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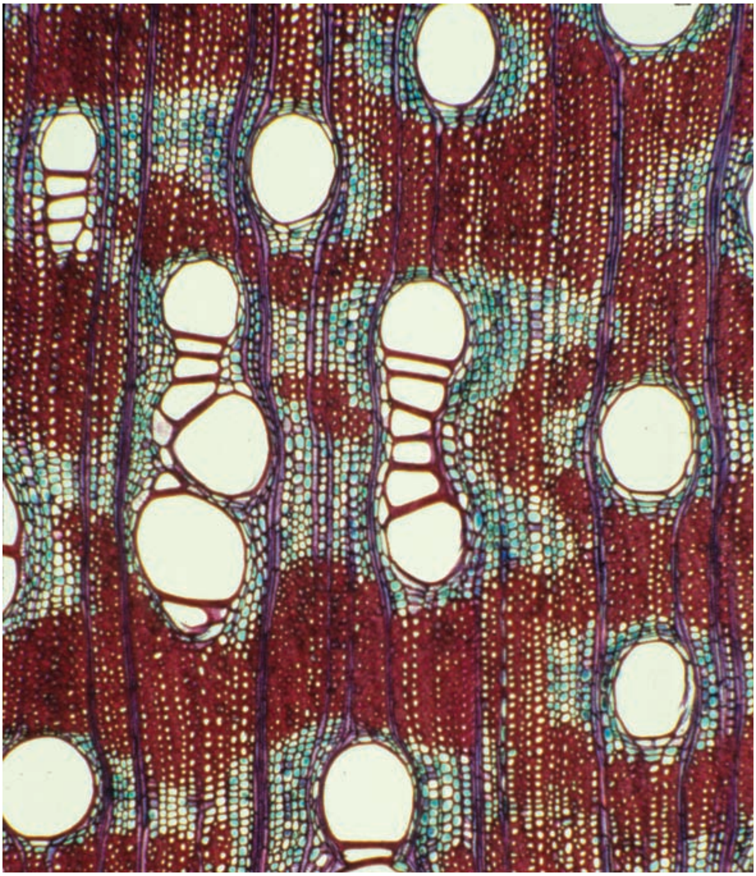

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SUMMARY

The pantropical subfamily Mimosoideae (Leguminosae) currently comprises 78 genera and 3,270 species. Many changes have recently been made to the classification of the subfamily, and more are likely to occur in the future as further morphological and molecular data are collected. This study provides a detailed account of mimosoid wood anatomy, covering c. 77% of the genera, and the photographic plates act as an identification atlas for the subfamily. We highlight cases in which wood anatomical characters of potential taxonomic significance support or conflict with the current classification of genera, suprageneric groups, and tribes. Mimosoid wood is very homogeneous and distinguishable from members of the other subfamilies of Leguminosae, Caesalpinioideae and Papilionoideae. The characters found to be most divergent in Mimosoideae wood are: the presence or absence of septate fibres, the presence and extent of confluent or banded axial parenchyma, and ray width. These characters tend to be conserved within genera and also between members of the same generic group, but they are not of taxonomic value at the tribal level where there is too much variation within and overlap between tribes.

Key words: Mimoseae, Ingeae, Acacieae, Mimozygantheae, wood descriptions.

INTRODUCTION

The Mimosoideae is a pantropical subfamily of the Leguminosae comprising 78 genera and 3,270 species (Lewis *et al.* 2005; Schrire *et al.* 2005). Most are trees, shrubs or lianas, and many are important fuel and food plants. The traditional classification of the subfamily follows Elias (1981a) who divided the Mimosoideae into five tribes: the Mimoseae, Ingeae, Acacieae, Parkieae and Mimozygantheae based on floral morphology (mainly stamen number and fusion). Recent molecular evidence demonstrates that many genera and suprageneric groupings within Mimosoideae are not monophyletic and that there is little support for the tribes themselves (*e.g.* Luckow *et al.* 2003). The present study follows the treatment of Mimosoideae used by Luckow (2005), Lewis (2005), Fortunato (2005) and Lewis & Rico (2005) which is based on a combination of revised morphological data and recent molecular phylogenies.

The Acacieae and Ingeae are believed to have been derived from within the Mimoseae based on morphological characters (Chappill & Maslin 1995) and molecular data (Luckow *et al.* 2003). Recent studies have also suggested that the Mimoseae is not monophyletic with respect to the Caesalpinioideae (Doyle *et al.* 2000; Luckow *et al.* 2000; Bruneau *et al.* 2001; Luckow *et al.* 2003). The tribe Mimoseae currently comprises c. 870 species in 40 genera organised into 14 suprageneric groups, although much reshuffling of genera and higher taxa is likely to occur in the future as more sampling is undertaken. The tribe Parkieae has been included in the Mimoseae by Luckow in Lewis *et al.* (2005) on the basis of molecular evidence which also shows that the constituent genera (*Parkia* and *Pentaclethra*) are not sister taxa (Luckow *et al.* 2000; Bruneau *et al.* 2001; Herendeen *et al.* 2003; Luckow *et al.* 2003). *Faidherbia* was moved from the Acacieae to the Ingeae (Polhill 1994; Luckow *et al.* 2003), leaving tribe Acacieae, at least temporarily, monogeneric. The monophyly of the genus *Acacia* has been questioned (*e.g.* Maslin *et al.* 2003; Miller & Bayer 2003; Miller e*t al.* 2003) and it is suggested that at least five elements of *Acacia sensu lato* should be recognised as distinct genera. Part of *Acacia sensu lato* (comprising *Acacia* subg. *Phyllodineae = Racosperma*) is nested in tribe Ingeae (Miller & Bayer 2003) thus supporting the need to divide *Acacia sensu lato*. Relationships within tribe Ingeae are equally unresolved, mostly due to a lack of molecular sampling. Based on studies of neotropical taxa, Barneby and Grimes (1996) divided tribe Ingeae into five informal generic alliances. Grimes (1995) and Luckow *et al.* (2003) found one of the largest ingoid genera, *Albizia*, to be polyphyletic and the position and monophyly of several other ingoid genera is uncertain. There is little doubt that the monogeneric tribe Mimozygantheae will be disbanded in the future (Fortunato 2005) and the single species (*Mimozyganthus carinatus* (Griseb.) Burkart) is likely to be placed, together with *Piptadeniopsis* and *Prosopidastrum*, close to the Leucaena group of tribe Mimoseae (Luckow *et al.* 2005). It is clear that the current tribal system of the Mimosoideae (and perhaps even the delimitation of the subfamily) is unresolved, and much more analysis is required. The classification used in Lewis *et al.* (2005) retains, in large part, the tribes and groups presented by Elias (1981a, 1981b, 1981c), Lewis and Elias (1981), Vassal (1981), and Nielsen (1981), with changes where published supporting data are robust.

