How deep is the conflict between molecular and fossil evidence on the age of angiosperms?

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Supplementary Information

Methods S1 - Supplementary data and methods used in LTT analysis

The dated phylogeny of the angiosperms based on the data set and fossil calibrations of Magallon *et al.* (2015), analyzed without the paleontologically inspired prior on the root node, was kindly provided by Susana Magallón.

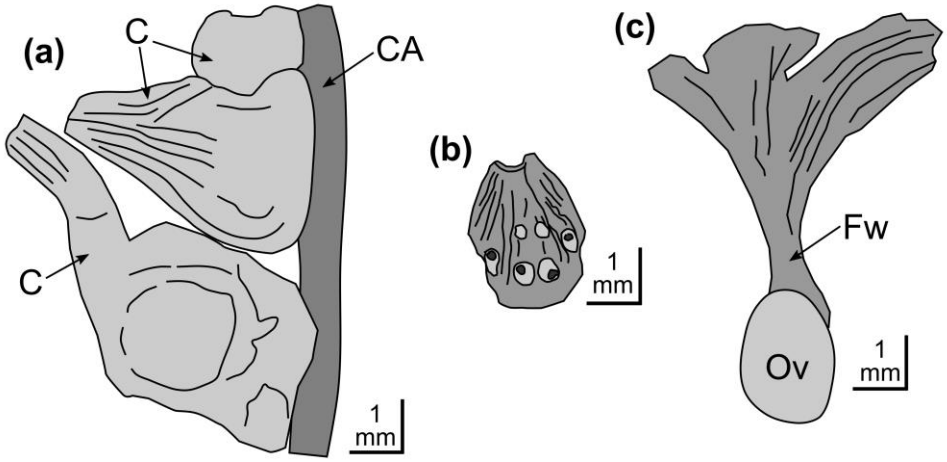
Data for pollen aperture type were scored from the classic compendium of Erdtman (1952), PalDat (2000 onwards), Doyle (2005) and references cited therein for "basal" groups, and sources in the primary literature. We did not attempt an exhaustive search for literature on taxa not covered by these sources; most of the taxa not scored are from "derived" clades of eudicots and monocots and are unlikely to affect the main results. Pollen aperture was scored as either sulcate (including trichotomosulcate, disulculate, zonasulcate, zonasulculate, ulcerate), colpate (including tricolpate, tetracolpate, stephanocolpate, pantocolpate), colporate (dicolporate, tricolporate, tetracolporate etc.), porate (diporate, triporate, pantoporate, but not monoporate = ulcerate), or inaperturate.

A lineage-through-time plot using the method of Mahler et al. (2015) was reconstructed using these pollen data and the phylogeny. The method was originally developed to investigate the number of lineages occupying each biogeographical area at each node of a tree, but we repurpose it here to estimate how many lineages possessed the different types of pollen aperture. The method estimates a diversity vector for all nodes that contains the number of lineages having a particular character state weighted for the probability of the state reconstruction for each node in the phylogeny. This is then plotted against the age of the nodes, with pie charts indicating the probability of the reconstruction at each node. The diversity vector was generated using the estDiversity function from the phytools package (Revell, 2012) on the dated tree trimmed to include only angiosperms. We employed a stochastic mapping method to calculate the probability of each state at the nodes. The ancestral state reconstruction for the pie charts was conducted using the function make.simmap from the library phytools running 500 replicates of the stochastic mapping algorithm, and using an "All rates different" model. This was conducted over the whole phylogeny, and the results were then trimmed to include only angiosperms. Input (Nexus file of the character matrix, treefile, and a tabular version of the pollen characters) and the script used to generate the basic graph are available on the FigShare repository (https://figshare.com/s/480faad574632f2280a9).

Please see Table S1 for references cited here.

Notes S1 - Supplementary discussion of purported pre-Cretaceous angiosperms

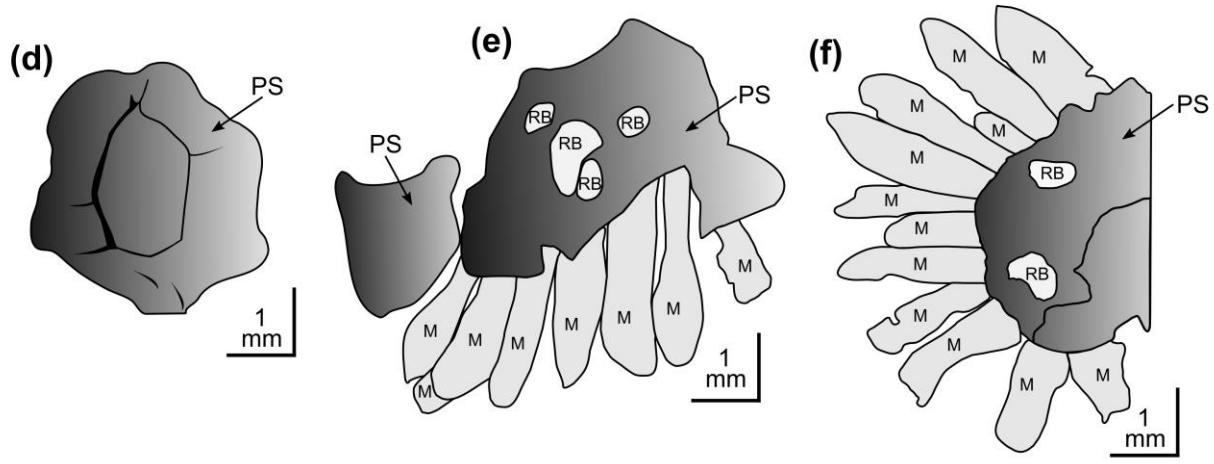
Below we present more detailed summary information and interpretive diagrams for recently proposed pre-Cretaceous megafossil angiosperms to illustrate our interpretations of their structure and possible affinities. These are *Schmeissneria sinensis* (a), *Schmeissneria microstachys* (b, c), *Solaranthus daohugouensis* (=*Aegianthus daohugouensis*) (d-f), *Euanthus panii* (g-j), *Xingueanthus sinensis* (k, l), *Juraherba bodae* (m, n), *Yuhania daohugouensis* (o-q), and *Nanjinganthus dendrostyla* (r-s).



