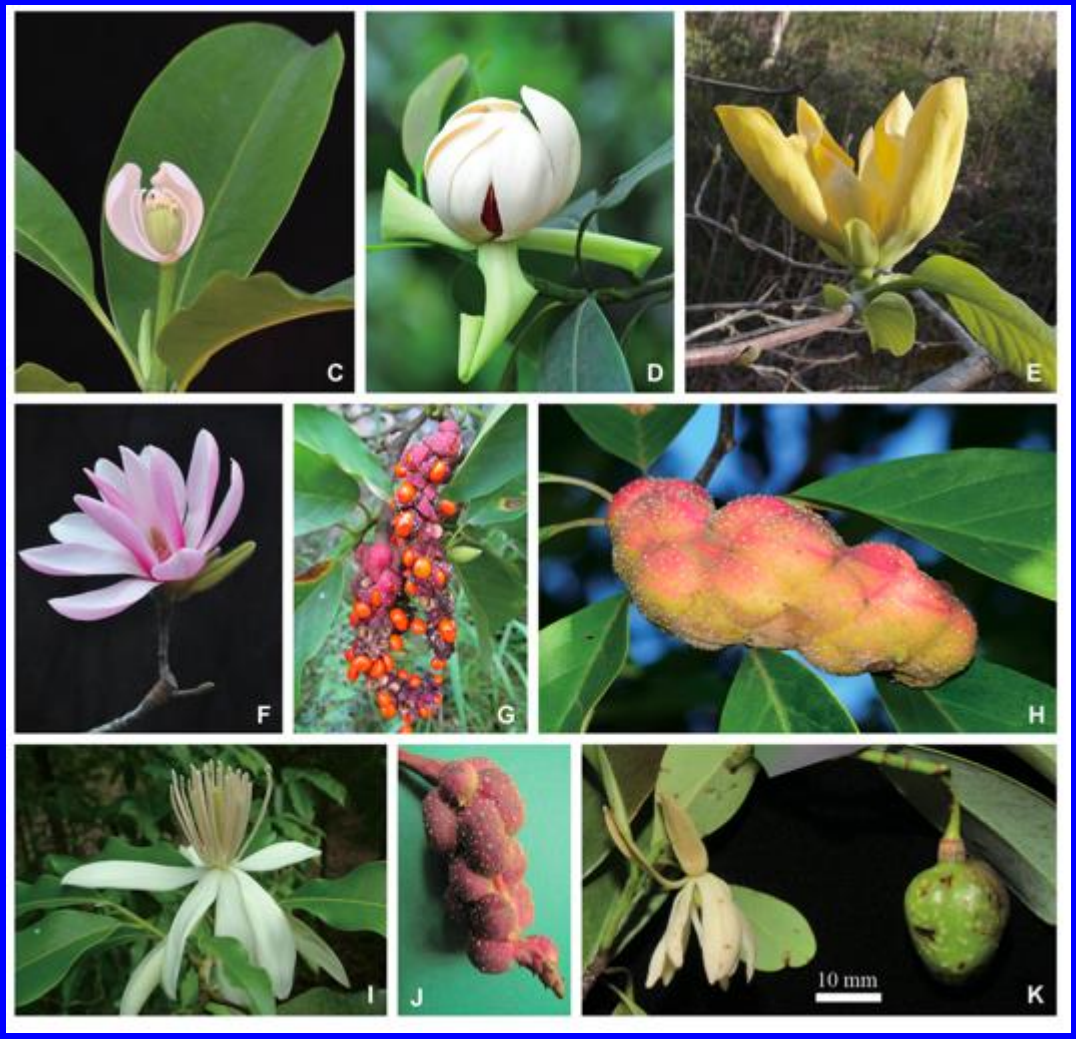
Magnolia sensu lato or sensu stricto?



Paul Goetghebeur, Botanical Garden Ghent University

Here is my answer: one magnificent genus Magnolia

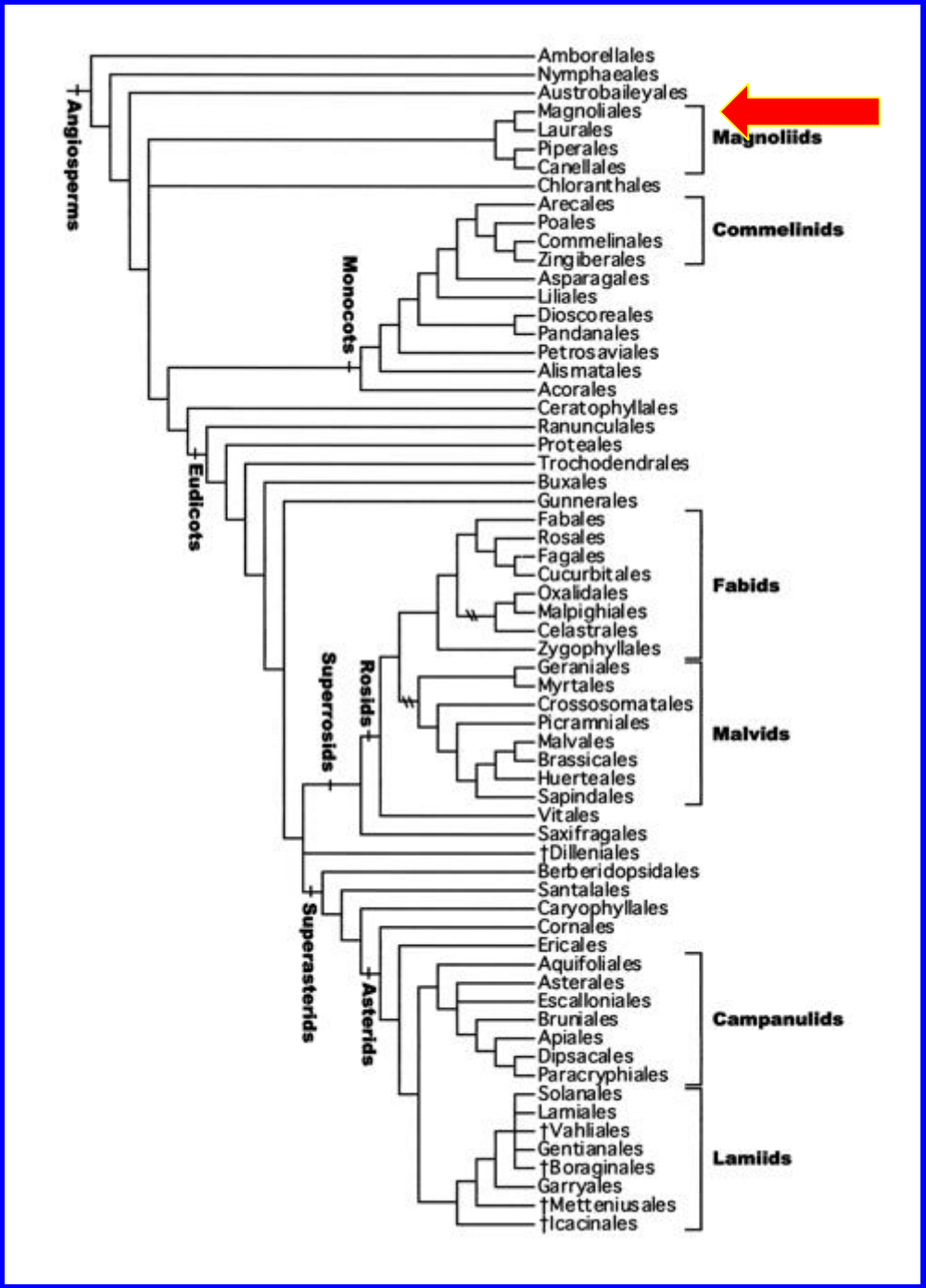
Introduction

APG IV (2016)

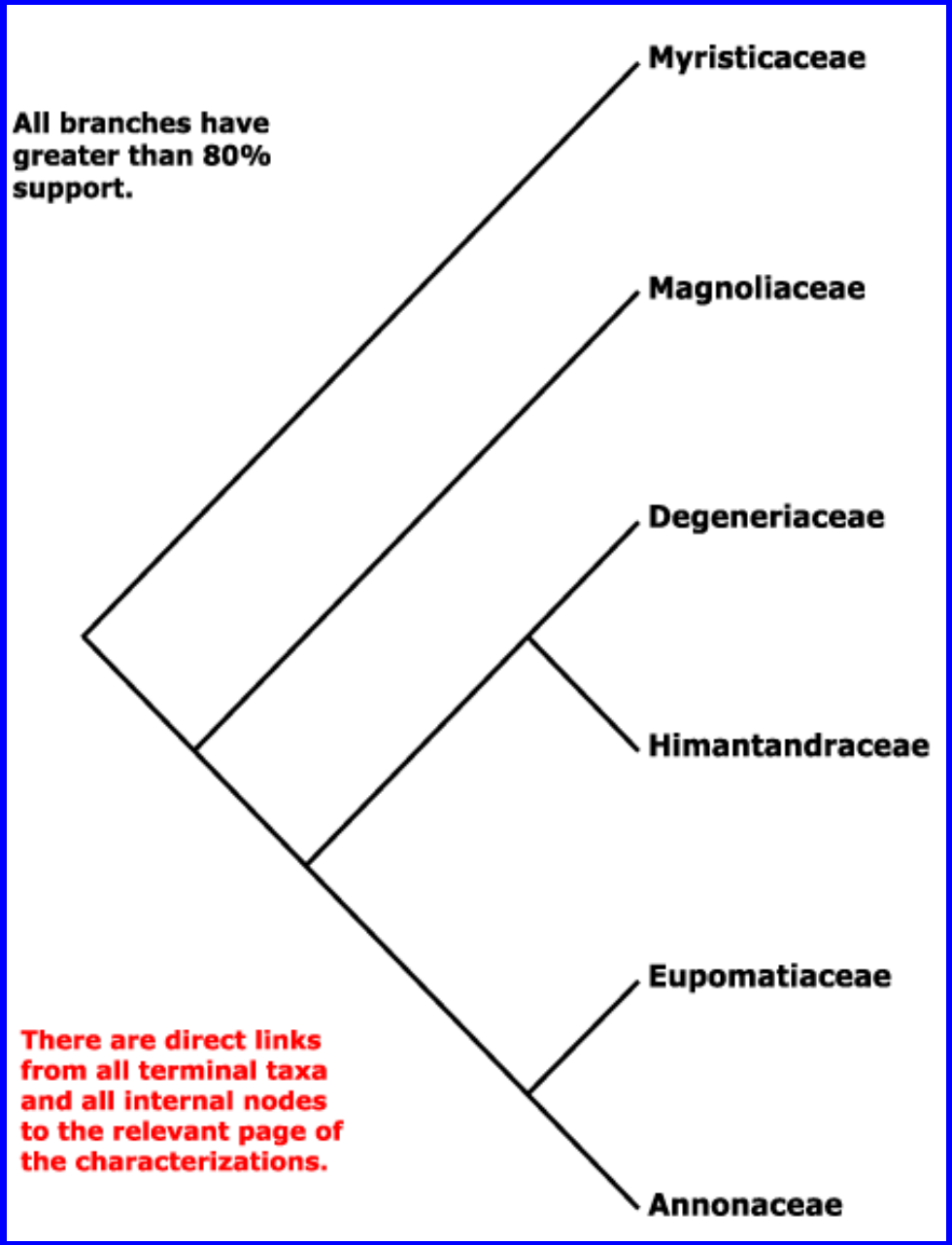
(Angiosperm Phylogeny Group)

Basal Angiosperms

Magnoliales



Magnoliales



Stevens 2001 onwards

Charles Plumier

NOVA PLANTARUM AMERICANARUM GENERA,

Authore P. CAROLO PLUMIER Ordinis Minimorum in Provincia Franciæ, & apud Insulas Americanas Botanico Regio.

PARISIIS,
Apud JOANNEM BOUDOT, Regis & Regiæ Scientiarum Academiæ Typographum, via Jacobæa, ad Solem Aureum.

M. DCCIII.

CUM PRIVILEGIO REGIS.

de posse debellari, si præcipue Galenicis præceptis chymica remedia veniant subsidio; specimen etiam plantarum, ubi plantæ quædam typis æneis perbelle exprimuntur. Opus extat apud Hadrianum Beys, Parisiis, an. 1611. in quarto.

ZANONIA.

Tab. 38. ZAnonia est plantæ genus flore A rosaceo, tribus scilicet petalis B constante, in orbem positis, & calyci C insidente infundibuli-formi; is autem calyx abit deinde in fructum D mollem, convolutum, succo plenum, & duobus ut plurimum seminibus E subrotundis fœtum.

Zanoniæ unicam novi speciem.

Zanonia graminea, perfoliata.

Clarissimus D. Jacobus Zanoni, Botanicus, & in Horto publico Bononiensi Præfectus, plantarum ab antiquis memoratarum discretor perspicacissimus, & dissertator sapientissimus, Historiam Botanicam edidit, in qua tum antiquorum, tum recentiorum plantæ non antea observatæ, ac ex variis orbis partibus advectæ, ad vivum tabulis æneis repræsentantur, & genuinis descriptionibus referuntur. Extat Opus Bononiæ apud Josephum Longhi 1675. fol.

MAGNOLIA.

Tab. 7. MAgnolia est plantæ genus flore A rosaceo, plurimis scilicet petalis I in orbem positis, constante; ex cujus calyce H surgit pistillum B, quod deinde abit in fructum C clavatum, durum, tuberosum, in quo veluti nidulantur L ossicula oblonga E, ejusdem figuræ nucleum F continentia.

Magnoliæ unicam speciem vidi.

Magnolia amplissimo flore albo, fructu cæruleo.

Clarissimus D. Petrus Magnol, Regis Consiliarius, in alma Monspelliensium Medicorum Academia Professor Regius, nec non ejusdem Horti Præfectus, & Professor Botanicus per triennium à Ludovico Magno designatus. Inter Botanicos nostri ævi fama magnus, & magna mercede dignus, ut qui à juvenilibus annis tum in Medicina edisscenda, tum in re Botanica amplificanda & illustranda, non sine fructu magno contulerit operam. Quam magnus sit ejus labor testatur Hortus Regius Monspeliensis, sive Catalogus plantarum quæ in Horto Regio Monspeliensi ab ipso sunt demonstratæ, in quo obscura multa illustravit, novarum aliquot plantarum icones & descriptiones dedit, ac virtutes etiam juxta Neotericorum principia breviter explicavit.

GUAIACUM.

GUaiacum est plantæ genus flore A rosaceo, plurimis scilicet petalis B in orbem positis, constante; e cujus calyce L surgit pistillum C, quod deinde abit in fructum D carnosum, subrotundum, ossiculo, aut ossiculis fœtum E ovatis H, & pulpa tenerrima involutis F G. Tab. 17.

Guaiaci species sunt.

Guaiacum flore cæruleo, fructu subrotundo.

Guaiacum flore cæruleo, fimbriato, fructu tetragono.

Guaiacum, vulgo Guaiac, nomen est Americanum, satis apud Europam notum.

CALABA.

CAlaba est plantæ genus flore A rosaceo, plurimis scilicet petalis B C in orbem positis, constante; e cujus calyce E surgit pistillum, quod deinde abit in fructum sphæricum F carnosum, ossiculo, seu semine fœtum G, ejusdem formæ nucleum includente H. Tab. 18.

Calabæ unicam novi speciem.

Calaba folio citrii splendente.

Calaba est nomen Americanum apud Caraibas vulgare.

BREYNIA.

BReynia est plantæ genus flore A rosaceo, plurimis scilicet petalis B in orbem positis, constante; ex cujus calyce C surgit pistillum G, quod deinde abit in fructum D, seu siliquam mollem, carnosam, seminibusque fœtam E reniformibus, & carnosis F. Tab. 16.


7
Magnolia
Hypericoides

Pierre Magnol

610. MAGNOLIA.* *Plum. 7. Dill. elth. 168.*

CAL. *Perianthium* triphyllum: *foliolis* ovatis, concavis, petaliformibus, deciduis.

COR. *Petala* novem, oblonga, concava, obtusa, basi angustiora.

STAM. *Filamenta* numerosa, brevia, acuminata, compressa, receptaculo communi pistillorum infra germina inserta. *Antheræ* lineares, margini filamentorum utrinque adnatæ.

PIST. *Germina* numerosa, ovato-oblonga, receptaculum clavatum tegentia. *Styli* recurvi, contorti, brevissimi. *Stigmata* longitudinalia styli, villosa.

PER. *Strobilus* ovatus: *Capsulis* compressis, subrotundis, vix imbricatis, confertis, acutis, unilocularibus, bivalvibus, sessilibus, extrorsum dehiscentibus, persistentibus.

SEM. solitaria, reniformia, filo pendentia ex sinu singulæ squamæ strobili.

611. MICHELIA.†

CAL. *Perianthium* nullum sed basis vestita cortice truncato.

COR. *Petala* octodecim, lanceolata; exterioribus majoribus.

STAM. *Filamenta* plurima, subulata, brevissima. *Antheræ* erectæ, acutæ.

PIST. *Germina* numerosa, in spicam oblongam imbricata. *Styli* nulli. *Stigmata* reflexa, obtusa.

PER. *Baccæ* totidem, globosæ, uniloculares, in racemum dispersæ.

SEM. quatuor, hinc convexa, inde angulata.

virginiana.

1. MAGNOLIA.
Magnolia foliis ovato-lanceolatis. *Hort. cliff.* 222. *Gron. virg.* 61. *Roy. lugdb.* 493.

glauca.

α. Magnolia foliis ovato-lanceolatis ſubtus glaucis. *Anon.* Magnolia lauri folio ſubtus albicante. *Catesb. car* 1. *p.* 39. *t.* 39. *Dill. eltb.* 207. *t.* 168. *f.* 205.
Tulipifera virginiana, laurinis foliis averſa parte rore cæruleo cinctis, coni-bacciſera. *Pluk. alm.* 379. *t.* 68. *f.* 4.

fœtida.

Laurus tulipifera, baccis calyculatis. *Raj. hiſt.* 1690.
β. Magnolia foliis ovato-oblongis ſubtus viridibus. *Anon.* Magnolia altiſſima, flore ingenti candido. *Catesb. car.* 2. *p.* 81. *t.* 81. *Ehret. pict.*
Magnolia ampliſſimo folio, fructu cæruleo. *Plum. gen.* 38.
Magnolia flore maximo albo fœtido, foliis deciduis amplis, florum ad ramulorum ſeriem ſphærice cingentibus, fructu majori. *Gron. virg.* 61.

griſea.

γ. Magnolia foliis ovato-oblongis ſubtus griſeis. *Anon.* Laurus tulipifera, foliis ſubtus ex cinereo aut argenteo purpuraſcentibus. *Raj. hiſt.* 1718.

tripetala.

δ. Magnolia ampliſſimo flore albo, fructu coccineo. *Catesb. car.* 2. *p.* 80. *t.* 80.

acuminata.

ε. Magnolia flore albo, folio majore acumniato haud albicante. *Catesb. car.* 2. *p.* 15. *t.* 15. *Gron. virg.* 61.
Habitat in Virginia, Carolina. ♄
Utrum hæ: α. β. γ. δ. ε. ſint diſtinctæ, determinent autoptæ in ſolo naturali? harum.
δ. Petalis tribus exterioribus reflexis.
ε. Foliis ovatis acuminatis.
β. Flore maximo & longiore in diametro quam foliorum longitudo & Foliis ſubtus griſeis.

MICHELIA.

Champaca.

1. MICHELIA. *Fl. zeyl.* 144.
Champacam. *Rheed. mal.* 1. *p.* 31. *t.* 19. *Raj. hiſt.* 1641.
Habitat in India. ♄

One single genus! Why?

Wang et al. 2020

Table 1 Classifications of the Magnoliaceae by different authors

Dandy (1927, 1950, 1974, 1978b)	Law (1984, 2000)	Nooteboom (1985,1987)	Figlar (2006)	Xia (2012)	Sima & Lu (2012)	This study
Tribe Magnolieae	**Subfam. Magnolioideae**	**Subfam. Magnolioideae**	**Subfam. Magnolioideae**	**Subfam. Magnolioideae**	**Subfam. Magnolioideae**	**Subfam. Magnolioideae**
Genus *Magnolia*	**Tribe Magnolieae**	**Tribe Magnolieae**	Genus *Magnolia*	**Tribe Magnolieae**	**Tribe Magnolieae**	Genus *Magnolia*
Subgen. *Magnolia*	Subtribe Manglietiinae	Genus *Magnolia*	Subgen. *Magnolia*	Genus *Houpoea*	Genus *Paramagnolia*	Sect. *Splendentes*
Sect. *Rytidospermum*	Genus *Manglietia*	Subgen. *Magnolia*	Sect. *Auriculata*	Genus *Oyama*	Genus *Metamagnolia*	Sect. *Talauma*
Sect. *Oyama*	Genus *Manglietiastrum*	Sect. *Rytidospermum*	Sect. *Macrophylla*	Genus *Lirianthe*	Genus *Houpoea*	Sect. *Gwillimia*
Sect. *Lirianthe*	Genus *Pachylarnax*	Sect. *Oyama*	Sect. *Rytidospermum*	Genus *Magnolia*	Genus *Oyama*	Sect. *Tuliparia*
Sect. *Gwillimia*	Subtribe Magnoliinae	Sect. *Lirianthe*	Subsect. *Rytidospermum*	Genus *Pachylarnax*	Genus *Lirianthe*	Sect. *Macrophylla*
Sect. *Magnolia*	Genus *Magnolia*	Sect. *Gwillimia*	Subsect. *Oyama*	Genus *Parakmeria*	Genus *Magnolia*	Sect. *Magnolia*
Sect. *Theorhodon*	Genus *Talauma*	Sect. *Magnolia*	Sect. *Gwillimia*	Genus *Talauma*	Genus *Pachylarnax*	Sect. *Rytidospermum*
Sect. *Gynopodium*	Genus *Dugandiodendron*	Sect. *Theorhodon*	Subsect. *Gwillimia*	Genus *Dugandiodendron*	Genus *Talauma*	Sect. *Oyama*
Sect. *Maingola*	Genus *Aromadendron*	Sect. *Gynopodium*	Subsect. *Blumiana*	Genus *Kmeria*	Genus *Dugandiodendron*	Sect. *Gynopodium*
Subgen. *Yulania*	Genus *Parakmeria*	Sect. *Maingola*	Sect. *Magnolia*	Genus *Woonyoungia*	Genus *Kmeria*	Sect. *Kmeria*
Sect. *Yulania*	Genus *Kmeria*	Sect. *Alcimandra*	Sect. *Talauma*	Genus *Manglietia*	Genus *Manglietia*	Sect. *Manglietia*
Sect. *Buergeria*	Genus *Woonyoungia*	Subgen. *Yulania*	Subsect. *Talauma*	**Tribe Michelieae**	**Tribe Michelieae**	Sect. *Tulipastrum*
Sect. *Tulipastrum*	Subtribe Alcimandriinae	Sect. *Yulania*	Subsect. *Dugandiodendron*	Genus *Yulania*	Genus *Yulania*	Sect. *Yulania*
Genus *Pachylarnax*	Genus *Alcimandra*	Sect. *Buergeria*	Subsect. *Cubenses*	Genus *Michelia*	Genus *Michelia*	Sect. *Maingola*
Genus *Parakmeria*	**Tribe Michelieae**	Sect. *Tulipastrum*	Sect. *Kmeria*	Genus *Elmerrillia*	Genus *Aromadendron*	Sect. *Michelia*
Genus *Talauma*	Genus *Elmerrillia*	Subgen. *Talauma*	Sect. *Manglietia*	Genus *Aromadendron*	**Subfam. Liriodendroideae**	**Subfam. Liriodendroideae**
Genus *Kmeria*	Genus *Michelia*	Sect. *Talauma*	Subgen. *Yulania*	Genus *Alcimandra*	Genus *Liriodendron*	Genus *Liriodendron*
Genus *Manglietia*	Genus *Paramichelia*	Sect. *Blumiana*	Sect. *Yulania*	**Subfam. Liriodendroideae**		
Genus *Michelia*	Genus *Tsoongiodendron*	Sect. *Aromadendron*	Subsect. *Yulania*	Genus *Liriodendron*		
Genus *Elmerrillia*	**Subfam. Liriodendroideae**	Sect. *Manglietastrum*	Subsect. *Tulipastrum*			
Genus *Tsoongiodendron*	Genus *Liriodendron*	Genus *Pachylarnax*	Sect. *Michelia*			
Genus *Aromadendron*		Genus *Kmeria*	Subsect. *Michelia*			
Genus *Alcimandra*		Genus *Manglietia*	Subsect. *Elmerrillia*			
Tribe Liriodendreae		**Tribe Michelieae**	Subsect. *Aromadendron*			
Genus *Liriodendron*		Genus *Michelia*	Subsect. *Maingola*			
		Genus *Elmerrillia*	Subgen. *Gynopodium*			
		Subfam. Liriodendroideae	Sect. *Manglietiastrum*			
		Genus *Liriodendron*	Sect. *Gynopodium*			
			Subfam. Liriodendroideae			
			Genus *Liriodendron*			

11 ***15*** ***6*** ***1*** ***16*** ***14*** ***1 genus***

Very slow evolutionary rate in the family

Very low number of polyploids in the family

WGD (whole genome duplication) may lead to a genomic combination that generates evolutionary novelty

Polyploidy may serve as a catalyst for diversification

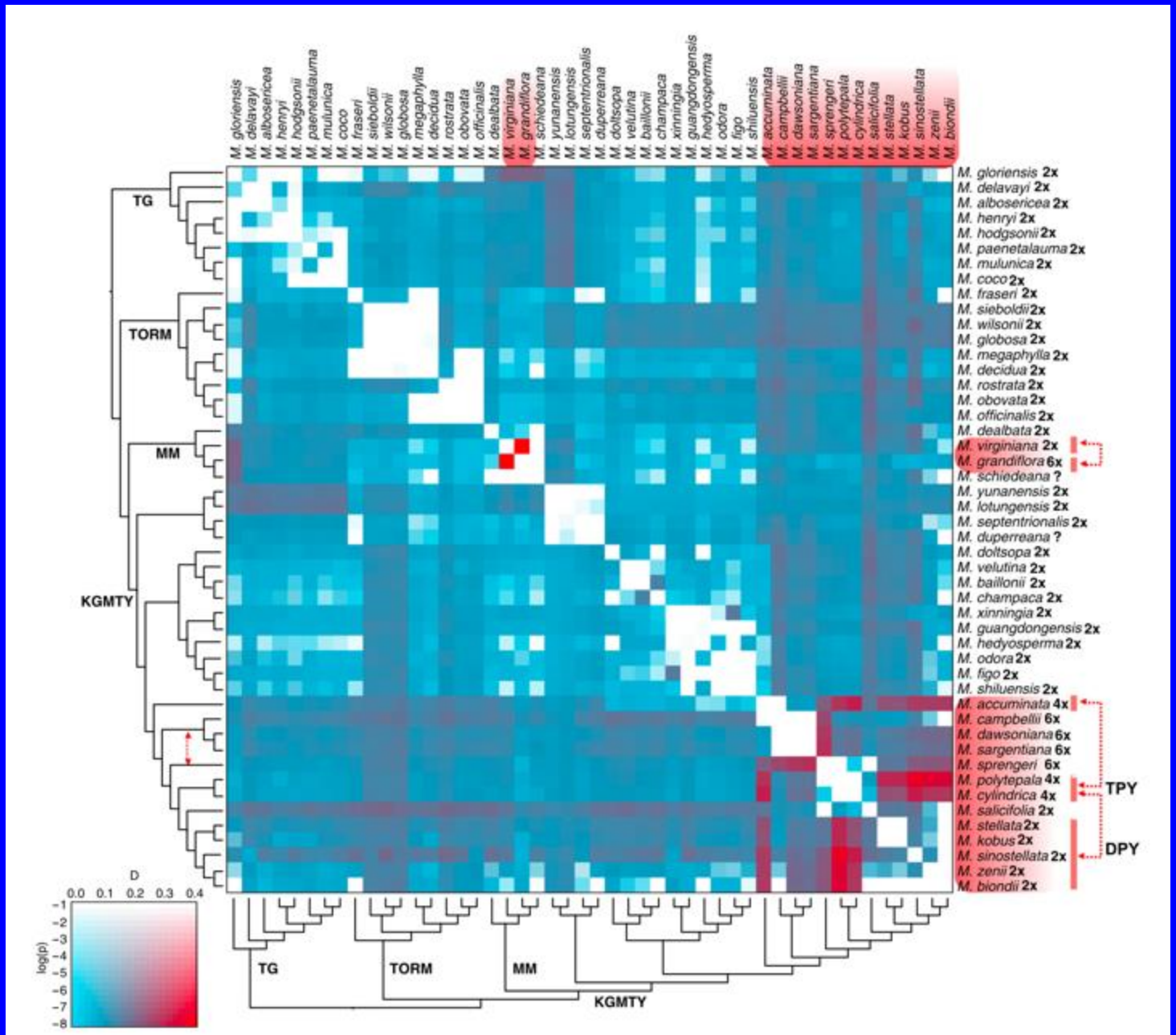


Fig. 2. Detection of introgression events using Patterson's *D*-statistic among different *Magnolia* species.