The purpose of this study is to provide a detailed account of mimosoid wood anatomy, and to ascertain how well wood anatomy supports or conflicts with the current classification of the subfamily. The plates act as an identification atlas by illustrating the wood of every genus available to us in the Kew slide collection, and show the range of wood anatomical variation in the entire subfamily. Wood anatomy has been shown to have a bearing on classification in the Papilionoideae and Caesalpinioideae (Fujii *et al.* 1994; Gasson 1994, 1996, 1997, 1999, 2000; Gasson & Webley 1999; Gasson & Wray 2001; Gasson *et al.* 2003, 2004) and all of the subfamilies (Baretta-Kuipers 1973, 1981). Cassens and Miller (1981) have indicated that there are key characteristics of mimosoid wood that may be of taxonomic use. There are numerous publications containing wood anatomical descriptions (and, frequently, discussions and analysis of these descriptions) for many mimosoid genera, including Brazier (1958), Fasolo *et al.* (1963), Cassens & Miller (1981), Détienne & Jacquet (1983), Quirk (1983), Berti & Edlmann Abbate (1988), Tanaka & Bernard (1995), Höhn (1999), Neumann *et al.* (2000) and Chauan & Vijendra Rao (2003). Each of these examines a significant number of mimosoid species, usually as part of a regional study. InsideWood (http://insidewood.lib.ncsu.edu/search/), an interactive database for wood identification, contains descriptions of species in 55 mimosoid genera, 37 of which have photomicrographs. The most comprehensive study of mimosoid wood to date is by Baretta-Kuipers (1981) who examined 35 mimosoid genera as part of an overview of legume wood anatomy. She regarded the Caesalpinioideae and Papilionoideae as a group united by wood similarities, whereas the Mimosoideae was distinctly different, lacking the storeying of all elements, that is often found in the other two subfamilies and nearly always having homocellular rays which are often low and usually not storied. A comprehensive list of publications that contain mimosoid wood anatomical descriptions published prior to 1994 can be found in Gregory (1994). The reader should bear in mind that following many taxonomic changes, the names of some genera and constituent species within genera have been changed, and where possible these changes have been cross-referenced in this paper.

MATERIALS AND METHODS

Wood samples of 249 species from 52 genera were examined using light microscopy. Previous publications provided data for a further 37 species from 8 genera. These were found on the Plant Micromorphology Bibliographic Database at Kew (http://www.rbgkew.org.uk/bibliographies/PA/PAhome.html). Details of the samples used can be found in the Appendix (p. 107). Abbreviations for wood collections in the Appendix and figure captions are those used by Stern (1988). Species and genera not already in the slide collection at Kew were prepared using samples from the Kew wood museum, and samples of *Aubrevillea platycarpa* Pellegrin and *Fillaeopsis discophora* Harms were obtained from the wood collections at Madison (Wisconsin, USA) and Tervuren (Belgium). A Reichert sliding microtome was used to cut sections 20–30 µm thick; these were stained in 1% Alcian blue and 1% safranin in 50% ethanol, dehydrated in an alcohol series, cleared in histoclear and mounted in euparal. Slides were examined using a Leica Laborlux K light microscope, and photographs taken using a Leitz Diaplan light microscope fitted with a Zeiss Axio-cam HRc digital camera.

Measurements were taken using an eyepiece graticule, categorised according to the guidelines set out in the IAWA List (Wheeler *et al.* 1989), and are summarised in the key to abbreviations in Table 1. Vessel diameter was obtained by measuring the tangential diameter of 10 randomly selected pores, then taking an average. The frequency of vessels per mm^2 was calculated by counting the number of vessels in ten 1-mm^2 fields, then taking an average. Ray height was obtained by counting the vertical height in cells of ten randomly selected rays and calculating the average height. The width of the narrowest ray and the widest ray present (in cells) was counted and comprised the range of ray widths present. If these were abnormally narrow or wide compared to the majority of rays present, the values are given in parentheses to the side of the most common width range. Ray frequency was obtained by counting the number of rays bisecting a tangential 1-mm line, then averaging 10 measurements per sample.

