divide, *Forrest 14772* (E, K), *Rock 10270* (A, US); between Yung-ning and Yung-peh [Yung-sheng], *Schneider 1663* (A, E); Chien-ch'uan-Mekong Divide, *Forrest 22294* (A, K); Tong-shan, in the Yangtze bend, *Forrest 11091* (E, holotype of *Euodia vestita* W. W. Smith; A, BM, K, isotypes); Ta-long-t'an près de Ta-pin-tze [Ta-p'ing-tzu], Delavay 4526 (P, holotype of *Euodia delavayi* Dode; K, isotype; A,

photograph of isotype); vallee de Ta-ngai-tong, *Maire 3361* (UC); without definite locality, *Forrest 16484* (K), *16926* (K). Szechwan Province: west of Romi-chango [Tan Pa], *Wilson 3571* (A, holotype of *Euodia henryi* var. *villicarpa* Rehd. & Wils.; BM, US, isotypes); Wa-shan, *Wilson 1164*, July, 1908 (A, holosyntype of *Euodia baberi* Rehd. & Wils.), *3570* (US); Monkong [Hsiao-chin] Ting, *Wilson 3569* (A, US); Pao-hsing, Chu *3419* (BM, E, K, W); Li-fan Hsien [Li Hsien], *Wang 21610* (A); west and near Wen-ch'uan Hsien, *Wilson 994* (A, holotype of *Euodia velutina* Rehd. & Wils.; BM, US, isotypes); Omei-shan, *Fang 7855* (BM), *Sun 687* (US); district de Tchen-keou-tin [Chien-ko], *Farges 413* (NY, isosyntype of *Euodia henryi* Dode), *1284* (P, holotype of *Euodia sutchuenensis* Dode; K, isotype); without definite locality, *Bock & Rosthorn 1884* (A), *Farges 49* (W). Shensi Province: T'ai-pai-shan, *Purdom 1038* (A, US), *Wang 1518* (A); Miao-wan, *Fr. Hugh [Scallan]*, 1899 (A); Tsinling-schan [Tsin'lin Shan] inter Mei [Mei-hsien] et Liu-pa, *Fenzel 683* (W); Ning-shan Hsien, *Kung 3051* (A); Ichun Hsien, *Meyer 1929* (A); Huan-tow-shan, *Fr. Hugh [Scallan]*, July 1899 (A, BM); Kusan [Ku Shan], *Fr. Hugh [Scallan] 75* (A, BM); Yüan-ch'ü District, Ye-cho-shan, *Smith 6445* (A); without definite locality, *Giraldi*, 1897 (A). Shensi Province; Ja Siu, *Ren 6122* (UC). Hopeh Province: Peking Mts., *Bretschneider 152* (GH); Shang-fang-shan [Shan-fang-shan], *Bretschneider 1328* (LE, holotype of *Zanthoxylum bretschneideri* Maxim.), *Liu 2217* (A, NY); Eastern Tomb, *Li 10032* (NY); Kuan Tso Ling, *Liu 1225* (A, UC). Liaoning Province: Taliewhan [Ta-lien Wan], *Daniell*, 1861 (BM, holotype of *Zanthoxylum daniellii* Benn.); New Town, Port Arthur [Lu-shan], *Wilson 8800* (A). Shantung Province: Taitsinggong, prope Tsingtao [Ch'ing-tao], *Licent 13367* (W); Lao Shan, *Chiao 2708* (A, B, NY, UC, US), *2925* (A, NY, UC, US), *2926* (NY, US), *2942* (A, B, NY, US), *Meyer 278* (A); without definite locality, *Meyer 262* (A). Honan Province: Hweihsien [Hui-hsien], Chunghu, *Hers 739* (A); Chengchow [Cheng-hsien], *Hao 3508* (A); Sung-hsien, Sankuan Miao, *Hers 543* (A); Lushih, Lao Kiun Shan, *Hers 1157* (A); without definite locality, *Wilson leg. Hers 3* (A). Kiangsu Province: Hwang San Yu, *Ren & Tao Univ. Nanking 12579* (UC). Hupeh Province: western Hupeh, *Wilson 2183* (A, K, NY, US, W), *2183a* (K, NY), *2415* (A, K, NY, W), *2695* (K); Fang Hsien, *Wilson 324* (A, BM, GH, US, W), *4628* (A); Pa-tung Hsien, *Henry 2555* (K), *Wilson 3576* (A, BM, US, W); Hsing-shan Hsien, *Henry 6485* (K), *Wilson 387* (US), *387a* (A), *3574* (A, US); Chang-lo Hsien [Wu-feng], *Wilson 387b* (A); Pao-k'ang Hsien, *Wilson 2693a* (A, K); Nan-t'o and mountains to northward, *Henry 4534* K); I-ch'ang, *Henry 2939* (BM, US, isotypes of *Euodia hupehensis* Dode), *6712* (CAL, GH, US, isosyntypes of *Euodia henryi* Dode); Ch'ang-yang Hsien, *Wilson 3575* (A, US); Ch'ang-yang, *Wilson 2693* (A, K, NY, W); Heh Ya Tsze, *Ching 3985* (A), *Chun Univ. Nanking 4330* (GH); Liang Sung Kou, *Chun 3783* (A), *Univ. Nanking 4129* (US); Ta-gon, *Chun leg. Huang 3969* (A); without definite locality, *Henry 4482* (CAL, NY), *4534A* (MEL).

North Korea. Pingyang, *Jack*, 18 September 1905 (A, GH), *Wilson 10568* (A, BM).

South Korea. Seoul, *Jack*, 24 September 1905 (A); Chemulpo [Inch'on], *Carles 107* (BM, K); Province Keiki, Keijyo, *Wislon 10555* (BM, US), Province Keiki, Hakusen and on Kanghwa Island, *Wilson 10612* (A, BM, US); Mt. Chii, *Koidzumi*, 1933 (MICH); Shinsyu [Shinsu-do], Keisyonando, *Uno 2598* (A, NY, PH).

Cultivated. South Korea: Seoul, *Chung 1169* (MICH), *Faurie 468* (A). New Zealand: Botanic Garden Christchurch, *Sykes CHR 124917* (CHR), *CHR 124998A* (CHR), *CHR 124998B* (CHR). United States of America: California, Davis, *McCaskill & Reagan 684* (AK); Massachusetts, Jamaica Plain, Arnold Arboretum, *Hornby 4276* (MICH), *6898* (MICH), *Merrill*, August 1925 (NSW), *Palmer*, 4 August 1942 (AD, MICH, UC), *Sorensen 6672* (AK); Maryland, Glendale, Plant Introduction Station, *Meyer*, 13 October 1967

(CHR); Pennsylvania, Reading, Hampden Heights, Shappell Garden, *Brumbach 7238* (CHR), *7288* (AK, CHR). Great Britain: Edinburgh, Royal Botanic Garden, *Anonymous C6858* (CHR); Kew, Royal Botanic Gardens, *Anonymous,* 16 July 1961 (US, W), *Boom 10347* (L). Netherlands: Baarn, Cantonspark, *Anonymous 5537* (U), *6026* (U); Wageningen, Rijksarboretum, *Boom 8456* (L); Den Haag, Zuiderpark, *Boom 13136C* (L). West Germany: Darmstadt, Hortus, *Boom 30080* (L), *34597* (L).

As interpreted here, *Tetradium daniellii* is quite variable, especially in petiolule length (obsolete to 8 mm), vestiture of leaflet lower surface (glabrous to rather densely pubescent), leaflet shape and size (broadly ovate to lanceolate or rarely elliptic or elliptic-oblong, 5–18.5 cm long, 2.5–10.5 cm wide), vestiture of the follicle (sparsely to rather densely pubescent), length of the follicle beak (0.7–4.5 mm), and overall length of the follicle (6–11 mm).

The type material of most of the names here placed in synonymy differs somewhat from the type collection of *Zanthoxylum daniellii,* which has rather short- to medium-length petiolules, ovate, medium-sized leaflets with vestiture restricted to the midrib below, and sparsely pubescent, rather large follicles with medium-length beaks of *Euodia delavayi* has subsessile leaflets that are pubescent along the midrib and main veins below; that of *E. henryi* has nearly glabrous leaflets and unusually long-beaked follicles; that of *E. hupehensis* has leaflets tending to be lanceolate; that of *E. sutchuenensis* has unusually large, ovate to broadly elliptic leaflets; that of *E. henryi* var. *villicarpa* has rather densely pubescent, long-beaked follicles; that of *E. velutina* has leaflets that are rather densely pubescent below and small, short-beaked follicles; that of *E. vestita* has leaflets that are rather densely pubescent below and rather large, long-beaked follicles. *Euodia labordei,* the type of which I have not seen, is described as having subsessile to short-petiolulate leaflets that are sparsely pubescent on the nerves below and rather small, villous follicles.

This may appear to be an overly conservative interpretation of this species, but in the study of the large number of herbarium specimens of obviously closely inter-related plants here assigned to it, I have not found sufficient morphologic discontinuity in any of the variable characters, or sufficiently distinct combinations of various character states to warrant recognition of more than a single taxon.

Zanthoxylum bretschneideri, the type of which closely matches that of *Zanthoxylum daniellii,* was placed in the synonymy of *Euodia daniellii* by Rehder & Wilson (1914) and Huang (1957).

One of the two syntypes of *Euodia baberi* (*Wilson 1164,* July 1908) closely matches the type of *Zanthoxylum daniellii.* The other, as is noted in the synonymy, is *Tetradium rutaecarpum.*

4. **Tetradium calcicolum** (Chun *ex* Huang) Hartley, *comb. nov.*

Evodia calcicola Chun *ex* Huang, Acta Phytotax. Sin. 6 (1957) 120. *t. 32* . Type: *Ching 6306,* China, Kwangsi Province, south of Nee Bai, Kweichow border.