Dong et al. 2021

Easy hybridization between species from different sections, often producing fertile hybrids

de Spoelberch 1998
Magnolia acuminata (Tulipastrum) x Magnolia denudata (Yulania)
Magnolia tripetala (Rytidospermum) x Magnolia virginiana (Magnolia)
Magnolia tripetala (Rytidospermum) x Magnolia sieboldii (Oyama)
Magnolia obovata (Rytidospermum) x Magnolia virginiana (Magnolia)
Magnolia obovata (Rytidospermum) x Magnolia sieboldii (Oyama)

Lorentzon 1998
Magnolia obovata (Rytidospermum) x Magnolia wilsonii (Oyama)
Magnolia acuminata (Tulipastrum) x Magnolia liliifora (Yulania)

Gong et al. 2001
Magnolia delavayi (Gwillimia) x Parakmeria lotungensis (Gynopodium)

Wang et al. 2005
Magnolia “guangnanensis” (Manglietia) x henryi (Gwillimia)

Lobdell 2021
Magnolia acuminata (Tulipastrum) x campbellii (Yulania)
Magnolia acuminata (Tulipastrum) x denudata (Yulania)
Magnolia acuminata (Tulipastrum) x figo (Michelia)
Magnolia acuminata (Tulipastrum) x kobus (Yulania)
Magnolia acuminata (Tulipastrum) x sargentiana (Yulania)
Magnolia acuminata (Tulipastrum) x sprengeri (Yulania)
Magnolia acuminata (Tulipastrum) x stellata (Yulania)
Magnolia coco (Gwillimia) x grandiflora (Magnolia)
Magnolia globosa (Oyama) x obovata (Rytidospermum)
Magnolia globosa (Oyama) x virginiana (Magnolia)
Magnolia insignis (Manglietia) x virginiana (Magnolia)
Magnolia liliiflora (Yulania) x foveolata (Michelia)
Magnolia liliiflora (Yulania) x laevifolia (Michelia)
Magnolia obovata (Rytidospermum) x fraseri (Tuliparia)
Magnolia sieboldii (Oyama) x grandiflora (Magnolia)
Magnolia sieboldii (Oyama) x macrophylla (Macrophyllae)
Magnolia sieboldii (Oyama) x tripetala (Rytidospermum)
Magnolia virginiana (Magnolia) x macrophylla (Macrophyllae)
Magnolia virginiana (Magnolia) x macrophylla (Macrophyllae)

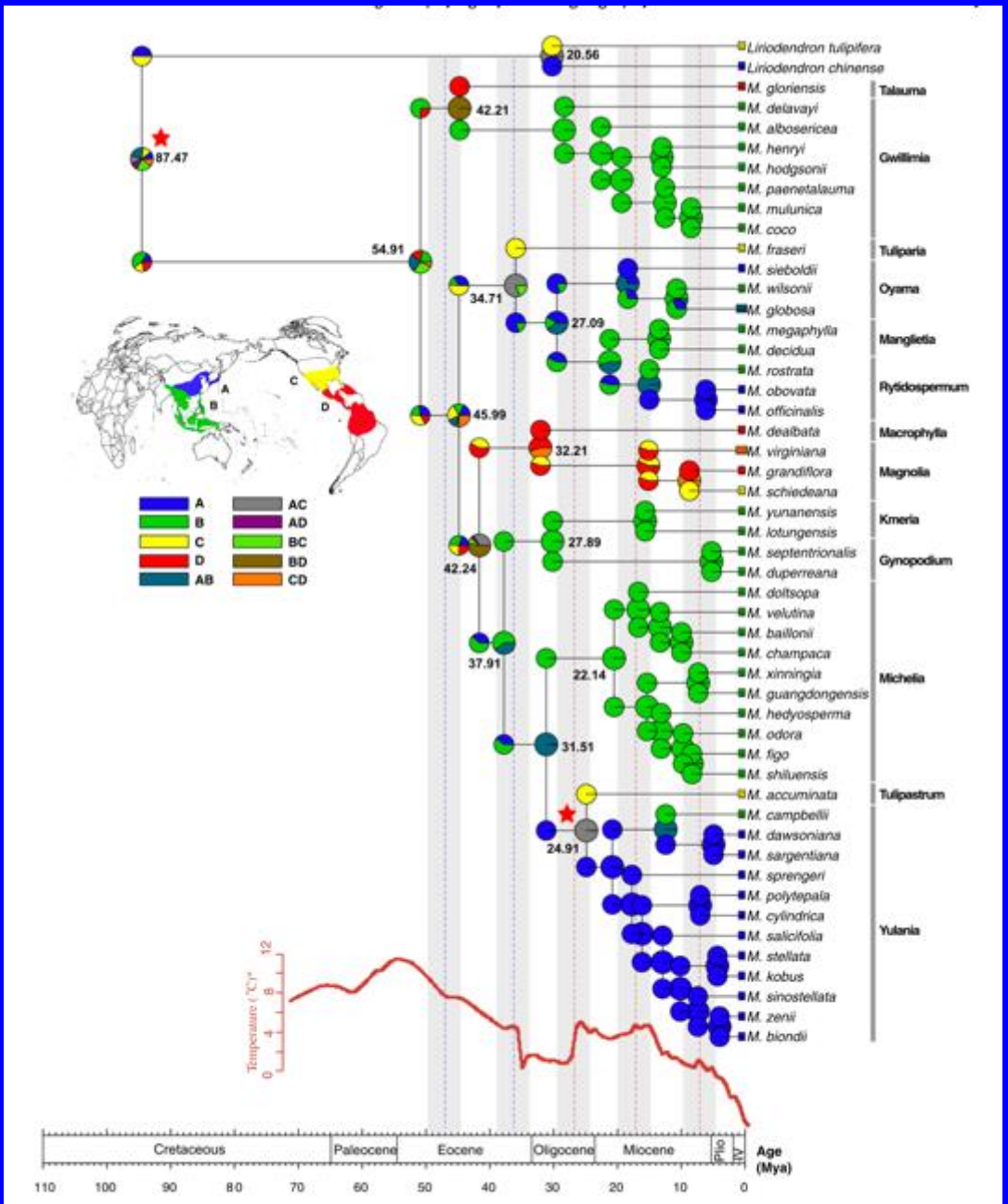


Fig. 3. Historical biogeography of *Magnolia* based on the analysis of the nuclear single nucleotide polymorphism dataset, using two calibration points (indicated by red stars). The root age is set to 70–110 Mya (uniform distribution) following Nie et al. (2008), and the stem age of sect. *Yulania* is set to 25 Mya (standard deviation of 1.0) following Azuma et al. (2001). The world map was downloaded from the official website of the Ministry of Natural Resources of China (http://bzdt.ch.mnr.gov.cn/).

Dong et al. 2021

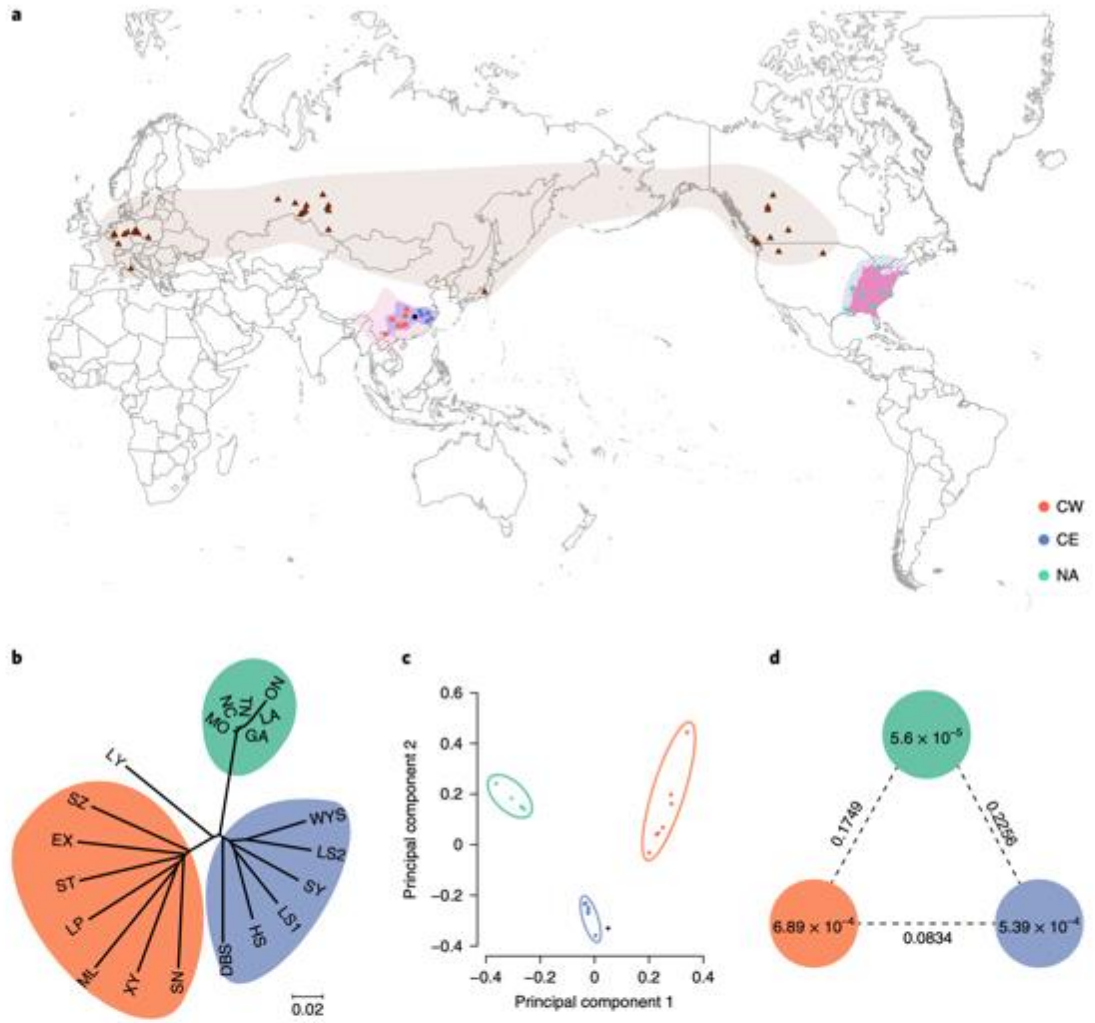
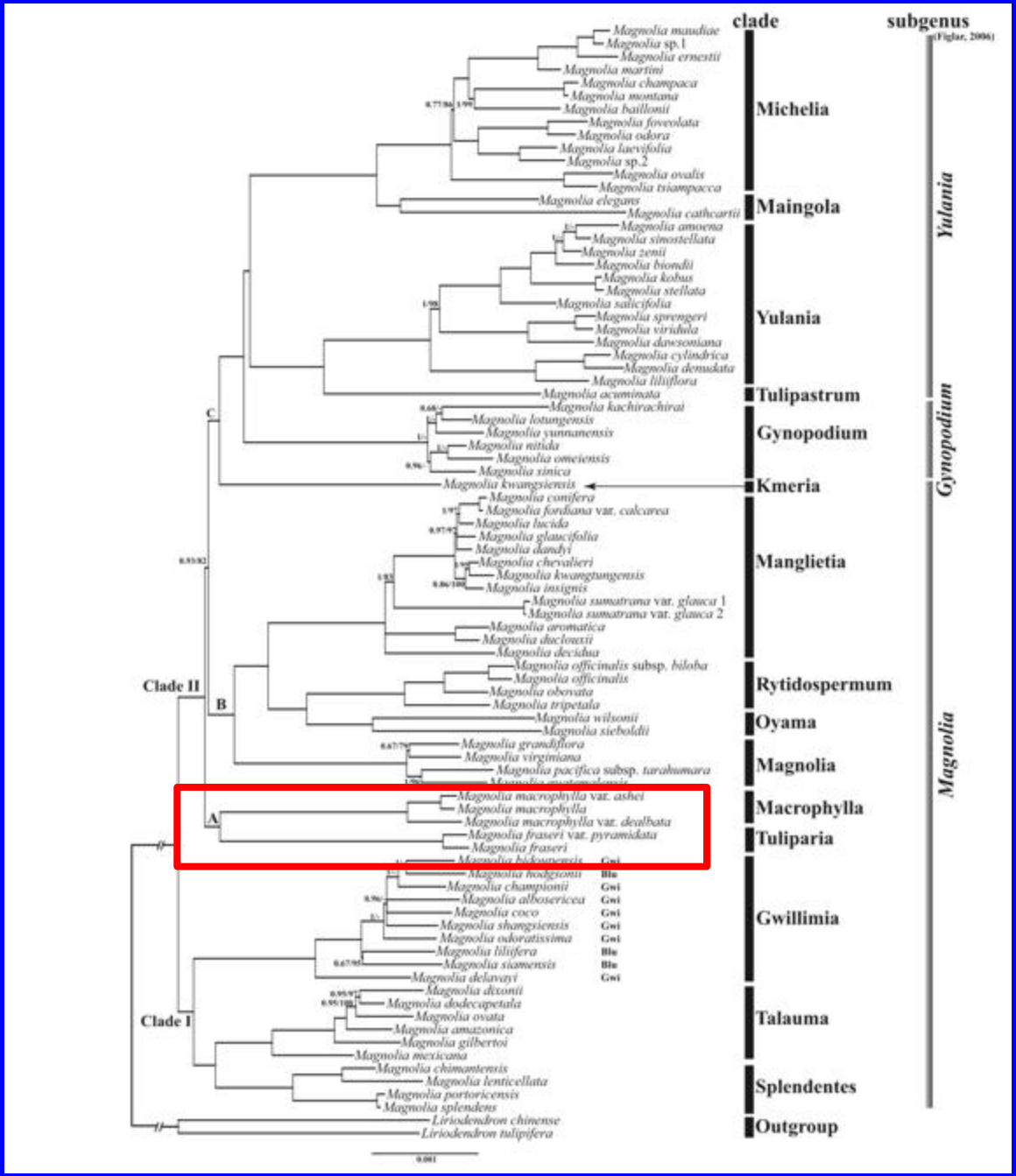


Fig. 3 | Geographic distribution and population diversity of *Liriodendron* accessions. a, Geographic distribution of *Liriodendron* accessions. Brown triangles represent the fossil distribution of *Liriodendron* plants in high-latitude regions of the Northern Hemisphere. Fringe patterns show two principal refugia where Tertiary relict floras occurred: southern East Asia and eastern North America. The natural distributions of *L. chinense* and *L. tulipifera* are plotted, with coloured dots representing individual *Liriodendron* accessions. **b**, Neighbour-joining tree of all accessions constructed from whole-genome SNPs. Accessions coming from the same geographic areas are grouped together and coloured corresponding to the colours used in **a**. LY, Liu Yang; SZ, Sang Zhi; EX, E Xi; ST, Song Tao; LP, Li Ping; ML, Meng La; XY, Xu Yong; SN, Sui Ning; DBS, DaBie Shan; HS, Huang Shan; LS1, Lushan_1; SY, Song Yang; LS2, Lushan_2; WYS, WuYi Shan; ON, Ontario; LA, Louisiana; GA, Georgia; TN, Tennessee; NC, North Carolina; MO, Missouri. **c**, Principal component analysis plots of the first two components for all 20 accessions, with dots coloured corresponding to their provenances. **d**, Nucleotide diversity (π) and population divergence (F_{ST}) across the three groups. The value in each circle represents a measure of nucleotide diversity for this group, and the value on each line indicates the population divergence between the two groups.

Chen et al. 2019

A survey of the 15 sections recognized by Wang et al. 2020 & Dong et al. 2021



Wang et al. 2020

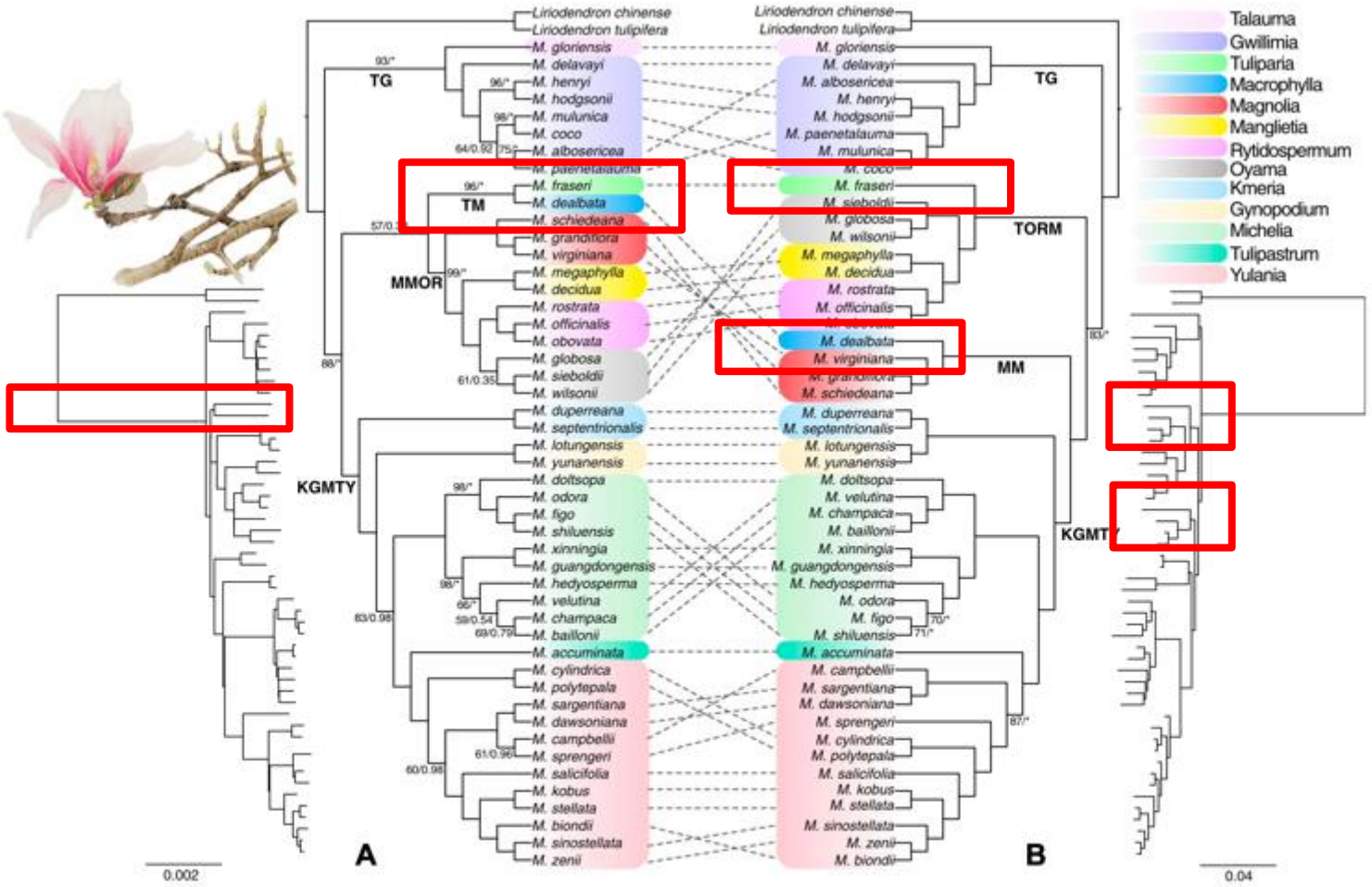
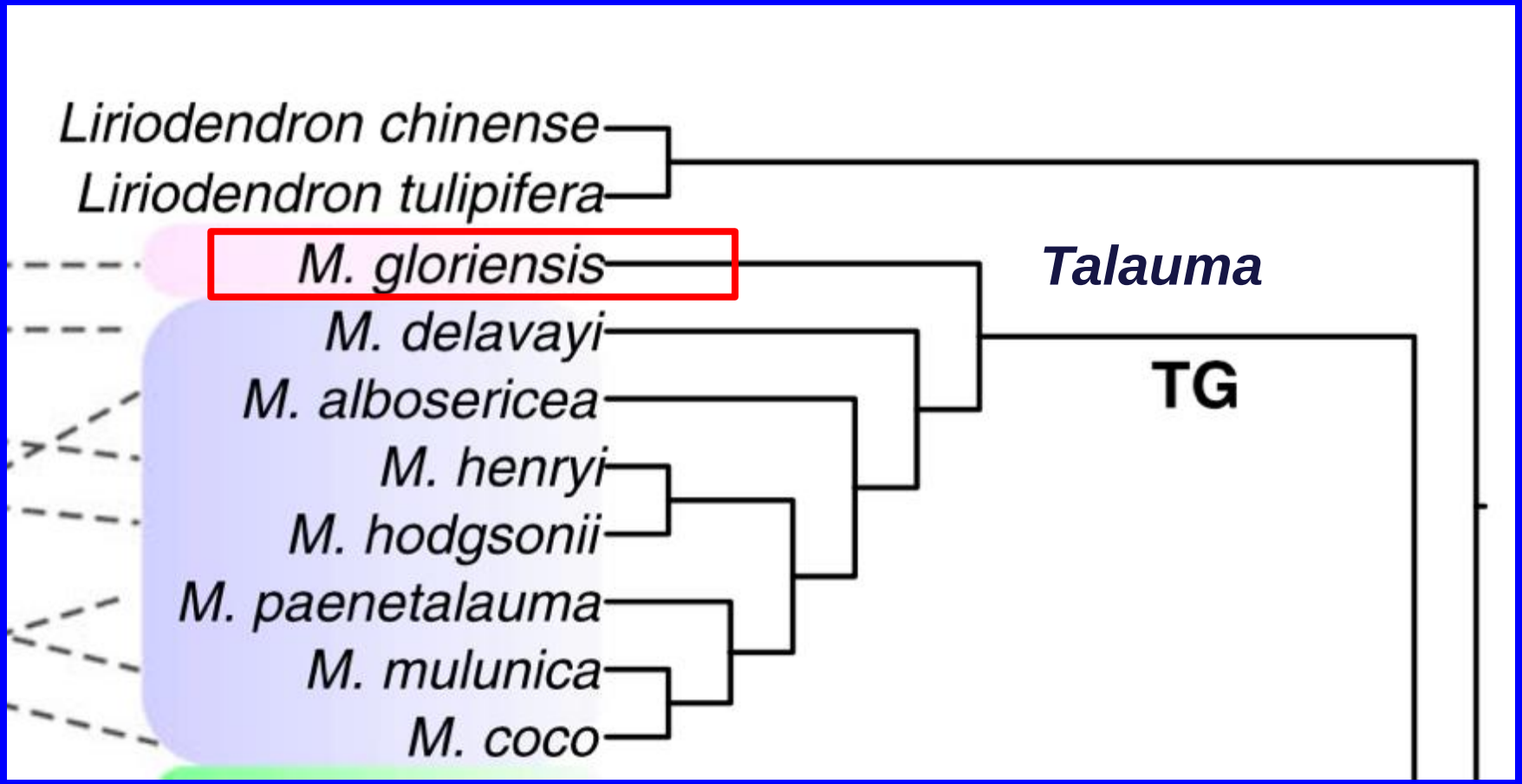


Fig. 1. Plastid and nuclear incongruences of *Magnolia*. **A,** Plastid maximum likelihood (ML) tree inferred from a concatenated nucleotide dataset of 75 protein-coding genes (PCGs). **B,** Nuclear ML tree inferred from concatenated 1 323 643 single nucleotide polymorphism loci within regions of 3745 single copy PCGs. Branches were maximally supported by the ML or Bayesian methods unless otherwise indicated. Asterisk indicates branches maximally supported by either method. Dashed gray lines connect taxa between the two phylogenies.

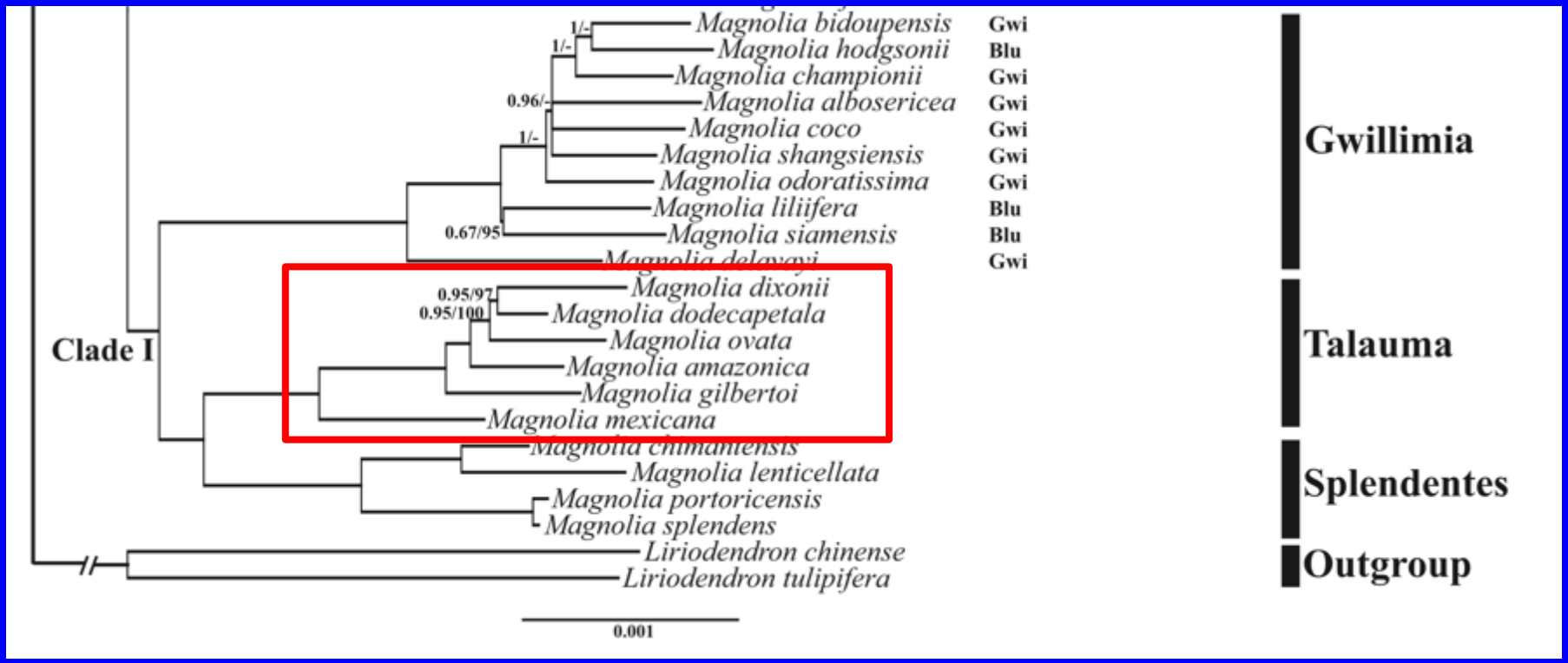
Dong et al. 2021

	AM	AS
Talauma	94	0
Splendentes	28	0
Gwillimia	0	30
Tuliparia	1	0
Oyama	0	4
Rytidospermum	1	3
Manglietia	0	41
Magnolia	39	0
Macrophyllae	10	0
Kmeria	0	3
Gynopodium	0	8
Tulipastrum	1	0
Yulania	0	26
Maingola	0	12
Michelia	0	61
Total	174	188

(1) sectio Talauma
(genus Talauma)



Dong et al. 2021



Wang et al. 2020

Plants evergreen

Petiole with large scars of stipules

Stamens caducous in male flowering phase

Anthers with introrse opening

Gynoecium sessile

Ovules 2 per carpel

Carpels opening circumscissile

Stomata of Baranova type 5

Magnolia chiguila

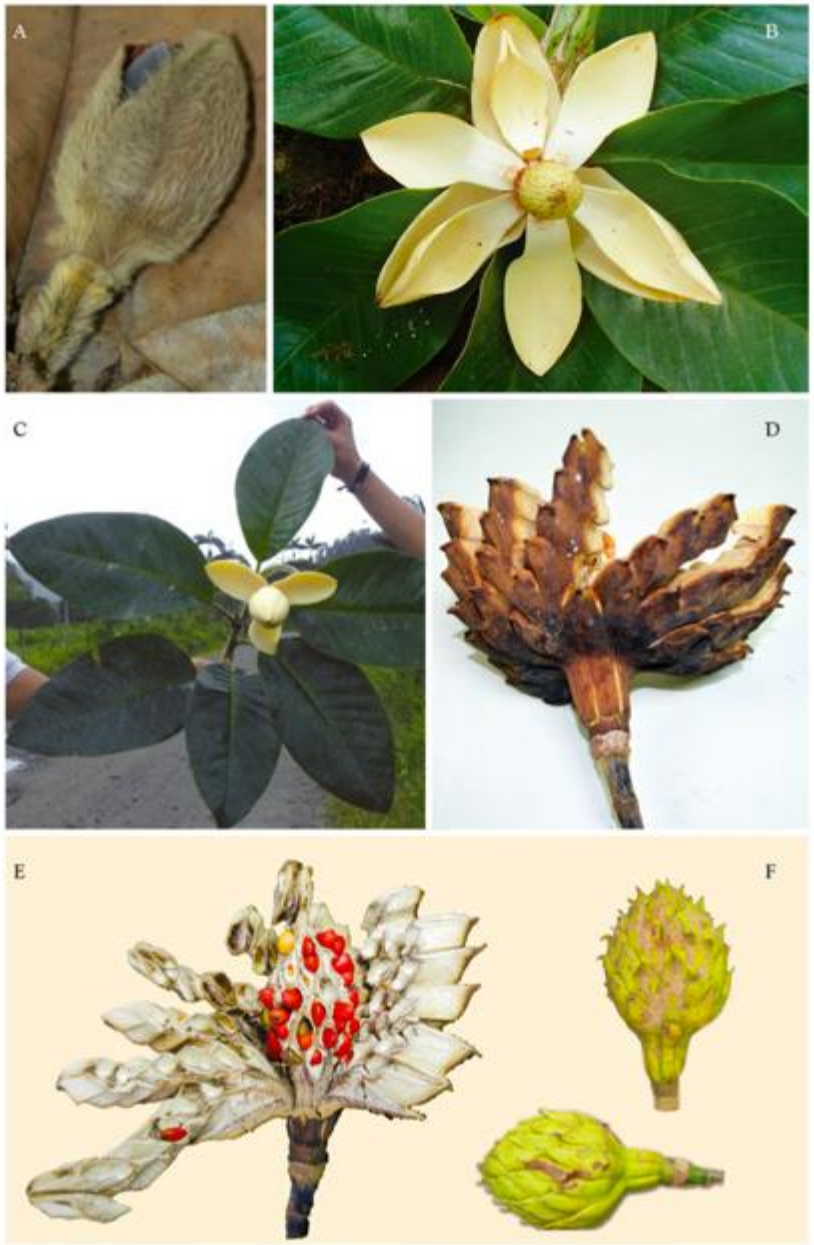


FIGURE 2. *Magnolia chiguila*. A. Flora bud (dried specimen). B. Flower in male phase. C. Flowering branch with flower in female phase. D. Outer side of fruit (dried). E. Inner side of fruit and seeds, during dehiscence. F. Mature fruit before dehiscence. Photographs: B–C and E–F by Álvaro J. Pérez; A, D by Antonio Vázquez; all from the holotype.