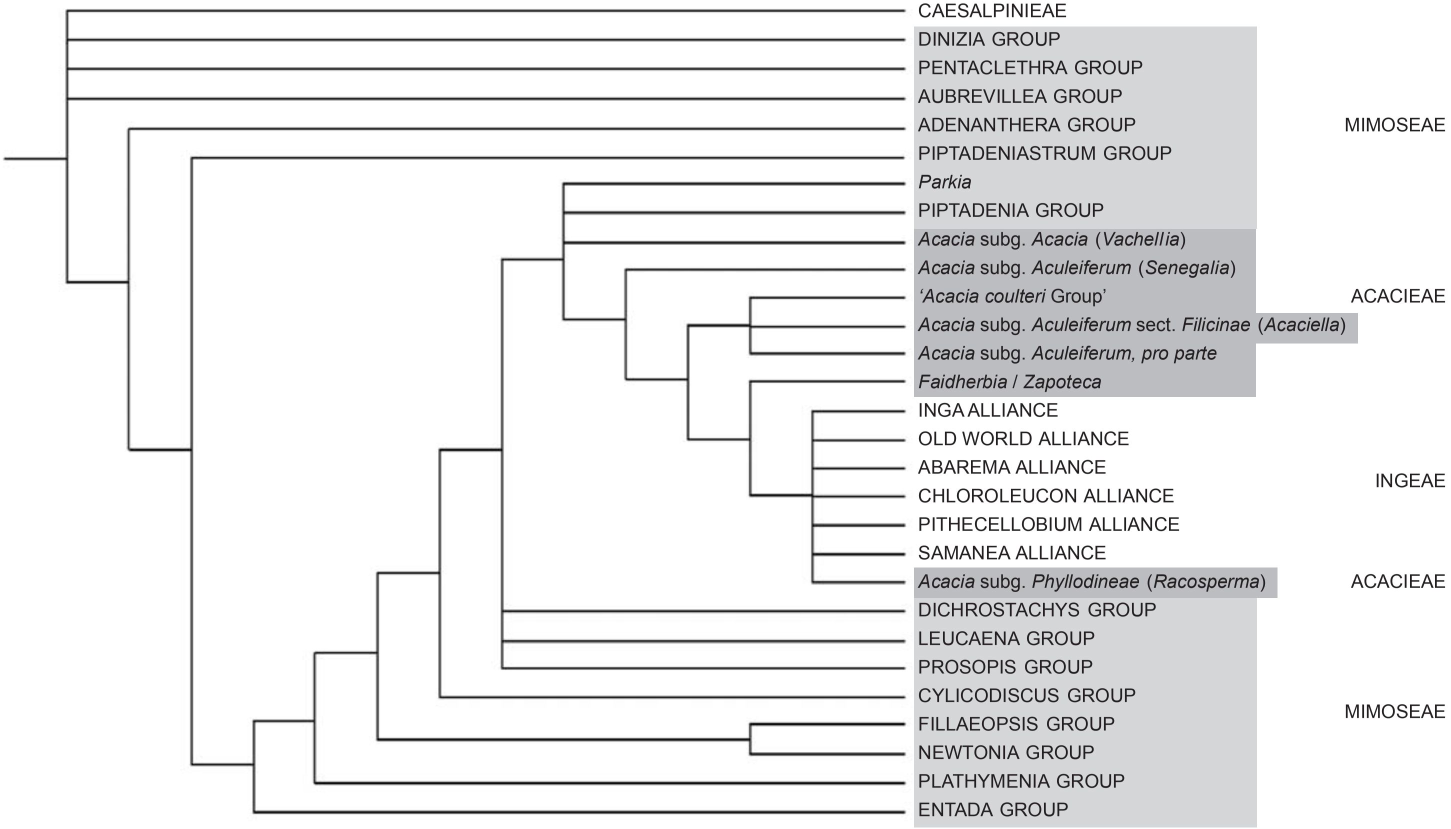
Although vestured pits were readily observed with light microscopy, some were examined using scanning electron microscopy. These samples were prepared for scanning electron microscopy by cutting fragments from wood blocks softened in boiling water using a razor blade, bleached with dilute parozone, thoroughly washed and air-dried (in accordance with guidelines in Jansen *et al.* 1998). These fragments were then mounted on SEM stubs with double-sided sellotape, coated in platinum using an Emitech K550 sputter coater, then examined using a Hitachi S-4700 SEM.

OBSERVATIONS AND DISCUSSION

Taxonomic revisions within the Mimosoideae and, particularly, recent evidence from molecular data have highlighted the non-monophyletic nature of the tribes, informal groups and some genera of the subfamily (see the Cladogram, page 9). The discoveries that the Ingeae and Acacieae are nested within the Mimoseae (Polhill 1981; Polhill *et al.* 1981; Doyle *et al.* 2000; Luckow *et al.* 2003), that *Acacia* subg. *Phyllodineae* is nested within the Ingeae (Chappill & Maslin 1995; Miller & Bayer 2000), and that the Mimoseae may not even be monophyletic with regard to the Caesalpinioideae (Doyle *et al.* 2000; Luckow *et al.* 2000, 2003), led us to investigate whether the wood anatomy of the traditionally recognised tribes reflects these discoveries. However, apart from a few key characters, mimosoid species across the subfamily have highly similar wood anatomy and where differences occur they are mostly in features affected by environmental and growth factors such as seasonality, climate, and the age of the plant. In contrast, the two other legume subfamilies have a wider range of anatomical characters that can be used for phylogenetic and diagnostic purposes: for example Gasson *et al.* (2003) identified 6–7 characters of phylogenetic and diagnostic use for the Caesalpinioideae. These included presence and location of silica bodies, prismatic crystals in ray cells, axial canals and their distribution, storeyed structure, vestured pits, and axial parenchyma distribution. Of these characters, silica bodies and normal axial canals have not been found in any Mimosoideae, storeying is rare, and vestured pits ubiquitous. Only axial parenchyma distribution is of equal significance in mimosoids and caesalpinioids.

In general, mimosoid species within the same genus showed a high degree of concordance of features. The characters found to be most divergent within the Mimosoideae are the presence or absence of septate fibres, presence (and extent) of confluent and banded axial parenchyma, and ray width. Within a genus these characters are generally consistent in each species; this is especially true of septate fibres which is the most useful of the key characters identified. However, differences between genera are often small. The subfamily can be divided based on the distribution of the above three characters, which are the same as those used by Cassens and Miller (1981) in their analysis of several ingoid genera. The Diagram (pages 26–27) illustrates the distribution of mimosoid genera between the different character states; the Ingeae forms four divisions, the Mimoseae forms five divisions, and when the two tribes are considered together, six divisions emerge. Every combination of character states can be found in tribe Acacieae (eight divisions in total). The uniformity of the wood anatomy of the subfamily indicates that it is a good taxonomic group. Similarities to members of the Dimorphandra group and other members of tribe Caesalpinieae in subfamily Caesalpinioideae (Gasson *et al.* 2003) were noted by Baretta-Kuipers (1981). These similarities support the phylogenetic evidence that places the Dimorphandra group close to the Mimosoideae (Luckow *et al.* 2000, 2003).

(text continued on page 28)



Cladogram – Phylogenetic relationships in subfamily Mimosoideae. Compiled from (tribal) cladograms in Lewis *et al*. (2005) which were based on data from Barneby & Grimes (1996, 1997), Luckow *et al*. (2000, 2003) and Miller & Bayer (2003). Suprageneric groups are shown, and shaded boxes indicate their current tribal positions.