Large shrub or small tree to 6 m high; branchlets puberulent, becoming glabrous or nearly so. Leaves 9–19 cm long; rachis puberulent to glabrate; leaflets 2 pairs; petiolules of lateral leaflets 1–2.5 mm long, terminal leaflet on an extension of the rachis 5–15 mm long; blades of leaflets subcoriaceous, sparsely and inconspicuously oil-dotted, below

drying pale grey-green, somewhat glaucous, pubescent along the midrib toward the base, otherwise glabrous, above entirely glabrous or puberulent on the midrib toward the base, ovate to elliptic, 5–9.5 cm long, 2.3–4.5 cm wide, base in lateral leaflets obtuse to rounded, usually slightly oblique, in terminal leaflet obtuse to rounded, main veins 10–14 pairs, departing from the midrib at an angle of 60–85 degrees, ultimate veinlets usually inconspicuous, margin entire, apex acuminate, the acumen 5–15 mm long. Inflorescences 5.5–13 cm long, rachis and branches finely pubescent, pedicels finely appressed-pubescent, 1–3.5 mm long. Flowers 5-merous; sepals puberulent, ciliolate, 0.7–1 mm long; petals purple, drying dull purplish-red, abaxially sparsely to rather densely appressed pubescent, adaxially villous, 3.5–4 mm long; disc glabrous, ovary sparsely to densely appressed pubescent, the carpels free to the base, ovules 2 per carpel, superposed. Fruits 5-carpellate, all of the carpels developing into follicles; follicles glabrate abaxially, densely appressed pubescent laterally, pyriform, not beaked, about 5 mm long, free to the base, endocarp glabrous. Seeds black, 2 per follicle, superposed, ellipsoid, coherent, the upper seed fertile, about 3 mm long, the lower seed sterile (containing what appears to be endosperm but no embryo), about 2 mm long, the pair of seeds attached in the dehisced follicle to an axile strip of pergamentaceous endocarp tissue; testa in fertile seed bony, without spongy outer testa, in sterile seed thin, brittle, also without spongy outer testa. Staminate flowers not seen.

Distribution. Southwestern China, Kwangsi Province and (according to Huang, *loc. cit.*) Yunnan Province; recorded from woods and thickets, 690–800 m.

China. Kwangsi Province: south of Nee Bai, border of Kweichow, *Ching 6306* (A, NY, UC, isotypes of *Euodia calcicola* Chun *ex* Huang); Pin-lam, *Ko 55618* (A).

5. **Tetradium glabrifolium** (Champ. *ex* Benth.) Hartley, *comb. nov.*

Boymia glabrifolia Champ. *ex* Benth. in Hooker, J. Bot. Kew Gard. Misc. 3(1851) 330. Type: *Champion 382,* China, Hong Kong.

Megabotrya meliaefolia Hance *ex* Walpers, Ann. Bot. Syst. 2 (1852) 259. Type: *Hance,* China, Hong Kong.

Evodia meliaefolia (Hance *ex* Walpers) Benth., Fl. Hongkong. (1861) 58.

Evodia glauca Miq., Ann. Mus. Bot. Lugd.-Bat. 3 (1867) 23. Syntypes (4 collections): *Oldham 130,* Japan, Nagasaki; *Buerger, Mohnike,* and *Pierot,* Japan, without further locality.

Ampacus meliaefolia (Hance *ex* Benth.) Kuntze, Rev. Gen. Pl. 1 (1891) 98.

Evodia ailantifolia Pierre, Fl. For. Cochinch. 3 (1893) *t. 287, fig. b.* Type: *Herb. Pierre 3862,* Vietnam, Austro-Cochinchina, in Prov. Tay nuih.

Eurycoma dubia Elmer, Leafl. Philipp. Bot. 2 (1908) 481. Type: *Elmer 10120,* Philippines, Prov. Negros Oriental, Cuernos Mts.

Evodia balansae Dode, Bull. Soc. Bot. Fance (1908) 55, (1909) 705. Type: *Balansa 4042,* Vietnam, Tonkin, Tu-phap.

Evodia fargesii Dode, *ibid.* 704. Syntypes: *Farges,* China, Szechwan Province, distr. de Tchen-kéou-tin; *Wilson 1930* and *2210a,* China, western Hupeh Province.

Evodia yunnanensis Huang, Acta Phytotax. Sin. 6 (1957) 104, *t. 26* Type: *Wang 80688,* China, Yunnan Province, Cheun-yueh-hsien (only photograph seen).

Phellodendron burkillii van Steenis, Gard. Bull. Sing. 17 (1960) 357, *fig. 1* Type: *Anonymous KEP 78904,* W. Malaysia, Kedah, Enggang Forest Reserve.

Large shrub or small to medium tree to 20 m high; branchlets finely pubescent to glabrate when young, becoming glabrous or nearly so. Leaves 14–38 cm long; rachis finely pubescent to glabrous; leaflets (1–)2–9 pairs; petiolules of lateral leaflets 3–15 mm long, terminal leaflet on an extension of the rachis 10–35 mm long; blades of leaflets chartaceous to subcoriaceous, sparsely and inconspicuously oil-dotted or without evident dots, below drying whitish or pale green or less often brownish-green, usually obviously glaucous, glabrous or with appressed to spreading hairs on the midrib, especially toward the base and, to a lesser extent, on the main veins; above glabrous or with appressed to spreading hairs on the midrib, especially toward the base, broadly ovate to lanceolate or less often elliptic to elliptic-oblong, often strong unequal-sided, 4–15 cm long, 1.7–6 cm wide, base in lateral leaflets acute to subrounded or subtruncate, usually oblique, in terminal leaflet acute to cuneate, main veins 8–18 pairs, departing from the midrib at an angle of 60–80 degrees, ultimate veinlets conspicuous (10x), densely reticulate, margin entire or more or less crenulate, rarely with conspicuous oil dots associated with the crenulations, apex acuminate, the acumen 5–30 mm long. Inflorescences 9–19 cm long, rachis, branches, and pedicels finely pubescent to glabrous, pedicels 0.3–4 mm long. Flowers predominantly 5–merous (occasional flowers 4-merous); sepals finely pubescent to glabrous, ciliolate, about 0.5 mm long; petals green to yellow to white, drying whitish to brown, abaxially glabrous or occasionally with sparse, appressed hairs, adaxially villous to nearly glabrous, 2.7–4 mm long; disc glabrous; ovary rather densely pubescent between the carpels, otherwise glabrous or finely pubescent toward the apex, carpels free to the base or connate toward the base abaxially, ovules 2 per carpel, collateral or subcollateral; rudimentary carpels sparsely to densely pubescent toward the base or occasionally entirely glabrous, connate basally. Fruits predominantly 5-carpellate (occasional fruits 4-carpellate), 4–5 (or occasionally 1–3) of the carpels developing into follicles; follicles sparsely to densely appressed-pubescent laterally, otherwise glabrous, trigonous, not beaked, 3.5–5 mm high and about as wide, free to the base or connate toward the base abaxially, endocarp sparsely to rather densely pubescent. Seed black, 1 per follicle, paired with an aborted seed, subglobose to broadly ellipsoid to ovoid, 2.5–4 mm long, attached in the dehisced follicle to an adaxial strip of pergamentaceous endocarp tissue; outer testa spongy (bounded externally by a shiny, crustaceous pellicle); inner testa bony.

Additional illustrations. Huang, Acta Phytotax. Sin. 6 (1957) *t. 25, figs. A, B, & C* (as *Euodia glauca, E. meliifolia,* and *E. fargesii*); Li, Woody Fl. Taiwan (1963) 370, *t. 133* (as *Euodia meliifolia*); Chang in Li et al., Fl. Taiwan 3 (1977) 516, *t. 708* (as *Euodia meliifolia*).

Distribution. Sikkim and northeastern India east through Indochina and southern China to Taiwan and southern Japan, and south to W. Malaysia, Sumatra, and the Philippines; recorded from well-drained forests, thickets, and open places; sea level to 1200 m.

Sikkim. Without definite locality, *Kurz* (BO); *Thomson* (BO).

India. West Bengal: Darjeeling Division, *Division Forest Officer 1384* (DD); Tista Valley, *Haines BB873* (A, DD). Assam: Goalpara, Long Sung Block, *Kanjilal 5081* (US);

Darrang, Charduar Reserve, *Kanjilal 4969* (A, DD); Khasi Hills, *Chand 6002* (L), *Koelz 30662* (L), *Native Collector of Bot. Gard. Calcutta* (BO); Khasi and Jaintia Hills, *Anonymous 4586* (NSW); without definite locality, *Biswas 3724* (A), *Jenkins* (BO, DD).

Burma. Maymyo, *Maung Ba Pe 1576* (DD, MEL); Maymyo Plateau, *Lace 5847* (CAL); South Tenasserim, *Lace 715* (DD).

Thailand. Northern: Lampang, Che Sawn, *Kerr 4762* (UC); Phitsanulok, *Phusomsaeng et al. BKF 46522* (L). Peninsular: Chumphon, Kuring, *Kerr 11438A* (L); Surat [Surat Thani], Kanchanadit, *Kerr 13035* (L); Krabi, *Sangkhachand BKF 36894* (L).

Vietnam. Tonkin: Quonbi, *Balansa 1171* (L); Tu-phap, *Balansa 4042* (P, holotype of *Euodia balansae* Dode; K, isotype); Dam Ha, Sai Wong Mo Shan, *Tsang 30475* (A, BO, L). Annam; Hue & vicinity, *J. & M. S. Clemens 3286* (A, MEL, NY, PH, U, UC, US, W); Province Tay nuih [Tayninh], *Herb. Pierre 3862* (P, holotype of *Euodia ailantifolia* Pierre).