Perez et al. 2016

Magnolia pajarito

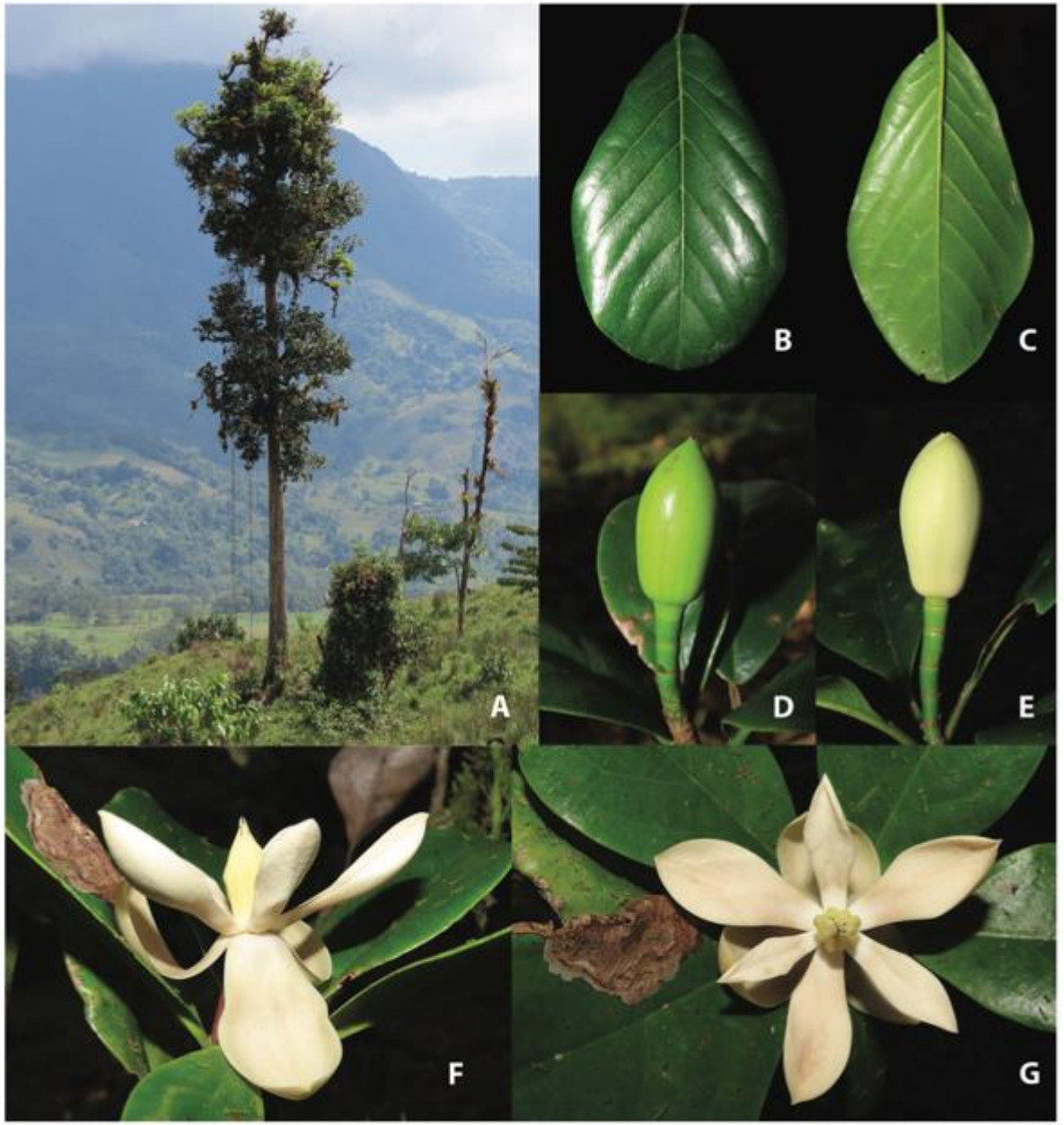


FIGURE 2. *Magnolia pajarito* Aymard, Rodríguez-D. & M. Escobar. **A**, Habit; **B**, Leaf adaxial size partially showing the canaliculate scar along the petiole; **C**, Leaf abaxial surface; **D**, Flower bud with spathaceous bract; **E**, Flower bud without spathaceous bract showing one of the sepals in the foreground; **F**, Flower, lateral view; **G**, Flower, upper view. Photographs by D. Rodríguez-D.

Rodriguez-Duque et al.2022

Magnolia mindoensis

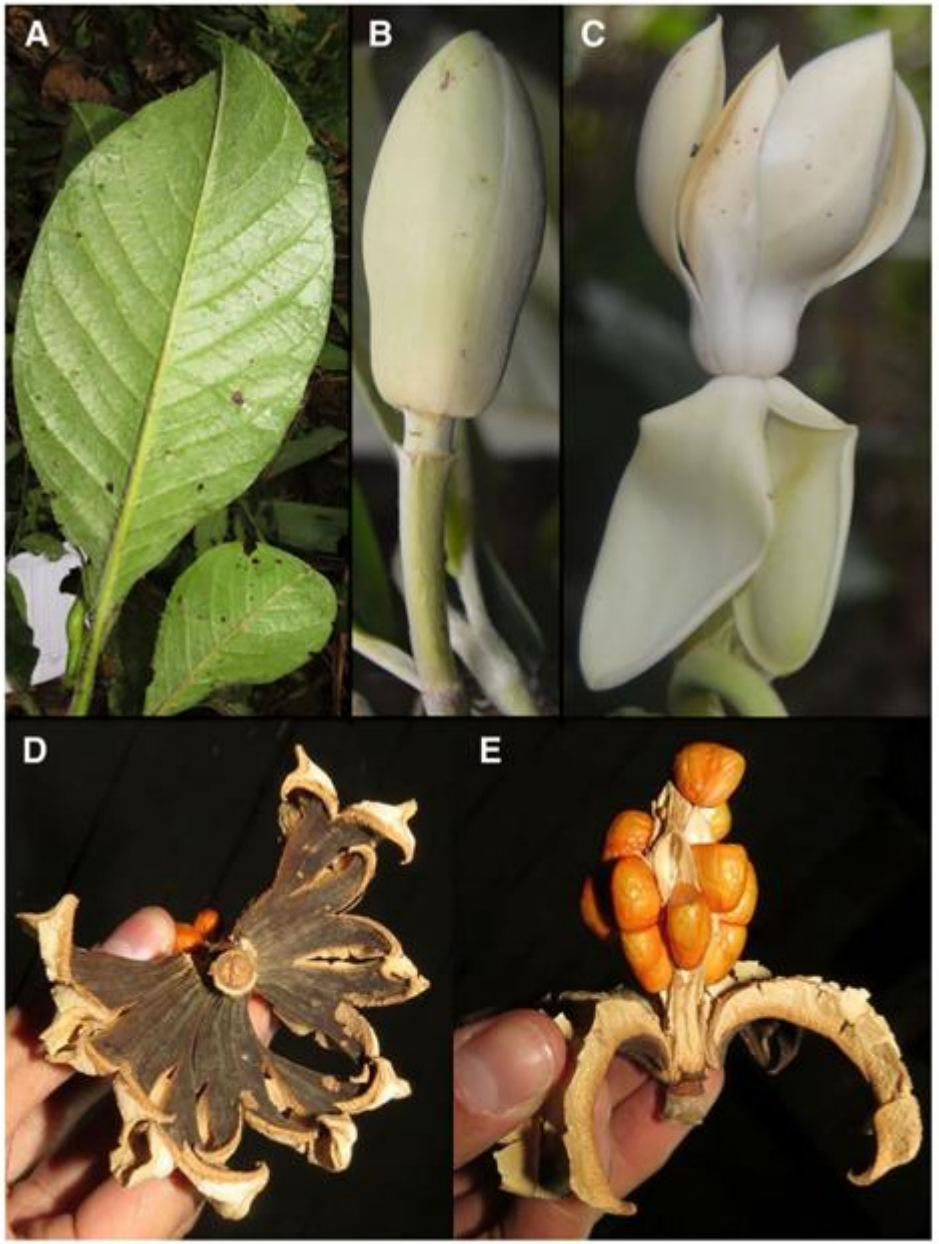


Fig. 2. *Magnolia mindoensis*. **A.** Hoja. **B.** Botón floral sin bráctea. **C.** Flor cerrando en primer día de apertura, fase femenina. **D.** Fruto visto por el dorso. **E.** Fruto con semillas durante la dehiscencia. (Fotografías A, D–E de *S.M. Urbano 1180* (COL) por Sandra M. Urbano-Apraez; B–C del holotipo (ECUAMZ), por Alex Dahua.).

Vazquez-Garcia et al. 2017

Magnolia brasiliensis

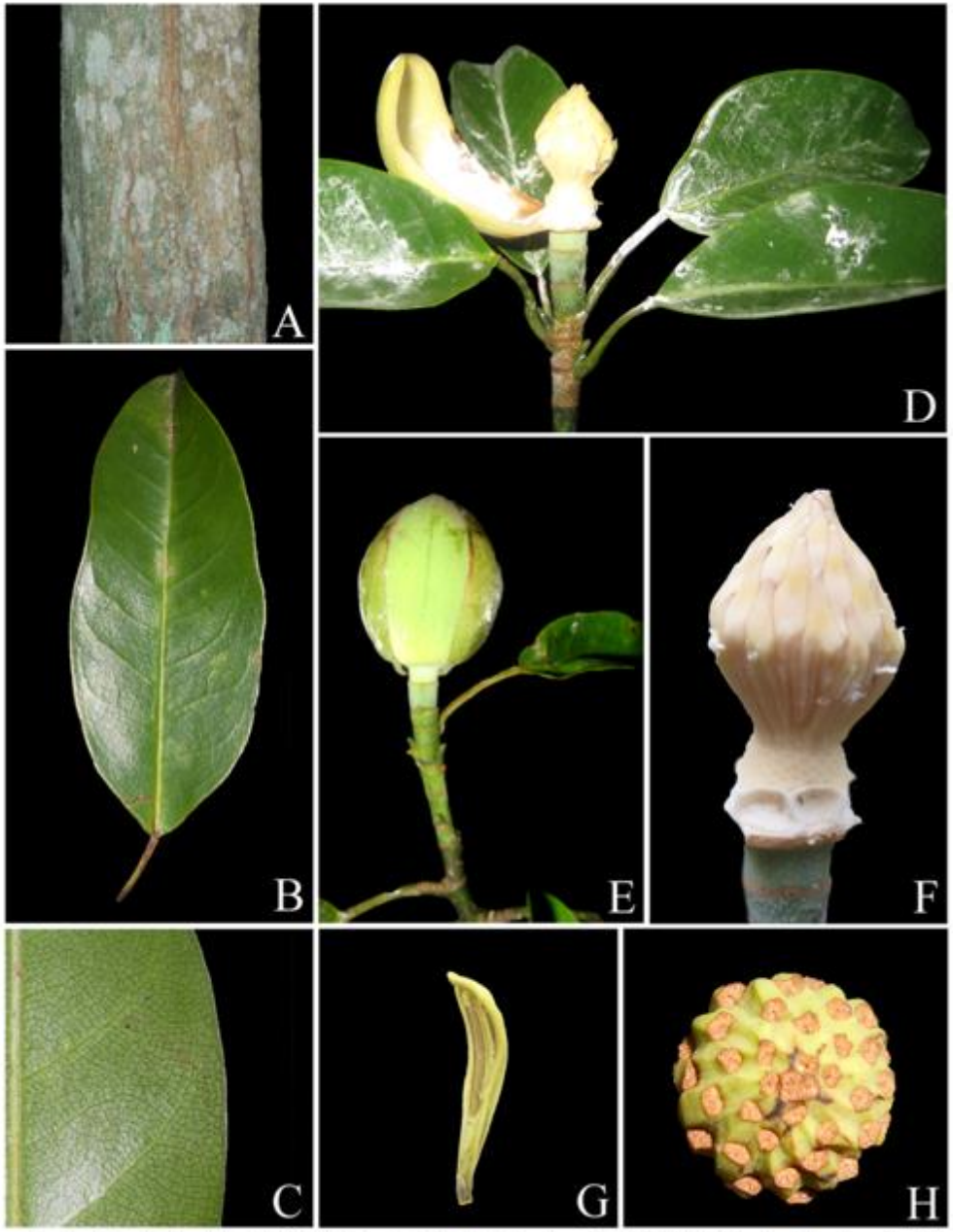
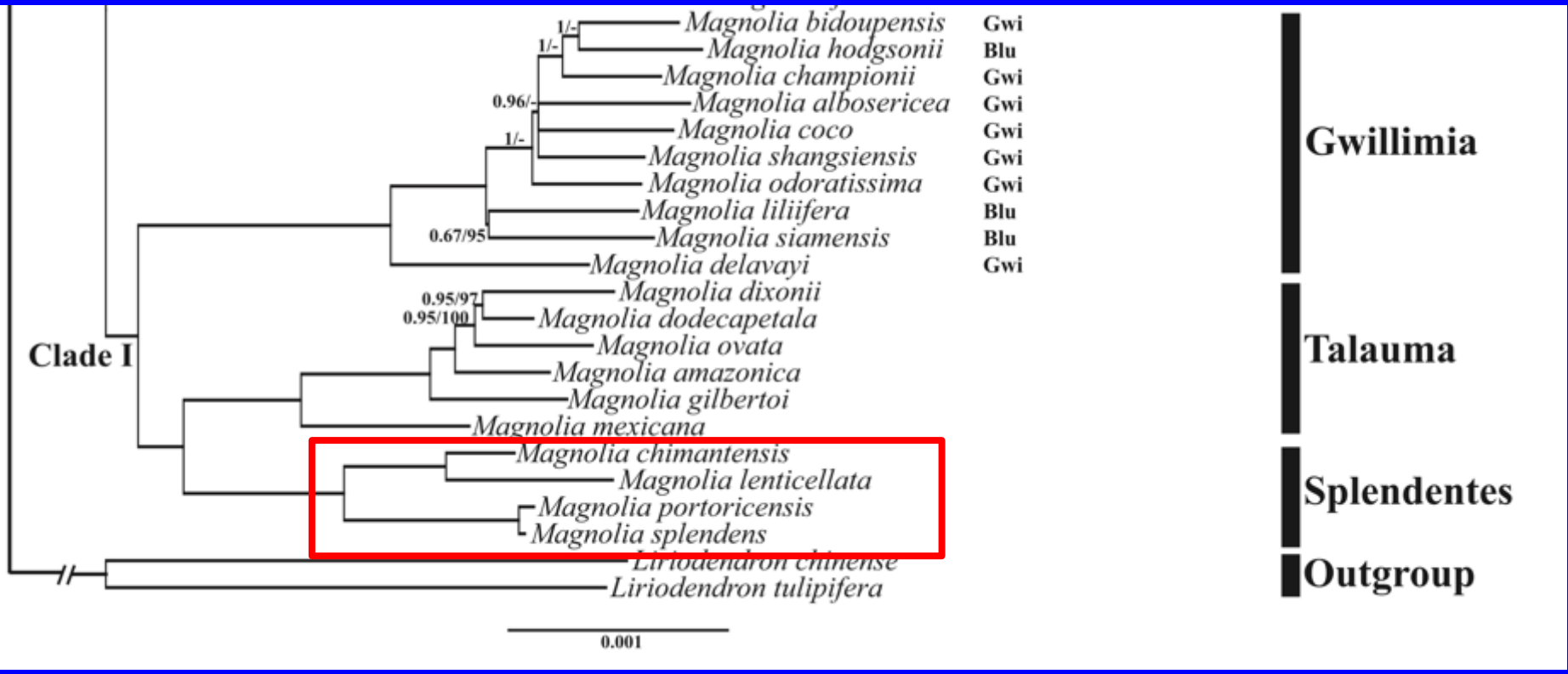


FIG. 1. *Magnolia brasiliensis*. **A**. Detail of the trunk. **B**. Adaxial surface of leaf. **C**. Detail of the abaxial surface of leaf. **D**. Branch with a senescent flower (with just one sepal). **E**. Branch with floral bud. **F**. Gynoecium, with sepals, petals and stamens removed. **G**. Stamen. **H**. Apical view of immature fruit. Photos: A–C and G, by L. C. Marinho, D–F and H, by C. O. Azevedo.

Azevedo et al. 2018

(2) sectio Splendentes
(genus Dugandiodendron)



Wang et al. 2020

Plants evergreen

Stipules (nearly) free from the petiole

Stamens with long connective embedded in gynoecium

Anthers with introrse opening

Carpels opening longitudinally or circumscissile

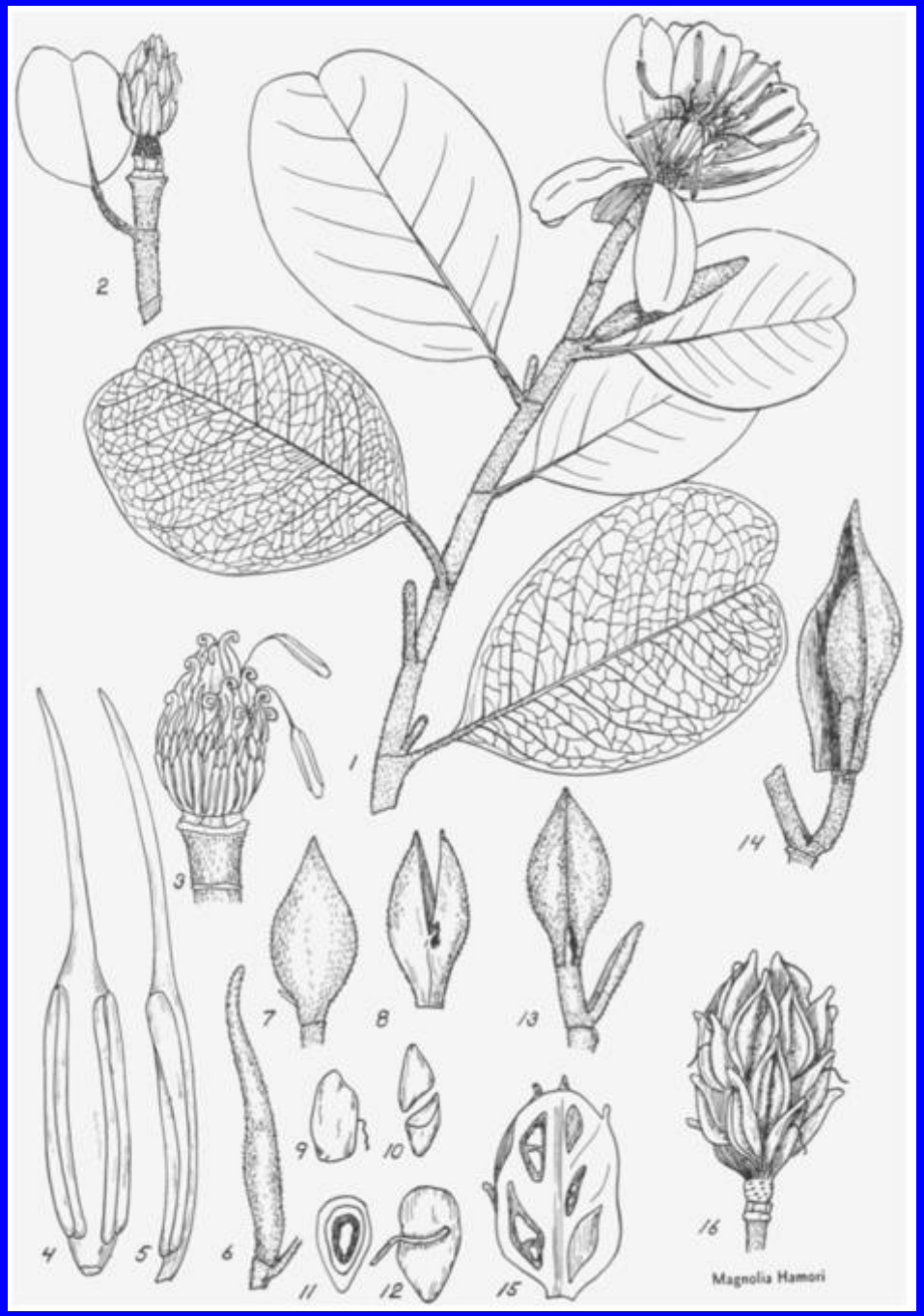
Stomata of Baranova types 2 & 3

Magnolia bankardiorum

Figura 16. *Magnolia bankardiorum* M.O. Dillon & Sánchez Vega. A) Rama. B) Detalle de la flor. Espécimen Arroyo & Pérez 291 (QCA).

Dillon & Sánchez-Vega 2009

Magnolia hamorii



Howard 1948

Magnolia jaenensis

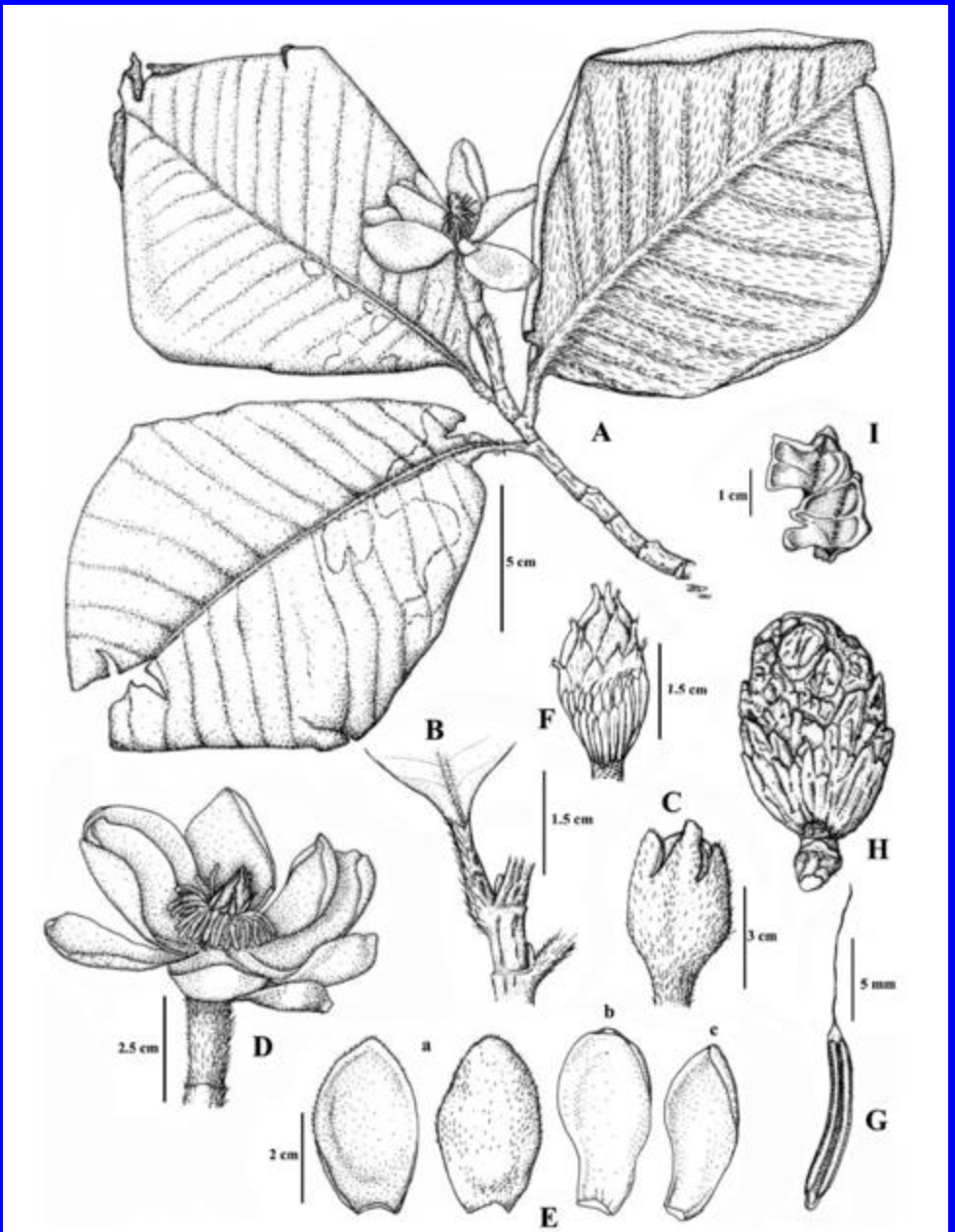
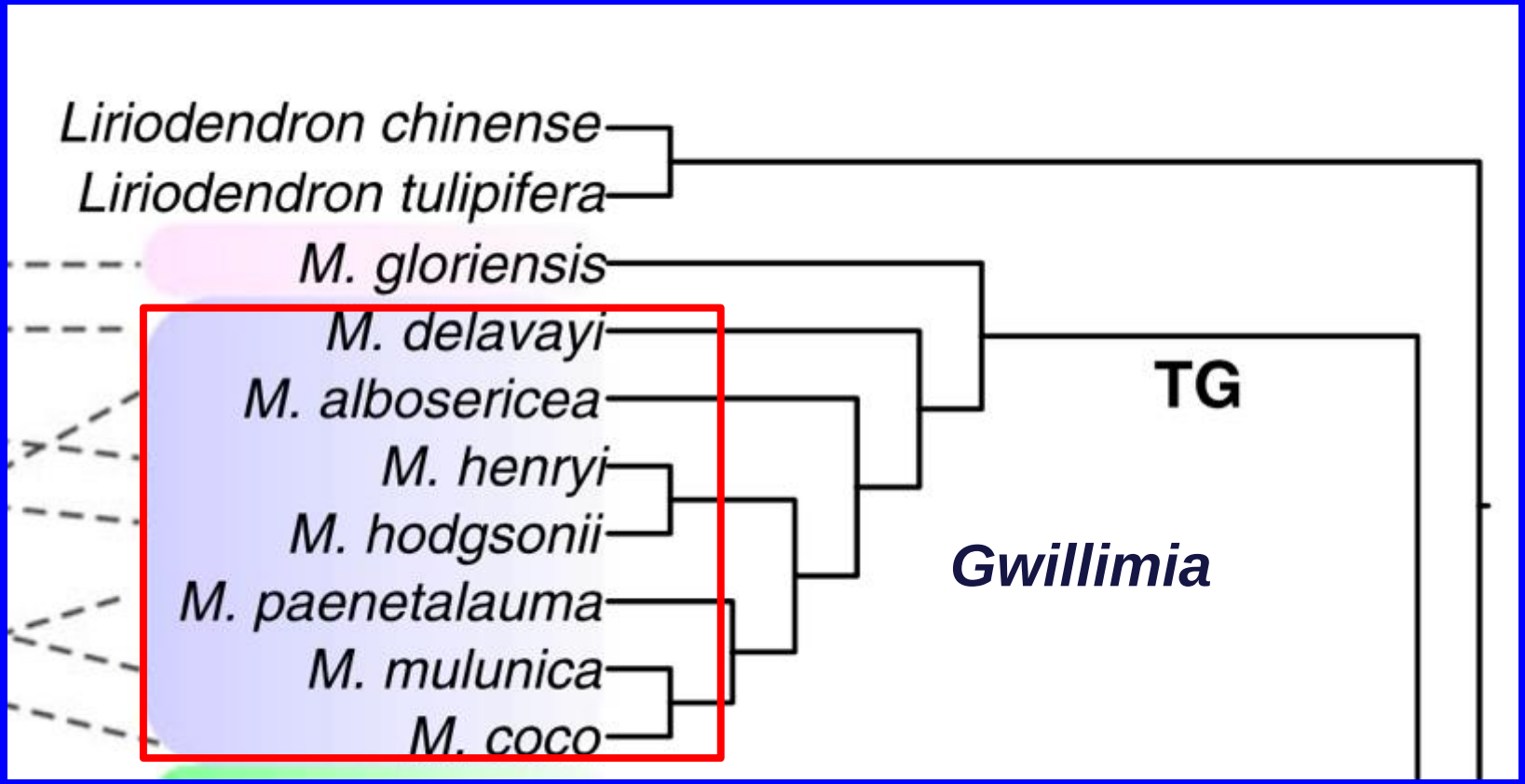


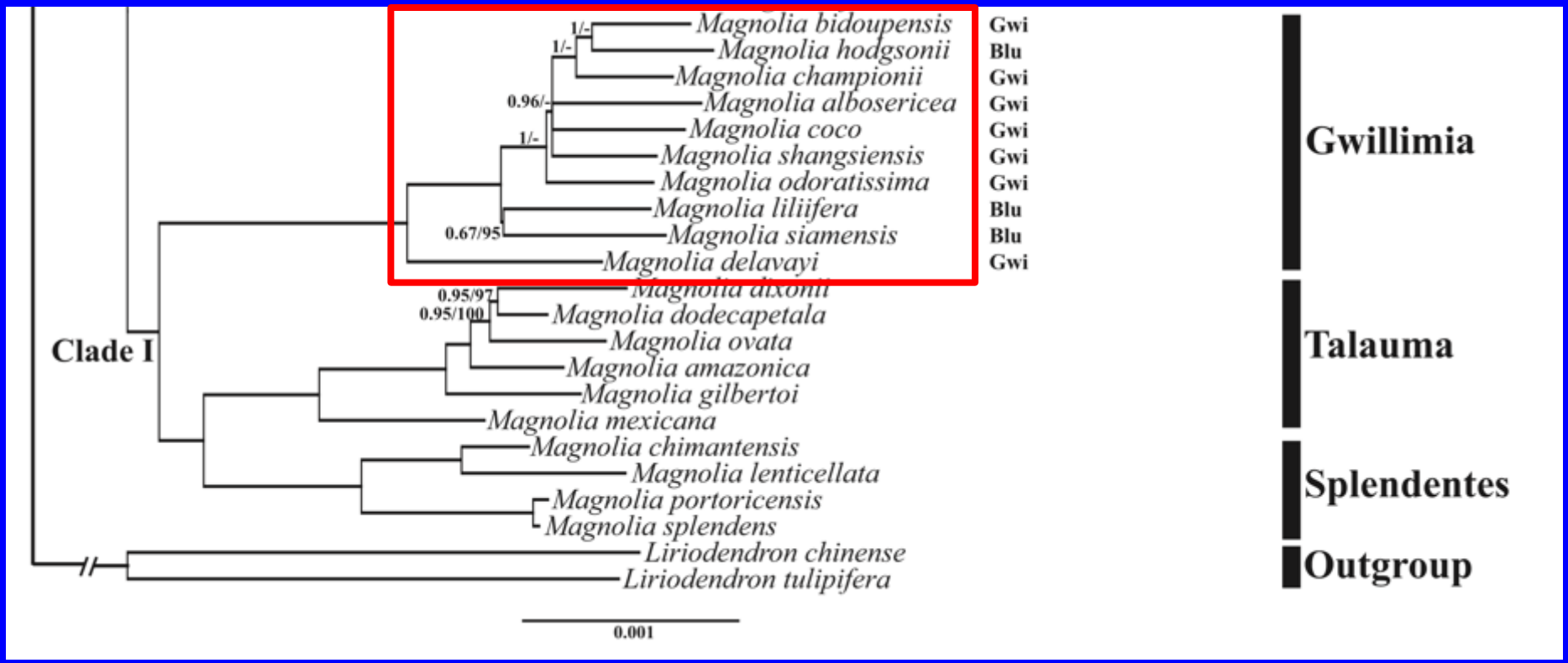
FIG. 1. *Magnolia jaenensis*. **A.** Rama con flor. **B.** Detalle del peciolo carente de cicatriz. **C.** Botón floral. **D.** Flor. **E. a.** Sépalos mostrando la cara interna y externa. **b.** Pétalo más externo. **c.** Pétalo más interno. **F.** Detalle de los carpelos y estambres. **G.** Estambre. **H.** Fruto. **I.** Folículos. (A–G dibujado del tipo; H, I de *Marcelo-Peña et al. 5001*, MOL.)