(a) Part of a female structure of *Schmeissneria sinensis* from the Jiulongshan Formation, western Liaoning province, China, interpreted by Wang *et al.* (2007) as an inflorescence of female flowers, for which we use the descriptive terms "strobilus" and "cupules." Image shows three cupules (C) attached to the strobilar axis (CA). Based on fig. 2a in Wang *et al.* (2007).

(b) Outline diagram of cupule of *Schmeissneria microstachys* from Germany observed as a film pull under SEM, showing position of rounded structures that Wang (2010) considered enclosed seeds but we interpret as resin bodies in the cupule wall. Dark dots within the resin bodies are where the film has pulled away part of the fossil. Based on fig. 2f of Wang (2010).

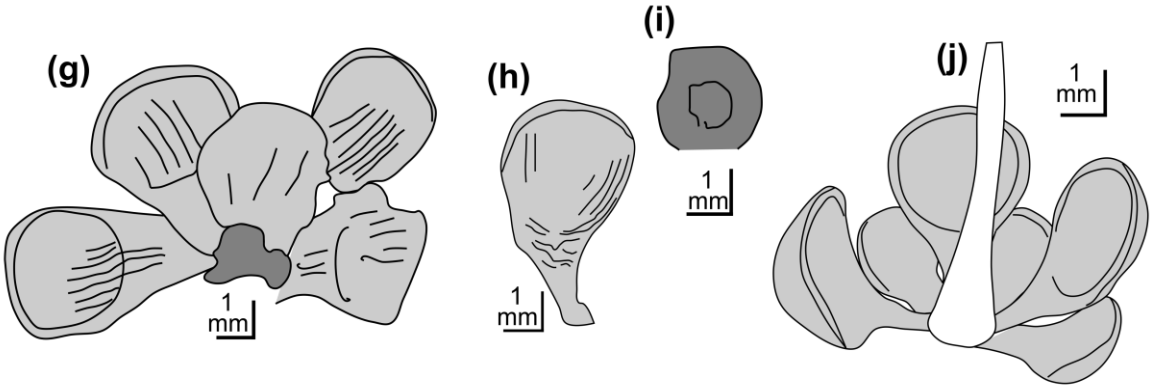
(c) Ovule (Ov) with fibrous wing (Fw) from *Schmeissneria microstachys* in Germany, similar to *Problematospermum*-type ovules recorded from China (Wang *et al.*, 2010). It is likely that such ovules were borne singly in cupules of *S. sinensis,* as they are in the German species. Based on fig. 1g of Wang (2010).



(d) Peltate sporophyll (PS) in plan view of *Solaranthus daohugouensis* from the Jiulongshan Formation at Daohugou, Inner Mongolia, interpreted by Zheng & Wang (2010) as an angiosperm flower. The genus was transferred into the genus *Aegianthus* by Deng *et al.* (2014), which was assigned to the cycads, although it may represent another gymnospermous group such as peltasperms. Based on fig. 2g of Zheng & Wang (2010).

(e) Peltate sporophyll of *Solaranthus daohugouensis* in lateral view revealing numerous microsporangia (M) and resin bodies (RB). The "stamens," "tepals," "carpels," and "partial inflorescence" of Zheng & Wang are all readily interpreted in terms of this scheme. Based on fig. 2j of Zheng & Wang (2010).

(f) Peltate sporophyll with resin bodies of *Solaranthus daohugouensis* in plan view showing radiating microsporangia; the microsporangia were interpreted as "tepals" and "sepals" and the resin bodies as "carpels" by Zheng & Wang (2010). Based on fig. 2i of Zheng & Wang (2010).



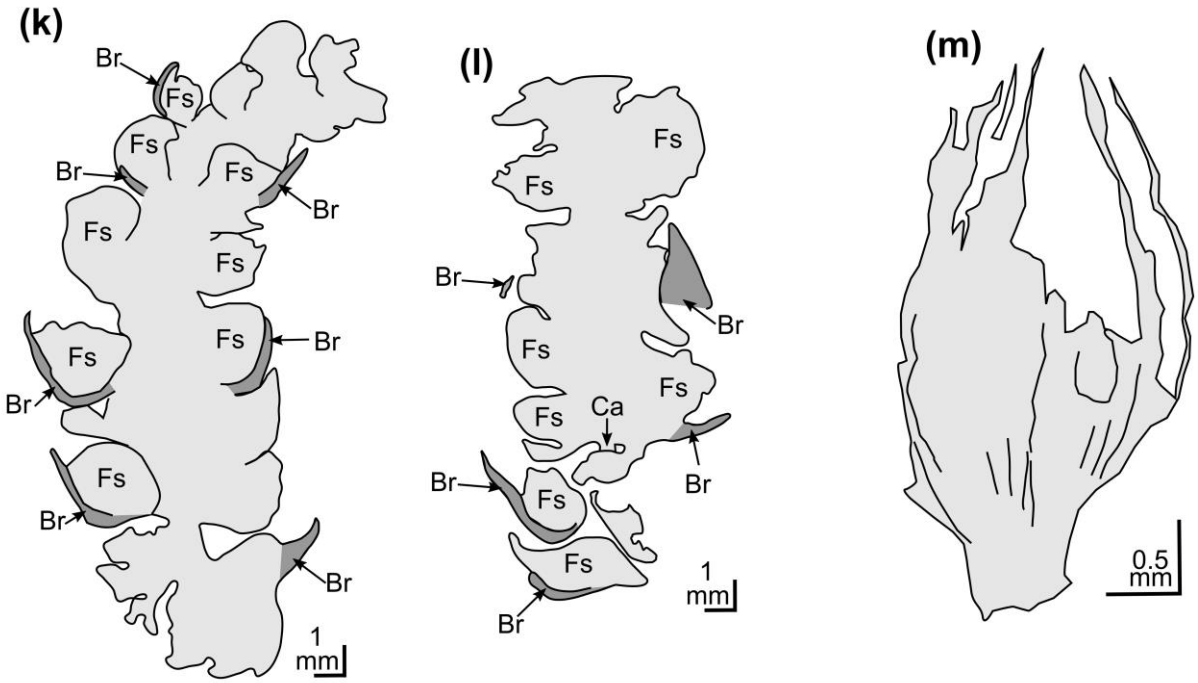
(g) Fossil with five scale-like appendages and central axis (dark shading) from the Jiulongshan Formation of western Liaoning, China, named *Euanthus panii* by Liu & Wang (2016) and interpreted as the "perfect flower" of an angiosperm. Specimen reinterpreted by Herendeen *et*