China. Yunnan Province: Che-li Hsien, *Wang 75621* (A), *75796* (A, PE), *77601* (A), *77770* (A), *77809* (A), *77841* (A), *77859* (A), *77955* (A), *78669* (A); Jenn-yeh Hsien [Cheun-yueh-hsien], Meng-la, *Wang 80688* (PE, holotype of *Euodia yunnanensis* Huang – photograph seen); without definite locality, *Forrest 12954* (K). Szechwan Province: Tchen-keou-tin [Chien-ko], *Farges* (BM, NY, US, isosyntypes of *Euodia fargesii* Dode); Wan-hsien, *Hwa 57* (A, UC); Wu-shan, *Wilson 1930,* May 1907 (W). Anhwei Province: Chiuhwashan [Chiu-hua-shan], *Ching 2773* (A, UC), *Fan & Li 200* (K), *Sun 1202* (A, NY); *1300* (A, NY); Huang-shan, *Chien 1129* (W); Si Liu, Chemen, *Ching 3098* (A, K, UC). Hupeh Province: Western Hupeh, *Wilson 1930,* June 1907 (A, E, isosyntypes of *Euodia fargesii* Dode), *1930a* (A, K, NY, W), *2210a* (A, E, NY, W, isosyntypes of *Euodia fargesii* Dode), *2415a* (K, W); Pa-tung Hsien, *Wilson 247* (A, BM, US), *1930,* July 1907 (K), 1930b (K), *2210* (A, K, US, W), *2322* (K, W), *3579a* (A); Hsing-shan Hsien, *Wilson 381* (A, US, W); Pakang [Pao-k'ang Hsien], *Wilson 2415b* (K); Nan-t'o and mountains to northward, *Henry 4577* (BM, GH, K); I-ch'ang, *Henry 13* (K, US); Ch'ang-yang-hsien, *Wilson 253* (A, BM, US), *1930,* August 1907 (NY), *3579* (A, BM, GH, US, W); without definite locality, *Cheo Univ. Nanking 18389* (BO), *Henry 6157* (NY), *Silvestri 1218* (A, K). Chekiang Province: T'ien-mu-shan, *Law 1277* (K), *1339* (K); Tai-pai-shan, *Keng 1134* (A, UC); Tung-yang Hsien, *Keng 914* (A, UC), *921* (A, UC); Yen-tang Shan, *Chiao Univ. Nanking 14748* (K, NY, UC); King Yuan [Ch'ing-yuan], *Ching 2559* (A, K, UC, US, W); between P'ing-yang and Tai-shan, *Ching 2163* (A, BM, K, NY, UC, US, W); Chen Chiong, 40 miles south of Siachu, *Ching 1805* (A, BM, UC, W). Kweichow Province: Ta Ho Yen, Fan Ching Shan, Kiangkou [Chiang-k'ou] Hsien, *Steward, Chiao, & Cheo 329* (A, L, NY, US, W); Lang-tai, *Tsiang 9567* (NY). Hunan Province: Pinkiang [P'ing-chiang], *Hsiung 5726* (A); Sinning [Hsin-ning] Hsien, *Fan & Li 556* (A, BM, BO, L, W); Sintien [Hsin-t'ien] Hsien, *Fan & Li 377* (A, BM, L, W). Kiangsi Province: Kiukiang [Chiu-chiang], *Wilson 1584* (A, NSW, US); Kuling [Lu-shan], *Wilson 1583* (A, BM, US), *1585* (A, NSW), *Hu 2358* (A), *Tsiang 10718B* (NY); Lushan Mts., *Chung & Sun 255* (A, NY), *317* (A, NY), *329* (A, NY), *685* (A, NY); Lu Shan, *Cheo 3* (K, US), *169* (K), *Chiao Univ. Nanking 18766* (US), *Steward Univ. Nanking 4668* (A, GH, UC, US); Feng-ch'eng, *Tsiang 10352* (NY); Lung-nan Hsien, *Lau 4780* (A, BM, US). Kwangsi Province: Bako Shan, W. Poseh [Pai-se], *Ching 7644* (NY, UC); Seh-fang Dar Shan, S. Nan-ning, *Ching 7950* (A), *8317* (A, NY, UC); Shap Man Taai Shan, southeast of Shang-sze [Shang-ssu], *Tsang 24189* (A, NY); without definite locality, *Ching 7679* (UC), *Liang 69916* (A), *70120* (A). Kwangtung Province: Fang-ch'eng District, Kung P'ing Shan, *Tsang 26685* (A, K); Kochow [Kao-chou] District, Kou Liang Ling, *Tsiang 1017* (A, K, NY, UC); Lo-fou Shan, *Merrill 10773* (A, NY, UC), *Tsang Lingnan Univ. 9938* (US), *Tsiang 1643*

(A, MEL), *1720* (A, K, US); Canton [Kwang-chou] & vicinity, *Levine CCC 1143* (A, GH, US), *CCC 1775* (A, GH), *leg. Ah To CCC 1854* (A, GH, US), *Sampson leg. Asui,* 25 August 1885 (K); Hwei-yang District [Hui-yang Hsien], Lin Fa Shan, *Tsang 25921* (A); Poon Yue District, *Levine CCC 3244* (A, GH); without definite locality, *McClure Lingnan Univ. 19709* (A, NY). Hainan Island: Ching Mai [Ch'eng-mai] *District, Lei 9* (B, K, L, NY, UC, US, W), *832* (A, B, BO, K, L, NY, US, W); Nodoa [Tan-hsien] & vicinity, *Chun Univ. Nanking 5687* (UC), *Univ. Nanking 5766* (UC), *Tsang Lingnan Univ. 15585* (A, K, NY, UC, US); Dung Ka to Wen Fa Shi, *Chun & Tso 43761* (A, L, NY, US, W), *43795* (BISH, L, NY, W); Dung Ka to Mo San, *Chun & Tso 43564* (NY); *Ch'ang-kiang [Ch'ang-*chiang] District, Ngo Ko Shan, *Lau 1930* (A, NY); Five Finger Mountain [Wu-chih Shan], *Chun Univ. Nanking 7056* (UC), *Fenzel 222* (W); Kan-en [Kan-ch'eng] District, Chim Fung Mountain, *Lau 5346* (A); Manning [Wan-ning], *How 73189* (BO); Lo-tung, *Lau 27468* (A); Hainan, *Liang 63392* (NY), *64634* (NY), *65135* (A, NY), *Wang 33111* (NY), *34072* (NY, UC, US), *35680* (NY, US), *36445* (NY); Po Teng [Pao-t'ing] & vicinity, *Chu 29* (UC), *How 72749* (BISH, BM); Yaichow [Yai-ch'eng], *How 71094* (A, B, NY, US), *How & Chun 70139* (B, NY, US), *Liang 62250* (A, NY), *62345* (NY), *63026* (NY, US); Fan Yah, *Chun & Tso 44010* (A, BISH, L, NY, W); Taam-chau District, *Tsang Lingnan Univ. 16247* (A, K, NY, UC); Loi area, Hung Mo Shan, *McClure Lingnan Univ. 18274* (A, B, K, NY, UC, US), *Tsang & Fung Lingnan Univ. 18274* (B, MICH); Tai Tsing, *McClure CCC 7751* (A, BM, K, NY); without definite locality, *Chun Univ. Nanking 5899* (UC), *Univ. Nanking 7121* (UC), *Fenzel 24* (W), *Henry 8706* (K). Hong Kong: Kowloon, *Liou 720* (NY); Chung Chi College, *Hu 5567* (US), *5596* (US); Tai-o, *Chun 3099* (A, NY); Tai P'o, *McClure CCC 13300* (A); Saigon, *Chun 6864* (A, BO, UC); Lantau Island, *Tsang Lingnan Univ. 16637* (A, NY, UC, US, W); Mt. Victoria, *Tang 257* (A); Wan-tsai Gap Road, *Sampson,* 5 November 1886 (K); Bowen Road, *Lau 159* (A); Happy Valley, *Lamont,* October 1874 (L), *Sargent,* 5 November 1903 (A); Little Hong Kong Woods, *Lamont 116* (L); without definite locality, *Champion 382* (K, holotype of *Boymia glabrifolia* Champ. ex Benth.), *Chun 5225* (UC), *6562* (UC), *7477* (NY), *40010* (K, NY), *Herb. Forbes 68* p. p. (PH), *Ford,* 17 August 1893 (A), *Gibbs Herb. Hongkong 7456* (NSW), *Hance* (K, holotype of *Megabotrya meliifolia* Hance *ex* Walpers), *Herb. Hance 311* (BM, W). Fukien Province: Chuanchow [Ch'uan-chou], *Chung 1050* (UC). Without definite locality: *Parkes,* 1841 (K).

Taiwan. Taipei, Kangu, *Keng,* 26 October 1950 (A, L, US); Taihoku, Sinten, *Ito,* 24 September 1923 (BM); Nan-t'ou, Lake Candidius [Jih-yueh T'au], *Wilson 9971* (A); Nan-t'ou, Mt. Bigen, *Kawakami & Mori 3196* (A); Heng-ch'un, *Chang 2418* (NY); Bankin-sing, *Henry 831* (A, K, NY), *1562* (A, NY); in montibus Okaseki, *Faurie 34* (A, BM); South Cape, *Henry 932* (A), *974* (A, BM), *1296* (A, K, US).

Ryukyu Islands. Amami O Shima, *Hosoyamada,* 29 July 1927 (A); Okinawa, *Hatusima 18236* (US), *18241* (US), *Kurata & Nakaike 2302* (U), *Sonohara 8* (US), *67* (L); Ishigaki, *Smith 120* (US); Yonaguni, *Walker & Tawada 6837* (US).

Japan. Kyushu Island: Nagasaki, *Maximowicz,* 1863 (BM, BO, K, L, MEL, NY, US, W), *Oldham 130* (L, holosyntype of *Euodia glauca* Miq.; GH, K, W, isosyntypes); Isahaya, *Hiroe 2471* (UC); Province Satsuma, *Masamune,* 26 September 1922 (NY); Province Ohsumi, Satamura, *Hatusima 14525* (A); without definite locality, *Wilson 6112* (A). Without definite locality: *Buerger* (L, holosyntype of *Euodia glauca* Miq.; U, isosyntype), *Mohnike* (L. holosyntype of *Euodia glauca* Miq.), *Pierot* (L, holosyntype of *Euodia glauca* Miq.), *Teysmann* (BO).

W. Malaysia. Kedah, Enggang Forest Reserve, *Anonymous KEP 78904* (L, holotype of *Phellodendron burkillii* van Steenis; K, isotype).

Sumatra. Central, Tandjoeng Ampaloe, *Koorders 10410β* (BO).

Philippines. Luzon: Mountain Province, Ifugao, Banaue, *Conklin & del Rosario PNH 72715* (L); Benguet Subprovince, Panai, *Santos BS 31968* (A, P, US). Negros: Negros Oriental, Dumaguete (Cuernos Mts.) *Elmer 10120* (A, BISH, K, L, NY, US, W, isotypes of *Eurycoma dubia* Elmer).

Cultivated. India, Dehra Dun, New Forest, *Raizada,* July 1939 (DD), September 1939 (DD).

The type collections of *Boymia glabrifolia* and *Megabotrya meliifolia,* both from Hong Kong, are clearly conspecific and the two names have long been considered to be synonymous. Assuming that their respective dates of publication as given in the present synonymy are correct, the former name has priority. Apparently only Seemann (Bot. Voy. Herald (1857) 370), who placed the latter name in synonymy under the former, considered this to be the case. Bentham *(loc. cit.),* in publishing the new combination *Euodia meliifolia,* listed *Boymia glabrifolia* in its synonymy and has been followed by subsequent authors.

The leaves of *Tetradium glabrifolium,* as the species is interpreted here, are quite varaible in length (14–38 cm) and in number of leaflets [(1–)2–9 pairs]. The larger leaves of the syntypes of *Euodia glauca,* from Japan, and the type of *Euodia ailantifolia,* from Vietnam, are about twice as long (up to 38 cm) and have about twice as many leaflets (up to 9 pairs) as those of the type collection of *Boymia glabrifolia.* In other characters, these collections do not differ significantly, and among other collections of *Tetradium glabrifolium,* especially from Kwangtung Province and Taiwan, a complete range of intermediate leaf sizes and leaflet numbers may be found.