Table 1

For legends, see pages 24 & 25

Species	growth rings A/I/D	tangential vessel diameter av. (µm)	vessels/mm²	radial multiples R/O/F/C/VC	no. of vessels/RM	clusters R/O/F/C	no. of vessels/cluster	IVP diameter (µm)
TRIBE MIMOSEAE 29/40								
Adenanthera group 5/6								
Adenanthera bicolor Moon	I	149	13	F	2-4	R/O	3-4	6-9
Adenanthera microsperma Teijsm.	A	154	10	O	2-3(7)	O	2-6	~9
Adenanthera pavonina L.	I	153	7	F/C	2-6	O/F	3-6	6-9
***Adenanthera* L. 3/13**	**A/I**	**149-154**	**7-13**	**O-F/C**	**2-6(7)**	**O-F**	**2-6**	**6-9**
***Amblygonocarpus andongensis* (Oliver) Exell & Torre 1/1**	**D**	**98**	**9**	**C**	**2-5**	**F**	**2-6**	**~6**
Calpocalyx aubrevillei Pellegrin	D/I	215	11	F	2-3	O	3-4	3-6
Calpocalyx brevibracteatus Harms	I	152	7	F	2-6	O	3-5	3-4
Calpocalyx dinklagei Harms	D	126	27	O	2-4	R/O	2-5	3-6
Calpocalyx heitzii Pellegrin	I	153	8	F	2-4	O	5	6-9
***Calpocalyx* Harms 4/11**	**I-D**	**126-215**	**7-27**	**O-F**	**2-6**	**O**	**2-5**	**3-9**
Pseudoprosopis Harms 0/7	?	?	?	?	?	?	?	?
***Tetrapleura tetraptera* (Schum. & Thonn.) Taubert 1/2**	**I**	**177**	**7**	**F**	**2-3**	**R**	**2-3**	**~9**
Xylia evansii Hutch.	A	162	17	O/F	2-3	R/O	2-3	6-9
Xylia xylocarpa (Roxb.) Taubert	I	131	30	F/C	2-4(5)	R	2-4	6-9
***Xylia* Benth. 2/9**	**A-I**	**131-162**	**17-30**	**O-C**	**2-4(5)**	**R-O**	**2-4**	**6-9**
Aubrevillea group 1/1								
Aubrevillea kerstingii (Harms) Pellegrin	I	130	5	O	2	N	0	6-9
Aubrevillea platycarpa Pellegrin	A	191	7	O	2-4	R	2-3	6-9
***Aubrevillea* Pellegrin 2/2**	**A/I**	**130-191**	**5-7**	**O**	**2-4**	**N/R**	**2-3**	**6-9**
Cylicodiscus group 1/1								
***Cylicodiscus gabunensis* Harms 1/1**	**I**	**223**	**8**	**F**	**2-3**	**N**	**0**	**6-9**
Dichrostachys group 2/4								
Alantsilodendron J.F.Villiers 0/10	?	?	?	?	?	?	?	?
Calliandropsis Hernandez & Guinet 0/1	?	?	?	?	?	?	?	?
***Dichrostachys cinerea* (L.) Wight & Arn. 1/14**	**D/I**	**111**	**23**	**F**	**2-6**	**O**	**4**	**~6**
***Gagnebina pterocarpa* Baill. 1/8**	**I**	**48**	**24**	**F**	**2-5**	**O**	**2-6**	**~3**
Dinizia group 1/1								
***Dinizia excelsa* Ducke 1/1**	**I**	**167**	**8**	**F**	**2-4**	**O**	**2-3**	**3-6**
Entada group 2/2								
***Elephantorrhiza burkei* Benth. 1/9**	**I**	**154**	**N/S**	**F**	**2-7**	**F**	**2-8**	**9-12**
Entada abyssinica Steud. ex A.Rich.	A	262	3	O	2-5	R	2	6-9
Entada africana Guillemin & Perrotet (c)	I/A	?	?	?	2-3	?	?	?
Entada gigas (L.) Fawcett & Rendle	?	N/S	N/S	F	2-3	F	2-3	?
Entada mannii (Oliver) Tisser	A	461	7	F	2-3(10)	F	2-6	9-12
Entada phaseoloides (L.) Merr.	A	N/S	N/S	F	2-3	F	2-3	~9
Entada rheedii Spreng.	A	376	N/S	O	3-5	R	<10	9-12
***Entada* Adans. 6/c.28**	**A-I**	**262-461**	**3-7**	**O-F**	**2-3(10)**	**R-F**	**2-10**	**6-12**
Fillaeopsis group 1/1								
***Fillaeopsis discophora* Harms 1/1**	**I**	**210**	**8**	**F**	**2-8**	**O**	**3-7**	**~9**

fibre wall thickness thin / med / thick	septate fibres Y/N	axial paren A/V/S/U/C/B/W	axial paren confluent R/O/F/C/VC	no. of vessels linked	axial paren banded Y/N/MB/CO	no. of cells/strand	ray height av. no. cells	range of ray height	rays/mm	ray width (cells)	rays homo Y/N	crystals N/F/A/R	gum N/R/AP/V/F
thick	N	A	O	2-6	N	2-4	15	2-33	11	1-2	Y	F, A	R, AP
med/thick	Y	A	F	2-6	N	2-4	16	2-34	11	(1)2	Y	F, A	R,AP,V,F
med	N	V/A	F	2-3	N	2-4	12	2-21	7	1-2	Y	F, A	R, AP, V
med-thick	**Y/N**	**V-A**	**O-F**	**2-6**	**N**	**2-4**	**12-16**	**2-34**	**7-11**	**1-2**	**Y**	**F, A**	**R,AP,V**
med/thick	**N**	**V/A**	**C**	**2-(many)**	**CO**	**2-4**	**10**	**1-16**	**11**	**1-3**	**Y**	**A**	**R**
med/thick	Y	A	F	2-3	N	2-4	13	3-26	7	2-3	Y	F, A	R, V
med	Y	A	C	2-7	N	1-4	15	2-33	10	1-3	Y	F, A	R, AP
med	Y	A/C	C	2-6	CO	2-4	20	3-45	9	1(2)	Y	F, A	R, AP
med/thick	Y	AW	C	2-3	N	2-4	16	3-51	10	1 (2)	Y	F, A	R, F
med-thick	**Y**	**A/W/C**	**F-C**	**2-7**	**N/CO**	**1-4**	**13-20**	**2-51**	**7-10**	**1-3**	**Y**	**F, A**	**R,AP,V,F**
?	?	?	?	?	?	?	?	?	?	?	?	?	?
med	**N**	**V/A**	**C**	**2-4**	**N**	**1-4**	**13**	**5-24**	**9**	**(1)2**	**Y**	**F, A**	**R**
thick	Y	A/C	VC	2-7(13)	CO	2-4	17	2-28	13	1-2	Y	F, A	R,AP,F,V
thick	Y	A	C	2-5	N	2-4	17	2-42	13	1-2	Y	F	R, AP, V
thick	**Y**	**A-C**	**C-VC**	**2-7(13)**	**N/CO**	**2-4**	**17**	**2-42**	**13**	**1-2**	**Y**	**F, A**	**R,AP,V,**
med	Y	A/C	C/VC	2-(many)	CO, some apo	2-4	16	4-31	7	1-4	Y	F, A	R
med/thick	Y	V/A	F	2-3	N	2-4	17	4-30	6	2-3	Y	F, A	R, V
med	**Y**	**V/A/C**	**F-VC**	**2-(many)**	**N/CO**	**2-4**	**16-17**	**4-31**	**6-7**	**1-4**	**Y**	**F, A**	**R, V**
thick	**?**	**A**	**O**	**2-3**	**N**	**2-4**	**19**	**5-42**	**5**	**2-3(4)**	**Y**	**F, A**	**R, AP, V**
?	?	?	?	?	?	?	?	?	?	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?	?	?
thick	**N**	**A/U**	**O**	**2-4**	**N**	**1-2**	**15**	**2-55**	**5**	**2-4**	**Y**	**F, A**	**R,AP,V,F**
thin/med	**N**	**A**	**O**	**2-3(4)**	**N**	**1(2)**	**13**	**2-29**	**9**	**1-3**	**Y**	**F, A**	**R**
thick	**N**	**A(W)**	**C**	**2-3 (6)**	**N**	**2-8**	**19**	**4-39**	**6**	**1-3**	**Y**	**F, A**	**R, AP**
med/thick	**Y**	**B**	**C**	**2-(many)**	**Y thin dis reg**	**2-4**	**17**	**4-60**	**5**	**1-4**	**N**	**F, A**	**R, AP, V**
med/thick	Y	B	VC	(many)	Y thick long reg	4-10	16	3-61	4	(2)3-6	N	F, A	R, F, V
thick	Y	A/C	C	(many)	Y irr dis	2-4	?	?	5	4-5(8)	Y	A	R
thick	?	?	?	?	N	?	N/S	?	?	?	?	?	?
thick	Y	?	?	?	N	2-4	40+	18-66	3	3-5	Y	F	R, AP, F
thick	Y	?	?	?	N	?	N/S	?	N/S	?	?	?	?
thick	Y	B	-	-	Y thin long reg	?	25	?	?	?	Y	F, A	R, AP
thick	**Y**	**A-B**	**C-VC**	**(many)**	**long irr-reg**	**2-10**	**16-40+**	**3-66**	**3-5**	**2-8**	**Y/N**	**F, A**	**R,AP,V,F**
thin/med	**Y**	**V/A**	**O**	**2-3**	**N**	**2-4**	**18**	**4-30**	**7**	**1-3**	**Y**	**F, A**	**R, AP**