al. (2017) as a conifer cone with coriaceous cone scales, with striations representing wrinkles and/or vascular bundles. Based on fig. 4b of Liu & Wang (2016).

(h) Single coriaceous cone scale of *Euanthus panii* showing striations and no clear fertile structures. Based on fig. 5a of Liu & Wang (2016).

(i) Line diagram of the robust cone axis of *Euanthus panii* in section view with superficially pentamerous structure and depressed inner area, presumably pith. Based on fig. 4d of Liu & Wang (2016).

(j) Reconstruction of *Euanthus panii* showing apical continuation of axis, clearly resembling a coniferous cone. The cone axis is not convincingly shown to be in organic attachment to the scales. Based on fig. 8c of Liu & Wang (2016).

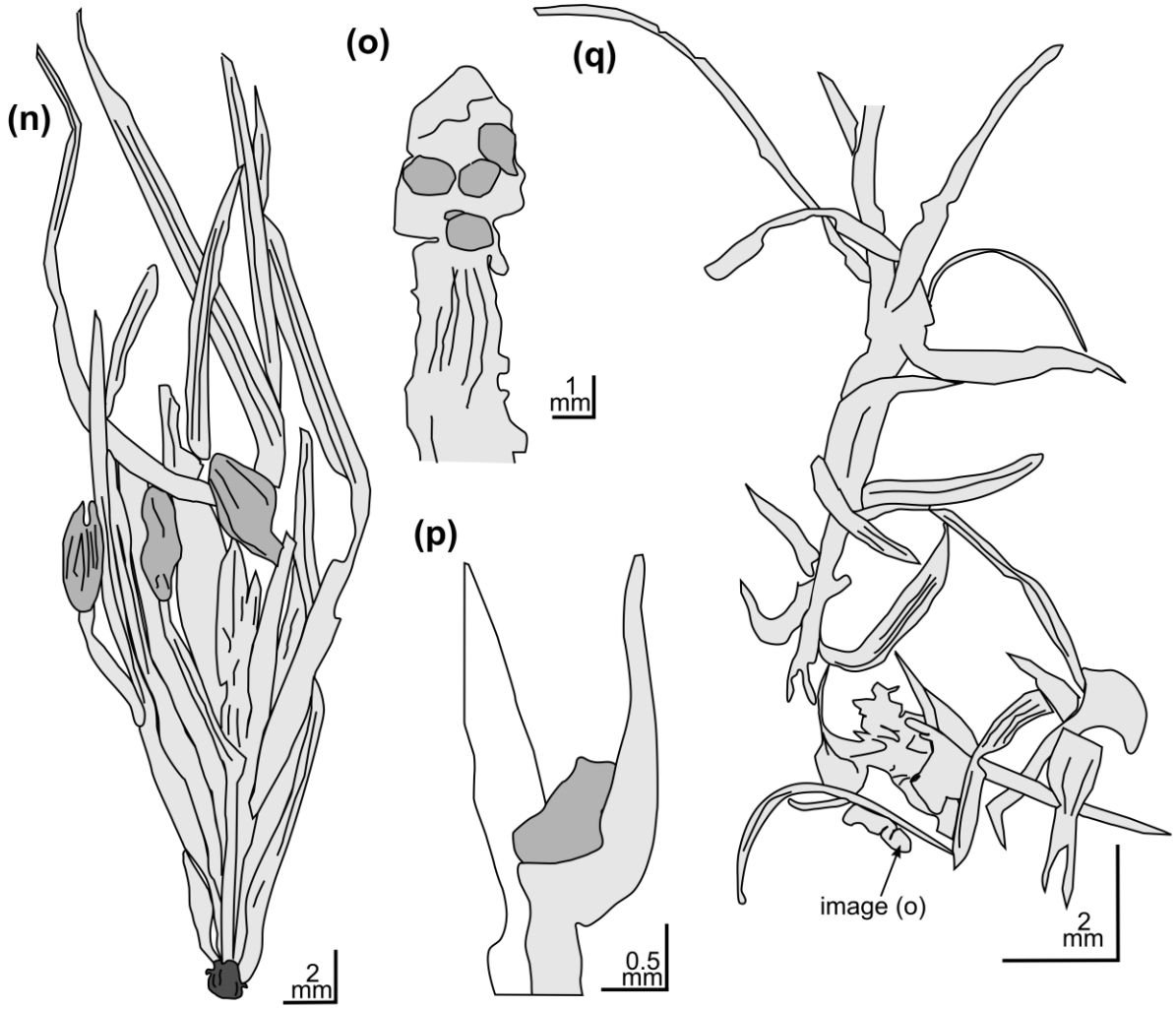


(k) Line diagram of *Xingueanthus sinensis* from the Jiulongshan Formation of western Liaoning, China. Although *Xingxueanthus* was interpreted by Wang & Wang (2010) as an angiosperm inflorescence, it appears to be a poorly preserved conifer cone with bracts seen in lateral view and axillary fertile short shoots or ovuliferous scales. Based on fig. 2a of Wang & Wang (2010).