Marcelo-Peña & Arroyo 2013

(3) sectio Gwillimia
(genus Lirianthe)



Dong et al. 2021



Wang et al. 2020

Plants evergreen

Petiole with large scars of stipules

Stamens caducous in male flowering phase

Anthers with introrse opening

Gynoecium sessile

Ovules 2 per carpel

Carpels opening longitudinally or circumscissile

Stomata of Baranova type 9

Magnolia tiepii

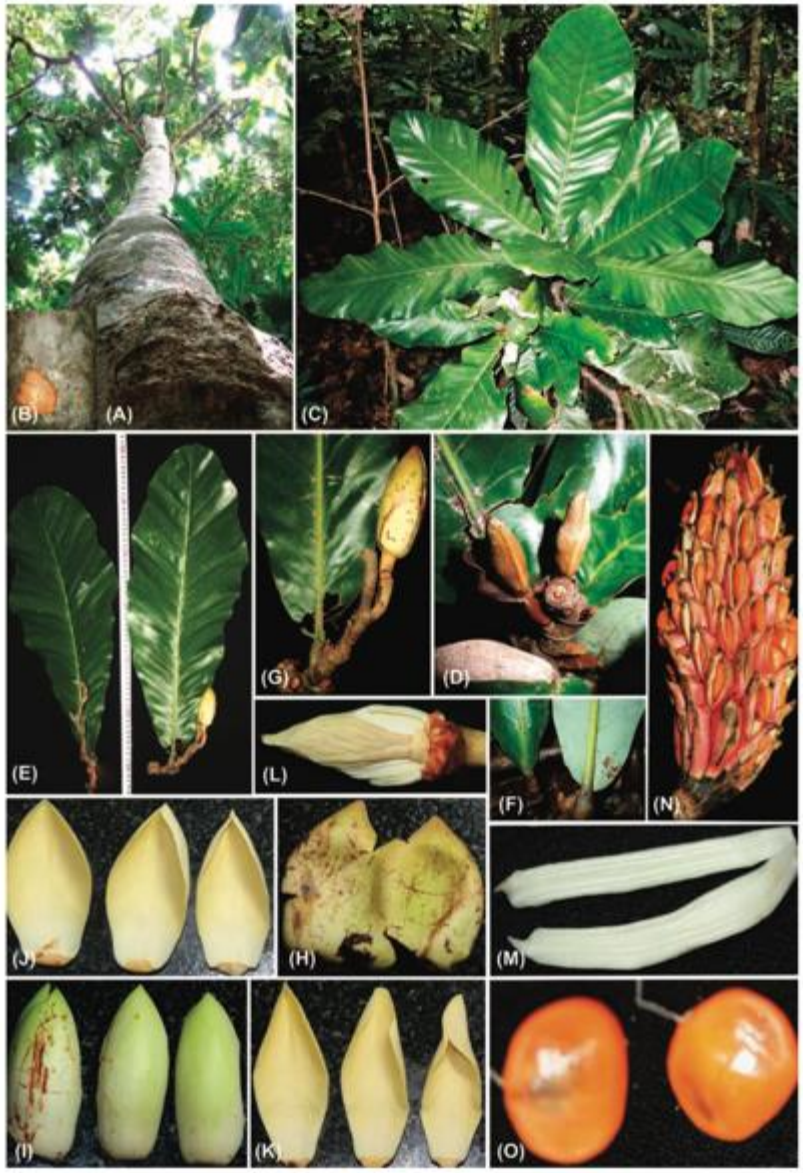


Figure 2. *Magnolia tiepii* sp. nov. Colour photos by Nong Van Duy and Tran Van Tien from the type locality. (A) habit, (B) bark, (C) old twig with leaves crowded in two false whorls at the end of a branchlet, (D) young twig with terminal buds, (E) leafy branch with terminal bud (F) stipular scar of the petiole, (G) part of leafy branch with terminal flower, (H) spathaceous bract, (I) outer whorl tepals, (J) middle whorl tepals, (K) inner whorl tepals, (L) androecium, (M) stamens, (N) aggregate fruit, (O) seeds. Photo by Nong Van Duy and Tran Van Tien from the type locality.

Van et al. 2015

Magnolia tiepii

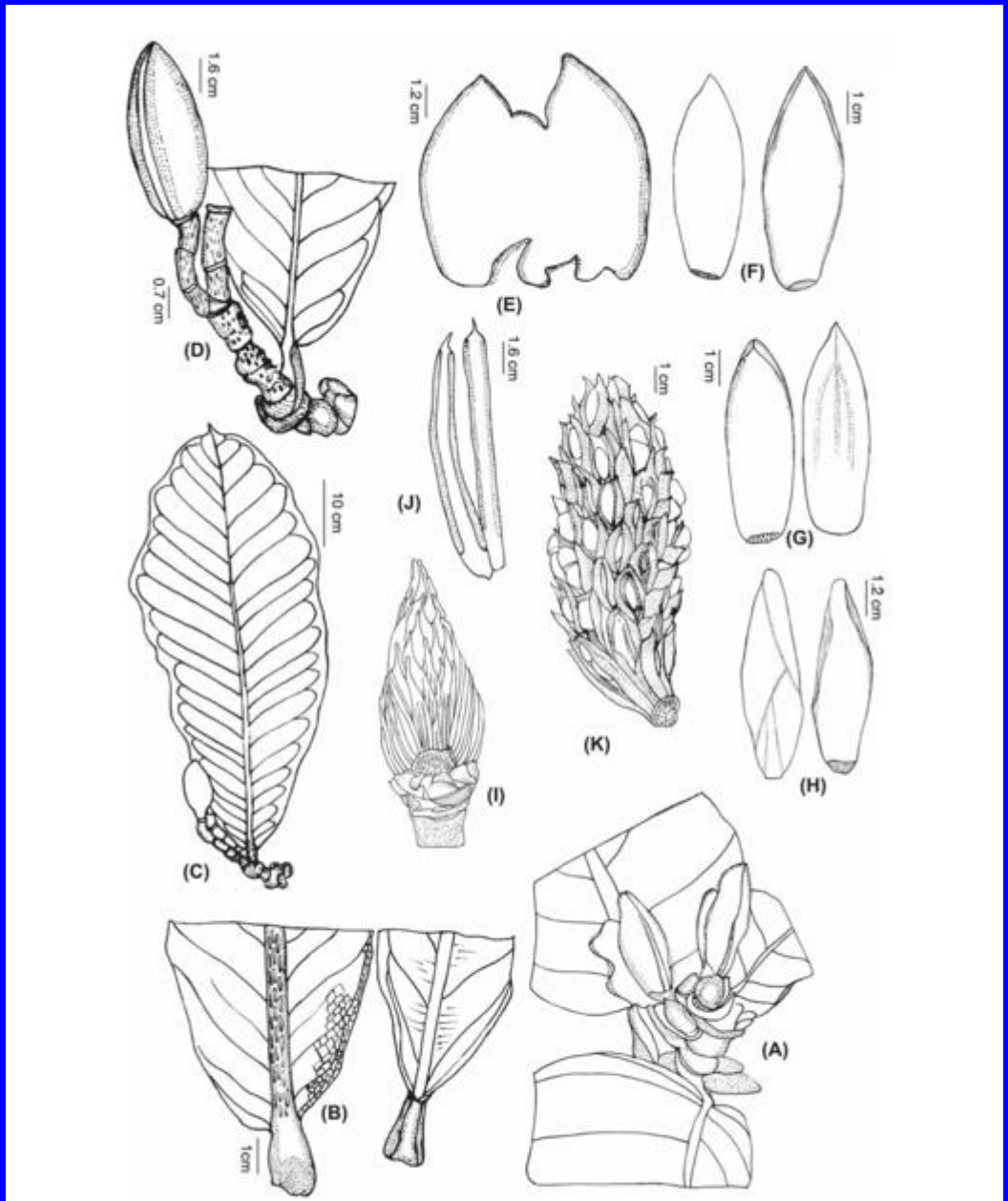


Figure 1. *Magnolia tiepii* sp. nov. (A) part of leafy branch, (B) leaf base (right: seen from above surface, left: seen from below surface), (C) branchlet with leaf and flower, (D) flowering twig with terminal flower, (E) spathaceous bract, (F) outer whorl tepals (left: dorsal, right: ventral), (G) middle whorl tepals (left: ventral, right: dorsal), (H) inner whorl tepals (left: dorsal, right: ventral), (I) androecium, (J) stamens, (K) aggregate fruit with seeds. Drawn by Tran Van Tien from the holotype.

Van et al. 2015

Magnolia quangninhensis

FIGURE 1. *Magnolia quangninhensis*. A. Habit, with inset showing bark (lower left). B. Branch apex with adaxial view of leaves. C. Adaxial and abaxial view of leaves, with inset showing scars of petioles (lower left). D. Flower pink-purple globose bud. E. Flower creamy-white broadly ovoid bud. F. Pink-purple flower. G. Pink-purple flower with outermost tepals removed, inner tepals creamy-white and innermost tepals pink. H. Pink-purple flower with creamy white outer tepals. I. Creamy white flower. J. Creamy white flower, showing six tepals of three whorls. K–L. Tepals. M–N. Androecium and gynoecium. O. Stamens. P. Portion of a brachyblast, showing brown tomentose to tomentulose surface and glabrous lower surface of leaf. Q–S. Fruits with bright red seeds.

Van et al. 2020

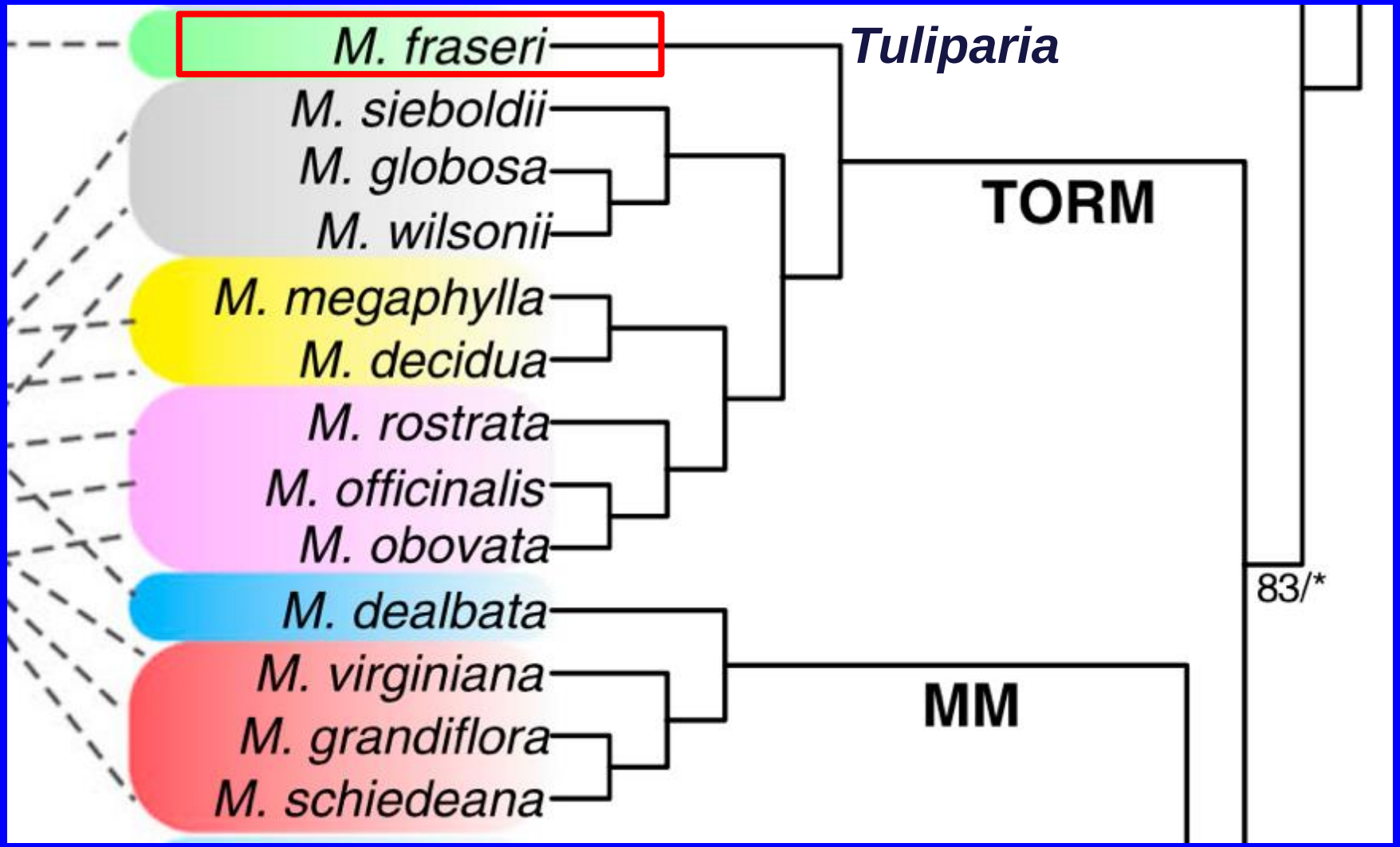
Magnolia liliifera

Fig. 3. *Magnolia candollii* (Blume) H. Keng var. *candollii*: **a**, habit; **b**, fruit (*van Steenis* 9417); **c**, carpel (*Kostermans* 7337), all × 0.75; **d**, ovaries × 1.1 ; **e**, anther × 3.3 (both Herb. Bog. 124717). From Blumea 32(2): 372 (1987).

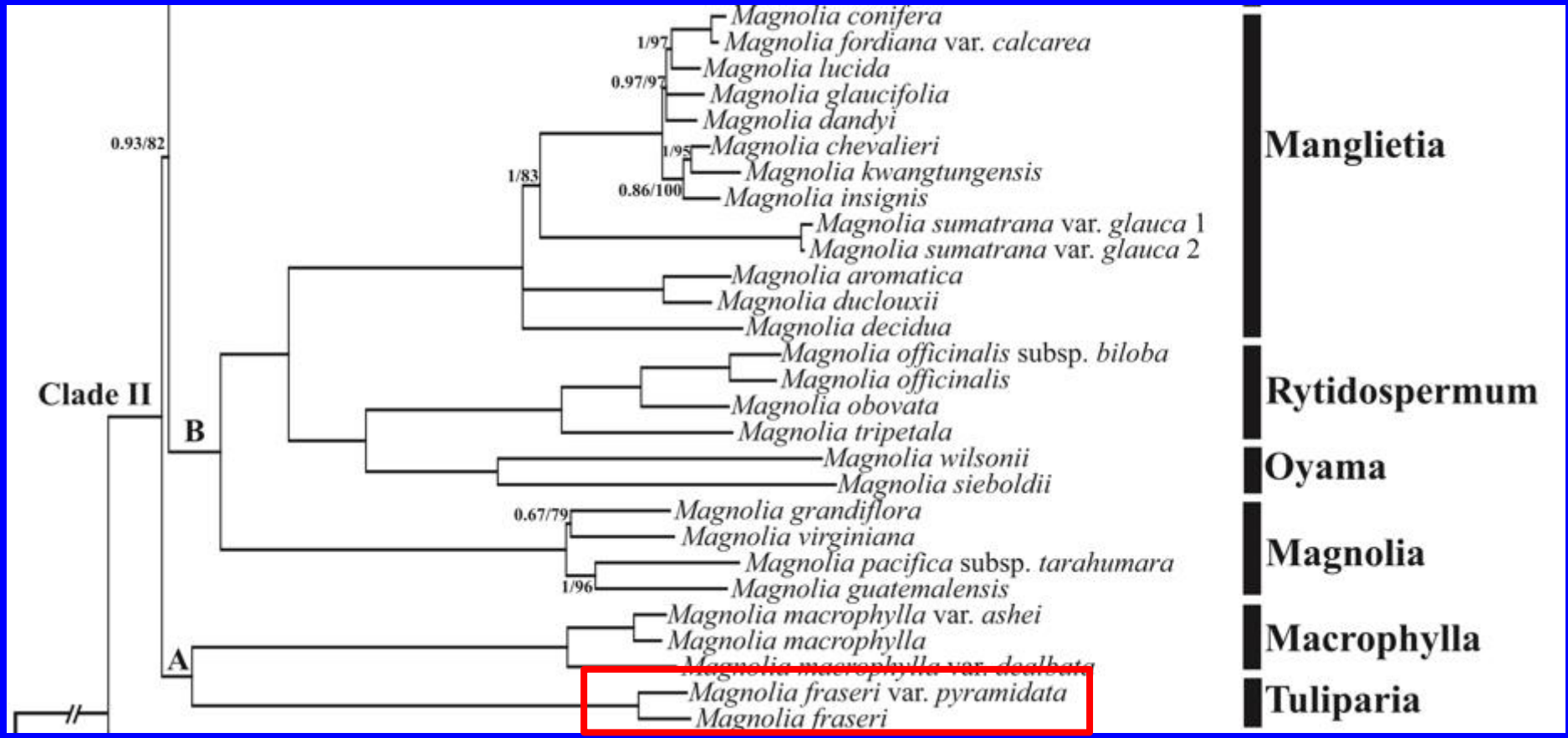
Nooteboom 1998

Magnoliaceae_Magnolia_delavayi_HGAA19860007A_JDL018358_15OCT2012_01.jpg

(4) sectio Tuliparia
(genus Paramagnolia)



Dong et al. 2021



Wang et al. 2020

Leaves deciduous, with auriculate base

Early-season leaves arranged in false whorls

Stamens caducous in male flowering phase

Anthers with introrse opening

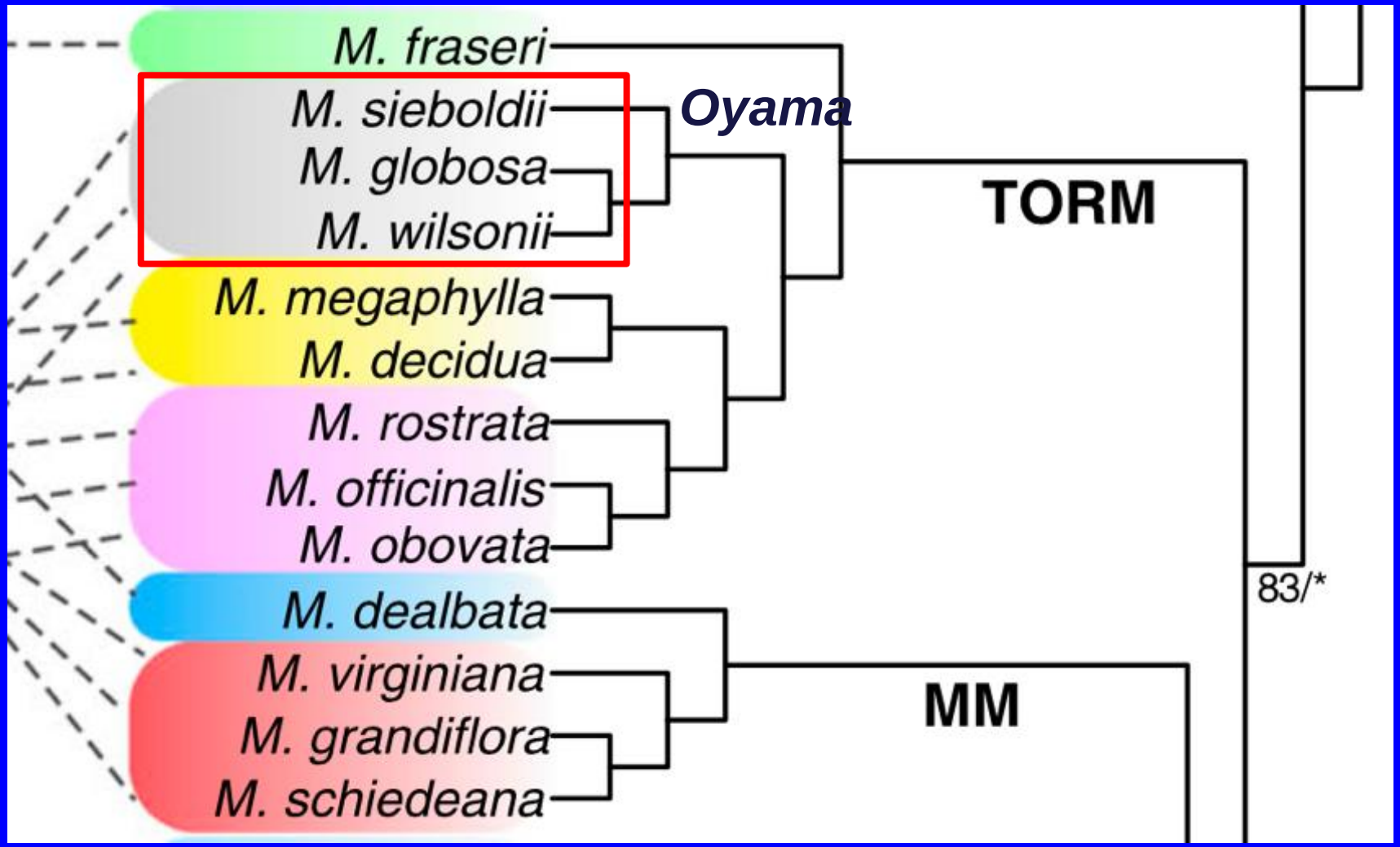
Gynoecium sessile

Stomata of Baranova type 6

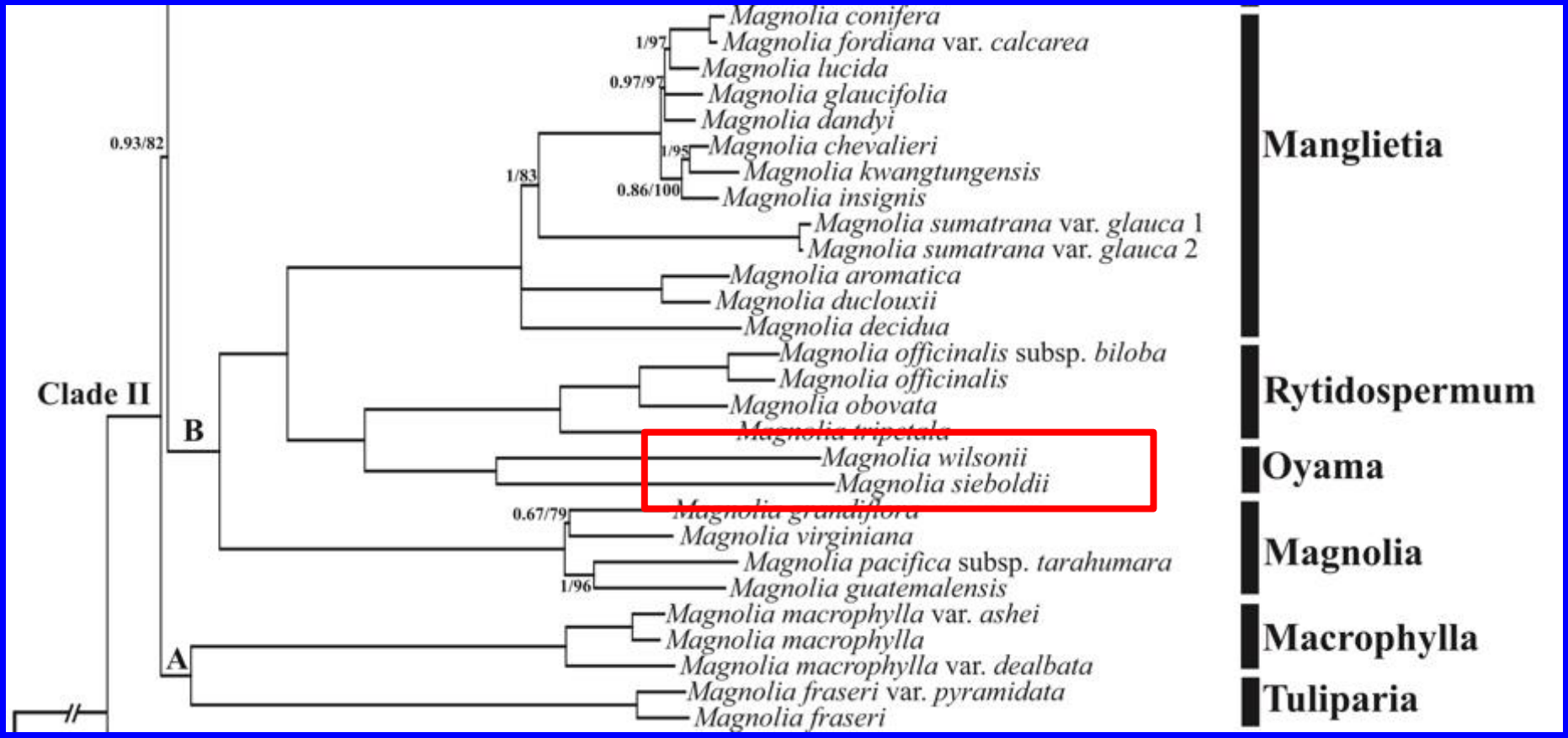
Magnolia fraseri

Magnoliaceae_Magnolia_fraseri_HWH93251-SmokeyMts_WLD_JDL019359_25AUG2014_01.jpg

(5) sectio Oyama
(genus Oyama)



Dong et al. 2021



Wang et al. 2020

Leaves deciduous

Branching by prolepsis

Peduncles slender and pendent

Stamens persistent during male flowering phase

Anthers with introrse opening

Gynoecium sessile

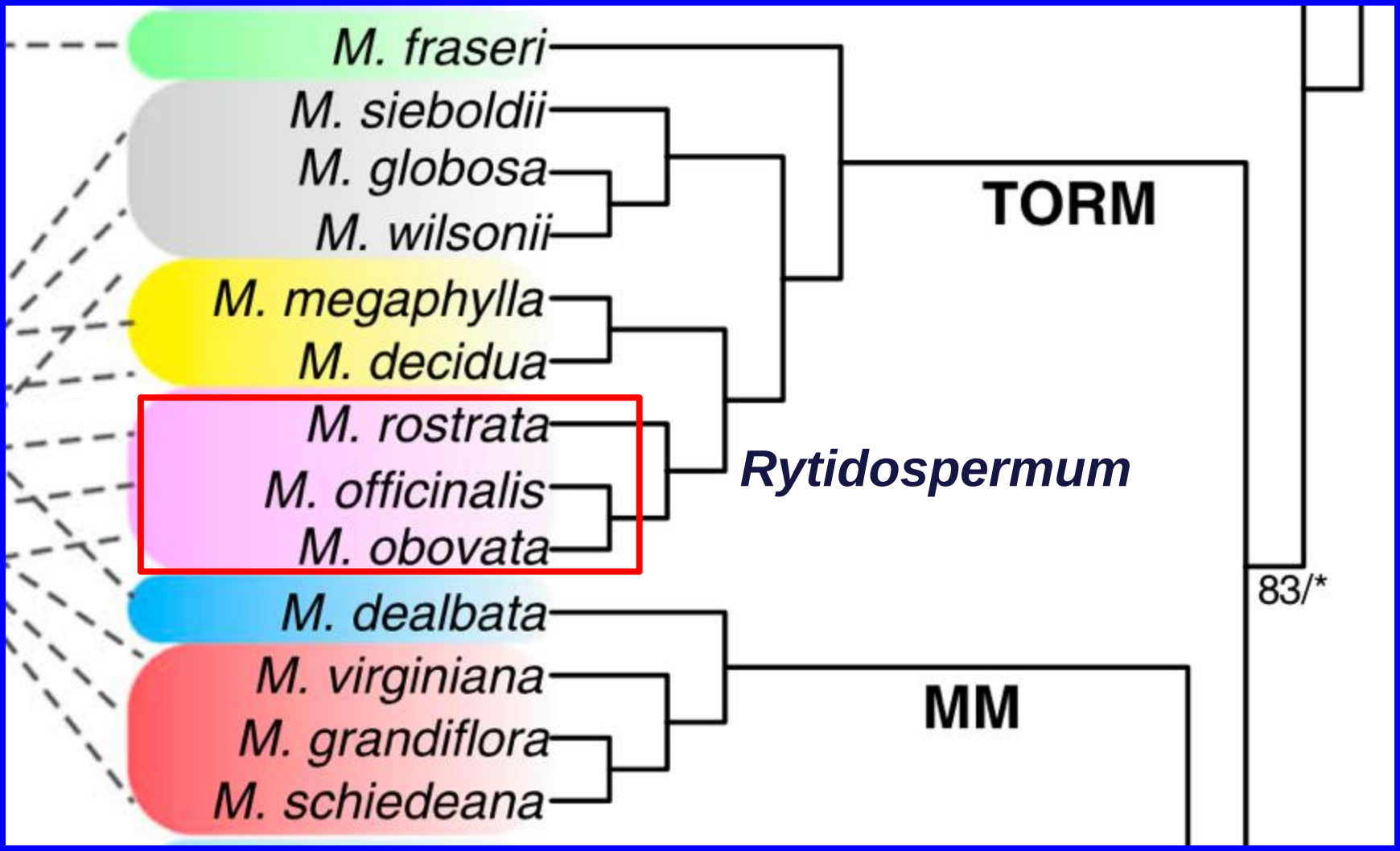
Stomata of Baranova type 7

Magnolia sieboldii

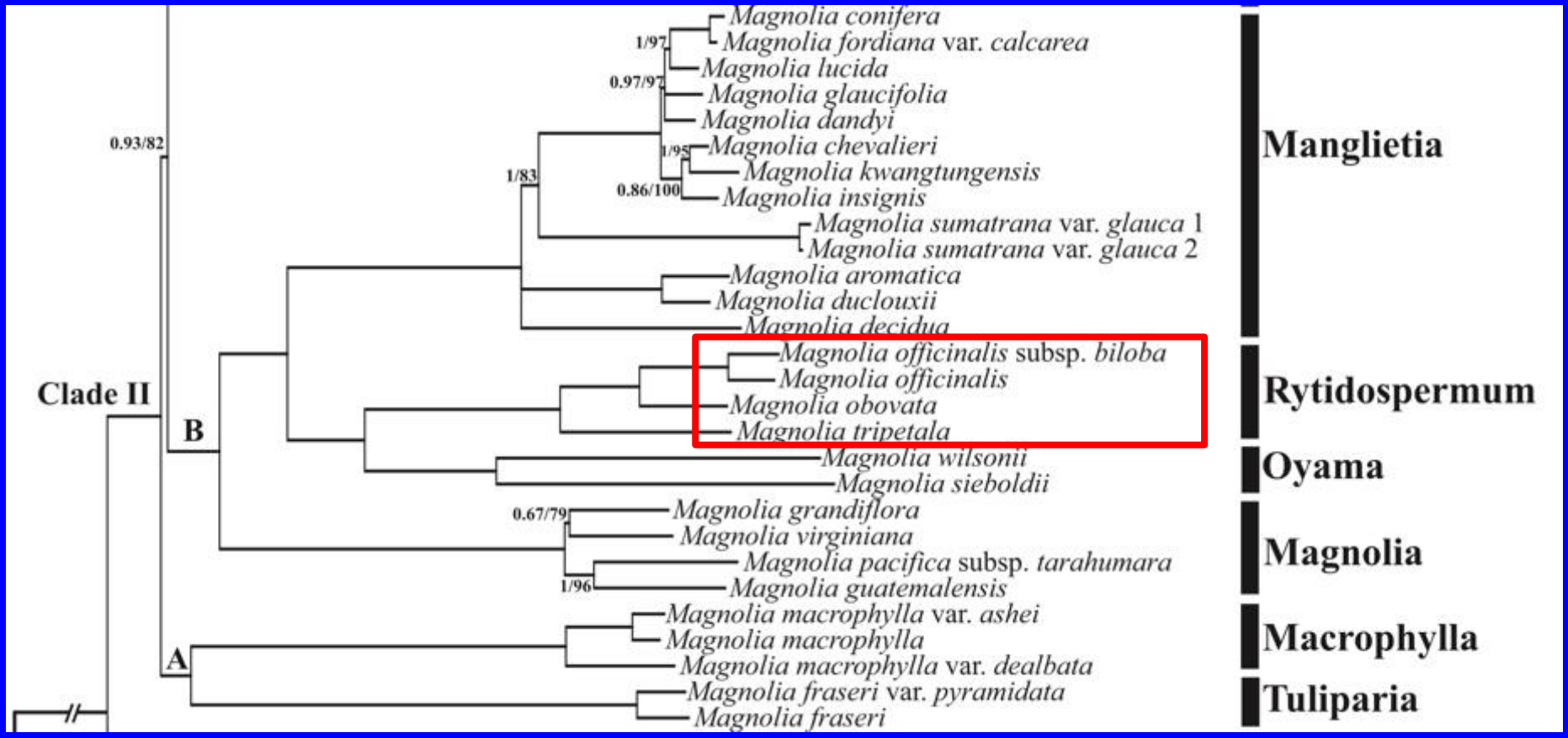
Magnoliaceae_Magnolia_sieboldii_HWH96009E-Chollipo_WLD_JDL019364_25AUG2014_07.jpg