continued

Table 1
(continued)

Species	growth rings A/I/D	tangential vessel diameter av. (µm)	vessels/mm^2	radial multiples R/O/F/C/VC	no. of vessels/RM	clusters R/O/F/C/VC	no. of vessels/cluster	IVP diameter (µm)
Leucaena group 2/4								
Desmanthus Willd. 0/24	?	?	?	?	?	?	?	?
Kanaloa D.H.Lorence & K.R.Wood 0/1	?	?	?	?	?	?	?	?
Leucaena collinsii Britton & Rose	A	143	16	F/C	2-5	O/F	2-4	~6
Leucaena confertiflora Zarate	I	86	54	C	2-8	O/F	2-7	6-9
Leucaena diversifolia (Schtdl.) Benth.	D	142	14	O/F	2-4	O/F	2-6	6-9
Leucaena esculenta (Sessé & Moc. ex DC.) Benth.	I	97	15	O/F	2-4	O	2-6	~6
Leucaena latisiliqua (L.) Benth. (b)	?	115	4	?	3-6	?	?	?
Leucaena macrophylla Benth.	I	118	13	O/F	2-3	O	2-3	9-12
Leucaena shannonii J.D.Smith	D	156	18	F/C	2-6	R/O	2-3	6-9
Leucaena trichodes (Jacq.) Benth.	D	174	12	F	2-4	O	2-3	~6
***Leucaena* Benth. 7/22**	**A-D**	**86-174**	**12-54**	**OC**	**2-8**	**R-F**	**2-7**	**6-12**
***Schleinitzia novo-guineensis* (Warb.) Verdc. 1/4 (d)**	**?**	**?**	**?**	**?**	**?**	**?**	**?**	**?**
Newtonia group 2/3								
***Indopiptadenia oudhensis* Brenan 1/1 (i)**	**D**	**100**	**7**	**F**	**2-3**	**O**	**?**	**8-11**
Lemurodendron Villiers & Guinet 0/1	?	?	?	?	?	?	?	?
Newtonia buchananii (Baker) G.Gilbert & Boutique	A	174	8	C	2-3 (5)	R/O	2	~3
Newtonia duparquetiana (Baillon) Keay	A	121	22	O	2-3	R/O	2-4	~3
***Newtonia* Baillon 2/15**	**A**	**121-174**	**8-22**	**OC**	**2-3(5)**	**R/O**	**2-4**	**~3**
Pentaclethra group 1/1								
Pentaclethra macroloba Kuntze	D/I	132	18	O	2-5	R/O	2-5	~6
Pentaclethra macrophylla Benth.	D	145	7	O	2-3	R	2	6-9
***Pentaclethra* Benth. 2/3**	**I-D**	**132-145**	**7-18**	**O**	**2-5**	**R-O**	**2-5**	**6-9**
Piptadenia group 8/9								
Adenopodia C.Presl 0/7	?	?	?	?	?	?	?	?
Anadenanthera colubrina (Vell.) Brenan var. *cebil* (Griseb.) Altschul	D	98	50+	C	2-6	O	2-4	~6
Anadenanthera peregrina (Vell.) Brenan var. *falcata* (Benth.) Altschul	D	86	57	F	2-7	F	2-7	~9
***Anadenanthera* Speg. 2/2**	**D**	**86-98**	**50-57**	**F-C**	**2-7**	**O-F**	**2-7**	**6-9**
***Microlobius foetidus* (Jacq.) Sousa & Andrade 1/1 (j)**	**?**	**100**	**7**	**?**	**?**	**?**	**?**	**?**
Mimosa arenosa (Willd.) Poiret (d)	?	108	15	?	3	?	?	?
Mimosa rhododactyla B.L.Robinson	A	112	58	F/C	2-3 (5)	F	2	3-5
Mimosa orthocarpa Spruce ex Benth.	D/I	79	27	F/C	2-5	R	3-4	6-9
Mimosa ophthalmocentra Martius	D	82	50+	F	2-7	F	2-3(7)	3-5
Mimosa pigra L. (d)	?	79	16	?	3	?	?	?
Mimosa tenuiflora (Willd.) Poiret	I/A	101	40	C/VC	(2)5-10	C	2-5(10)	3-6
***Mimosa* L. 6/490-510**	**A-I**	**79-112**	**15-50+**	**F-VC**	**2-10**	**R-C**	**2-5(10)**	**3-6**
Parapiptadenia excelsa (Griseb.) Burkart	D	117	30+	C/VC	2-7	F	3-7	6-9
Parapiptadenia pterosperma (Benth.) Brenan	A	112	24	F/C	2-3	R/O	2-4	3-6
Parapiptadenia rigida (Benth.) Brenan	D/I	123	23	O	2-4	R/O	2-5	~9
***Parapiptadenia* Brenan 3/6**	**A-D**	**112-123**	**23-30+**	**O-VC**	**2-7**	**R/O-F**	**2-7**	**3-9**
Parkia biglobosa (Jacq.) R.Br. ex G.Don	I	183	6	O	2-3(6)	R	2-3	3-4
Parkia bicolor A.Chev.	D	186	6	F	3-4	O/F	2-5	4-6
Parkia leiophylla Kurz	I	241	9	O/F	2-5	R	2	6-9
Parkia nitida Miq.	D	191	4	F	2-5	F	3-7	6-9
Parkia pendula (Willd.) Benth.	I	180	9	O	2-4	F	2-8	6-9