(l) Line diagram of counterpart to (k) showing outline view of a single triangular bract as well as three others in lateral view, again resembling a conifer and not an angiosperm. Based on fig. 2b of Wang & Wang (2010).

(m) Fertile aggregation of *Juraherba bodae*, interpreted by Han *et al.* (2016) as the fructification of an herbaceous angiosperm. Preservation is poor and diagnostic characters of angiosperms are absent; the “fruits” and the surrounding “perianth” show no structural features that might allow

more confident morphological interpretation and systematic assignment. Based on fig. 2d of Han *et al.* (2016).



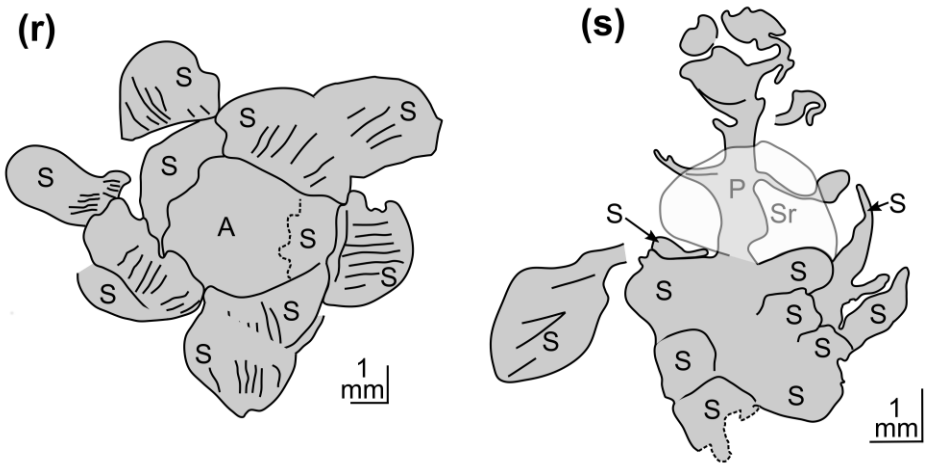
(n) Complete specimen of *Juraherba* showing plant base (dark shading), long vegetative leaves and short presumably fertile leaves ending in fertile aggregations (mid-shading). Leaves have one longitudinal vein and in some places appear to show longitudinal folds. The leaves were interpreted as being helically attached, but their phyllotaxis is not clear. The specimen bears little resemblance to the reconstructions shown by Han *et al.* (2016) in their fig. 7. Material with better preservation is required for a comprehensive characterization of this plant. Based on fig. 2a of Han *et al.* (2016).

(o) Fertile aggregation of *Yuhania daohugouensis* from the Jiulongshan Formation at Daohugou, Inner Mongolia, China. This is the best fertile structure illustrated by Liu & Wang (2017), but it is not attached to the rest of the plant and its preservation looks different, and it is therefore uncertain if it belongs to the same plant species. Liu & Wang (2017) interpreted the fertile aggregations of *Yuhania* as unisexual female axillary structures including carpels that are

helically arranged along the stem. Based on fig. 2d of Liu & Wang (2017). Position of fertile aggregation shown in image (q) below.

(p) Presumed fertile structure (dark shading) of *Yuhania* that could be either a sporangium at the base of a sporophyll as in lycophytes or, less likely, a fertile shoot in the axil of a bract; additional information is required from the specimens to determine the nature of this enigmatic and poorly preserved fossil. Note that the organization does not readily agree with that of the fertile aggregation shown above in (o). Based on fig. 2h of Liu & Wang (2017).

(q) Whole plant of *Yuhania* showing attached flexible leaves of different lengths and numbers of longitudinal veins, which makes characterization of the growth architecture of the plant challenging. In addition, several key parts of the specimen are obscured by shelly fossils. Based on 2a of Liu & Wang (2017). Position of fertile aggregation shown in (o) is indicated.



(r) Partially preserved specimen of *Nanjinganthus dendrostyla* from the South Xiangshan Formation near Nanjing, China, flattened on bedding plane in basal plan view showing helically inserted scale-like appendages (S) around the axis (A). This was interpreted by Fu *et al.* (2018) as a flower with sepals and petals, but the scales are less differentiated than typical sepals and petals and have prominent longitudinal striations suggesting a coriaceous texture. Based on fig. 2d of Fu *et al.* (2018).

(s) Partially preserved specimen of *Nanjinganthus* in lateral view on the bedding plane, which Fu *et al.* (2018) interpreted as exhibiting sepals, petals, and an apical dendroid style. We interpret this specimen as a conifer cone with tightly spaced and helically inserted basal cone scales (or possibly bracts) and degraded apical cone scales (or possibly microsporophylls) (S). The cone axis was concealed below a single scale (Sr) that was removed by Fu *et al.* (2018) during specimen preparation. Image based on figs. 3a and 3b in Fu *et al.* (2018), rescaled to the same

size and rotated to overlap each other and to reveal the position of the scale overlying the cone axis before and after preparation.