The type collection of *Eurycoma dubia,* from the Philippines, is in young flower bud, but is almost certainly conspecific with the type of *Boymia glabrifolia.* Merrill, Philipp. J. Sci. 14 (1919) 409, placed the Philippine species in the synonymy of *Euodia meliifolia.*

The type of *Euodia balansae,* from Vietnam, is similar to that of *Euodia ailantifolia,* differing mainly in having leaves with fewer leaflets (4–5 pairs). Dode, sometime after his publication of the former species, recognized the two as being conspecific. An undated annotation slip on the holotype sheet of *E. ailantifolia* reads: *"Evodia balansae* mihi Dode Specimen a me visum post speciem descriptam."

The syntypes of *Euodia fargesii,* from the Chinese provinces of Szechwan and Hupeh, have leaflets that are pubescent along the lower midrib toward the base. As *Tetradium glabrifolium* is interpreted here, this is a common feature in collections from the northern part of its range. Most collections from the southern part of the range, including the type of *Boymia glabrifolia,* have glabrous leaflets, but occasional collections from southernmost China, Indochina, Taiwan, and the Philippines have similarly pubescent leaflets.

The collection number of one of the syntypes of *Euodia fargesii, Wilson 1930,* represents four collections made from different localities on different dates. They are as follows: May 1907, Szechwan (W); 7 June 1907, Western Hupeh (A, E); 1 July 1907, Hupeh, Pa-tung (K); and August 1907, Hupeh, Chang-yang (NY). Dode, in the original description of *E. fargesii,* cited only the collection from Western Hupeh.

I have seen only a photograph of the type of *Euodia yunnanensis,* but all nine of the *Wang* collections cited above from Yunnan Province, Che-li Hsien, are paratypes. These collections differ from most of the other material I have placed in *Tetradium glabrifolium* mainly in having leaflets with the lower surface pubescent on the midrib and main veins. This is only a minor variation which also occurs, sporadically, in collections from Assam, Thailand, Vietnam, and Kwangsi Province. The paratypes of *E. yunnanensis* also differ from most of the other material of this species in having leaflets that are not noticeably glaucous on the lower surface. Glaucousness appears to be variable in most parts of the range of the species.

The type of *Phellodendron burkillii,* from W. Malaysia, is clearly conspecific with that of *Boymia glabrifolia.* In an unpublished note distributed with reprints of the original description of the Malayan speciies, van Steenis points out that since its publication it has been found to be conspecific with *Euodia meliifolia.*

The leaflets of *Tetradium glabrifolium* are distinctive in the genus in having densely reticulate ultimate veinlets that are clearly visible on the lower surface with about 10x magnification. This is a difficult feature to describe quantitatively, but once recognized provides a reliable "spot" character for the identification of the species.

6. **Tetradium trichotomum** Lour., Fl. Cochinch. (1790) 91. Type: *Loureiro,* Vietnam, Cochinchina.

Brucea trichotoma (Lour.) Spreng., Syst. 1 (1825) 441.

Ampacus trichotoma (Lour.) Kuntze, Rev. Gen. Pl.1 (1891) 98.

Evodia viridans Drake, J. Bot. (Morot) 6 (1892) 273. Syntypes: *Balansa 3669,* Vietnam, Tonkin, Mont Bavi; *Balansa 4038,* Tonkin, village de Tchion-tao à la base du Mont Bavi; *Balansa 4043,* Tonkin, Tu-phap.

Evodia trichotoma (Lour.) Pierre, Fl. For. Cochinch. 3 (1893) *t. 287, fig. a.*

Evodia colorata Dunn, Kew Bull.(1906)2. Syntypes: *Henry 12137, 12137A, 12137B,* and *12137C,* China, Yunnan Province, Szemao.

Evodia hainanensis Merr., Philipp. J. Sci. 21 (1922) 346. Type: *McClure CCC 8449,* China, Hainan Island, Five Finger Mt.

Evodia lenticellata Huang, Acta Phytotax. Sin. 6 (1957) 98, *t. 24.* Type: *Hung, Chang, & Tsiang 33600,* China, Szechuan Province, Mt. Omei (not seen).

Evodia trichotoma var. *pubescens* Huang, Acta Phytotax. Sin. 16 (1978) 83. Type: *Chang 10748,* China, Kwangsi Province, Lung-lin Autonomous District (not seen).

Shrub or small tree to 8 m high; branchlets finely pubescent to glabrate. Leaves 12–37 cm long; rachis finely pubescent to glabrate; leaflets (1–)2–5(–6) pairs; petiolules of lateral leaflets obsolete to 5.5(–10) mm long, terminal leaflet on an extension of the rachis 10–20(–30) mm long; blades of leaflets chartaceous to subcoriaceous, oil-dotted, below usually drying green or brownish-green, glabrous or with fine pubescence mainly on the midrib and main veins, above glabrous or with fine pubescence on the midrib,

elliptic, elliptic-oblong, lanceolate, or occasionally ovate, 3–16 cm long, 1.3–5 cm wide, base in lateral leaflets cuneate to subrounded, often oblique, in terminal leaflet cuneate, main veins 11–14 pairs, departing from the midrib at an angle of 65–85 degrees, ultimate veinlets inconspicuous, margin entire, apex acuminate, the acumen 5–15 mm long. Inflorescences 5–30 cm long, rachis finely pubescent to glabrate, branches and pedicels finely pubescent, pedicels 0.5–2.5 mm long. Flowers predominantly 4-merous (occasional flowers 5-merous); sepals finely pubescent to glabrate, ciliolate, 0.5–1 mm long; petals green to yellow to white, drying brown to whitish, abaxially glabrous, adaxially sparsely subvillous to glabrous, 3–4 mm long; disc glabrous; ovary glabrous or with a few short hairs basally between the carpels, carpels connate toward the base abaxially, free to the base adaxially, ovules 2 per carpel, collateral; rudimentary carpels sparsely hairy or glabrous, connate toward the base. Fruits predominantly 4-carpellate (occasional fruits 5-carpellate), 1–4 of the carpels developing into follicles; follicles entirely glabrous or with sparse pubescence laterally toward the base, subglobose to obovoid, not beaked, 4–7 mm long, connate toward the base abaxially, free to the base adaxially, endocarp glabrous. Seed balck, 1 per follicle, paired with an aborted seed, subglobose to broadly ovoid, 3.7–6 mm long, attached in the dehisced follicle to an adaxial strip of pergamentaceous endocarp tissue; outer testa spongy (bounded externally by a shiny, crustaceous pellicle); innter testa bony.

Additional illustration. Huang, Acta Phytotax. Sin. 6 (1957) *t. 23* (as *Euodia trichotoma*).

Distribution. Thailand, Laos, and Vietnam north and east to the Chinese provinces of Shensi, Hupeh, and Kwangtung; recorded from well-drained forests and thickets; 300–1900 m.

Thailand. Northern: Chiang Mai, Doi Chang, *Rock 1778* (A, US).

Laos. Phongsaly, *Poilane 25989* (A, US).

Vietnam. Tonkin: Laichau, *Poilane 29658* (L); Chapa, *Pételot 2483* (A), *3124* (A, UC), *5692* (A, US); Mont Bavi, *Balansa 3669* (G–DC, holosyntype of *Euodia viridans* Drake); village de Tchion-tao à la base du Mont Bavi, *Balansa 4038* (G–DC, holosyntype of *Euodia viridans* Drake; K, LE, isosyntypes); Tu-phap, *Balansa 4043* (G–DC, holosyntype of *Euodia viridans* Drake); route de Hanoi à Hoa Binh, *Pételot 2599* (A); Dam-ha, Sai Wong Mo Shan, *Tsang 30357* (A, E, L); Cho Ganh, *Pételot 1165* (UC); Hacoi, Taai Wong Mo Shan, *Tsang 27026* (A, E), *29300* (A, E), *29454* (A, BO, E, L). Annam: In montibus Cochinchinae, *Loureiro* (BM, holotype of *Tetradium trichotomum* Lour.).

China. Yunnan Province: Fo-hai [Meng-hai], *Wang 73987* (A), *74237* (A), *74893* (A), *77145* (A), *77294* (A); between Muang-hun and Muang-hai, *Rock 2391* (A, UC, US); Che-li [Ching-hung] Hsien, *Wang 75835* (A), *75942* (A), *77980* (A), *79663* (A); Szemao [Fu-hsing-chen], *Henry 12137* (K, holosyntype of *Euodia colorata* Dunn; A, US, isosyntypes), *12137A* (K, holosyntype of *Euodia colorata* Dunn; A, NY, isosyntypes), *12137B* (K, holosyntype of *Euodia colorata* Dunn; A, US, isosyntypes), *12137C* (K, holosyntype of *Euodia colorata* Dunn; NY, isosyntype), *12237* (A, K, NY), *12237A* (A, K), *12237B* (NY); I-wu, *Henry 13577* (K); zw. Yangwu & Schangyentang n. von Yuenkiang, *Wissmann 120* (W); Meng-tsze [Meng-tzu], *Henry 10951* (A, K, NY, US); Ping-pien Hsien, *Tsai 61062* (BO), *62045* (BO); Nan-chiao, *Wang 75111* (A), *75116* (A). Szechwan Province: Tienchuan [T'ien-ch'üan], *Kuan & Wang 3333* (K); Hung-ya Hsien, *Wilson 3573* (A, GH, US, W); Kiating Fu [Lo-shan], *Wilson 3572* (A, US), *4568* (A); An Hsien & vicinity, *Wang 22187* (A); without definite locality, *Chu 3997* (W), *Fang 3376* (E, NY).

Shensi Province: Young-hsien, *Koo 2033* (PE). Hupeh Province: Fang [Fang-hsien], *Wilson 2578* (K); Hsing-shan Hsien, *Wilson 791* (A, US). Kwangsi Province: North Hin Yen, Tsin Hung Shan, *Ching 7010* (A, NY). Kwangtung Province: Fang-ch'eng District, Kung-p'ing-shan, *Tsang 26720* (E); Fang-ch'eng District, Na Leung, *Tsang 26637* (A, K). Hainan Island: Hung Mo Shan, *Tsang & Fung Lingnan Univ. 18218* (A, K, NY), *Tsang, Tang, & Fung Lingnan Univ. 17744* (A, K, NY, UC, US); Tai Pin, *Gressitt 1061* (BM, UC), *1118* (A, BM, UC); Liamui, *Gressitt 1186* (A); Fan Yah, *Chun & Tso 44140* (A, B, NY, US); Five Finger Mountain [Wu-chih Shan], *McClure CCC 8449* (A, US, isotypes of *Euodia hainanensis* Merr.); Pao-ting, *How 71981* (A), *72442* (A), *73470* (A, BO); without definite locality, *Henry 8605* (K).

Euodia viridans, E. colorata, and *E. hainanensis,* here considered (on the basis of type and syntype collections) to be conspecific with *Tetradium trichotomum,* have previously been placed in synonymy under *Euodia trichotoma* – see Rehder and Wilson (1914), Merrill, Comm. Lour. Fl. Cochinch. (1935) 219, and Huang (1957).