fibre wall thickness thin / med / thick	septate fibres Y/N	axial paren A/V/S/U/C/B/W	axial paren confluent R/O/F/C/VC	no. of vessels linked	axial paren banded Y/N/MB/CO	no. of cells / strand	ray height av. no. cells	range of ray height	rays/mm	ray width (cells)	rays homo Y/N	crystals N/F/A/R	gum N/R/AP/V/F
?	?	?	?	?	?	?	?	?	?	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?	?	?
thick	Y	V/A	F/C	2-6	N	2-4	16	3-30	7	1-3(4)	Y	F	R
med/thick	Y	A	VC	2-(many)	N	2-6	15	3-22	8	1-2(3)	Y	F, A	R
thin/med	Y	A	R/O	2	N	?	13	2-21	7	1-3	Y	F, A	N
thick	Y	A	F/C	2-5	N	2-4	13	3-23	9	1-3	Y	F, A	R
thin	?	V	?	?	N	2-4	?	?	?	1-2	Y	A	?
med	Y	V/A	R/O	2-3	N	?	25	6-42	7	2-4	Y	F	AP
thick	Y	V	R/O	2	N	?	21	2-56	9	(1)3-5(7)	Y	F, A	R, AP
thin/med	Y	V/A	O	2-3	N	2-4	29	3-40	5	1-4 (5)	Y	F, A	R, AP
thin-thick	**Y**	**VA-A**	**R-VC**	**2-6+**	**N**	**2-6**	**13-29**	**2-56**	**5-9**	**1-5(7)**	**Y**	**F, A**	**R, AP**
thin	**?**	**S**	**?**	**?**	**N**	**?**	**?**	**?**	**?**	**1-2**	**Y**	**A**	**?**
med/thick	**Y**	**V-C**	**O**	**?**	**MB**	**(1)2-4**	**?**	**1-40**	**7**	**(1)2**	**Y**	**F, A**	**?**
?	?	?	?	?	?	?	?	?	?	?	?	?	?
thin	Y	V	N	N	N	?	20	5-54	5	2-3	Y	N	R, AP
med/thick	Y	V/A	O	2-3	N	2-4	19	3-29	6	(1)2-4	Y	A	R, AP
thin-thick	**Y**	**V-VA**	**N-O**	**2-3/N**	**N**	**2-4**	**19-20**	**3-54**	**5-6**	**(1)2-4**	**Y**	**N/A**	**R, AP**
med/thick	?	V/A	O	2-4	MB	1-4	13	2-36	24	1(2)	Y	F, A	R, V
thick	Y	A	F/C	2-4	N	2-4	14	2-24	7	1-2	Y	F, A	R, AP
med-thick	**Y**	**VA-A**	**O-C**	**2-4**	**N (MB)**	**1-4**	**13-14**	**2-36**	**7-24**	**1-2**	**Y**	**F, A**	**R, AP, V**
?	?	?	?	?	?	?	?	?	?	?	?	?	?
thick	N	V/A	F/C	2-8	N	2-4	17	3-46	8	1-4	Y	F, A	R, AP
thick	N	A	VC	2-(many)	CO	2-8	11	2-24	8	1-3(4)	Y	N	R, V
thick	**N**	**VA-A**	**F-VC**	**2-8+**	**N (CO)**	**2-8**	**11-17**	**2-46**	**8**	**1-4**	**Y**	**F, A**	**R, AP, V**
thick	**N**	**V/A/C**	**F**	**2-(many)**	**CO**	**?**	**?**	**?**	**?**	**1(2)**	**Y**	**A**	**?**
thin	N?	V	?	?	N	2-4	?	?	?	1-2	N	A	R
thick	Y	A/C	VC	2-(many)	Y irr dis	1-4	13	2-19	6	1-3	?	F, A	R, V
med/thick	N	A	F/C	2-5	N	1-4	9	2-17	15	1-2	Y	F, A	V
thick	N	V	F/C	2-6	CO	?	8	4-17	7	2(3)	Y	F, A	R, AP, V
thin/med	N?	V	?	?	N	2-4	?	?	?	1	N	?	R
thick	Y	C	VC	(many)	Y irr dis	1-4	12	2-25	11	1-3	Y	F, A	R,AP,V,F
thin-thick	**Y/N**	**V-C**	**C-VC**	**2-6+**	**some irr dis/CO**	**1-4**	**8-13**	**2-25**	**6-15**	**1-3**	**Y/N**	**F, A**	**R,AP,V,F**
med	Y	V/A	F/C	2-4	N	2-4	11	3-18	10	1-3	N	F, A	R, AP
thick	N	V/A	C	2-3	N	2-4	12	4-22	8	1-2	Y	F, A	N
thick	N	V/A	O/F	2-3+	MB	2-4	24	4-45	8	1-3	Y	?	R,AP,V,F
med/thick	**Y/N**	**V/A**	**O-C**	**2-4+**	**N/MB**	**2-4**	**11-24**	**3-45**	**8-10**	**1-3**	**Y/N**	**F, A**	**R,AP,V,F**
med	N	AW/C	VC	2-(many)	Y med reg long	2-4	14	3-26	7	1-5	Y	F, A	R, AP
med	?	A	F/C	2-5	N	2-4	16	4-38	6	2-4	Y	F, A	R, AP
thin	N	A(W)	F	2-4	N	2-4	16	3-28	7	2-4	Y	F, A	R
thin	N	A	?	?	N	2-4	14	5-23	6	1-3	Y	F	R
thin	N	A	C	2-7	CO	2-4	15	4-22	7	1-3(4)	Y	F, A	R

continued

Table 1
(continued)