Magnoliaceae_Magnolia_sinensis_HWH07108-pds_JDL019365_25AUG2014_01.jpg

(6) sectio Rytidospermum
(genus Houpoëa)



Dong et al. 2021



Wang et al. 2020

Leaves deciduous

Early-season leaves often forming false whorls

Stamens caducous in male flowering phase

Anthers with introrse opening

Gynoecium sessile

Stomata of Baranova type 7

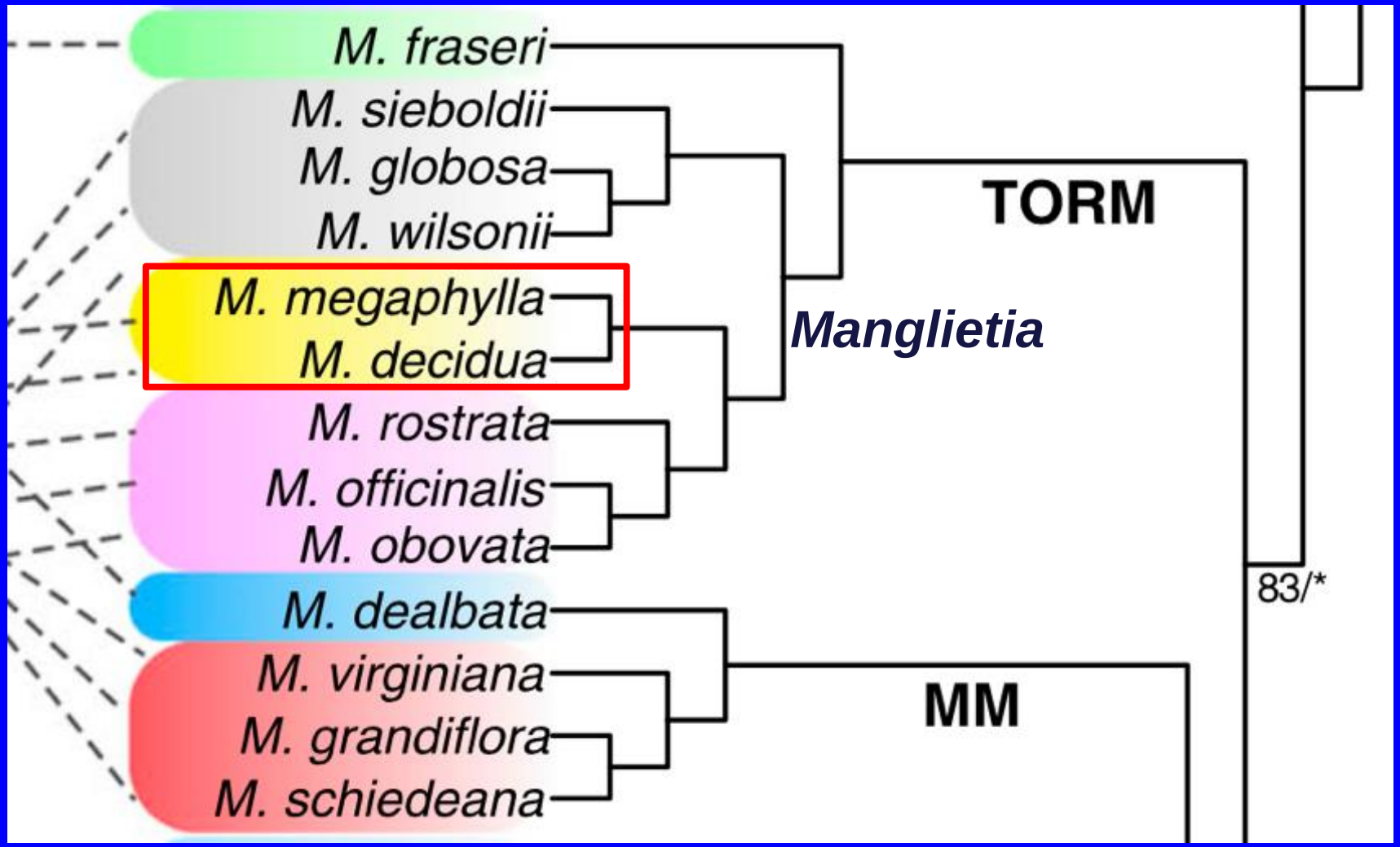
Magnolia tripetala

Magnolia tripetala

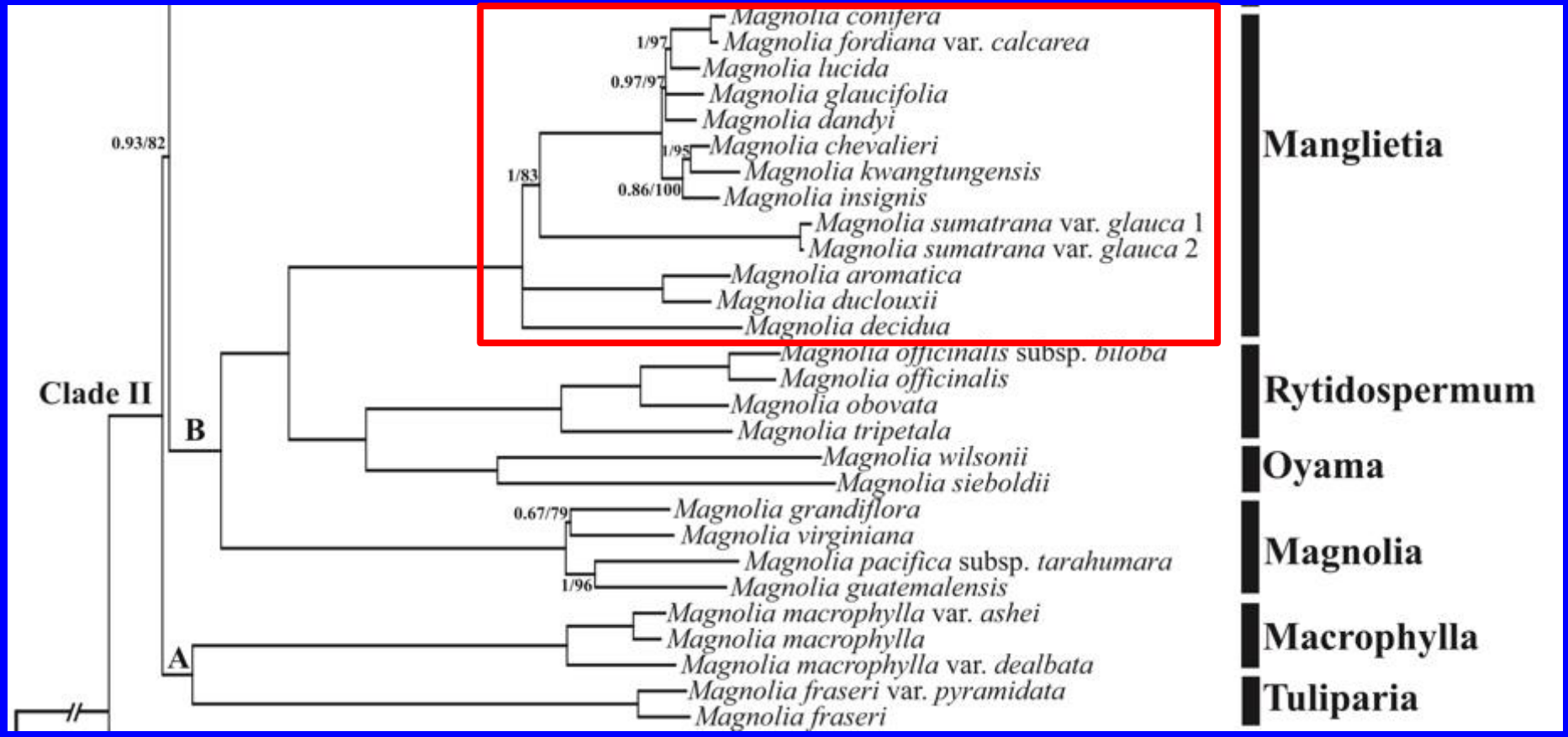
Magnolia officinalis

Magnoliaceae_Magnolia_officinalis_TPAR1998-36-PdS-Da-mao-shan-Sichuan_WLD_JDL019433_10SEP2014_01.jpg

(7) sectio Manglietia
(genus Manglietia)



Dong et al. 2021



Wang et al. 2020

Plants evergreen (except in *M. decidua*)

Petioles with large scars of stipules

Stamens caducous in male flowering phase

Anthers with introrse opening

Gynoecium sessile

Ovules 4 -10 per carpel

Stomata of Baranova type 8

Magnolia fordiana

Magnolia insignis

Magnolia sabahensis

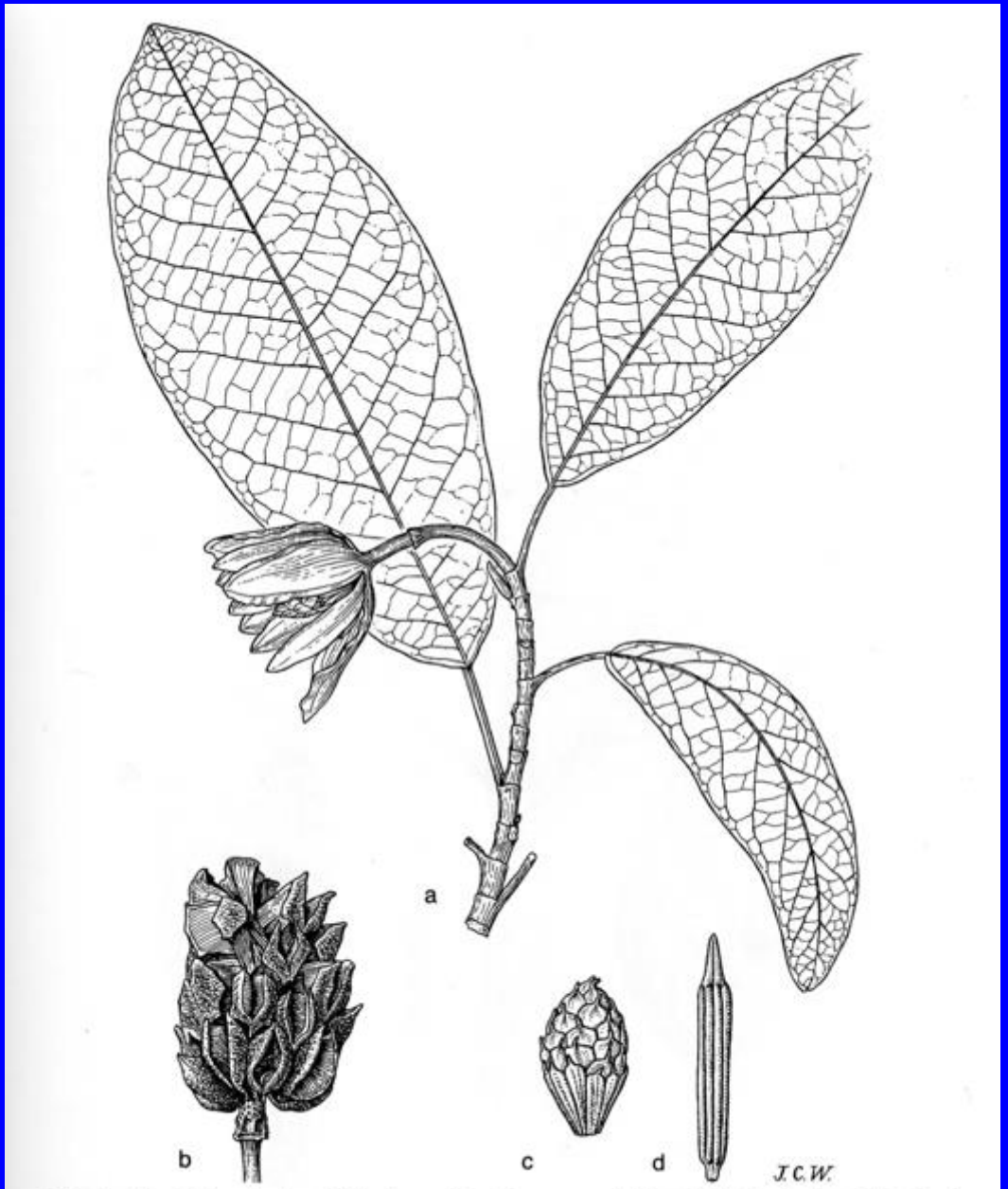


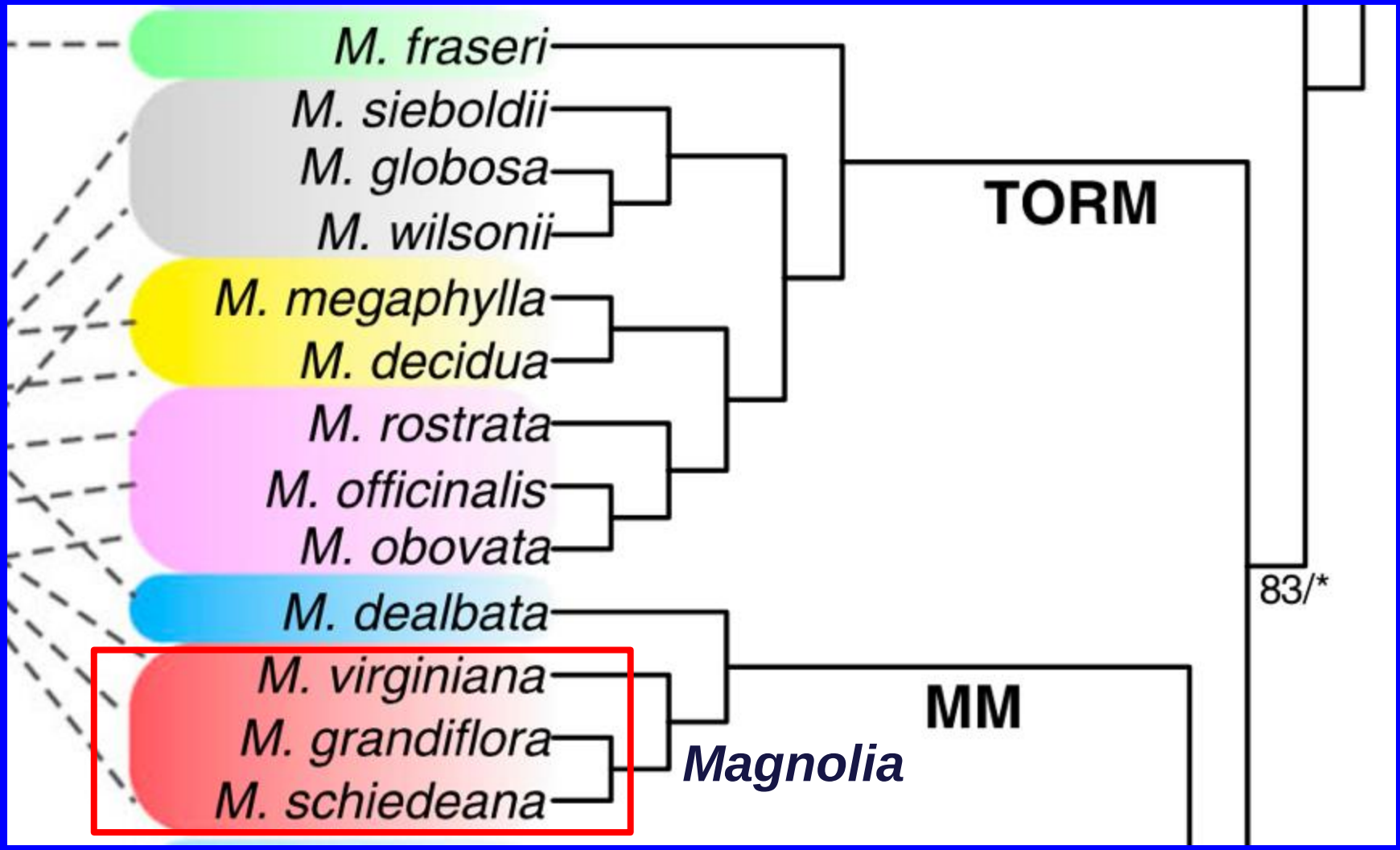
Fig. 2. *Manglietia sabahensis* Dandy ex Nooteboom: **a**, habit × 0.75; **b**, fruit × 0.75 (both *Clemens* 40979); **c**, ovary × 1.1; **d**, anther × 4.5 (both *Clemens* 40769). From Flora Malesiana ser. 1, 10(3): 592 (1988).

Nooteboom 1998

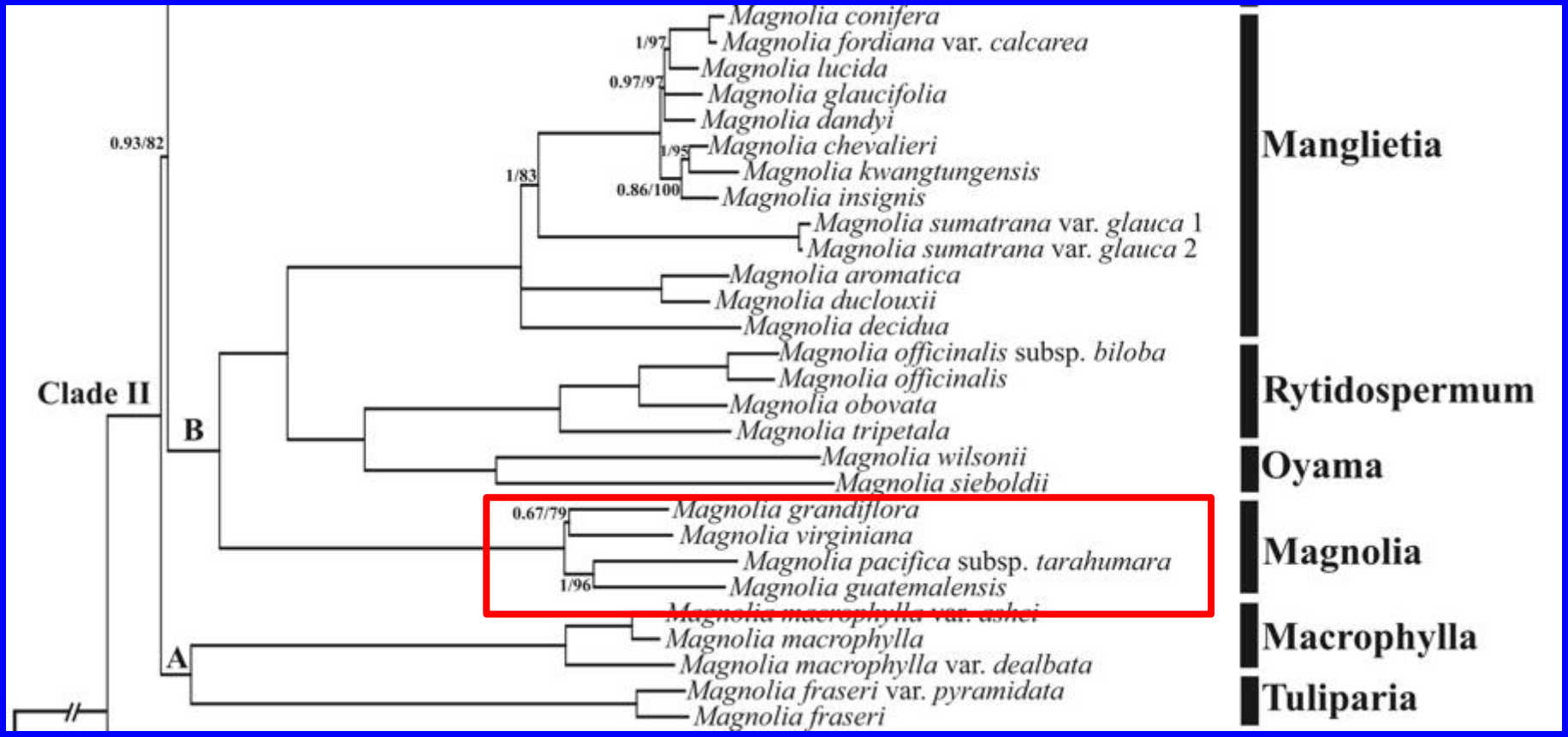
Magnoliaceae_Magnolia_sapaensis_TPAR20100333-1999-63-OS-Vietnam_WLD_JDL019474_10SEP2014_01.jpg

Magnoliaceae_Magnolia_sapaensis_TPAR20100333-1999-63-OS-Vietnam_WLD_JDL019474_10SEP2014_02.jpg

(8) sectio Magnolia



Dong et al. 2021



Wang et al. 2020

Plants evergreen (or facultatively deciduous)

Petiole without (rarely with) scars of stipules

Stamens caducous in male flowering phase

Anthers with introrse opening

Gynoecium sessile

Ovules 2 per carpel

Stomata of Baranova type 5

Magnolia virginiana


Previous
Magnoliaceae_Magnolia_virginiana_AHLE00002594_JDL019492_25SEP2014_09.jpg

Magnoliaceae_Magnolia_virginiana_AHLE00002594_JDL019492_25SEP2014_10.jpg

Magnolia yoroconte

FIGURE 23. *Magnolia yoroconte*. Tree ca. 40 m tall, in habitat at Negro Norte, Morales, Izabal, Guatemala, near the border of Honduras, close to and endangered by agricultural expansion. Darío Mejía, Yovany Alvarado-Padilla and Francisco Deras standing at the base of the tree. Photograph by W. Morales.

Vazquez-Garcia et al. 2020a

Magnolia yoroconte

FIGURE 22. *Magnolia yoroconte*. A. Fruiting branch and leaves. B. Fruit s(young) showing ca. 45 carpels. C. Fruit, dehiscing with scarlet red seeds. D. Tree trunk 1.13 m in dbh, Wilson Morales on a side. E. Nurse tree for coffee plantation, Sr. Mejía holding a mature dehiscing fruit. Photographs A–C and E by W. Morales, D by D. Mejía.

Vazquez-Garcia et al. 2020a

Magnolia poqomchi

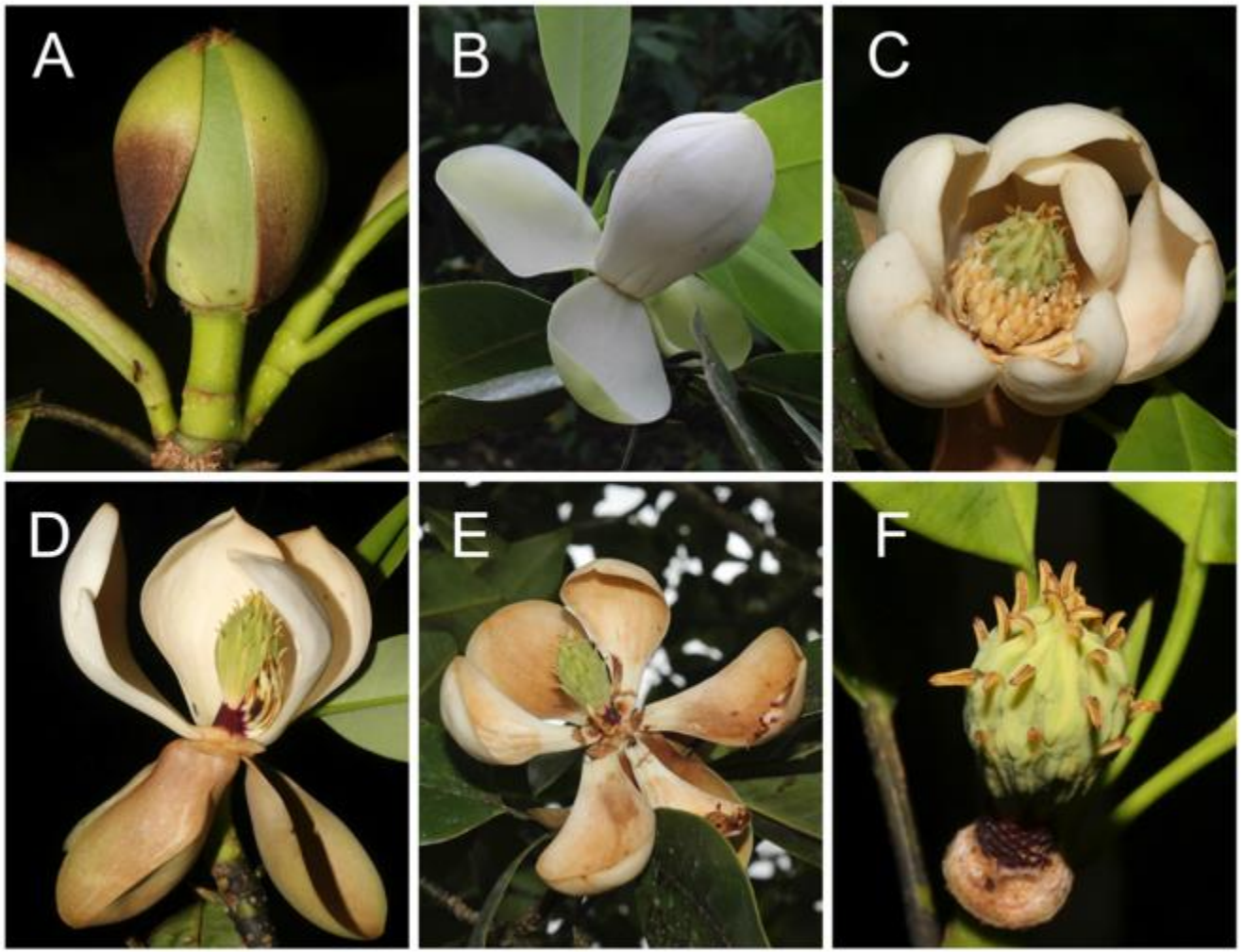


FIGURE 4. *Magnolia poqomchi.* A. Flower bud with hirsute spathaceous bract. B. Closed flower. C. Flower during male phase. D. Flower after male phase, dropping the stamens. E. Late flower, after male phase. F. Gynoecium with yellowish green stigmas. Photographs by Rafael Grajeda-Estrada from holotype.

Serrano et al. 2020

Magnolia poqomchi

FIGURE 5. *Magnolia poqomchi.* A–F. Fruit maturation to dehiscence. Photographs by Rafael Grajeda-Estrada & Marcelo J. Serrano, A & C from the holotype; B from paratype.