I have not seen the type collection of *Euodia lenticellata,* from Szechwan Province, but four of the collections cited above, *Wilson 3572, Wang 22187,* and *Chu 3997,* from Szechwan Province, and *Ko 2033,* from Shensi Province, are paratypes. As *Tetradium trichotomum* is interpreted here, these specimens merely represent a northern variant with reduced leaves (down to 12 cm long with leaflets as small as 3 cm long and 1.3 cm wide) and flowers (petals about 3 mm long); among other collections of the species there is a complete series of intermediates with the larger-leaved, larger-flowered plants, such as represented by the type of *T. trichotomum,* that tend to occur in the southern part of the range.

Huang (1957), in distinguishing between *Euodia lenticellata* and *E. trichotoma* in a key, notes that they differ, respectively, in lenticel prominence (convex vs. not convex) and vestiture of the lower surface of the leaflets (covered with long, soft hairs vs. glabrous or nearly so). In the study of the above-mentioned paratypes of *E. lenticellata* and collections from the northern part of the range that match them closely (*Wilson 791* and *2578,* from Hupeh Province, *Fang 3376,* from Szechwan Province, and *Henry 13577* and *Wang 75116,* from Yunnan Province), I have found that the lenticels are variable in prominence and that the lower surface of the leaflets varies from pubescent with spreading hairs on the midrib and main veins to nearly glabrous with short, appressed hairs on the midrib only. Similar variability in these characters also can be found among collections of more typical *Tetradium trichotomum* from the southern part of the range.

7. **Tetradium ruticarpum** (A. Juss.) Hartley, *comb. nov.*

Boymia rutaecarpa A. Juss., Mem. Mus. Hist. Nat. 12 (1825) 507. *t. 25, fig. 39,* Mem. Rutac. (1825) 124; *t. 25, fig. 39.* Type: *d'Incarville,* China, sub nomine vernaculo Ou-Tchou-Yu (not seen).

Evodia rutaecarpa (A. Juss.) Benth., Fl. Hongkong. (1861) 59.

Ampacus rutiecarpa (A. Juss.) Kuntze, Rev. Gen. Pl. 1 (1891) 98

Evodia bodinieri Dode, Bull. Soc. Bot. France (1908) 55, (1909) 703. Syntypes: *Bodinier 1689,* China, Kouy-tchéou [Kweichow] Province, mont de Lout Song Koan (not seen); *Ford (ex Herb. Hong Kong Bot. Gard) 343,* China, Kouang-toung [Kwangtung Province] (not seen).

Evodia officinalis Dode, *ibid.* Syntypes: *Farges 305*, China, Szechwan Province, Sutchuen oriental, district de Tchen-Kéou-tin (not seen); *Henry 6199*, China, Hupeh Province, Ichang; *Henry 1802* (not see) and *6136*, China, Hupeh Province, Patung District; *Henry 6549*, China, Hupeh Province (not seen); *Wilson 1309*, China, Western Hupeh Province, Chien-shih Hsien.

Evodia baberi Rehd. & Wils., *p. p.*, in Sargent, Pl. Wils. 2 (1914) 131. Syntypes: *Wilson 1164*, July 1908 (staminate), China, Szechwan Province, Wa-shan (= *Tetradium daniellii*); *Wilson 1164*, October 1908 (carpellate), China, Szechwan Province, Wa-shan (= *Tetradium ruticarpum*).

Evodia rugosa Rehd. & Wils., *ibid.* 132. Type: *Henry 10245*, China, Yunnan Province, Mengtze.

Evodia hirsutifolia Hayata, Ic. Pl. Formosa 6 (1916) 5. Type: *Inaba*, August 1911, Formosa, Rinkiho.

Evodia compacta Hand.-Mazz., Symb. Sin. 7 (1933) 627. Type: *Handel-Mazzetti 12320*, China, Hunan Province, monte Yün-shan bei Wu-kang.

Evodia compacta var. *meionocarpa* Hand.-Mazz., *ibid.* Type: *Chien 1029*, China, Anhwei Province, Hwang-shan.

Evodia rutaecarpa var. *bodinieri* (Dode) Huang, Acta Phytotax. Sin. 6 (1957) 113. *t. 27, figs. E & F.*

Evodia rutaecarpa forma *meionocarpa* (Hand.-Mazz.) Huang, *ibid.* 112.

Evodia rutaecarpa var. *officinalis* (Dode) Huang, *ibid.* 114; *t. 27, fig. A.*

Shrub or small tree to 9 m high; branchlets puberulent to finely pubescent when young, usually becoming glabrous or nearly so. Leaves 15–40 cm long; rachis finely pubescent or occaisonally nearly glabrous; leaflets (1–)2–6(–7) pairs; petiolules of lateral leaflets obsolete to 9 mm long, terminal leaflet on an extension of the rachis 10–30 mm long; blades of leaflets chartaceous, usually conspicuously oil-dotted, below drying brown to greenish brown or rarely pale green and slightly glaucous, rather sparsely to densely pubescent, above puberulent to densely pubescent on the midrib, otherwise rather sparsely pubescent to glabrous, elliptic to ovate or less often lanceolate, oblanceolate, or obovate, often rather unequal-sided, 4.5–17 cm long, 2–8 cm wide, base in lateral leaflets acute to obtuse or less often rounded, subtruncate, or cuneate, oblique or not, in terminal leaflet cuneate or rarely attenuate, main veins 9–17 pairs, departing from the midrib at an angle of 60–85 degrees, ultimate veinlets rather conspicuous (10x) or not, rather loosely reticulate, margin entire or rather irregularly crenulate, inconspicuous oil dots associated with the crenulations, apex acuminate, the acumen 7–20 mm long. Inflorescences 2.5–18 cm long, rachis and branches sparsely to densely pubescent, pedicels sparsely to densely pubescent, puberulent, or nearly glabrous, obsolete to 3.5 mm long. Flowers predominantly 5-merous (occasional flowers 4-merous); sepals sparsely to densely pubescent, puberulent, or nearly glabrous, ciliolate, 0.5–1.2 mm long; petals green to yellow to white, drying brown or whitish, abaxially glabrous or with sparse, short hairs, adaxially villous to nearly glabrous, 3–5 mm long; disc glabrous; ovary glabrous or sparsely hairy, the carpels connate toward the base abaxially, free to the base adaxially, ovules 2 per carpel, collateral or subcollateral; rudimentary carpels glabrous or

rarely sparsely hairy, connate toward the base. Fruits predominantly 5-carpellate (occasional fruits 4-carpellate), 1–5 of the carpels developing into follicles; follicles glabrous or occasionally sparsely hairy, subglobose, not beaked, 3.5–6 mm long, connate toward the base abaxially, free to the base adaxially, endocarp glabrous. Seed black, 1 per follicle, paired with an aborted seed, ovoid or occasionally ellipsoid or subglobose, 3.5–5.5 mm long, attached in the dehisced follicle to an adaxial strip of pergamentaceous endocarp tissue; outer testa spongy (bounded externally by a crustaceous, shiny pellicle); inner testa bony.

Additional illustrations. Siebold and Zuccarini, Fl. Jap. 1 (1837 or 1838) 50, *t. 21* (as *Boymia ruticarpa*); Huang, Acta Phytotax. Sin. 6 (1957) *t. 27, figs. B, C, & D, & t. 28* (as *Euodia ruticarpa*).

Distribution. Nepal east to east-central China (Kiangsu and Chekiang Provinces) and Taiwan; recorded from well-drained forests, thickets, and open places; 120–3000 m.

Nepal. Samela, *Polunin, Sykes, & Williams 483* (BM); Gurjakhani, *Stainton, Sykes, & Williams 3549* (BM); Lumsum, *Stainton, Sykes, & Williams 2930* (A, BM).

Sikkim. Lachung, *Smith & Cave 2620* (MEL); without definite locality, *Hooker* (GH, L, W), *Prain's Collector 281* (CAL).

Bhutan. Punakha, *Cooper 3048* (E).

India. Assam: Khasi Hills, *Kanjilal 7048* (CAL).

Burma. Adung Valley, *Kingdon-Ward 9496* (A, BM).

China. Yunnan Province: Valli Doyonlumba ad fluvium Lu-djian (Salween), *Handel-Mazzetti 9605* (A, W); Chien-chuan-Mekong Divide, *Forrest 21513* (K, US); Yunnan Bor.-occident., Pe-yen-tsin, *Ten 396* (E); Tali Range, *Forrest 11668* (BM, K), *27966* (BM); vicinity of Tengyueh [T'eng-ch'ung], *Forrest 7592* (K), *11849* (BM, K, UC, W); Mengze [Meng-tzu], *Henry 10245* (A, holotype of *Euodia rugosa* Rehd. & Wils.; K, NY, isotypes); Ngaza, drainage basin of the Yangtze west of Likiang [Li-chiang], *Rock 10610* (A, US); Kiang-ti [Chiang-ti], *Maire 247* (E); Yungpeh [Yung-sheng] Mountain, *Forrest 15105* (E, K); mountains of Yang-p'i River, *Rock 6235* (A, US); without definite locality, *Forrest 13468* (K), *Ten 271* (W). Szechwan Province: Huang-ya-hsien, *Fang 8801* (A, K); Omei Hsien, *Chien 6055* (UC); Omei Shan, *Faber 26* (A, K), *233* (K, NY), *Fang 2412* (A, NY), *12553* (A, BM), *Lee 3050* (US), *Wang 23163* (A), *Wilson 4772* (A, K); Omei-shan, *Fang 7444* (A, K, NY); Mo-ting-ling, *Wang 22511* (A); western Szechwan, Wa-shan, *Wilson 1164,* October 1908 (US, isosyntype of *Euodia baberi* Rehd. & Wils.); Nan-ch'uan Hsien, *Fang 1119* (A); vicinity of Wan-hsien, *Hwa 83* (A, UC). Anhwei Province: Chiu-hua Shan, *Ching 2779B* (A), *Fan & Li 117* (K, US), *190* (K), *Sun 1280* (A); Hwang-shan, *Chien 1029* (W, holotype of *Euodia compacta* var. *meionocarpa* Hand.-Mazz.); Huang Shan, *Ling Univ. Nanking 9623* (UC); Wang Shan, *Ling Univ. Nanking 7732* (UC); near Sujen, *McClure Lingnan Univ. 15232* (A, UC); without definite locality, *Chang 5102* (K). Kiangsu Province: I-hsing, *Ling Univ. Nanking 12447* (UC). Hupeh Province: Chien-shih Hsien, *Chow 1714* (A, NY), *Wilson 882* (K), *1309* (A, K, NY, US, W, isosyntypes of *Euodia officinalis* Dode); western Hupeh, *Wilson 2212* (K, W); Fang [Fang-hsien], *Henry 6569* (GH, K); Pa-tung, *Chow 714* (A, NY), *Henry 6136* (E, K, MEL, NY, US, isosyntypes of *Euodia officinalis* Dode), *Wilson 251* (A, BM, US); Chang-lo [Wu-feng], *Wilson 3577* (A, BM); Nan-t'o and mountains to northward, *Henry 2077*