References

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Table S1 – Taxa coded for generating Fig. 4 and sources of data.

Taxon	*References and notes*
Abatia	Erdtman 1952, Keating 1973
Abelia	Erdtman 1952
Abrophyllum	APSA Members 2007
Acacia	PalDat
Acalypha	Sagun et al. 2006
Acanthochlamys	Furness & Rudall 2006
Acanthus	PalDat
Acharia	Furness 2011
Acicarpha	PalDat
Acorus	Rudall & Furness 1997
Acridocarpus	Erdtman 1952, Gosling et al. 2013
Actinidia	Erdtman 1952, PalDat
Adoxa	Erdtman 1952
Aesculus	Erdtman 1952, PalDat
Aextoxicon	Erdtman 1952, Kubitzki et al. 2007
Afrostyrax	Baas 1972
Agave	Erdtman 1952, PalDat
Ailanthus	Erdtman 1952, PalDat
Akebia	Furness et al. 2007, PalDat
Alangium	Erdtman 1952, PalDat
Albizia	PalDat
Alisma	PalDat
Allium	PalDat
Alluaudia	Erdtman 1952
Alnus	PalDat
Alseuosmia	Erdtman 1952
Alstroemeria	Erdtman 1952
Altingia	Erdtman 1952
Amborella	Sampson 1993, PalDat
Anagallis	PalDat
Anarthria	Linder & Ferguson 1985
Ancistrocladus	Erdtman 1952
Androsace	PalDat
Androstachys	Erdtman 1952
Anemopsis	Smith & Stockey 2007
Angelica	PalDat
Anigozanthos	Erdtman 1952
Anisophyllaea	Erdtman 1952
Annona	PalDat, Doyle & Le Thomas 2012
Anopterus	Erdtman 1952
Anredera	Erdtman 1952

Antirrhinum	PalDat
Apium	Ronse et al. 2010
Arabidopsis	PalDat
Aralia	Erdtman 1952
Arbutus	PalDat
Argophyllum	Erdtman 1952
Aristaea	Goldblatt & Le Thomas 1997
Aristolochia	PalDat
Asarum	PalDat
Ascarina	Eklund et al. 2004
Asimina	Doyle & Le Thomas 2012
Asparagus	PalDat
Asteropeia	Erdtman 1952
Astragalus	Simons & Chinnappa 2004
Atherosperma	Sampson & Forman 1988, Doyle 2005
Atropa	Erdtman 1952
Aucuba	Erdtman 1952
Austrobaileya	PalDat
Austrobuxus	APSA Members 2007
Averrhoa	Erdtman 1952, PalDat
Azorella	Erdtman 1952
Balanops	Erdtman 1952
Barbacenia	PalDat
Barbeya	Erdtman 1952, Zavada & Dilcher 1986
Barnadesia	Zhao et al. 2000
Barringtonia	PalDat
Basella	PalDat
Batis	Erdtman 1952, Nowicke & Skvarla 1979
Bauhinia	Erdtman 1952
Begonia	PalDat
Berberidopsis	Keating 1975
Bergia	Erdtman 1952
Berzelia	Erdtman 1952
Beta	Nowicke & Skvarla 1979
Biebersteinia	Erdtman 1952
Bischofia	APSA Members 2007
Bixa	Erdtman 1952
Blandfordia	Erdtman 1952
Boehmeria	APSA Members 2007
Bomarea	PalDat
Bombax	PalDat
Bonnetia	Erdtman 1952
Boopsis	Erdtman 1952
Borago	PalDat
Borya	Erdtman 1952
Bougainvillea	PalDat
Brasenia	Taylor & Osborn 2006

Brassica	PalDat
Brexia	Erdtman 1952
Bruguieria	Erdtman 1952
Brunellia	Erdtman 1952
Brunia	Erdtman 1952
Bulbine	Kosenko & Sventorzhetskaya 1999
Bursera	Harley et al. 2005
Buxus	PalDat
Byrsonima	Erdtman 1952
Cabomba	Taylor et al. 2008
Calceolaria	Erdtman 1952
Calectasia	Erdtman 1952
Callicarpa	Ma et al. 2016 (based on photos)
Calophyllum	Erdtman 1952
Calycanthus	PalDat
Camellia	Erdtman 1952, PalDat
Campanula	PalDat
Campsis	PalDat
Camptotheca	Erdtman 1952
Campynema	Erdtman 1952
Cananga	Doyle & Le Thomas 2012
Canna	Erdtman 1952
Canella	Wilson 1964
Cannabis	PalDat
Capparis	PalDat
Cardiopteris	Schori & Furness 2014
Carica	Erdtman 1952
Carludovica	Erdtman 1952
Carpodetus	Erdtman 1952
Caryocar	Erdtman 1952
Caryota	Erdtman 1952
Casearia	Erdtman 1952
Cassipourea	Erdtman 1952
Casuarina	Erdtman 1952
Catalpa	PalDat (areolate: derivation unknown)
Caulophyllum	Nowicke & Skvarla 1981
Ceanothus	Schirarend & Kohler 1993
Celastrus	PalDat
Celosia	PalDat
Celtis	Erdtman 1952
Centrolepis	Erdtman 1952
Cephalotus	Erdtman 1952
Ceratonia	PalDat
Ceratophyllum	Takahashi 1995
Cercidiphyllum	PalDat
Cercis	PalDat
Cespedesia	Furness 2013