Serrano et al. 2020

Magnolia poqomchi

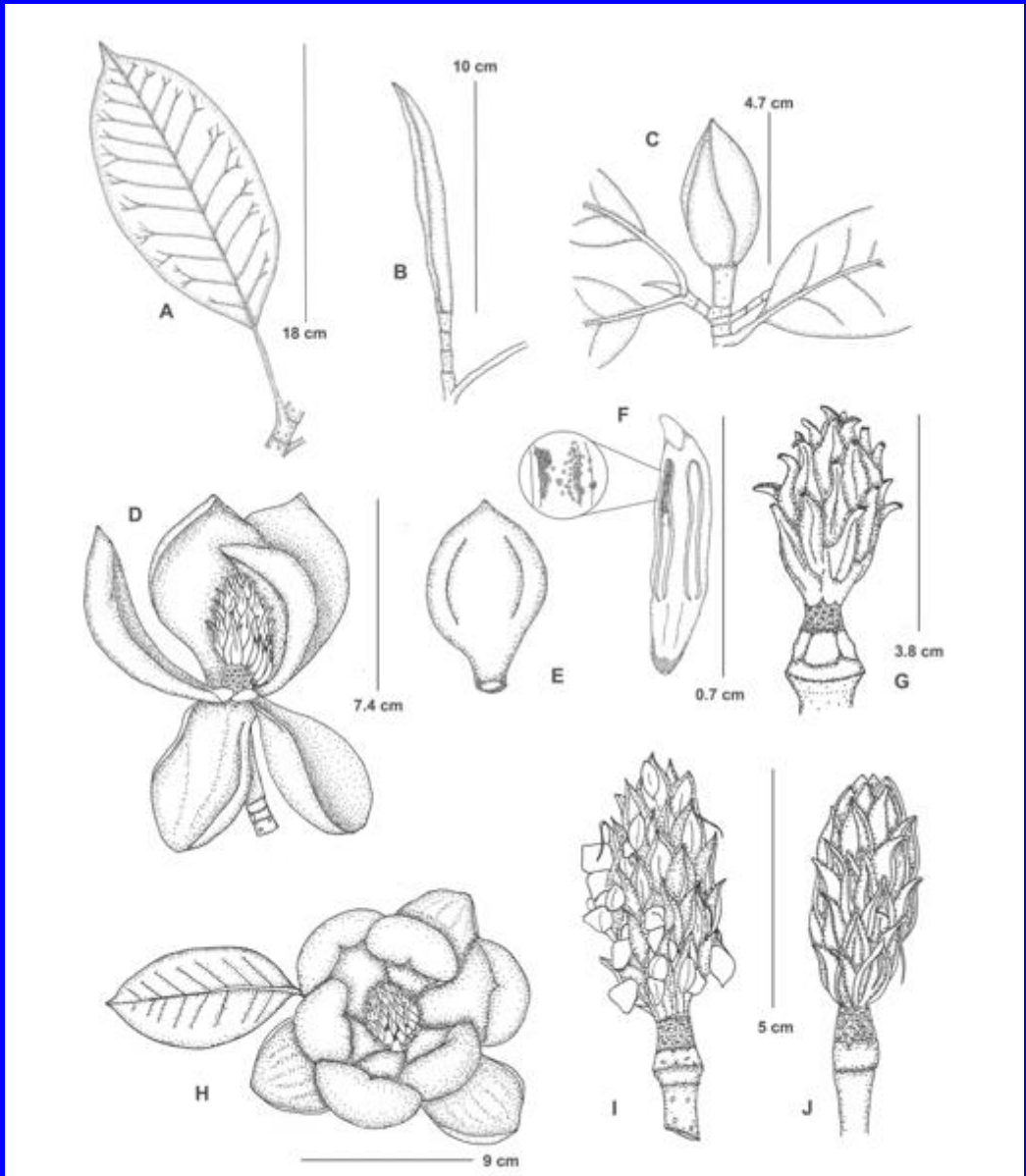
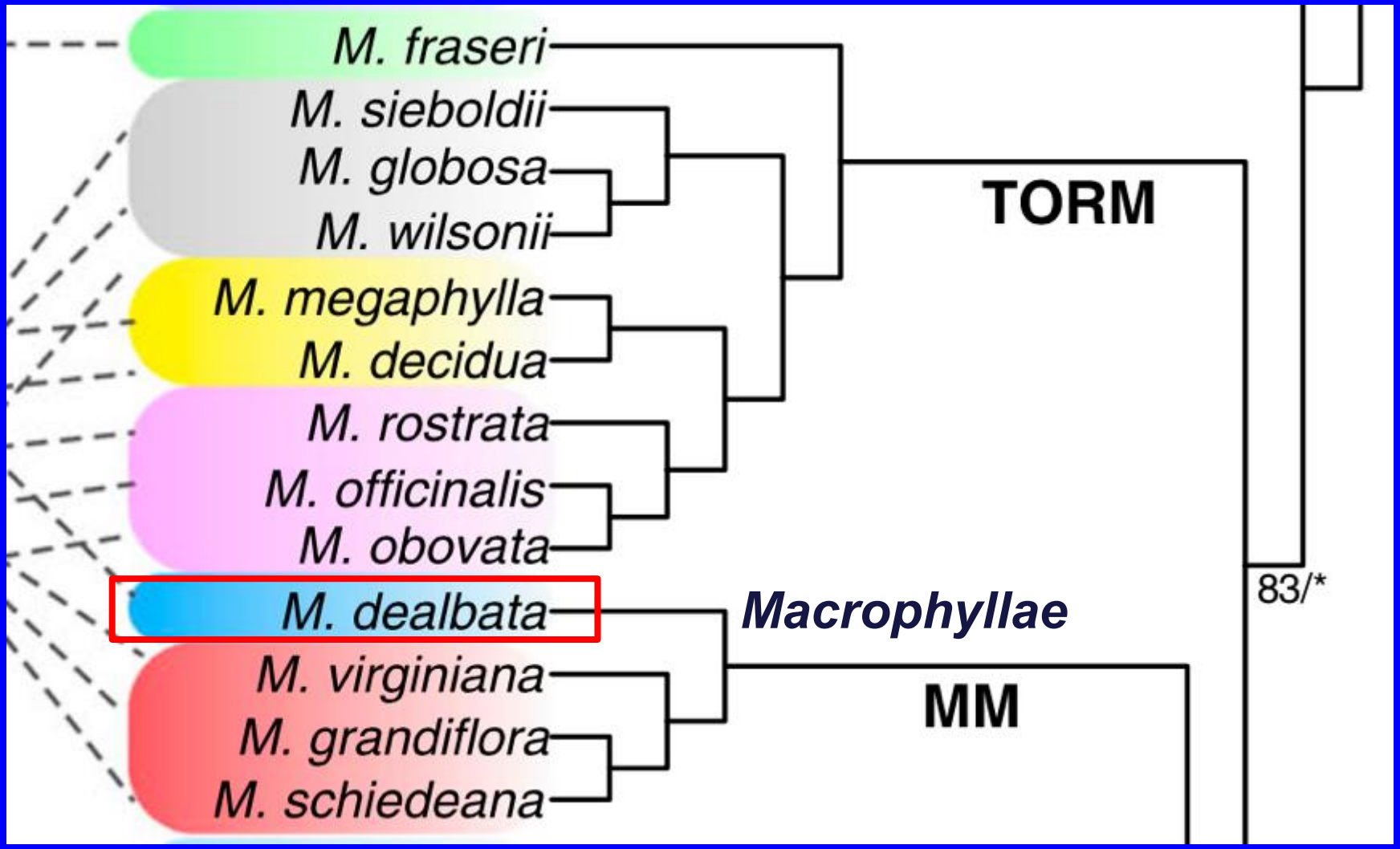


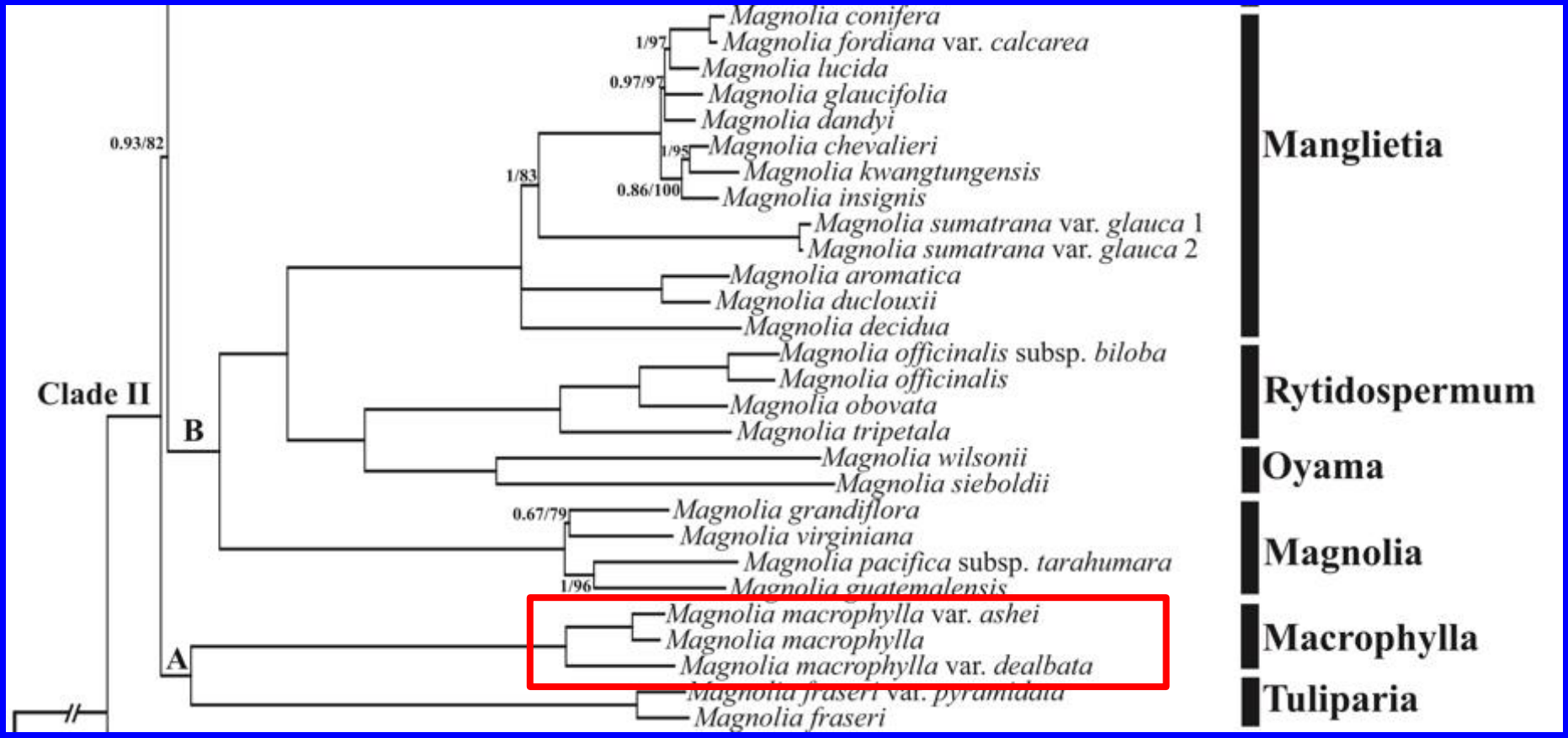
FIGURE 6. *Magnolia poqomchi.* A. Mature leaf with petiole. B. Leaf stipule in late vegetative bud. C. Flower bud with hirsute spathaceous bract, early vegetative buds and leaves. D. Open flower missing two petals and one sepal with some stamens fallen. E. Petal of open flower. F. Stamen with pollen. G. Developing fruit. H. Open Flower with leaf. I–J. Fruits during dehiscence. Illustration by María Renée Álvarez-Ruano and digital plate composition by Ana Isabel García-Ambrosy. A–H from the holotype. I–J from the holotype and paratype.

Serrano et al. 2020

(9) sectio Macrophyllae
(genus Metamagnolia)



Dong et al. 2021



Wang et al. 2020

Leaves deciduous, with cordate to auriculate base

Early-season leaves more or less in false whorls

Stamens caducous in male flowering phase

Anthers with introrse opening

Gynoecium sessile

Stomata of Baranova type 4

Magnolia zotictla (L)

Magnolia dealbata (R)

FIGURE 2. *Magnolia zotictla* (A–D): A. Flower bud in female phase. B. Stamens and stigmas. C. Flower in female phase. D. Flower in male phase. *Magnolia dealbata* (E–H): E. Flower bud in female phase, F. Stamens and stigmas. G. Flower in female phase. H. Flower in male phase. Photographs A–D by Arturo Sánchez. Photographs E–H by Reyna Domínguez.

Sanchez-Gonzalez et al. 2021

Magnolia zotictla (T)

Magnolia dealbata (U)

FIGURE 3. *Magnolia zotictla* (A–C): A. Mature fruit, B–C. During and after dehiscence. *Magnolia dealbata* (D–F): D. mature fruit, E–F. During and after dehiscence. A–C Photographs by Arturo Sánchez. D–F Photographs by Reyna Dominguez.

Sanchez-Gonzalez et al. 2021

Magnolia zotictla

FIGURE 4. *Magnolia zotictla*. Trees with dehiscing fruits from Zotictla, Hidalgo. Photographs: Arturo Sánchez

Sanchez-Gonzalez et al. 2021

Magnolia rzedowskiana

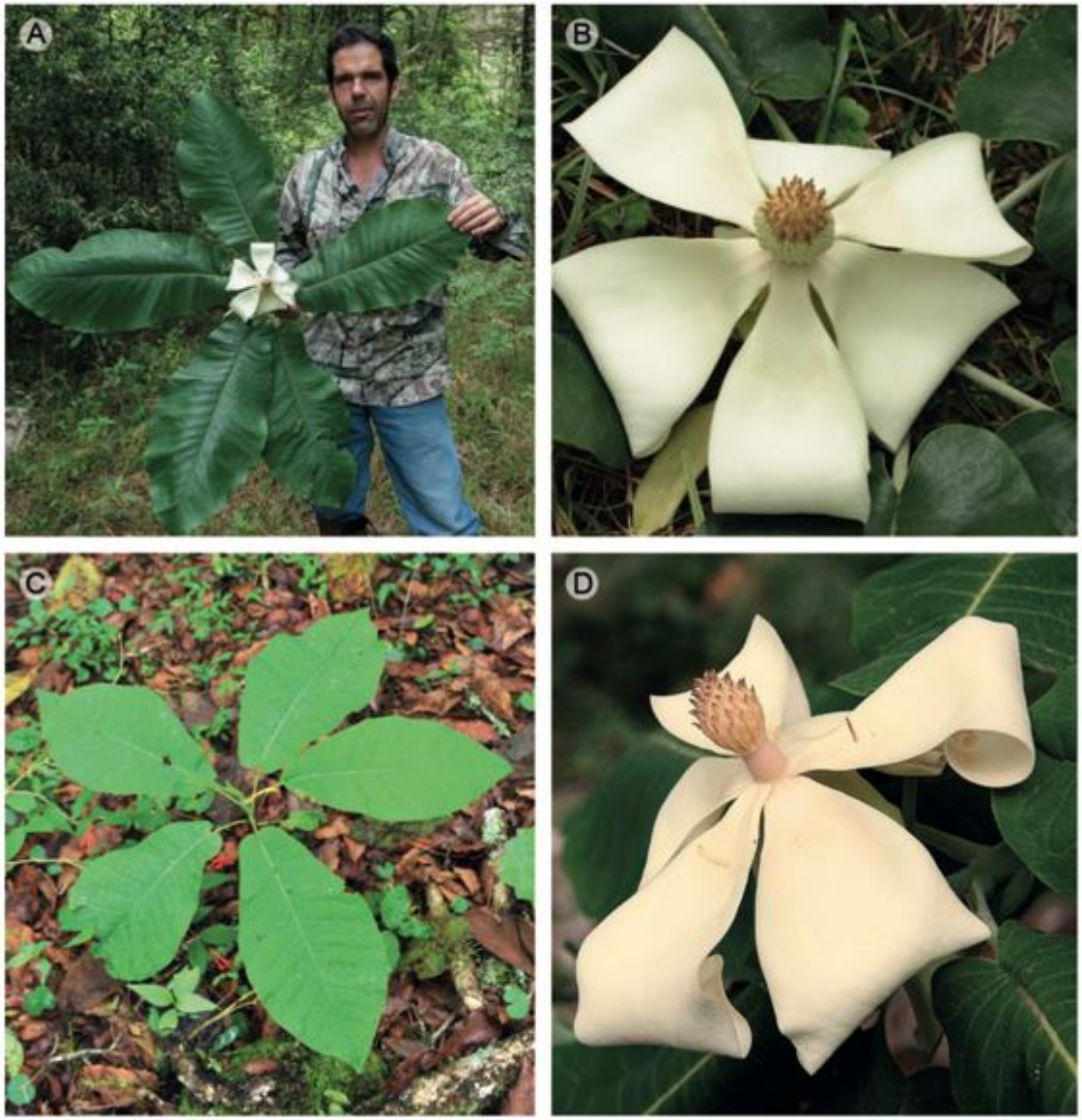


Fig. 3. *Magnolia rzedowskiana*. A. Roberto Pedraza Ruiz, con rama y flor; B. flor, aun conservando sus estambres; C. plántula; D. flor después de que han caído sus estambres. Fotografías de Roberto Pedraza.

Vazquez-Garcia et al. 2015

Magnolia rzedowskiana

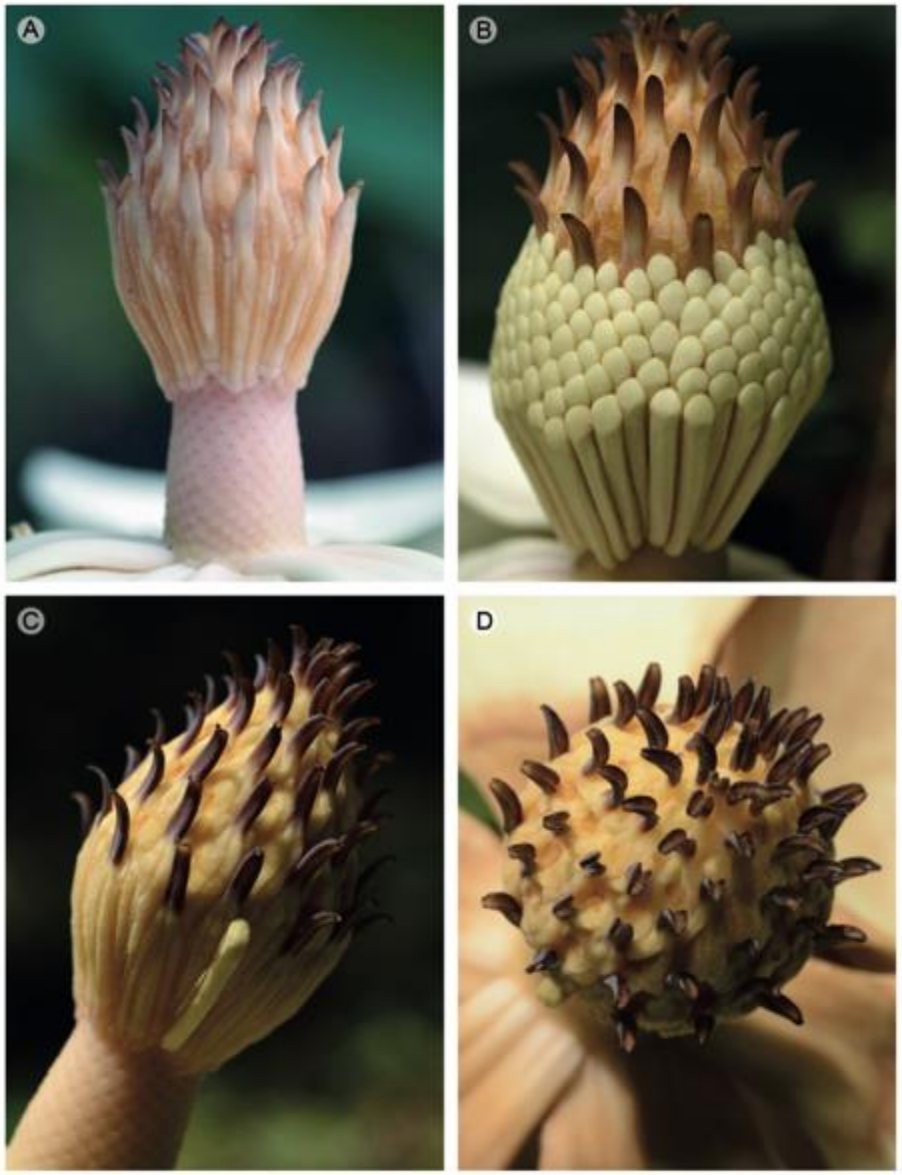
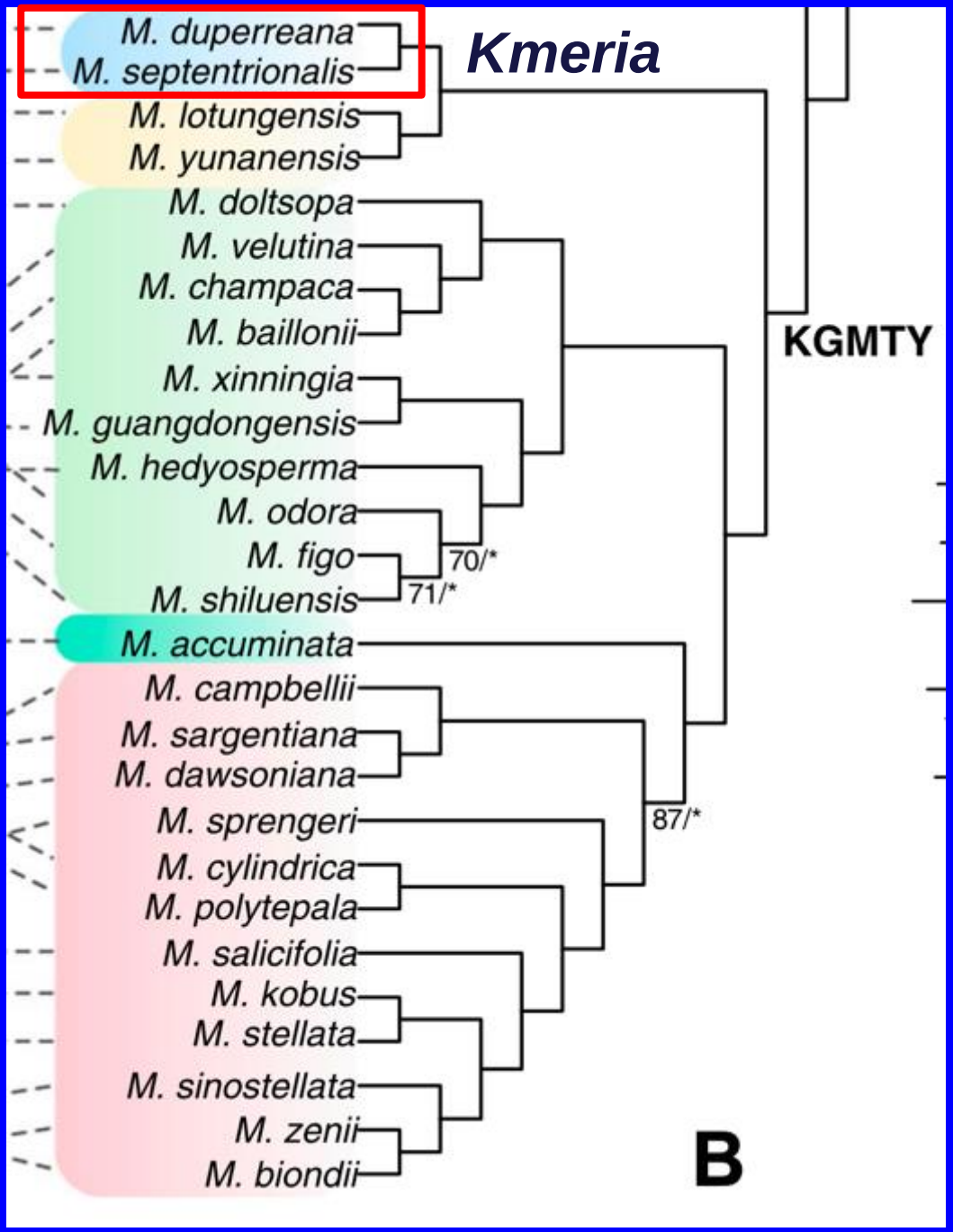


Fig. 4. *Magnolia rzedowskiana*. A. Gineceo receptivo con estambres removidos; B. gineceo receptivo, aún conservando los estambres; C. gineceo no receptivo después de que los estambres han caído de manera natural; D. gineceo no receptivo, iniciando el desarrollo del fruto. Fotografías de Roberto Pedraza.

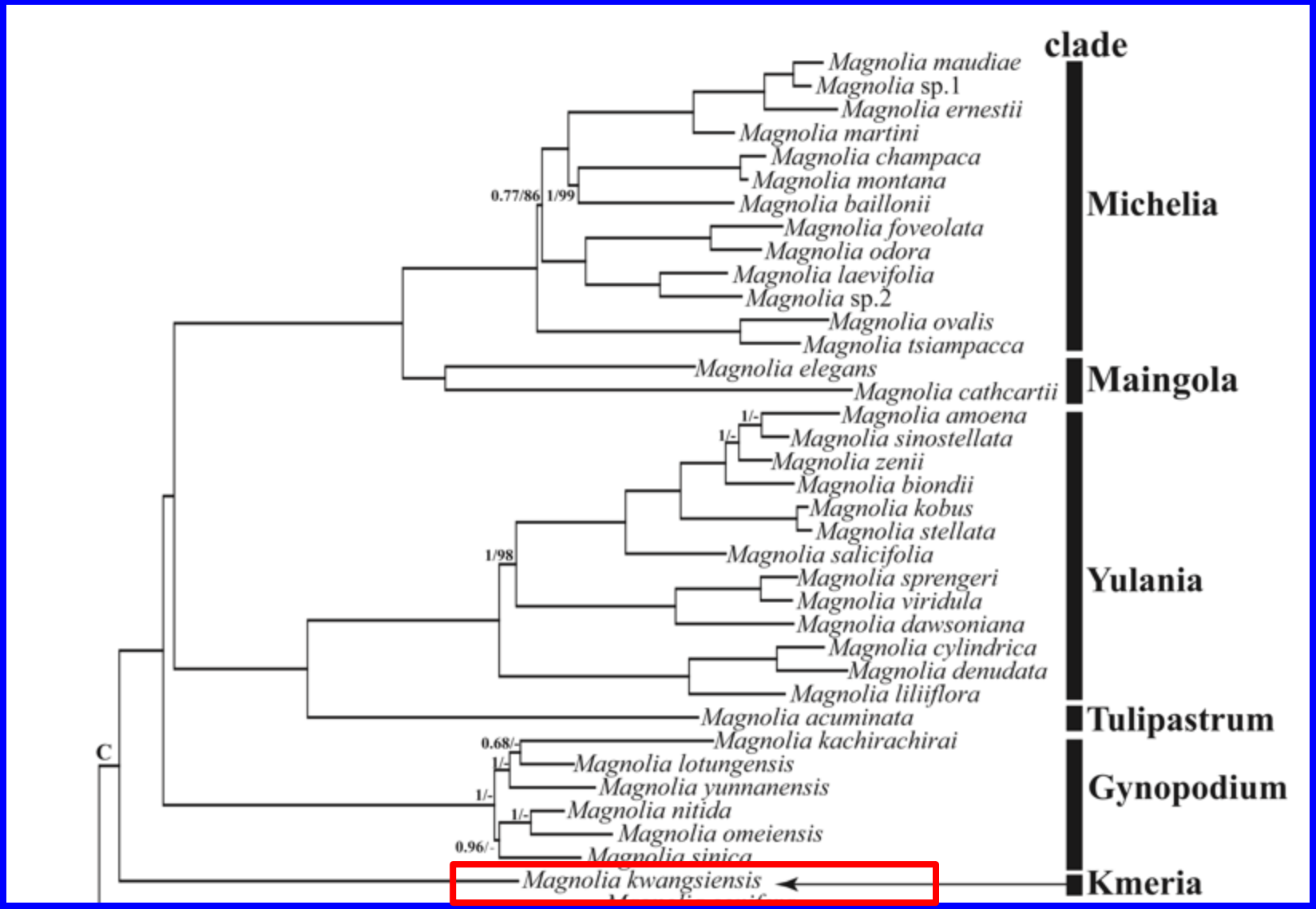
Vazquez-Garcia et al. 2015

Magnoliaceae_Magnolia_macrophylla_var. ashei_HWH95240-pds_JDL019362_25AUG2014_01.jpg

(10) sectio Kmeria
(genera Kmeria, Woonyoungia)



Dong et al. 2021



Wang et al. 2020

Plants evergreen

Petiole with large scars of stipules

Plants dioecious

Anthers with latrorse opening

Gynoecium sessile

Stomata of Baranova type 11

Magnolia kwangsiensis

Magnolia thailandica

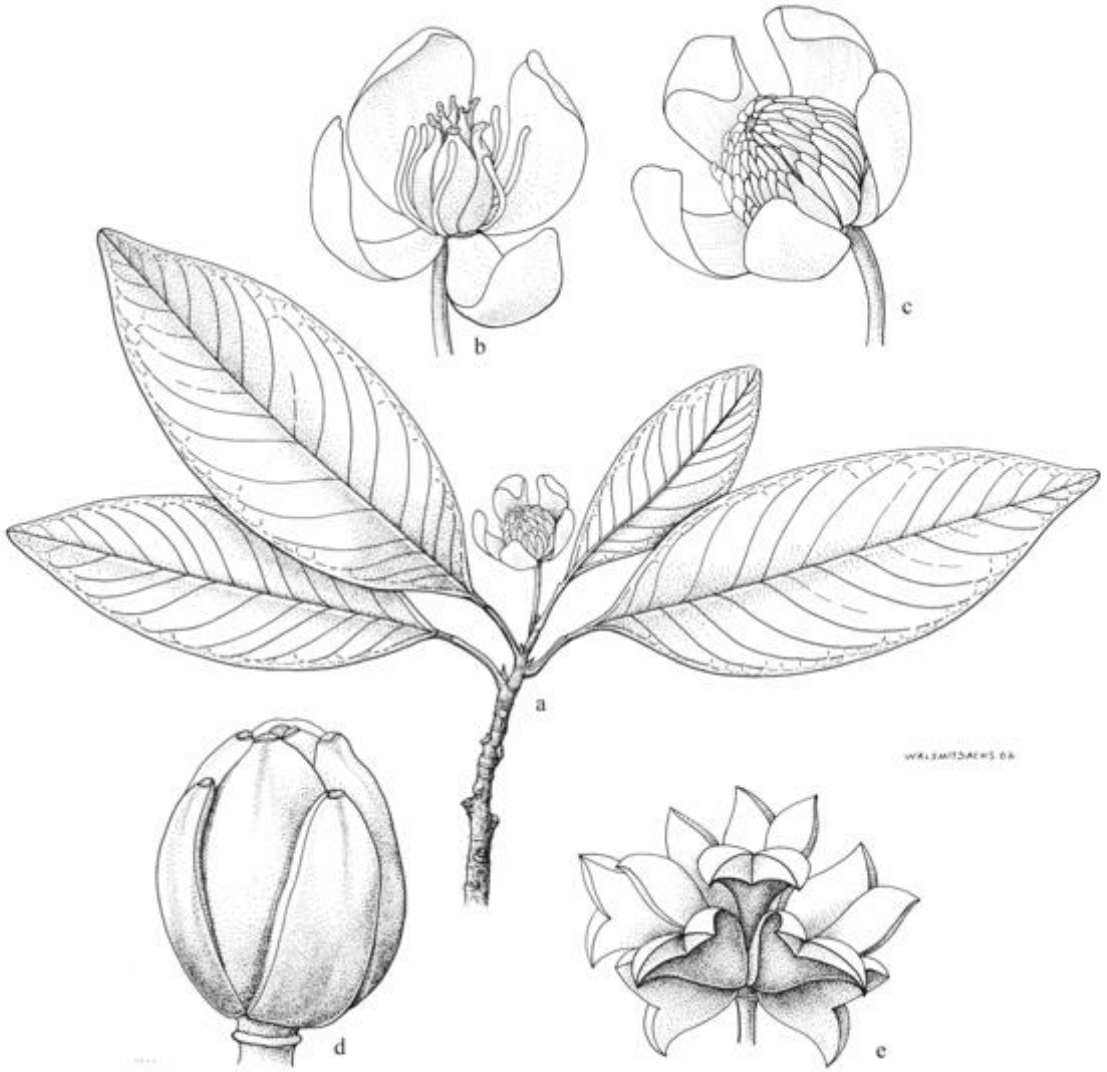
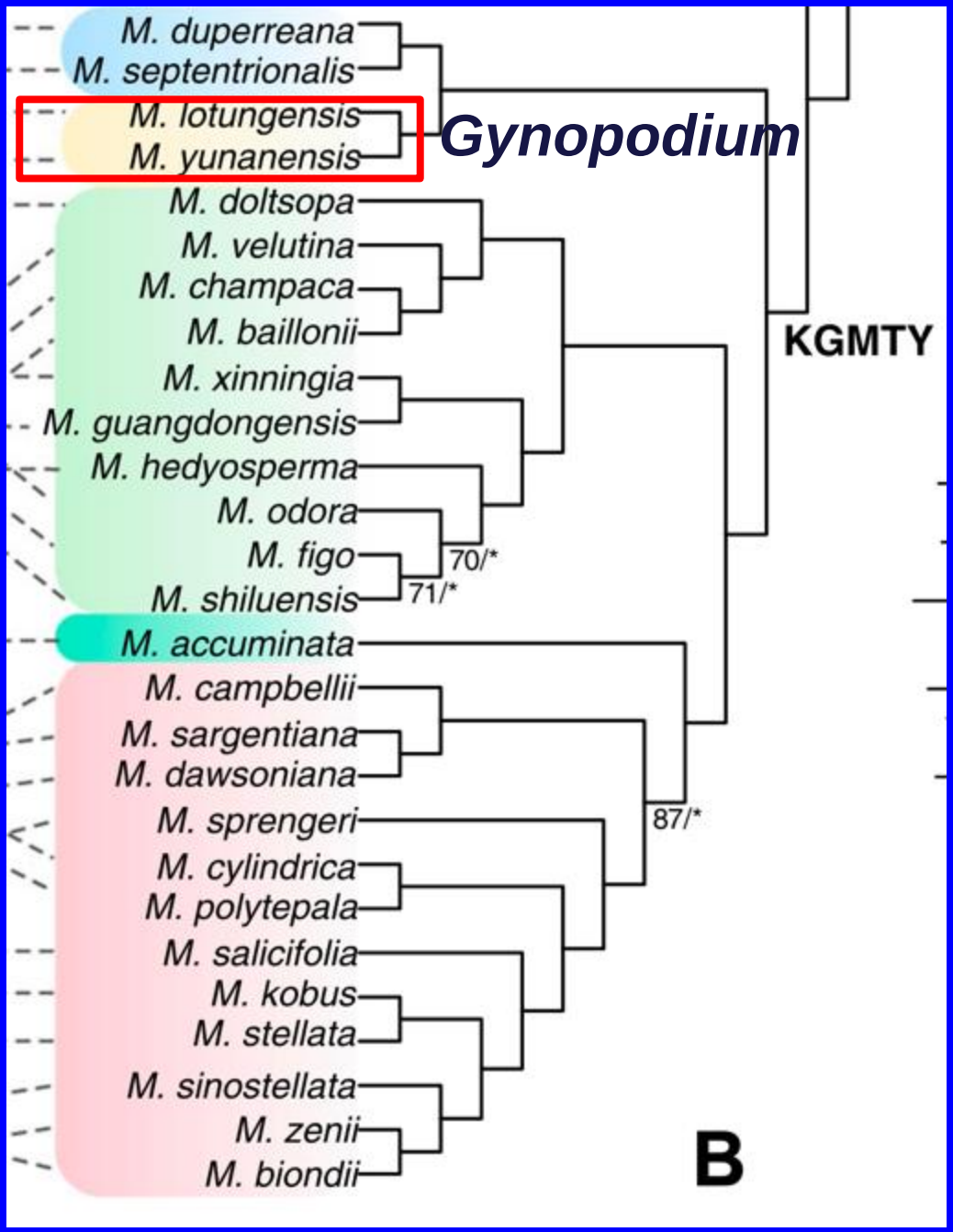