(GH, K), *4525* (K); Ch'ang-yang, *Henry 6199A* (GH, K, US), *Wilson 366a* (A); I-ch'ang, *Henry 924* (K), *1676* (GH, K), *2259* (K), *2616* (K), *6199* (BM, E, GH, isosyntypes of *Euodia officinalis* Dode), *Wilson 366* (A, BM, GH, US); without definite locality, *Henry 6136A* (GH, K), *Silvestri,* August 1906 (A). Chekiang Province: Anh-ki [Chiu-an-chi], *Ching 4908* (A); Mo-kan Shan, *Cheo & Wilson Univ. Nanking 12807* (GH, UC); Mo-kan-shan, *Read 1204* (BM); Tien-mu-shan [Hsi-t'ien-mu-shan], *Ching 5102* (A), *Law 1347* (K), *1389* (K); Ch'ang-hua-hsien, *Keng 631* (A, UC); Ning-po Mts., *Faber 95* (A, K), *1717* (K); Tsing-tien-hsien [Ch'ing-t'ien-hsien], *Keng 47* (A), *96* (A); region of King Yuan [Ch'ing-yuan], *Ching 2493* (A, UC, US, W); without definite locality, *Liou 380* (NY). Kweichow Province: Tsunyi [Tsun-i] Hsien, Liang-feng-yah, *Steward, Chiao, & Cheo 115* (L, NY, US, W); Tungt'ze [T'ung-tzu], *Tsiang 4919* (NY); environs du Kouy-yang [Kuei-yang], *Bodinier 1689 bis* (P), Tsiang *8655* (NY); Kweiting [Kuei-ting], *Tsiang 5447* (NY); Tu-yun, *Tsiang 5870* (NY); inter Nganschan et Nganping, *Handel-Mazzetti 10440* (A, W); inter Duyun et Gudong, *Handel-Mazzetti 10690* (A, W). Hunan Province: monte Yün-schan bei Wu-kang, *Handel-Mazzetti 12320* (W, holotype of *Euodia compacta* Hand.-Mazz.; A, isotype); ad flumen Tsi-djiang supra Hsin-hwa, *Handel-Mazzetti 12564* (A, W); Ch'ang-ning Hsien, Yang-shan, *Fan & Li 180* (BM, BO, L, W). Kiangsi Province: Kiukiang, *Bullock 10* (US), *Shearer,* 1873 (K); Ti-ping-shan, *Hsiung 5315* (A); Kuling Lu-shan, *Chiao Univ. Nanking 18585* (NY), *Univ. Nanking 18618* (NY, US), *Chung 4382* (W); Lu Shan, *Chung & Sun 614* (A, NY), *Ip Univ. Nanking 1083* (UC); Nan-ch'ang, *Chung 607* (A), *693* (A); Kan River about 60 li south of Nan-ch'ang, *Chung 28* (A), *31* (A); Kao-an, Hua-ling-shan, *Tsiang 10406* (NY), *10419* (NY); Kiennan [Ch'uan-nan] District, Tung Lei Village, *Lau 4128* (A, BM); without definite locality, *Anonymous CCC 51919* (A). Kwangsi Province: Ling-yun Hsien, Loh Hoh Tsuen, *Steward & Cheo 463* (A, BM, NY, W); San-chiang Hsien, Ling-wang Shan, *Steward & Cheo 1016* (A, BM, NY, W); Tou-ngok Shan, near T'ung-chung Village, *Tsang 23111* (A. W). Kwangtung Province: Lok-chong [Lo-ch'ang], *Tso 20688* (NY), *20886* (NY); Yu-yuen [Ju-yüan], *Ko 52936* (A); Ying Tak [Ying-te], Tai Tsan, *Tsang & Wong Lingnan Univ. 14845* (A, UC), *CCC 14188* (A, UC); Sin-fung [Hsin-feng] District, *Taam 694* (A); Wung-yuen District, *Lau 2462* (A); Lung-t'au Shan, *Anonymous CCC 12776* (UC, US, W), *To & Tsang 12776* (A, BM); Lok-fan *Anonymous Lingnan Univ. 9933* (NY, US, W). Fukien Province: Fan Ka Cha, *Dunn 112* (A).

Taiwan. Taipingshan [T'ai-p'ing], *Chang 4882* (NY); Kagi Province, Arisan [A Lan Shan], *Wilson 10880* (A); Nantou Hsien, Horisha, *Sasaki 42* (UC), *Wilson 9955* (A); Nantou, *Kawakami & Mori 3397* (A); Jitsugetsu Tan [Jih-yuen T'an], *Tanaka 468* (A, BM, NY, US); Taiheisan (Mt. Taihei), between Taiheisan Club and Minamoto, *Bartlett 6059* (MICH, US); Rinkiho, *Inaba,* August 1911 (TI, holotype of *Euodia hirsutifolia* Hayata); without definite locality, *Suzuki-Tokio 11705* (A).

Cultivated. China. Hunan Province: Ping-kiang [P'ing-chiang], *Hsiung 5723* (A). Kwangsi Province: Ling-yun Hsien, Loh Hoh Tsuen, *Steward & Cheo 703* (BM, BO, NY, W); North Lin Yen, Tsin Lung Shan, *Ching 6894* (A, UC, US). Japan. Honshu Island: Yokohama, *Maximowicz,* 1862 (BM, BO, GH, L, US, W); Province Chiba, Konodai, *Santo 399* (US); Kyoto Prefecture, Kitaserakawa, *Muroi 6942* (A); Koyoto Prefecture Yase, *Muroi 4985* (A); Koyasan, *Faurie 95* (W). Kyushu Island: Nagasaki, *Maximowicz,* 1863 (BM), *Oldham 131* (GH, K, L); Province Ohsumi, Mt. Kirishima, *Masamure,* 27 September 1924 (NY). Without definite locality: *Herb. Buerger* (U), *Mohniki* (L), *Pierot 281* (L), *Siebold,* 1829 (GH, L).

I have not seen the type of collectin of *Boymia ruticarpa* and it is apparently not among the specimens of the Jussieu herbarium photographed on IDC microfiches (L. Pedley, pers. comm.). Nevertheless, on the basis of Jussieu's original description and accompanying illustration, I am reasonably certain of its identity.

I have included a rather wide range of specimens in this species among which I have not been able to find any constant or correlating characters enabling me to recognise more than a single taxon. Some of the morphologic variation I have accepted includes: leaves 15–40 cm long; leaflets (1–)2–6(–7) pairs, 4.5–17 cm long, 2–8 cm wide, sparsely to densely pubescent on the lower surface; inflorescences 2.5–18 cm long, compact to spreading; petals 3–5 mm long; fruits 3.5–6 mm long; and seeds 3.5–5.5 mm long.

Of the names placed in synonymy, the type material of *Euodia officinalis* has rather large, spreading inflorescences and small flowers; that of *E. rugosa* has rather small, sparsely pubescent leaves (the leaflets are more or less wrinkled, but I do not think this is taxonomically significant in this case) and small, compact infructescences; that of *E. hirsutifolia* has rather long leaves with small leaflets and small fruits; and that of *E. compacta* and *E. compacta* var. *meionocarpa* have small, compact infructescences.

I have not seen either of the syntype collections of *Euodia bodinieri, Bodinier 1689* and *Ford 343,* but it seems likely that one of the specimens cited above, *Bodinier 1689 bis* (P), which is labelled as *Euodia bodinieri,* was considered by Dode to represent that species. It has rather small, sparsely pubescent leaves and small flowers.

Euodia hirsutifolia was placed in the synonymy of *Euodia ruticarpa* by Li, Woody Fl. Taiwan (1963) 371 and Chang in Li et al., Fl. Taiwan 3 (1977) 517.

8. **Tetradium austrosinense** (Hand.-Mazz.) Hartley, *comb. nov.*

Evodia austrosinensis Hand.-Mazz., Sinensia 5 (1934) 1. Type: *Ching 6214,* China, Kwangsi Province, Wang Tung, N. Luchen, near Shan-fang.

Small to medium tree 7–20 m high; branchlets pubescent when young, becoming glabrous or nearly so. Leaves 20–35 cm long; rachis sparsely to densely pubescent; leaflets 3–5 pairs; petiolules of lateral leaflets 2–4 mm long, terminal leaflet on an extension of the rachis 15–30 mm long; blades of leaflets chartaceous, sparsely and inconspicuously oil-dotted or without evident oil dots, below glaucous, minutely (10x) papillate, sparsely to densely pubescent with spreading or ascending hairs, above sparsely puberulent to nearly glabrous, broadly elliptic or occasionally elliptic-oblong, ovate, ovate-lanceolate, or, in some terminal leaflets, obovate to suboblanceolate, 5.5–14.5(–17) cm long, 2.5–7(–8.5) cm wide, base in lateral leaflets obtuse to nearly rounded, often oblique, in terminal leaflet cuneate, main veins 9–12 pairs, departing from the midrib at an angle of 55–70 degrees, ultimate veinlets usually rather conspicuous (10x), rather loosely reticulate, margin entire, apex acuminate, the acumen 4–8 mm long. Inflorescences 11–18 cm long, rachis and branches rather sparsely to densely pubescent, pedicels sparsely pubescent, 1.5–2 mm long. Flowers predominantly 5-merous (occasional flowers 4-merous); sepals sparsely pubescent, about 0.5 mm long; petals green or greenish –yellow, drying brown, abaxially sparsely puberulent to glabrous, adaxially sparsely to densely villous, 2.5–3 mm long; disc glabrous; ovary glabrous, the carpels connate toward the base, ovule 1 per carpel; rudimentary carpels villous toward the base, otherwise glabrous, connate toward the base. Fruits predominantly 5-carpellate (occasional fruits 4-carpellate), 1–5 of the carpels developing into follicles; follicles glabrous or rarely with a few scattered hairs, trigonous or subtrigonous, not beaked, 3.5 mm long and about as wide, connate toward the base, endocarp glabrous. Seed black, 1 per follicle, ellipsoid to subreniform, 2.3–2.5 mm long, attached in the dehisced follicle to an adaxial strip of pergamentaceous endocarp tissue; outer testa spongy (bounded externally by a crustaceous, shiny pellicle); inner testa bony.

Distribution. Northern Vietnam and adjacent southwestern China; recorded from forests (apparently well-drained); 360–1500 m.