Species	growth rings A/I/D	tangential vessel diameter av. (µm)	vessels/mm^2	radial multiples R/O/F/C/VC	no. of vessels/RM	clusters R/O/F/C/VC	no. vessels/cluster	IVP diameter (µm)
Parkia singularis Miq.	D	197	8	O	2-4	O	3-6	6-9
Parkia timoriana (DC.) Merrill	I	226	5	F	2-5	O	2-3	6-9
Parkia ulei (Harms) Kuhlmann	D	160	3	R	(2)3-5	N	N	4-6
***Parkia* R.Br. 8/34**	**I-D**	**160-241**	**3-9**	**R-F**	**2-5(6)**	**N/R-F**	**2-8**	**4-9**
Piptadenia flava (DC.) Benth. (d)		62	9	?	3-4	?	?	?
Piptadenia gonoacantha J.F.Macbr.	I	109	50+	O/F	2-6	O	3-4	9-12
Piptadenia obliqua J.F.Macbr.	A	54	50+	F	2-3	R/O	2-3(5)	6-9
Piptadenia paniculata Benth.	D	130	35	F	2-4(7)	F	2-7	4-6
Piptadenia pteroclada Benth.	A	?	?	C	2-7(15)	F	3-(many)	?
Piptadenia trisperma (Vell.) Benth.	I	170	N/S	O	2-9	O	2-6	6-8
Piptadenia viridiflora (Kunth) Benth.	D	104	13	R/O	2-3	R/O	2-4	6-8
***Piptadenia* Benth. 10/24**	**A-D**	**54-170**	**13-50+**	**R-C**	**2-9(15)**	**R-F**	**2-7+**	**4-12**
***Pseudopiptadenia suaveolens* (Miq.) Grimes 1/11**	**D**	**142**	**20**	**O/F**	**2-4(7)**	**R/O**	**3-6(12)**	**3-6**
Stryphnodendron adstringens (Martius) Colville	I	133	14	C	2-6	R/O	2-4	6-9
Stryphnodendron polyphyllum Martius	D/I	95	33	F	2-3(7)	O	2-4	6-12
***Stryphnodendron* Martius 2/30**	**I-D**	**95-133**	**14-33**	**F-C**	**2-7**	**R-O**	**2-4**	**6-12**
Piptadeniastrum group 1/1								
***Piptadeniastrum africanum* (Hook.f.) Brenan 1/1**	**D**	**202**	**8**	**O/F**	**2-3**	**O**	**2-3**	**9-12**
Plathymenia group 1/1								
***Plathymenia reticulata* Benth. 1/1**	**D**	**178**	**12**	**F**	**2-4(7)**	**R/O**	**2-5**	**9-12**
Prosopis group 1/5								
Neptunia Lour. 0/12	?	?	?	?	?	?	?	?
Piptadeniopsis Burkart 0/1	?	?	?	?	?	?	?	?
Prosopidastrum Burkart 0/5	?	?	?	?	?	?	?	?
Prosopis africana (Guillemin & Perrotet) Taubert	I	176	15	C	2-3(4)	R	2/3	6-9
Prosopis chilensis (Molina) Stuntz amend. Burkart	D	126	40+	C	2-6	C	2-(many)	~6
Prosopis farcta (Banks & Sol.) J.F.Macbr.	I	120	50+	F/C	2-3(5)	F/C	2-3(8)	6-8
Prosopis flexuosa DC.	I	131	29	C	2-5(9)	C	2-8	~9
Prosopis glandulosa Torrey	A	142	31	O	2-3	R/O	2-4	6-9
Prosopis juliflora (Sw.) DC.	A/I	131	31	F	2-4(8)	R	2-5	~9
Prosopis kuntzei Harms	I	130	35	C	2-8	F	2-8	4-6
Prosopis nigra (Griseb.) Hieronymus	A	129	24	F	2-3(5)	O	2-3(4)	6-9
Prosopis pubescens Benth.	D	146	31	F	2-6(9)	O	2-(many)	6-9
Prosopis ruscifolia Griseb.	A	123	50+	F	2-7	F	2-5(11)	3-4
***Prosopis* L. 10/c.44**	**A-D**	**120-176**	**15-50+**	**O-C**	**2-9**	**R-F/C**	**2-11+**	**3-9**
Xerocladia Harv. 0/1	?	?	?	?	?	?	?	?
TRIBE INGEAE 29/36								
Abarema Alliance 3/3								
Abarema alexandri (Urban) Barneby & J.W.Grimes	I	150	11	F	2-4	R	2-4	3-6
Abarema glauca (Urban) Barneby & J.W.Grimes	A/I	173	17	F	2-7	O	2-9	3-6
Abarema jupunba (Willd.) Britton & Killip	A	153	8	O	2	N	0	~6
Abarema langsdorfii (Pittier) Barneby & J.W.Grimes	A	128	13	F	2-4	O	2-3	3-6
Abarema macradenia (Pittier) Barneby & J.W.Grimes	I	178	9	F/C	2(3)	R	2	~6
***Abarema* Pittier 5/46**	**A/I**	**153-178**	**8-17**	**O-C**	**2-7**	**N-O**	**2-9**	**3-6**
Hydrochorea corymbosa (L.C.Rich.) Barneby & Grimes	D/I	153	9	F	2-6(10)	R/O	2-4	6-9
Hydrochorea gongrijpii (Kleinhoonte) Barneby & Grimes	I	178	10	F	2-5(8)	R	2-5	6-9
***Hydrochorea* Barneby & J.W.Grimes 2/3**	**I-D**	**153-178**	**9-10**	**F**	**2-6(10)**	**R-O**	**2-5**	**6-9**
***Pararchidendron pruinosum* (Benth.) I.C.Nielsen 1/1**	**I**	**109**	**21**	**C**	**2-6**	**O**	**2-3 (6)**	**3-6**