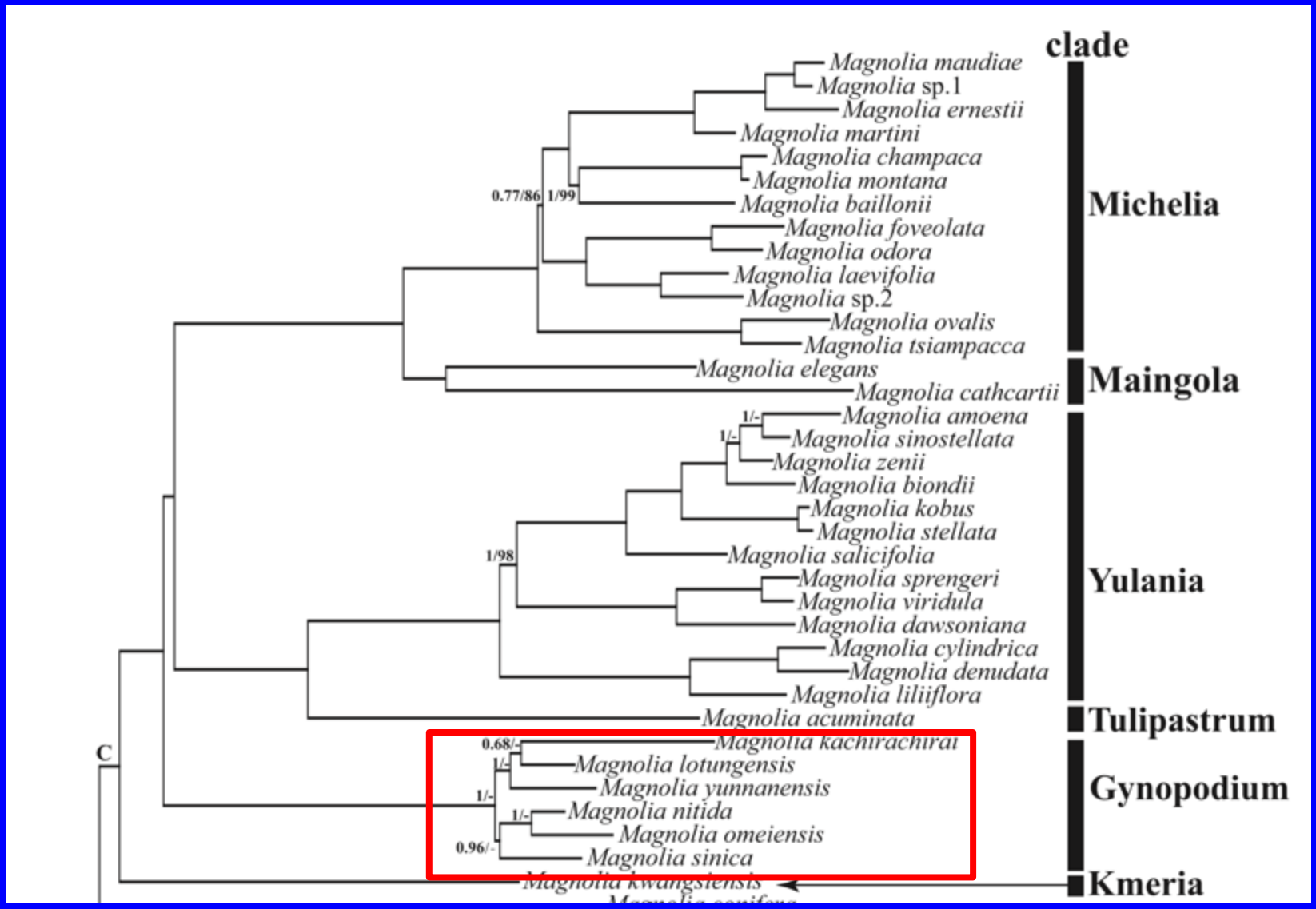
Figure 2. *Magnolia thailandica* Noot. & Chalermglin: a. habit (*Chalermglin* 410530); b. female flower (*Chalermglin* 450417-2); c. male flower (*Chalermglin* 450417-2); d. young fruit *(P. Chalermglin* 410719); e. ripe fruit (*Chalermglin* 411203).

Nooteboom & Chalermglin 2009

(11) sectio Gynopodium
(genera Pachylarnax, Parakmeria)



Dong et al. 2021



Wang et al. 2020

Plants evergreen

Young leaves open in bud (not conduplicate)

Stipules completely free from the petiole

Branching by prolepsis

Stamens persistent during male flowering phase

Gynoecium sessile or shortly stipitate

Ovules 2-8 per carpel

Stomata of Baranova types 10 & 11

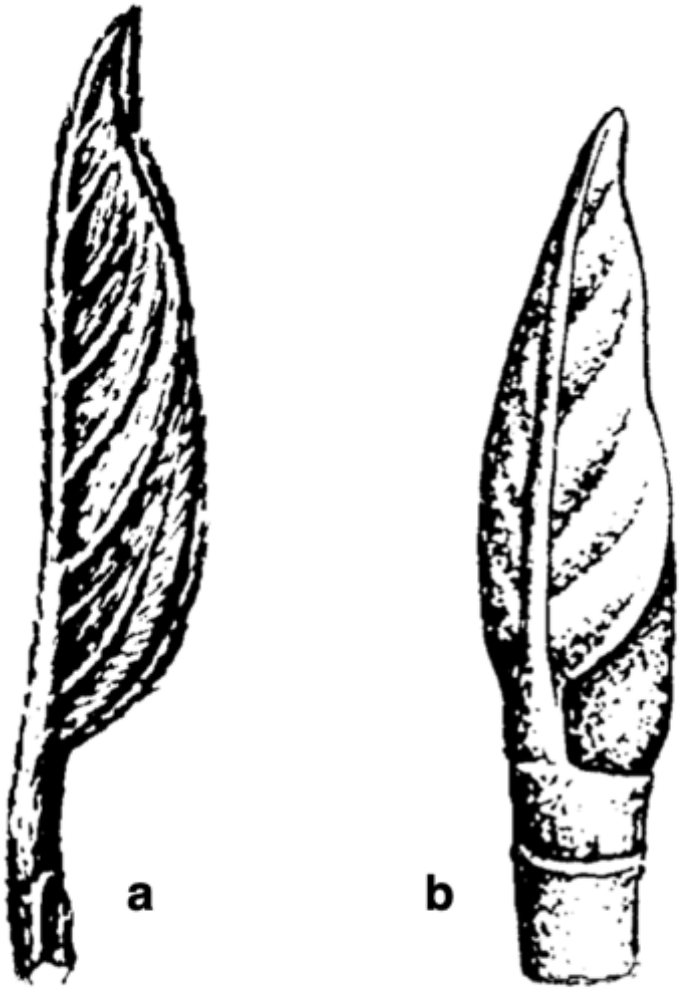


Fig. 1. a. Conduplicate prefoliation; b. open prefoliation (after Flora of China).

Magnolia sinica

Fig. 1. Flowering process, insects visitors and fruits of *M. sinica*. (A) A bud tip at the pre-pistillate stage; (B)–(C) Tepals separating and moving outwords to a fully open at the pistillate stage; (D) Tepals re-closing at the end of the pistillate stage; (E) Tepals except for the outer ones remaining closed during the pre-staminate stage; (F) The tepals completely re-opening at the staminate stage; (G)–(H) Beetles entering the open chamber at the pistillate stage. (I)–(J) Beetles leaving the re-opening chamber at the staminate stage; (K)–(L) Beetles (Pleocomidae) visiting the open flower, touching the exudate-secreting stigma; (M) Tepals partly eaten on the inside by visiting beetles. (N) Bees (*A. mellifera*) visiting a re-opening flower during the staminate stage; (O) Young fruit; (P) Mature fruit with red aril on seeds.

Chen et al. 2016

Magnolia sinica

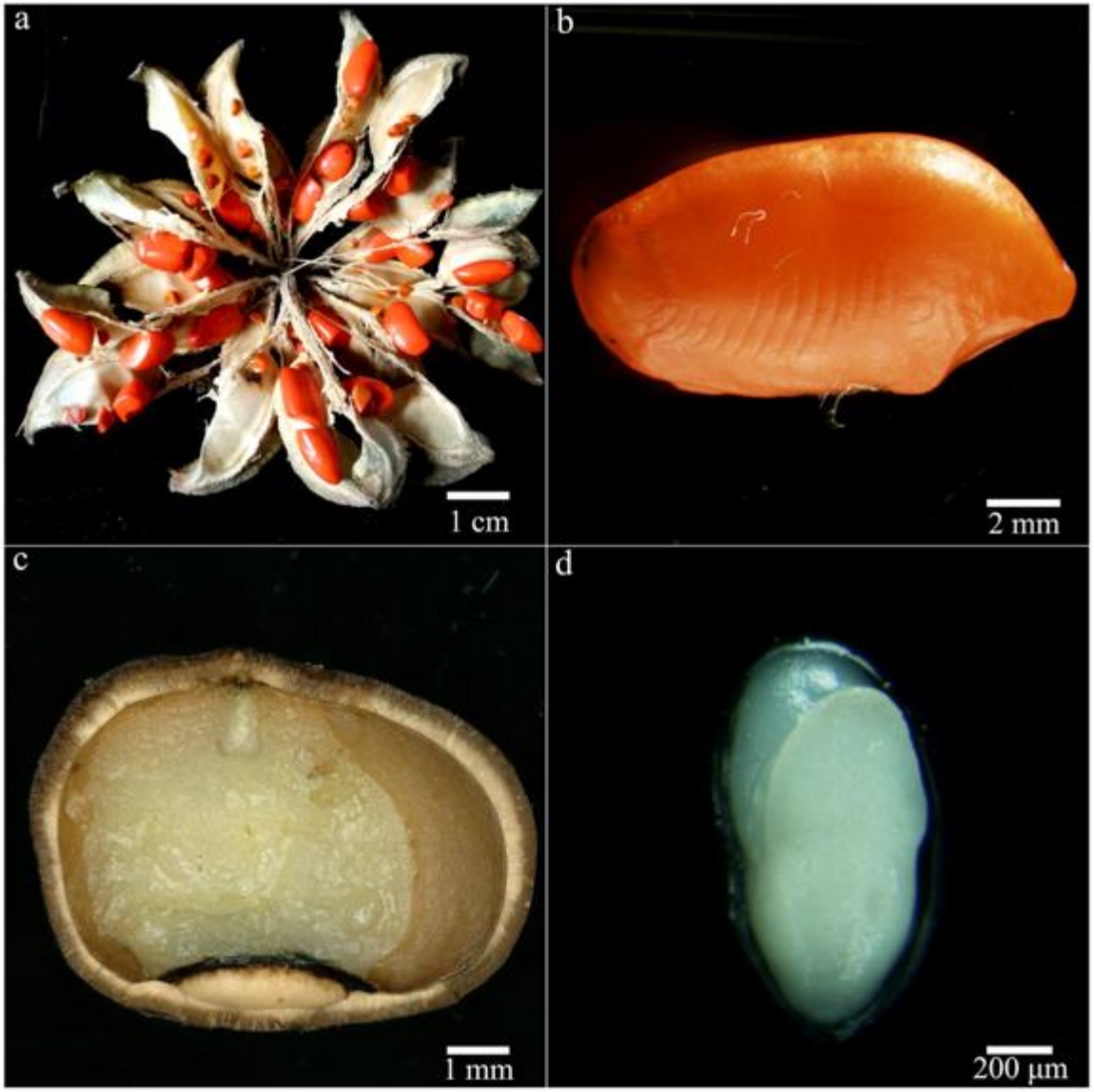


Fig. 1. Fruit, seed and embryo morphology of *Magnolia sinica*. Dehiscent fruit (a), seed (b), profile of seed (c) and excised embryo (d).

Lin et al. 2022

Magnolia praecalva

Fig. 4. *Pachylarnax praecalva* Dandy. – a. Habit, × 2/3; b. fruit, × 2/3; c. ovary, × 2; d. anther, × 3 (*Curtis 3012*).

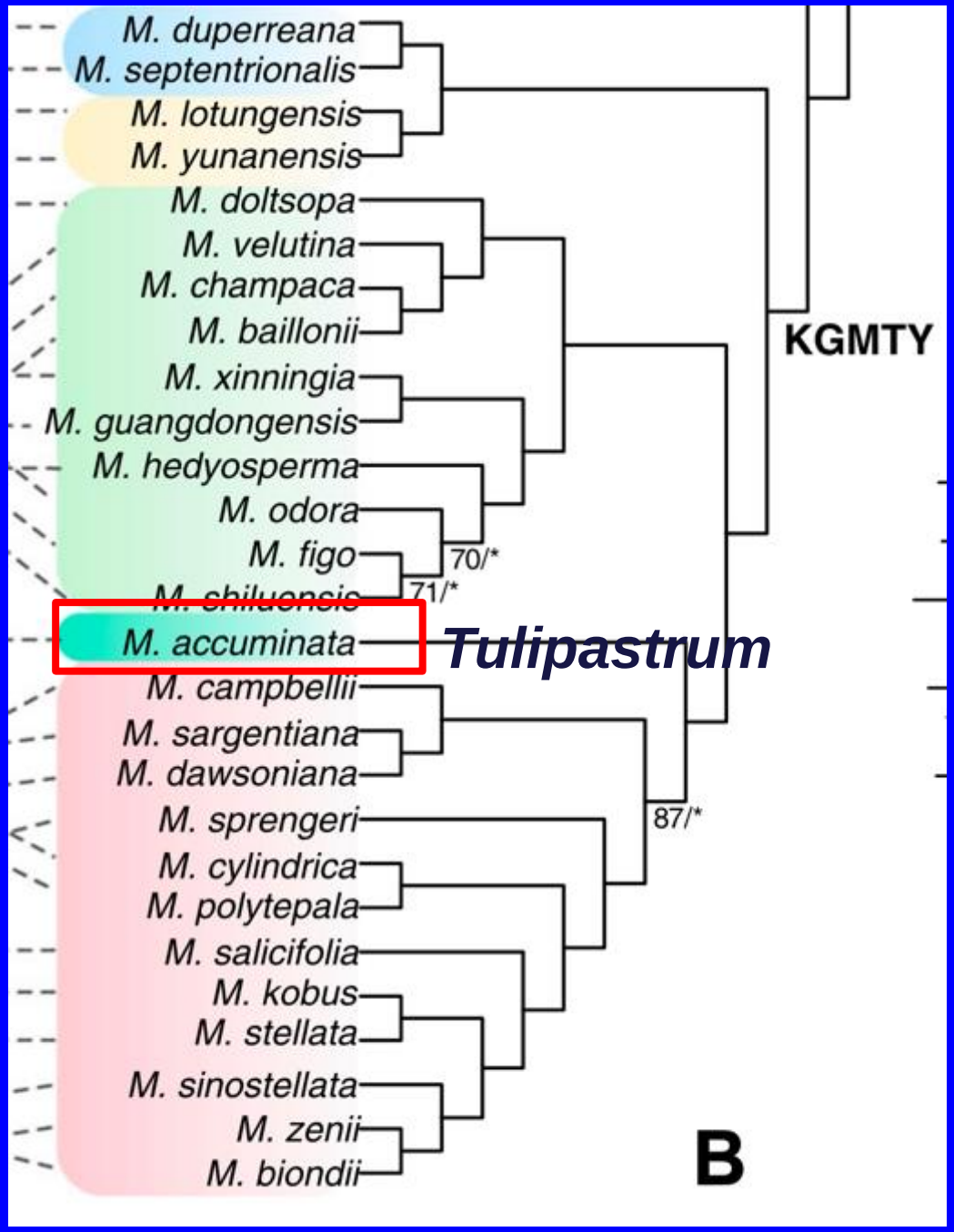
Nooteboom 1985

Magnoliaceae_Magnolia_nitida_TPAR2001-41-China_WLD_JDL019458_09SEP2014_01.jpg

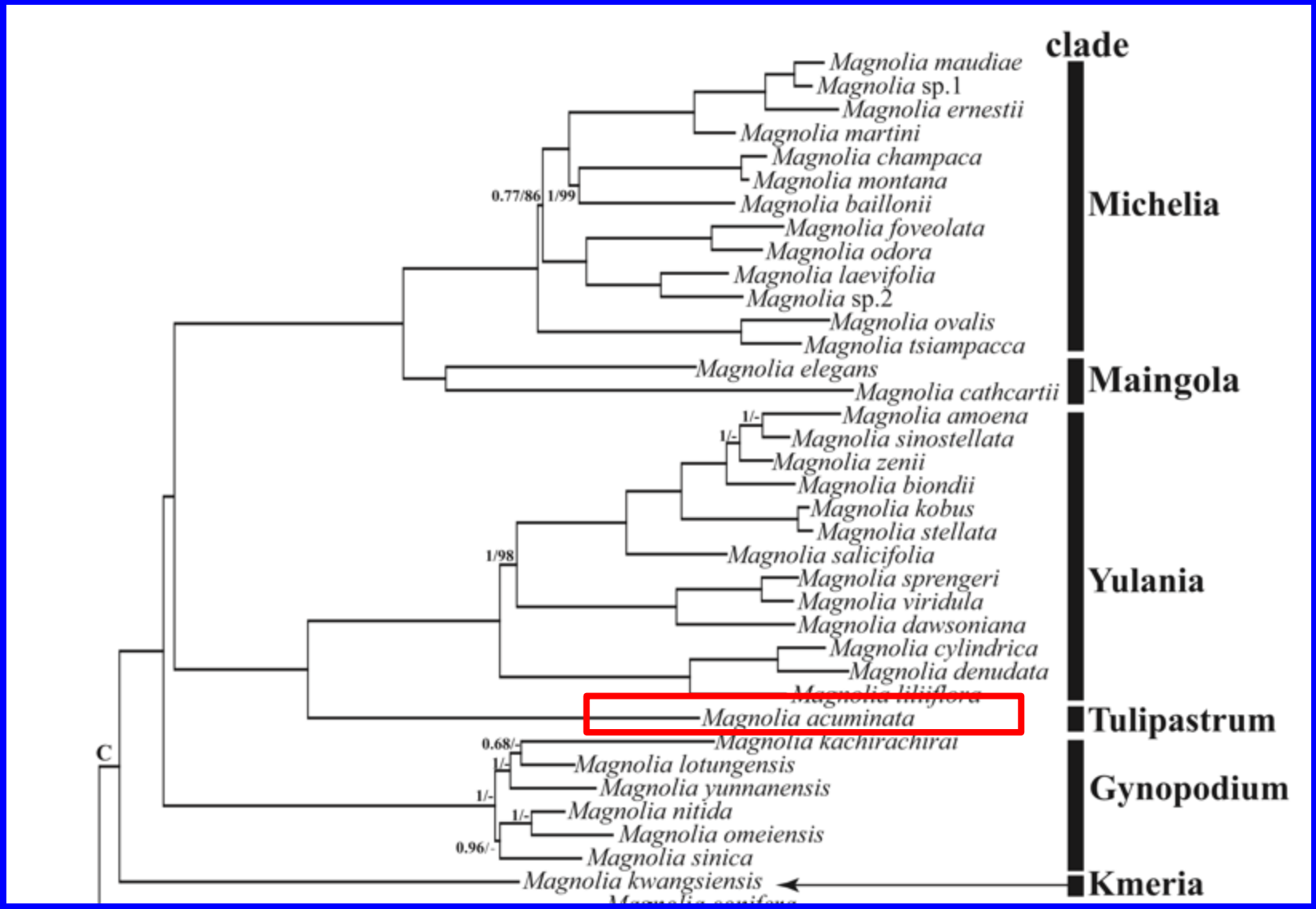
Magnoliaceae_Magnolia_nitida_TPAR2001-41-China_WLD_JDL019458_09SEP2014_04.jpg

Magnoliaceae_Magnolia_lotungensis_HGAA200101201B-RaulstonARB_JDL019287_30JUL2014_01.jpg

(12) sectio Tulipastrum
(genus Tulipastrum)



Dong et al. 2021



Wang et al. 2020

Leaves deciduous

Branching by prolepsis

Flowering semi-precocious

Tepals green to yellow

Stamens persistent during male flowering phase

Anthers with latrorse opening

Stomata of Baranova type 13

Magnolia acuminata

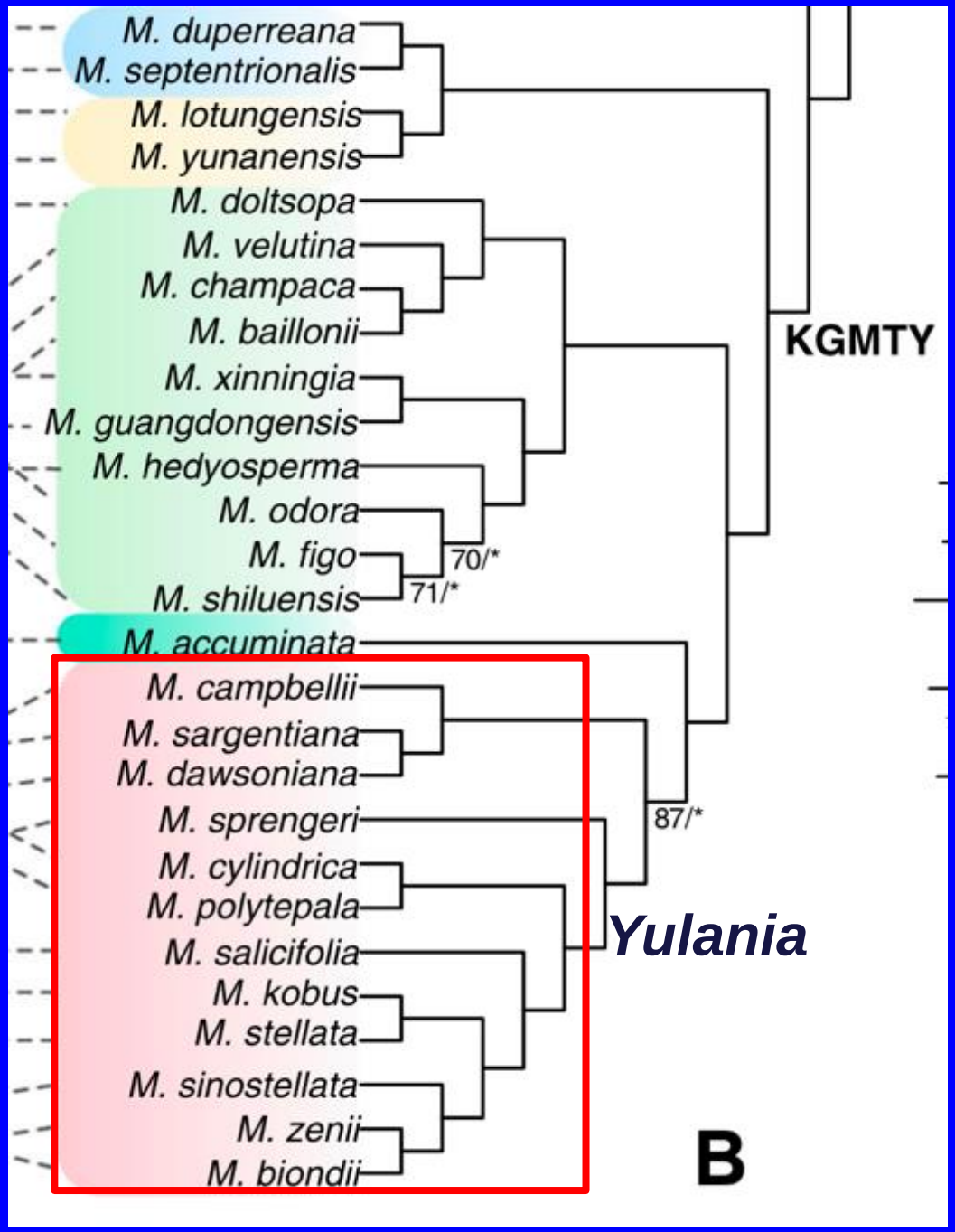
Magnolia acuminata

Magnoliaceae_Magnolia_acuminata_AHLE00000070_JDL019494_25SEP2014_01.jpg

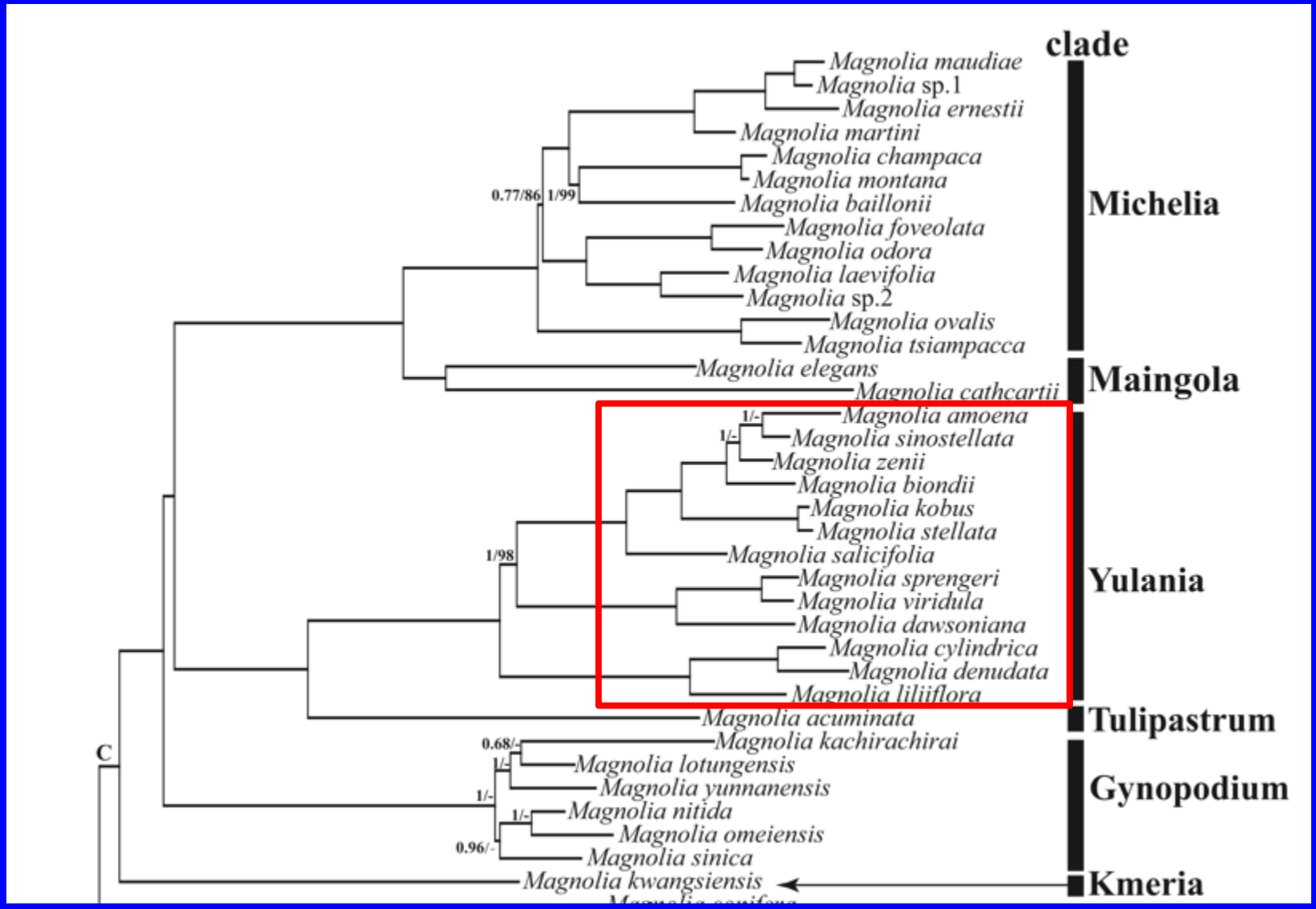
Magnolia decidua

Magnoliaceae_Magnolia_acuminata_AHLE00000070_JDL019494_25SEP2014_02.jpg

(13) sectio Yulania
(genus Yulania)



Dong et al. 2021



Wang et al. 2020

Leaves deciduous

Branching by prolepsis

Flowering pronounced precocious

Tepals white, pink or purple

Stamens persistent during male flowering phase

Anthers with latrorse opening

Stomata of Baranova type 13

Magnolia denudata

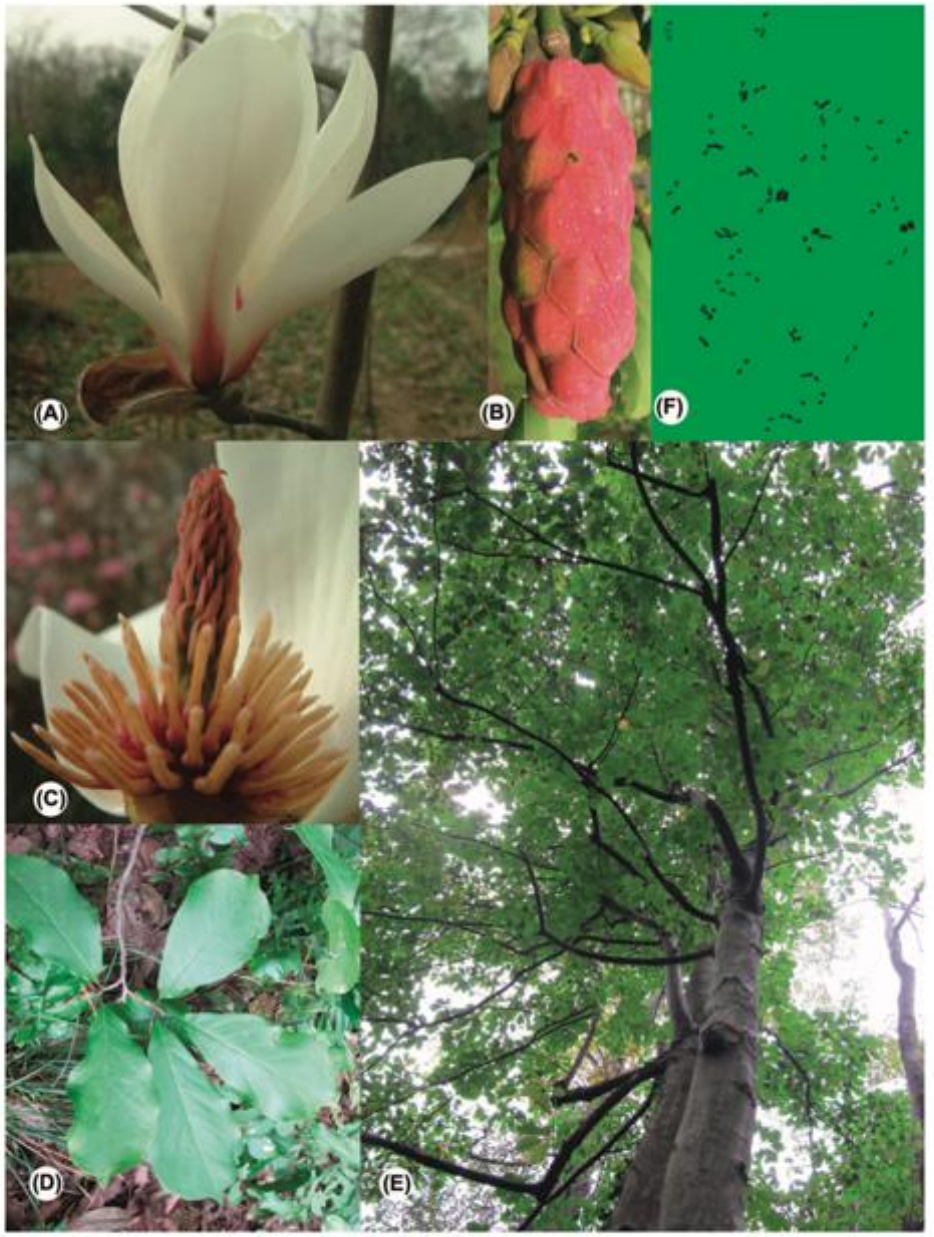


Figure 1. *Magnolia denudata* var. *glabrata* var. nov. from Mt Hengshan. (A) flower, (B) fruit, (C) stamens and gynoecium, (D) leaves, (E) tree, (F) metaphase of meiosis.