Vietnam. Tonkin: Chapa, *Pételot 4892* (NY, US); Chapa prope Laokai, *Fenzel 50* (W); Route de Chapa a Laokai, *Pételot 4375* (NY).

China. Kwangsi Province: Wang-tung, North Luchen, near Shan-fang, *Ching 6214* (W, holotype of *Euodia austrosinensis* Hand.-Mazz.; A, NY, isotypes); Yung [Jung] Hsien, Ta Tseh Tsuen, *Steward & Cheo 878* (A, BO, NY, W); North Lin-yen, Tsin-lung Shan, *Ching 7026* (NY). Kwangtung Province: Lung-t'au Mt., near Iu, *To, Tsang, & Tsang CCC 12483* (A, K, NY, UC, US, W); Taai-yeung Shan, *McClure 6556* (A, K, NY).

9. **Tetradium sumatranum** Hartley, *sp. nov.*

Arbor mediocris vel magna usque 42 m alta; ramulis puberulis; foliis (19–) 26–48 (–55) cm longis; rhachidi puberula; foliolis in paribus (3–)4–6 (–7); petiolulis foliolorum lateralium obsoletis vel usque 3 mm longis, rhachidi ad apicem extensa 8 – 20 mm longa foliolum terminale ferente; laminis chartaceis vel subcoriaceis, sparse et inconspicue pelluciodo-punctatis vel sine punctatione distincta, subtus glaucis, minute papillatis, minute adpresse puberulis, supra praeter costa puberulis glabris, elliptics, elliptico-oblongis vel interdum late lanceolatis, 6.5–13.5 cm longis, 3.5–5.5 cm latis, basi obtusis vel rotundatis et plerumque inaequilateralis in foliolis lateralibus, actuis vel cuneatis in foliolo terminali, venis primariis utrinsecus costa 13–16, sub angulo 55°–70° abeuntibus, venulis ultimis inconspicuis, margine integris, apice acuminatis, acumine 7–10 mm longo; inflorescentiis 10–17.5 cm longis, rhachidi et ramis puberulis vel subtiliter pubescentibus, pedicellis subtiliter pubescentibus, 0.5–2 mm longis; floribus pentameris; sepalis dense adpresse pubescentibus, ca. 0.5 mm longis; petalis viridulis, in sicco brunneis, abaxialiter subtiliter adpresse pubescentibus vel fere glabris, adaxialiter villosis, 3.2–4.5 mm longis; disco glabro; ovario aequaliter vel inaequaliter adpresse pubescenti, carpellis basin versus connatis, ovulo in quoque carpello solitario; carpellis rudimentariis basin versus villosis, aliter glabris, basin versin versus connatis; fructibus non visis.

Holotypus: *Krukoff 4248* (NY).

Medium to large tree to 42 m high; branchlets puberulent. Leaves (19–)26–48(–55) cm long; rachis puberulent; leaflets (3–)4–6(–7) pairs; petiolules of lateral leaflets obsolete to 3 mm long, terminal leaflet on an extension of the rachis 8–20 mm long; blades of leaflets chartaceous to subcoriaceous, sparsely and inconspicuously oil-dotted or without evident oil dots, below glaucous, minutely (10x) papillate, puberulent with minute, appressed hairs, above glabrous except for puberulent midrib, elliptic, elliptic-oblong, or occasionally broadly lanceolate, 6.5–13.5 cm long, 3.5–5.5 cm wide, base in lateral leaflets obtuse to rounded, usually oblique, in terminal leaflet acute to cuneate, main veins 13–16 pairs, departing from the midrib at an angle of 55–70 degrees, ultimate veinlets inconspicuous, margin entire, apex acuminate, the acumen 7–10 mm long. Inflorescences 10–17.5 cm long, axis and branches puberulent to finely pubescent, pedicels finely pubescent, 0.5–2 mm long. Flowers 5-merous; sepals densely appressed-pubescent, about 0.5 mm long; petals greenish, drying brown, abaxially finely appressed-pubescent or nearly glabrous, adaxially villous, 3.2–4.5 mm long; disc glabrous; ovary evenly or unevenly appressed pubescent, the carpels connate toward the base, ovule 1 per carpel; rudimentary carpels villous toward the base, otherwise glabrous, connate toward the base. Fruits not seen.

Distribution. Endemic to Sumatra; recorded from well-drained, primary rain forest; 400 m.

Sumatra. East Coast: Pematangsiantar, *Lörzing 16614* (L), *16938* (L); Asahan, Masihi Forest Reserve, *Krukoff 4248* (NY, holotype; A, BRI, L, NY, SING, US, isotypes); Asahan, Pargambiran, *Rahmat Si Boeea 5783* (L).

INSUFFICIENTLY KNOWN OR OTHERWISE EXCLUDED NAMES

Boymia martinicensis (Lam.) G. Don, Gen. Hist. 1 (1831) 805 [based on *Fagara martinicensis* Lam., Tabl. Encycl. 1 (1792) 334] = *Zanthoxylum martinicense* (Lam.) DC., Prodr. 1(1824) 726.

Evodia[3] *chaffanjoni* Lévl. in Feddes, Repert. Spec. Nov. Regni. Veg. 13 (1914) 265 = *Euscaphis japonica* (Thunb.) Dippel according to Rehder, J. Arnold Arb. 15 (1934) 2.

Evodia meliaefolia var. *celebica* Koorders, Versl. Minahasa (1898) 371; Koorders-Schumacher, Syst. Verzeich. 3 (1914) 59; Koorders, Suppl. Fl. Celebes 3 (1922) 12, *t. 22. Syntypes: Koorders 18754β, 18755β*, and *18757β*, Celebes, Prov. Minahassa. The only fertile material I have seen of this taxon is staminate. While undoubtedly belonging in *Tetradium*, its further identity cannot be determined with certainty without seeing carpellate material. The lower surface of the leaflets is minutely papillate, as in *T. austrosinense* and *T. sumatranum*, and, to a lesser extent, in some specimens of *T. fraxinifolium*. It seems probable that it is most closely related to *T. sumatranum*. Relevant collections in the Index to Exsiccatae are identified as "aff. 9" (*Tetradium* sp. aff. *sumatranum*).

Evodia mollicoma Hu & Chen, Acta Phytotax. Sin. 1 (1951) 225 = *Zanthoxylum molle* Rehd. according to Huang, Acta Phytotax. Sin. 6 (1957) 43.

Evodia odorata Lévl. in Feddes, Repert. Spec. Nov. Regni. Veg. 9 (1911) 458 [*Zanthoxylum odoratum* (Levl.) Levl. *ibid.* 13 (1914) 266] = *Zanthoxylum rhetsoides* Drake according to Huang, Acta Phytotax. Sin. 6 (1957) 47.

Evodia parviflora Craib, Kew Bull. (1915) 425 = *Turpinia parviflora* (Craib) Craib, Fl. Siam Enum. I (1926) 339.

Evodia tonkinensis Engl. in Engler & Prantl, Nat. Pflanzenfam. III: 4 (1896) 121 (in key; no specimen cited) = *Evodia ailantifolia* Pierre according to Engler, *ibid.* ed. 2, 19a (1931) 228. Probably = *Tetradium glabrifolium* (Champ. *ex* Benth.) Hartley.

Tetradium amarissimum (Lour.) Poir., Encycl. Suppl. 5 (1817) 291 [based on *Gonus amarissimus* Lour., Fl. Cochinch. (1790) 658] = *Brucea javanica* (L.) Merr. according to Nooteboom, Fl. Males. ser. 1: 6 (1962) 211.

3. The *Euodia* names included here are only those representing plants that belong in *Tetradium* or could be confused with it (in having pinnately compound leaves). *Euodia*, in the sense of its type species and as interpreted in the present study, has unifoliolate or trifoliolate leaves.

ACKNOWLEDGEMENTS

I wish to thank the directors and curators of the herbaria listed in the introduction for making specimens in their care available to me. Thanks are also extended to Roy Pullen, C.S.I.R.O. Division of Plant Industry, who translated into English portions of Huang's paper on Chinese Rutaceae, and to Rod Henderson, the Australian Botanical Liaison Officer at Kew in 1979, who assisted in having the type of *Tetradium trichotomum* loaned to me.

LITERATURE CITED

Bentham, G., and J. D. Hooker (1862). Gen. Pl. 1, 296.

DeCandolle, A. P. (1825). Prodr. 2, 88.

Endlicher, S. L. (1840). Gen. Pl., 1149.

Engler, A. (1896). Rutaceae. In Engler & Prantl, Nat. Pflanzenfam. III: 4, 95–201.

_____. (1931). Rutaceae. Nat. Pflanzenfam. ed. 2. 19a, 187–358.

Hartley, T. G. (1966). A Revision of the Malesian Species of *Zanthoxylum* (Rutaceae). J. Arnold Arb. 47, 171–221.

_____.(1974). A Revision of the Genus *Acronychia* (Rutaceae). J. Arnold Arb. 55, 469–523, 525–567.

Hegnauer, R. (1973). Rutaceae. Chemotaxonomie der Pflanzen 6, 174–239. Basel. Birkhauser.

Huang, C. C. (1957). Preliminary Study on Chinese Rutaceae (1) [in Chinese]. Acta Phytotax. Sinica 6, 1–143.

Jussieu, A. (1825). Mem. Rutac., 138.

Price, J. R. (1963). The Distribution of Alkaloids in the Rutaceae. In: Chemical Plant Taxonomy, T. Swain, Editor, 429–452. Academic Press, London and New York.

Rehder, A. and E. H. Wilson (1914). Rutaceae. In Sargent, Pl. Wils. 2, 121–151.

Siebold, P. F. and J. G. Zuccarini (1837 or 1838). Fl. Jap. 1, 50.

Sprengel, K. (1824). Syst. Veg. 1, 441.

Waterman, P. G. (1975). Alkaloids of the Rutaceae: Their Distribution and Systematic Significance. Biochem. Syst. & Ecol. 3, 149–180.

INDEX TO COLLECTIONS

The numbers in parentheses refer to the corresponding species in the text.

Chang, R. E., *5102* (7).

Cheo *3, 169, Univ. Nanking 18389* (5).

Cheo & Wilson *Univ. Nanking 12807* (7).

Chiao *2708, 2925, 2926, 2942* (3); *Univ. Nanking 14748* (5); *Univ. Nanking 18585, Univ. Nanking 18618* (7); *Univ. Nanking 18766* (5).

Chien *1029* (7); *1129* (5); *6055* (7).

Ching *1805, 2163* (5); *2493* (7) *2559, 2773* (5); *2779B* (7); *3098* (5); *3985* (3); *4908, 5102* (7); *6214* (8); *6306* (4); *6894* (7); *7010* (6); *7026* (8); *7644, 7679, 7950, 8317* (5).