Chamaedorea	PalDat
Chimonanthus	PalDat
Chloranthus	Eklund et al. 2004, PalDat
Chrysobalanus	Furness 2013
Chrysolepis	Erdtman 1952
Cichorium	PalDat
Cinnamodendron	Erdtman 1952, Wilson 1964
Cinnamomum	PalDat
Circaeaster	Nowicke & Skvarla 1982
Cissampelos	Harley & Ferguson 1982
Citrus	PalDat
Clarkia	PalDat
Clavija	PalDat
Clethra	PalDat
Clusia	Hammel 1986 (based on photos)
Cobaea	PalDat
Coccinia	Erdtman 1952
Cocculus	Harley & Ferguson 1982
Coffea	PalDat
Colchicum	PalDat
Columellia	Erdtman 1952
Coriaria	PalDat
Cornus	PalDat
Corokia	PalDat
Corylopsis	PalDat
Corynocarpus	Erdtman 1952
Coula	Erdtman 1952
Crassula	PalDat
Cratoxylum	Erdtman 1952
Crinodendron	PalDat
Crinum	PalDat
Croomia	Erdtman 1952
Crossosoma	Erdtman 1952
Croton	PalDat
Crypteronia	Erdtman 1952
Cryptocarya	Kubitzki et al. 1993
Cucumis	PalDat
Cucurbita	PalDat
Cupaniopsis	Muller & Leenhouts 1976
Curtisia	Erdtman 1952
Cuscuta	PalDat
Cussonia	Erdtman 1952
Cyperus	PalDat (assuming one of pores = ulcus)
Cyphia	Erdtman 1952
Cypripedium	PalDat

Cyrilla	Erdtman 1952
Dalechampia	PalDat
Danthonia	Erdtman 1952
Daphnandra	Sampson & Foreman 1988, Doyle 2005
Daphniphyllaceae	Erdtman 1952, Zavada & Dilcher 1986 (based on photos)
Dasypogon	Erdtman 1952
Datisca	Erdtman 1952
Daucus	PalDat
Decaisnea	PalDat
Degeneria	Erdtman 1952, Doyle 2005
Delosperma	PalDat
Desfontainia	Erdtman 1952
Dicentra	PalDat
Dichapetalum	Erdtman 1952
Didymeles	Furness et al. 2007
Dillenia	Dickison et al. 1982
Dioscorea	PalDat
Diospyros	PalDat
Dipentodon	Erdtman 1952
Dipsacus.	PalDat
Dirachma	Erdtman 1952
Disanthus	Zavada & Dilcher 1986
Dissiliaria	Erdtman 1952
Donatia	Erdtman 1952
Doryphora	Sampson & Forman 1988, Doyle 2005
Drimys	PalDat
Drosera	PalDat
Drosophyllum	Erdtman 1952
Durio	Erdtman 1952
Ecdeiocolea	Erdtman 1952
Echinops	PalDat
Ehretia	Erdtman 1952
Elaeagnus	PalDat
Elaeis	Sowunmi 1968
Elaeocarpus	Erdtman 1952
Elatine	Erdtman 1952
Enkianthus	PalDat
Erythrina	Erdtman 1952
Erythrospermum	Erdtman 1952
Erythroxylum	Erdtman 1952
Escallonia	Erdtman 1952
Eschscholzia	PalDat
Eucalyptus	Erdtman 1952
Euclea	Erdtman 1952
Eucnide	Erdtman 1952
Eucommia	Erdtman 1952
Euonymus	PalDat

Euphorbia	PalDat
Eupomatia	Woodland & Garlick 1982, Doyle 2005
Euptelea	Erdtman 1952
Eurya	Erdtman 1952
Exacum	PalDat
Exbucklandia	Zavada & Dilcher 1986
Fagopyrum	PalDat
Fagus	PalDat
Ficus	Erdtman 1952, PalDat
Flacourtia	Erdtman 1952
Flagellaria	Erdtman 1952
Fouquieria	PalDat
Frankenia	PalDat
Fuchsia	PalDat
Galbulimima	Erdtman 1952, Doyle 2005
Galium	PalDat
Garcinia	Erdtman 1952
Garrya	Erdtman 1952
Geissoloma	Erdtman 1952
Gelsemium	PalDat
Gentiana	PalDat
Geranium	PalDat (brevitricolporate)
Gilia	Erdtman 1952
Gisekia	Nowicke & Skvarla 1979
Gladiolus	PalDat
Glaucidium	Wodehouse 1936
Gomortega	Erdtman 1952, Doyle 2005
Gomphandra	Erdtman 1952
Goodenia	Erdtman 1952
Gossypium	Christensen 1986
Goupia	Erdtman 1952
Grevillea	PalDat
Greyia	Erdtman 1952
Griselinia	Erdtman 1952
Grubbia	Erdtman 1952
Gunnera	PalDat
Gyrocarpus	Erdtman 1952, Doyle 2005
Gyrostemon	Nowicke & Skvarla 1979
Halesia	Erdtman 1952
Halophytum	Erdtman 1952
Haloragis	PalDat
Hamamelis	PalDat
Hedera	PalDat
Hedycarya	Sampson 1977
Hedyosmum	Eklund et al. 2004
Heisteria	Erdtman 1952
Helianthemum	PalDat