Wang et al. 2014

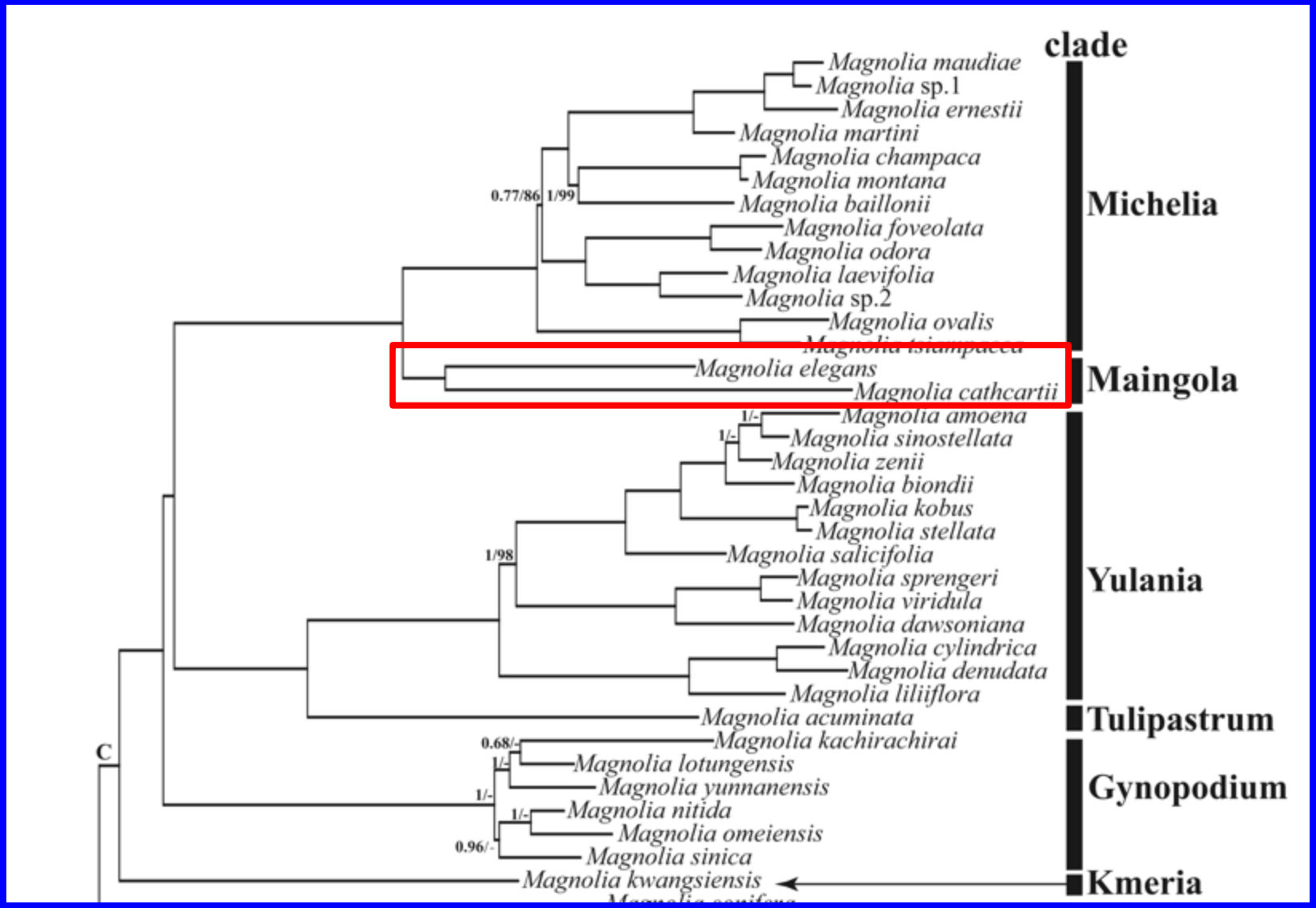
Magnolia denudata

Figure 2. *Magnolia denudata* var. *glabrata* var. nov. (A) flower bud, (B) flower, (C) outer tepals, (D) middle tepal, (E) inner tepal, (F) androecium and gynoecium, (G) leaf, (H) fruit. Drawn by Dinghan Cai.

Wang et al. 2014

Magnoliaceae_Magnolia_sprengeri_var. sprengeri_HWH84329-esv_JDL019347_25AUG2014_01.jpg

(14) sectio Maingola
(genera Alcimandra, Aromadendron)



Wang et al. 2020

Plants evergreen

Stipules completely free from the petiole

Branching by prolepsis

Stamens persistent during male flowering phase

Anthers with introrse opening

Gynoecium stipitate or sessile

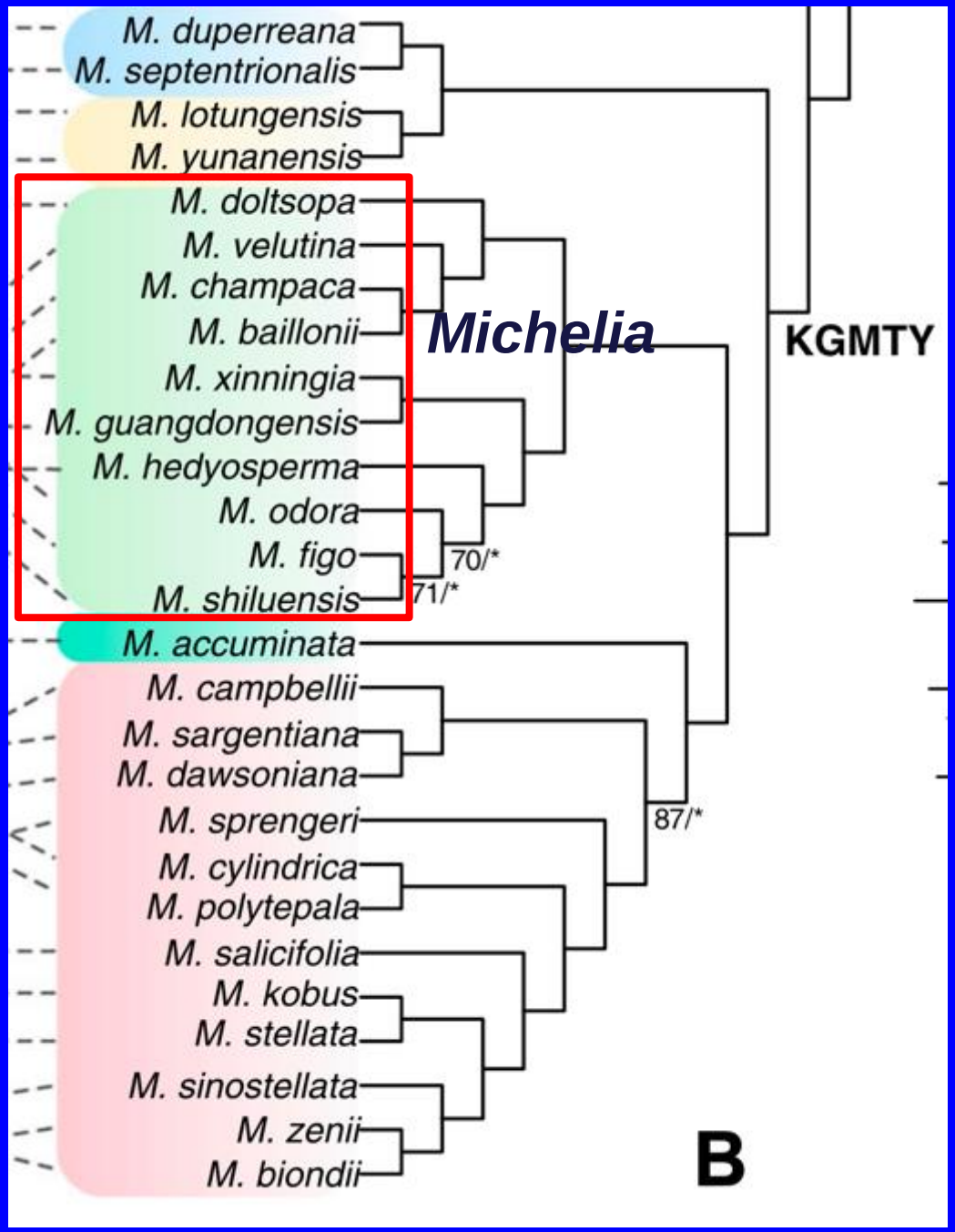
Ovules 2-5 per carpel

Stomata of Baranova types 12 & 14

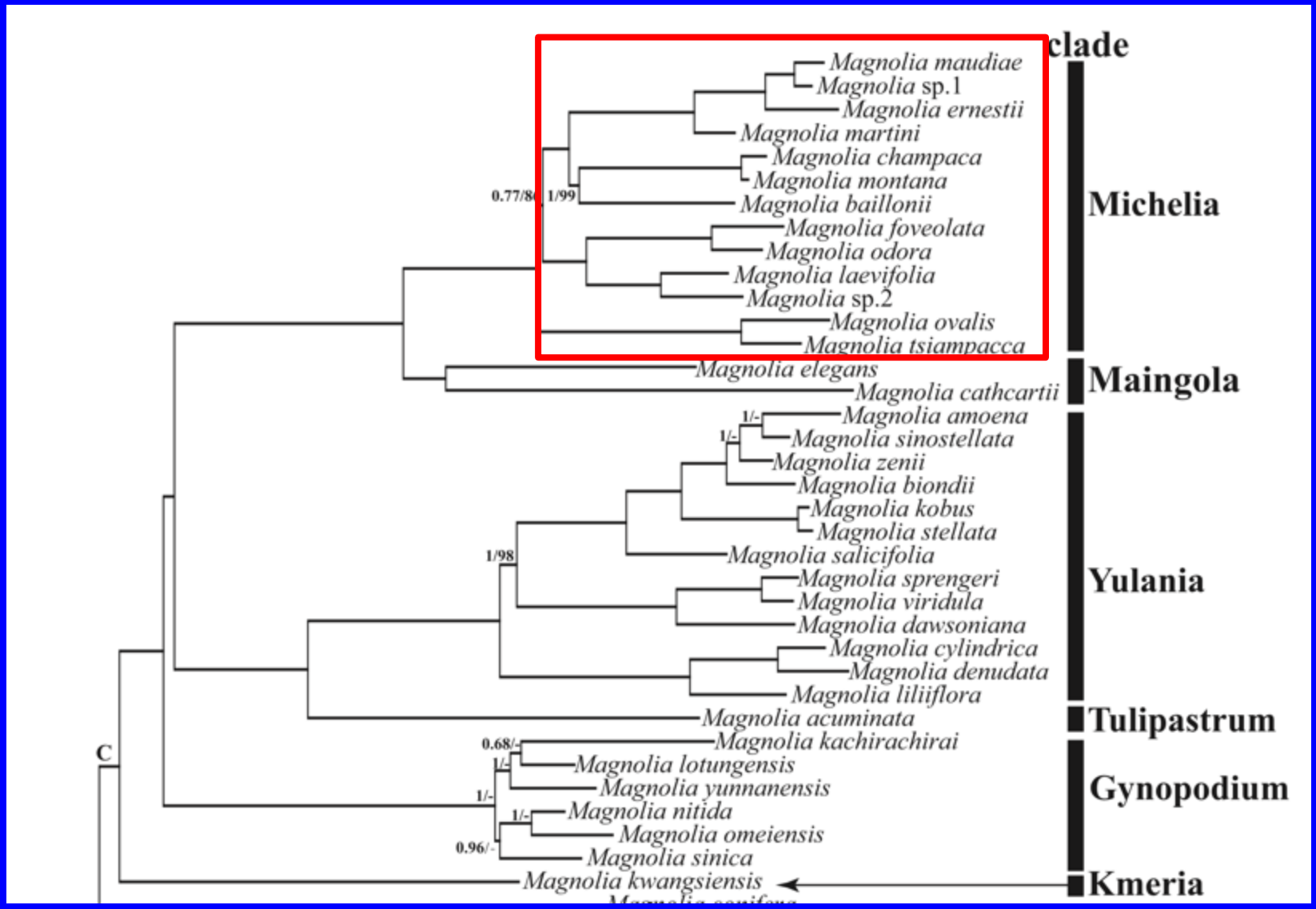
Magnolia cathcartii

Magnoliaceae_Magnolia_cathcartii _TPAR2005-63-Vietnam_WLD_JDL019450_10SEP2014_01.jpg

(15) sectio Michelia
(genera Michelia, Elmerrillia)



Dong et al. 2021



Wang et al. 2020

Plants evergreen

Flowers on lateral proleptic brachyblasts

Stipules free from or connate with the petiole

Stamens persistent during male flowering phase

Anthers with latrorse or introrse opening

Gynoecium stipitate or sessile

Ovules 2-6 (to many) per carpel

Stomata of Baranova type 12

Magnolia sectio Michelia

Fig. 5. Representatives of *Magnolia* sect. *Michelia* species. **A, B,** *M. maudiae*. **C, D,** *M. vrieseana*. **E,** *M. tsiampacca* subsp. *tsiampacca*. **F, G,** *M. odora*. **H, I,** *M. baillonii*. Photo credit: A and B: Yubing Wang; C and E: Fabian Brambach; D: Jun Wen; F and H: Yongkang Sima; G: Hongfeng Chen; I: Renbin Zhu.

Wang et al. 2020

Magnolia citrata

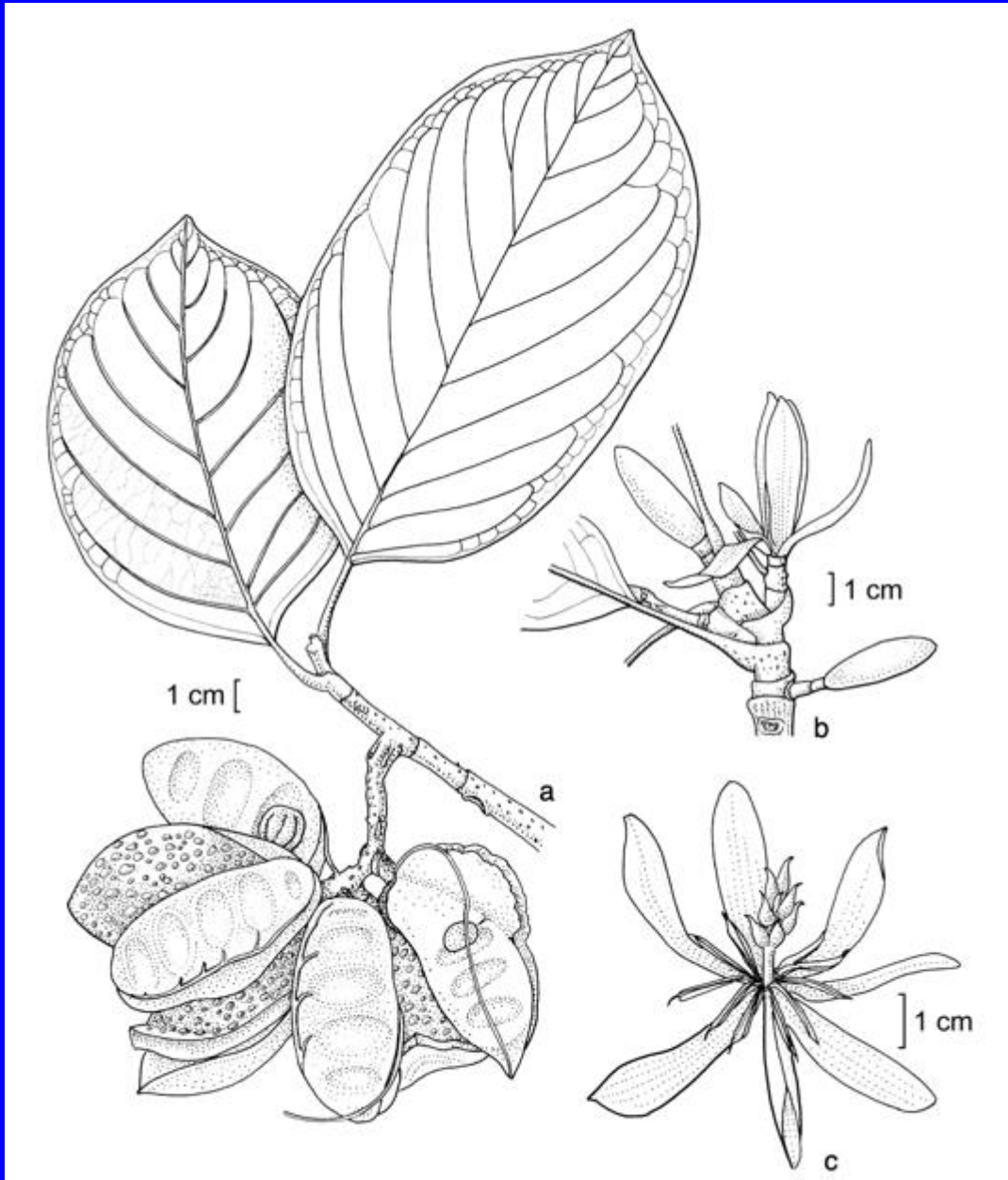


Fig. 1. *Magnolia citrata* Noot. & Chalermglin. a. Habit with ripening fruit; b. flower buds; c. flower (a: *Smitinand 90-269*; b, c: *P. Chalermglin 420410*).

Chalermglin & Nooteboom 2007

Magnolia tsiampacca

Fig. 7. *Elmerrillia tsiampacca* (L.) Dandy subsp. *tsiampacca* var. *tsiampacca*. – Flowering twig, × 2/3 (*Koorders 17776*).

Nooteboom 1985

Magnolia scortechinii

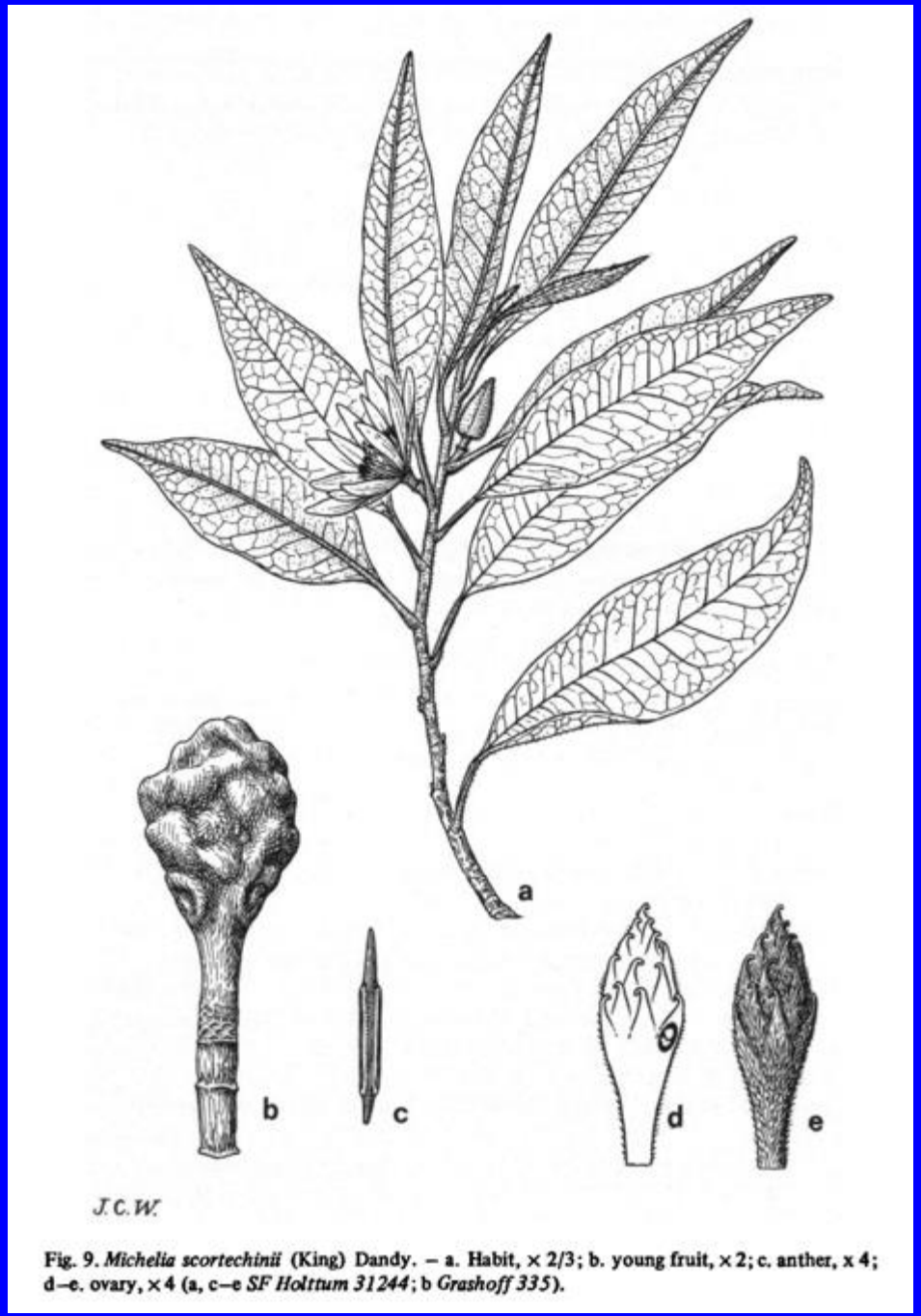


Fig. 9. *Michelia scortechinii* (King) Dandy. – a. Habit, × 2/3; b. young fruit, × 2; c. anther, x 4; d–e. ovary, × 4 (a, c–e *SF Holttum 31244*; b *Grashoff 335*).

Nooteboom 1985

Magnolia koordersiana

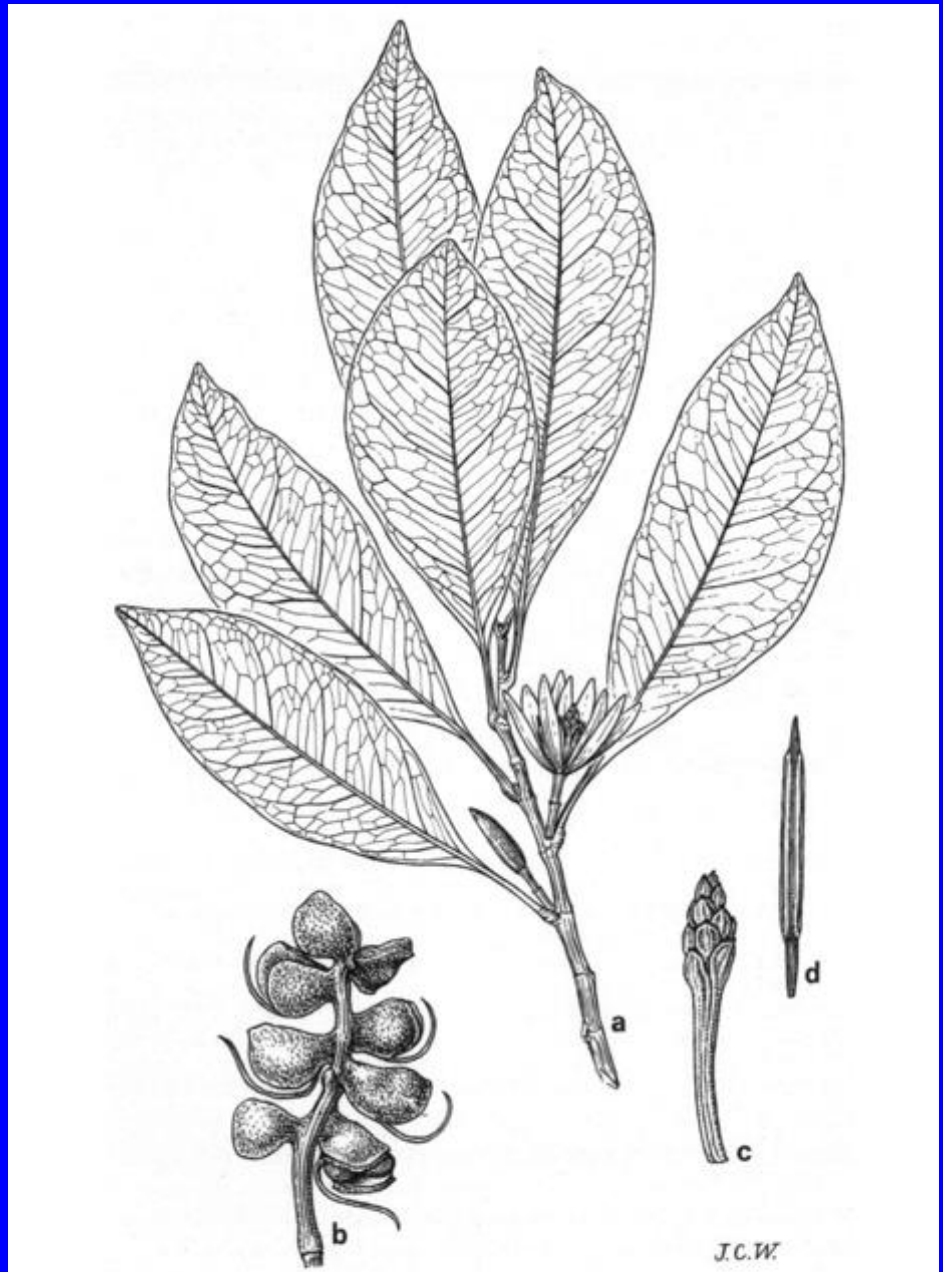


Fig. 10. *Michelia koordersiana* Noot. – a. Habit, × 2/3; b. fruit, × 2/3; c. ovary, × 4; d. anther, × 6 (*v. d. Zwaan voor Thorenaar T 345*).

Nooteboom 1985

Magnoliaceae_Magnolia_laevifolia_TPAR1998-16-Yunnan_WLD_JDL019439_09SEP2014_01.jpg

Magnoliaceae_Magnolia_champaca_HBUG0000_JDL019670_06MAR2015_01.jpg

Magnoliaceae_Magnolia_champaca_HBUG0000_JDL019670_06MAR2015_02.jpg

26. Magnolia fordiana

Magnoliaceae_Magnolia_ernestii_TPAR1996-22-MalletCourt_JDL019440_09SEP2014_07.jpg

Magnoliaceae_Magnolia_ernestii_TPAR1996-22-MalletCourt_JDL019440_09SEP2014_08.jpg

Magnoliaceae_Magnolia_ernestii_ITURRA0000R-Mbulk_JDL019785_06JUL2015_08.jpg

The take home messages

One single genus *Magnolia*, with 15 sections

Evolution in this genus was very slow, most sections do not appear before Midst Oligocene (30 My bp)

All sections are clearly distinguished by molecular data

All sections are morphologically distinguished by a combination of characters

All sections are restricted to either America or Asia (except for *Rytidospermum*)

Thanks to…

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All of you, members of the IDS

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Emma Kirkby
Werner Güra