Chow *714, 1714* (7).

Chu, K, L., *3419* (3); *3997* (6).

Chu, V. M., *29* (5).

Chun *7477* (5).

Chun, N. K., *40010* (5).

Chun, W. Y., *3099* (5); *3783, leg. Huang 3969, Univ. Nanking 4129, Univ. Nanking 4330* (3); *5225, Univ. Nanking 5687, Univ. Nanking 5766, Univ. Nanking 5899, 6562, 6864, Univ. Nanking 7056, Univ. Nanking 7121* (5).

Chun & Tso *43564, 43761, 43795, 44010* (5); *44140* (6).

Chung, H. H., *28, 31, 607, 693* (7); *1050* (5); *4382* (7).

Chung, T. H., *1169* (3).

Chung & Sun *255, 317, 329* (5); *614* (7); *685* (5).

Clarke *7312, 26635B, 27327, 35229C, 44335, 45921B* (2).

Clemens, J. & M. S., *3286* (5).

Conklin & del Rosario *PNH 72715* (5).

Cooper *3048* (7); *4473* (2).

Delavay *4526* (3).

Diepenhorst *HB 1399, HB 2560, HB 2917* (1).

Division Forest Officer *1384* (5).

Dunn *112* (7).

Elmer *10120* (5).

Faber *26, 95, 233, 1717* (7).

Fan & Li *117, 180, 190* (7); *200, 377, 556* (5).

Fang *1119, 2412* (7); *3376* (6); *7444* (7); *7855* (3); *8801, 12553* (7).

Farges *49, 413, 1284* (3).

Faurie *34* (5); *95* (7); *468* (3).

Fenzel *24* (5); *50* (8); *222* (5); *683* (3).

Herb. Forbes *68* (5).

Forrest *7592* (7); *8687* (2); *11091* (3); *11668, 11849* (7); *12954* (5); *13468* (7); *14299, 14772* (3); *15105* (7); *15803, 16079* (2); *16484, 16926* (3); *17743, 17859, 18592* (2); *21513* (7); *22294* (2); *24115, 25070, 25250, 26470* (2); *27966* (7).

Garrett *644* (2).

Gibbs *Herb. Hong Kong 7456* (5).

Gressitt *1061, 1118, 1186* (6).

Haines *BB 873* (5).

Herb. Hance *311* (5).

Handel-Mazzetti *9393* (2); *9605, 10440, 10690, 12320, 12564* (7).

Hao *3508* (3).

Hatusima *14525, 18236, 18241* (5).

Henry *13, 831* (5); *924* (7); *932, 974, 1296, 1562* (5); *1676, 2077, 2259* (7); *2555* (3); *2816* (7); *2939, 4482* (7); *4525* (7); *4534, 4534A* (3); *4577* (5); *6136, 6136A* (7); *6157* (5); *6199, 6199A* (7); *6485* (3); *6569* (7); *6712* (3); *8605* (6); *8706* (5); *10245* (7); *10951, 12137, 12137A, 12137B, 12137C, 12237, 12237A, 12237B, 13577* (6).

Hers *543, 739, 1157* (3).

Hiroe *2471* (5).

Hornby *4276, 6898* (3).

How *71094* (5); *71981, 72442* (6); *72749, 73189* (5); *73470* (6).

How & Chun *70139* (5).

Hsiung *5315, 5723* (7); *5726* (5).

Hu, H. H., *2358* (5).

Hu, S. Y., *5567, 5596* (5).

Rev. Fr. Hugh [Scallan] *75* (3).

Hwa *57* (5); *83* (7).

Ip. *Univ. Nanking 1083* (7).

Kanai, Murata, & Togashi *6301109* (2).

Kanjilal *2634, 4553* (2); *4969, 5081* (5); *7048* (7).

Kawakami & Mori *3196* (5); *3397* (7).

Keng, Y. L., *47, 96, 631* (7); *914, 921, 1134* (5).

Kepong series (KEP), Malaya Forestry Department; the following by an anonymous collector: *KEP 78904* (5).

Kermode *17346* (2).

Kerr *644* (2); *4762, 11438A, 13035* (5).

King *4868* (2).

Kingdon-Ward *9496* (7); *13088, 21150* (2).

Ko *52936* (7); *55618* (4).

Koelz *23190, 25374, 26051, 26118, 27485, 28383, 29441, 30358* (2); *30662* (5); *33721* (2).

Foo *2033* (6).

Koorders *6908β, 6909β, 6910β, 6911β* (1); *10410β* (5); *11096β* (1); *18754β, 18755β, 18757β* (aff. 9); *24156β, 26356β, 37906β* (1).

Kostermans *18716a, 18864* (1).

Krukoff *4248* (9).

Kuan & Wang *3333* (6).

Kung *3051* (3).

Kurata & Nakaike *2302* (5).

Lace *715* (5); *2205* (2); *5847* (5).

Lamont *116* (5).

Lau, S. K., *1930* (5); *2462, 4128* (7); *4780, 5346, 27468* (5).

Lau, Y. S., *159* (5).

Law *1277, 1339* (5); *1347, 1389* (7).

Lee *3050* (7).

Lei *9, 832* (5).

Lesger *255* (1).

Levine *CCC 1143, CCC 1775, leg. Ah To CCC 1854, CCC 3244* (5).

Li *10032* (3).

Liang *62250, 62345, 63026, 63392, 64634, 65135, 69916, 70120* (5).

Licent *13367* (3).

Ling *Univ. Nanking 7732, Univ. Nanking 9623, Univ. Nanking 12447* (7).

Lingnan University Herbarium: the following by an anonymous collector: *Lingnan Univ. 9933* (7).

Liou *380* (7); *720* (5).

Liu *1225, 2217* (3).

Lorzing *4351, 5282* (1); *16614, 16938* (9).

Maire *247* (7); *3361* (3).

Maradjo *25* (1).

Maung Ba Pe *1576* (5).

McCaskill & Reagan *684* (3).

McClure *6556* (8); *CCC 7751* (5); *CCC 8449* (6); *CCC 13300* (5); *Lingnan Univ. 15232* (7); *Lingnan Univ. 18274, Lingnan Univ. 19709* (5).

Merrill, E. D., *10773* (5).

Meyer, F. N., *262, 278, 1929* (3).

Muroi *4985, 6942* (7).

Oldham *130* (5); *131* (7).

Panigrahi *22427* (2).

Petelot *1165, 2483, 2599, 3124* (6); *4375, 4892* (8); *5692* (6).

Phusomsaeng et al. *BKF 46522* (5).

Pierot *281* (7).

Herb. Pierre *3862* (5).

Poilane *12927* (2); *25989* (6); *26800* (2); *29658* (6).

Polunin, Sykes, & Williams *483* (7).

Prain's Collector *281* (7); *953* (2).

Purdom *1038* (3).

Rahmat Si Boeea *5783* (9).

Read *1204* (7).

Ren *6122* (3).

Ren & Tao *Univ. Nanking 12579* (3).

Rock *1778, 2391* (6); *6235* (7); *10270* (3); *10610* (7).

Rodger *139* (2).

Sangkhachand *BKF 36894* (5).

Santos *BS 31968* (5).

Sasaki *42* (7).

Sastry *40950* (2).

Sato *399* (7).

Schneider *1663* (3).

Silvestri *1218* (5).

Smith, A., *120* (5).

Smith, H., *6445* (3).

Smith & Cave *2620* (7).

Sonohara *8, 67* (5).

Sorensen *6672* (3).

Stainton *3685, 4546, 6838* (2).

Stainton, Sykes, & Williams *2930, 3549* (7); *5064, 6679* (2).

Steward *Univ. Nanking 4668* (5).

Steward & Cheo *463, 703* (7); *878* (8); *1016* (7).

Steward, Chiao, & Cheo *115* (7); *329* (5).

Sun, C. L., *687* (3).

Sun, S. C., *1202* (5); *1280* (7); *1300* (5).

Suzuki-Tokio *11705* (7).

Sykes *CHR 124917, CHR 124998A, CHR 124998B* (3).

Taam *694, 797* (7).

Tanaka *468* (7).

Tang *257* (5).

Ten *271, 396* (7).

Theunissen *2* (1).

To & Tsang *12776* (7).

To, Tsang, & Tsang *CCC 12483* (8).

Treuther *139* (2).

Tsai *61062, 62045* (6).

Tsang, W. T., *Lingnan Univ. 9938, Lingnan Univ. 15585, Lingnan Univ. 16247, Lingnan Univ. 16637* (5); *23111* (7); *24189, 25921* (5); *26637* (6); *26685* (5); *26720, 27026, 29300, 29454, 30357* (6); *30475* (5).

Tsang & Fung *Lingnan Univ. 18218* (6); *Lingnan Univ. 18274* (5).

Tsang, Tang, & Fung *Lingnan Univ. 17744* (6).

Tsang & Wong *CCC 14188, Lingnan Univ. 14845* (7).

Tsiang *1017, 1643, 1720* (5); *4919, 5447, 5870, 8655* (7); *9567, 10352* (5); *10406, 10419* (7); *10718B* (5).

Tso *20688, 20886* (7).

Uno *2598* (3).

Walker & Tawada *6837* (5).

Wallich *Cat. No. 8521* (2).

Wang, C., *33111, 34072, 35680, 36445* (5).

Wang, C. W., *73987, 74237, 74893, 75111, 75116* (6); *75621, 75796* (5); *75835, 75942, 77145, 77294* (6); *77601, 77770, 77809, 77841, 77859, 77955* (5); *77980* (6); *78669* (5); *79663* (6); *80688* (5).

Wang, F. T., *21610* (3); *22187* (6); *22511, 23163* (7).

Wang, T. P., *1518* (3).

Whitmore *FRI 12139* (1).

Williams *1019* (2).

Williams & Stainton *8465* (2).

Wilson *3* (3); *247* (5); *251* (7); *253* (5); *324* (3); *366, 366a* (7); *381* (5); *387, 387a, 387b* (3); *791* (6); *882* (7); *994* (3); *1164* – Oct 1908 (7); *1164* – July 1908 (3); *1309* (7); *1583, 1584, 1585, 1930, 1930a, 1930b* (5); *2183, 2183a* (3); *2210, 2210a* (5); *2212* (7); *2322* (5); *2415* (3); *2415a, 2415b* (5); *2578* (6); *2693, 2693a, 2695, 3569, 3570, 3571* (3); *3572, 3573* (6); *3574, 3575, 3576* (3); *3577* (7); *3579, 3579a* (5); *4568* (6); *4628* (3); *4772* (7); *6112* (5); *8800* (3); *9955* (7); *9971* (5); *10555, 10568, 10612* (3); *10880* (7).

Wissmann *120* (6).

Yu *19451, 20510* (2).