Helianthus	PalDat
Helwingia	PalDat
Heptacodium	PalDat
Hernandia	Doyle 2005
Heteropyxis	Erdtman 1952
Heuchera	PalDat
Hevea	Erdtman 1952
Hibbertia	Dickison et al. 1982
Hirtella	Erdtman 1952
Hordeum	PalDat
Hortonia	Sampson 1993, Doyle 2005
Houttuynia	Smith & Stockey 2007
Hua	Baas 1972
Hugonia	Erdtman 1952
Humiria	Erdtman 1952
Humulus	PalDat
Hydnocarpus	Erdtman 1952
Hydrangea	PalDat
Hydrastis	Wodehouse 1936
Hydrocharis	PalDat
Hydrocotyle	Erdtman 1952
Hydrolea	Erdtman 1952
Hydrophyllum	Erdtman 1952, PalDat
Hypecoum	PalDat
Hypericum	PalDat
Hypoxis	PalDat
Idiospermum	Doyle 2005
Ilex	PalDat
Illicium	Sampson 2000 (assuming trichotomosulcate: Doyle 2005)
Impatiens	PalDat
Ipomoea	PalDat
Iris	PalDat
Irvingia	Erdtman 1952
Itea	Erdtman 1952
Ixerba	Erdtman 1952
Ixiolirion	Rudall et al. 1997
Japonolirion	Takahashi et al. 1989
Jasminum	PalDat
Joinvillea	Erdtman 1952
Juglans	PalDat
Juncus	PalDat
Justicia	PalDat
Kadsura	Sampson 2000 (assuming trichotomosulcate: Doyle 2005)
Kiggelaria	Erdtman 1952
Klainedoxa	Erdtman 1952
Kingdonia	Nowicke & Skvarla 1982
Koeberlinia	Erdtman 1952

Krameria	Erdtman 1952
Lacistema	Erdtman 1952
Lactoris	Zavada & Taylor 1986
Lactuca	PalDat
Lamium	PalDat
Lapageria	Erdtman 1952
Lardizabala	Nowicke & Skvarla 1982
Laurus	PalDat
Leea	Erdtman 1952
Lemna	Erdtman 1952
Leonia	Erdtman 1952
Lepidobotrys	Erdtman 1952
Leycesteria	Erdtman 1952
Licania	Erdtman 1952
Lilium	Erdtman 1952, PalDat
Limonium	PalDat
Linnaea	Erdtman 1952
Linum	PalDat
Liquidambar	Erdtman 1952
Liriodendron	PalDat
Lissocarpa	Erdtman 1952
Lobelia	PalDat
Lomandra	Erdtman 1952
Lonicera	PalDat
Lophopyxis	Erdtman 1952
Lotus	PalDat
Luxemburgia	Erdtman 1952
Lythrum	PalDat
Maesa	PalDat
Magnolia	Erdtman 1952, Doyle 2005
Mahonia	PalDat
Malesherbia	Erdtman 1952
Malpighia	PalDat
Mammea	PalDat
Manihot	Erdtman 1952
Maranta	Erdtman 1952
Marcgravia	Erdtman 1952
Mauloutchia	Sauquet & Le Thomas 2003
Mayaca	Erdtman 1952
Maytenus	Erdtman 1952
Mazus	PalDat
Medicago	PalDat
Medusagyne	Erdtman 1952
Melanophylla	Erdtman 1952
Melianthus	PalDat
Meliosma	Furness et al. 2007

Menispermum	Harley & Ferguson 1982
Menyanthes	PalDat
Metanarthecium	Erdtman 1952
Metrosideros	Erdtman 1952
Micrantheum	Erdtman 1952
Mimosa	PalDat
Minquartia	Erdtman 1952
Mirabilis	PalDat
Mollugo	PalDat
Morina	PalDat
Montinia	Erdtman 1952
Morus	PalDat
Moschopsis	Erdtman 1952
Musa	PalDat
Myoporum	Erdtman 1952
Myrica	Erdtman 1952
Myriophyllum	Erdtman 1952 (elliptical pores)
Myristica	Sauquet & Le Thomas 2003
Myrothamnus	Zavada & Dilcher 1986
Myrtus	PalDat
Nandina	PalDat
Najas	Erdtman 1952
Neoscortechinia	Erdtman 1952
Nelumbo	PalDat
Nerium	PalDat
Nicotiana	PalDat
Nitraria	Erdtman 1952
Nolana	Erdtman 1952
Nothofagus	Erdtman 1952, Zavada & Dilcher 1986 (brevicolpate)
Nothoscordum	Erdtman 1952
Nymphoides	Erdtman 1952, PalDat
Nuphar	PalDat
Nymphaea	PalDat
Nyssa	Erdtman 1952
Ochanostachys	Erdtman 1952
Ochna	PalDat
Ochthocosmos	Erdtman 1952
Oenothera	PalDat
Olea	PalDat
Olinia	Erdtman 1952
Oncidium	PalDat
Opilia	Erdtman 1952
Opuntia	PalDat
Orontium	PalDat
Oryza sativa	PalDat
Osyris	PalDat
Oxalis	PalDat

Pachysandra	PalDat
Paeonia	PalDat
Panax	Erdtman 1952
Panda	Erdtman 1952
Parnassia	PalDat
Paropsia	Erdtman 1952
Passiflora	PalDat
Patrinia	PalDat
Paulownia	PalDat
Pedicularis	PalDat
Pelargonium	PalDat
Pennantia	Erdtman 1952
Pentaphragma	Erdtman 1952
Penthorum	Erdtman 1952
Peperomia	PalDat
Pereskia	PalDat
Perrottetia	Erdtman 1952
Petalostigma	Erdtman 1952
Petrophile	Erdtman 1952
Petrosavia	Caddick et al. 1998
Peumus	Erdtman 1952, Doyle 2005
Phelline	Erdtman 1952
Philadelphus	Erdtman 1952
Philesia	Erdtman 1952
Philydrum	Erdtman 1952
Phoenix	Erdtman 1952
Phlox	PalDat
Photinia	PalDat
Physena	Erdtman 1952
Phytolacca	Erdtman 1952, PalDat
Phryma	PalDat
Phyllanthus	PalDat
Picramnia	Erdtman 1952
Pilea	PalDat
Pinguicula	PalDat
Piper	PalDat
Pisum	PalDat
Pittosporum	PalDat
Plantago	PalDat
Platanus	PalDat
Platyspermation	Erdtman 1952
Pleea	Erdtman 1952 (disulculate)
Plumbago	PalDat
Podophyllum	PalDat
Polemonium	PalDat
Polygala	PalDat
Polygonum	PalDat

Polyosma	Erdtman 1952
Polypremum	Erdtman 1952
Polyscias	PalDat
Pontederia	PalDat
Populus	PalDat
Portulaca	PalDat
Potamogeton	PalDat
Primula	PalDat
Prockia	Erdtman 1952
Prunus	PalDat
Pterostemon	Erdtman 1952
Puya	PalDat
Qualea	Erdtman 1952
Quercus	PalDat (colporoidate)
Quiina	Erdtman 1952
Quintinia	Erdtman 1952
Ranunculus	PalDat
Raphanus	PalDat
Ravenala	Erdtman 1952
Reinwardtia	Erdtman 1952
Reseda	PalDat
Restio	Linder & Ferguson 1985
Rhabdodendron	Erdtman 1952
Rhamnus	Erdtman 1952, PalDat
Rhizophora	Erdtman 1952
Rhododendron	PalDat
Rhodohypoxis	Erdtman 1952
Rhodoleia	Zavada & Dilcher 1986
Rhus	Erdtman 1952
Rhynchoglossum	PalDat
Rhynchospora	Simpson et al. 2003 (assuming one of pores = ulcus)
Ribes	PalDat
Ricinus	PalDat
Rinorea	Mark et al. 2012
Rivina	Erdtman 1952
Roridula	PalDat
Roupala	Erdtman 1952
Rourea	Erdtman 1952
Sabia	Furness et al. 2007
Saccharum	Erdtman 1952
Sacoglottis	Erdtman 1952
Salix	PalDat
Sambucus	Erdtman 1952, PalDat (photos show differentiation of ora)
Sanicula	PalDat
Santalum	Erdtman 1952
Sarcandra	PalDat
Sargentodoxa	Furness et al. 2007

Sarracenia	PalDat
Saruma	PalDat
Sassafras	PalDat
Saururus	PalDat
Sauvagesia	Erdtman 1952
Saxifraga	PalDat
Scabiosa	PalDat
Scaevola	Erdtman 1952
Schefflera	Erdtman 1952
Schinus	PalDat
Schisandra	PalDat (assuming trichotomosulcate: Doyle 2005)
Schoepfia	PalDat
Schotia	PalDat
Scrophularia	PalDat
Sedum	PalDat
Sesamum	Erdtman 1952
Simmondsia	Erdtman 1952
Siparuna	Erdtman 1952, Doyle 2005
Siphonodon	Erdtman 1952
Smilax	PalDat
Solanum	PalDat
Sollya	PalDat
Soyauxia	Erdtman 1952
Sparganium	PalDat
Spathiphyllum	PalDat
Sphenoclea	Erdtman 1952
Sphenostemon	Erdtman 1952
Spigelia	Erdtman 1952
Spinacia	Erdtman 1952
Stachyurus	PalDat
Stackhousia	Erdtman 1952
Staphylea	PalDat
Stegnosperma	Erdtman 1952
Stegolepis	Erdtman 1952
Stellaria	PalDat
Sterculia	PalDat
Strasburgeria	Erdtman 1952
Strelitzia	Erdtman 1952
Strychnos	Erdtman 1952
Stylidium	PalDat
Styrax	PalDat
Suregada	Erdtman 1952
Swietenia	Erdtman 1952
Symphonia	Erdtman 1952
Symphoricarpos	PalDat
Symplocos	Erdtman 1952
Syringa	PalDat

Tacca	Erdtman 1952
Takhtajania	Doyle 2005
Talinum	PalDat
Tamarix	PalDat
Tasmannia	Doyle 2005
Tecophilaea	Erdtman 1952
Terminalia	Erdtman 1952
Ternstroemia	Erdtman 1952
Tetracentron	Furness et al. 2007
Tetracera	Dickison et al. 1982
Tetramerista	Erdtman 1952
Tetraplasandra	Erdtman 1952
Tetrapterys	Erdtman 1952
Thunbergia	PalDat (spiraperturate: derivation unknown)
Thymelaea	PalDat
Tinospora	Harley 1985
Tofieldia	PalDat
Torricellia	Erdtman 1952
Tovaria	PalDat
Trachycarpus	Ferguson & Harley 1993
Tradescantia	Erdtman 1952
Tragopogon	PalDat
Trichilia	Erdtman 1952
Triglochin	PalDat
Trigonia	Erdtman 1952
Trimenia	Sampson 2007
Triosteum	Erdtman 1952
Triplostegia	Erdtman 1952
Trithuria	Remizowa et al. 2008
Trochodendron	PalDat
Tropaeolum	PalDat
Turnera	PalDat
Typha	PalDat
Urtica	Erdtman 1952, PalDat
Utricularia	PalDat
Vaccinium	PalDat
Valeriana	PalDat
Valerianella	PalDat
Vantanea	Erdtman 1952
Verbascum	PalDat
Verbena	PalDat
Veronica	PalDat
Viburnum	PalDat
Villarsia	Erdtman 1952
Viola	PalDat
Vitis	PalDat
Viviana	Erdtman 1952

Vochysia	Erdtman 1952
Vriesea	PalDat
Xanthorhiza	Furness et al. 2007
Xanthosoma	Erdtman 1952
Ximenia	Erdtman 1952
Xyris	Erdtman 1952
Yucca	Erdtman 1952
Zabelia	Erdtman 1952
Zea	PalDat
Zelkova	Erdtman 1952
Zingiber	Erdtman 1952

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