fibre wall thickness thin / med / thick	septate fibres Y/N	axial paren A/V/S/U/C/B/W	axial paren confluent R/O/F/C/VC	no. of vessels linked	axial paren banded Y/N/MB/CO	no. of cells / strand	ray height av. no. cells	range of ray height	rays/mm	ray width (cells)	rays homo Y/N	crystals N/F/A/R	gum N/R/AP/V/F
thin/med	N	AW	O	2-3	MB	2-4	14	2-21	5	2-4	Y	F, A	N
thin	N	A	F/C	2-4	N	2-4	16	4-27	5	1-3(4)	Y	F, A	R, AP
thin	N	A	R	2	N	2-4	19	4-30	4	1-2	Y	F	R, V
thin-med	**N**	**A-C**	**R-VC**	**2-7+**	**N/CO/Y**	**2-4**	**14-19**	**2-38**	**4-7**	**1-4**	**Y**	**F, A**	**R, AP, V**
med/thick	?	V	?	?	N	2-4	?	?	?	1-2(3)	N	A	?
thick	Y	V/A	F	2-7	Y med irr dis	1-3	16	2-30	5	1-3	Y	F, A	R
med/thick	Y	V	O	2-3	N	1	12	2-22	13	1(2)	Y	F	R, AP
med/thick	Y	V/A	C	2-6+	CO	2-4	16	2-41	7	1-2	Y	F, A	R, AP
thin	?	B	N	?	Y thin irr long	?	?	?	?	?	?	F, A	?
thick	Y	B	?	?	Y 3-4cells irr	?	12	2-38	5	1-2	N?	F, A	N
thick	Y	V/A	F/C	2-5	CO	1-4	21	4-62	8	2-4	Y	F, A	R
thin-thick	**Y**	**V-B**	**N-C**	**2-7+**	**thin-med irr**	**1-4**	**12-24**	**2-62**	**5-13**	**1-2(4)**	**Y/N**	**F, A**	**R,AP,V,F**
thin/med	**?**	**V-A**	**R-O**	**2-3**	**N**	**2-4**	**15**	**2-26**	**7**	**1(2)**	**Y**	**F, A**	**R,AP,F,V**
thin	N	S	N	N	N	2-4	8	2-16	9	1(2)	Y	F, A	R, AP
med	N	V	R/O	2	N	2-4	8	2-17	11	1	Y	F, A	R, AP, V
thin-med	**N**	**S-V**	**N-O**	**N/2**	**N**	**2-4**	**8**	**2-17**	**9-11**	**1(2)**	**Y**	**F, A**	**R, AP, V**
thin/med	**Y**	**V/A**	**F**	**2-3**	**N**	**1-4**	**25**	**10-69**	**6**	**2-5**	**Y**	**F, A**	**R**
med/thick	**Y**	**V/A**	**F**	**2-6**	**N**	**1-3**	**13**	**2-22**	**8**	**1-3**	**Y**	**F, A**	**R, V**
?	?	?	?	?	?	?	?	?	?	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?	?	?
thick	N	A	F	2	N	2-6	13	?	8	1-3	Y	A	R,AP,V,F
med/thick	N	V	C	2-5	Y thin irr dis	1-4	17	3-45	8	1-3	Y	F	R, AP, F
thin	N	V/A	C	2-6	N	1-3	17	2-47	7	1-4	N	R, F, A	R
thick	N	A/C	C	2-5+	Y med reg+MB	1-2	24	4-69	5	3-5(7)	Y	F, A	V
thick	N	A	C	2-5(8)	Y thin irr dis	1-3	23	2-51	7	(1)3-4	Y	F, A	V
thick	N	AW/C	VC	2-(many)	CO	1-2(4)	23	4-47	6	2-4	Y	F, A	R, V
thick	N	V	R	2	N	2-4	24	8-37	5	3-4	Y	F, A	V
thick	N	A/C	C/VC	2-(many)	Y thick reg dis	1-4	23	6-64	7	(1)4-5(6)	Y	F, A	R, AP, V
med	N	A	F/C	2-10	N	1-2	27	3-67	6	2-5	Y	F, A	R, AP, F
thick	N	A/C	VC	2-6	CO	1-3	25	4-78	6	(1)3-6	Y	F, A	AP, V
thin-thick	**N**	**V/A/C**	**R-VC**	**2-10+**	**thin-thick dis**	**1-4(6)**	**13-27**	**2-78**	**5-8**	**1-7**	**Y(N)**	**(R)F, A**	**R,AP,V,F**
?	?	?	?	?	?	?	?	?	?	?	?	?	?
med	N	A	F	2-4	N	2-4	6	2-12	7	1(2)	Y	F, A	R, V
med	N	A/C	C/VC	2-5(10)	CO	1-4	10	2-16	7	1(2)	Y	F, A	R, AP
med	N	V/A	O	2	N	2-4	11	3-21	9	1(2)	Y	F, A	AP
med/thick	N	(V)A	O	2-3	N	2-4	11	3-36	8	1	Y	F, A	V
med	N	A	C	2-4	N	2-4	9	2-15	7	1(3)	Y	F, A	R, AP
med	**N**	**A/V/C**	**O-VC**	**2-5(10)**	**N/CO**	**1-4**	**6-11**	**2-21**	**7-9**	**1(2)**	**Y**	**F, A**	**R, AP**
thin	N	A	R/O	2	N	1-4	10	2-20	8	1	Y	F, A	R, F
med	N	V/A	O	2-4	N	1-4	12	2-21	7	1(2)	Y	F, A	R
thin-med	**N**	**V-A**	**R-O**	**2-4**	**N**	**1-4**	**10-12**	**2-21**	**7-8**	**1(2)**	**Y**	**F, A**	**R, F**
thin	**N**	**A**	**F/C**	**2-8**	**Y med dis irr**	**1-5**	**10**	**2-16**	**10**	**1(2)**	**Y**	**F, A**	**N**

continued

Table 1
(continued)

Species	growth rings A/I/D	tangential vessel diameter av. (µm)	vessels/mm^2	radial multiples R/O/F/C/VC	no. of vessels/RM	clusters R/O/F/C/VC	no. of vessels/cluster	IVP diameter (µm)
Chloroleucon Alliance 3/5								
Blanchetiodendron Barneby & J.W. Grimes 0/1	?	?	?	?	?	?	?	?
Cathormion umbellatum **(Vahl) Kosterm. 1/1 (l)**	**A/I**	**100-200**	**5-20**	**?**	**?**	**?**	**?**	**4-10**
Chloroleucon mangense (Jacq.) Britton & Rose	A/I	63	25	F	2-5(8)	R-O	2-4(7)	3-6
Chloroleucon tenuiflorum (Benth.) Barneby & Grimes (g)	D	?	?	O	?	?	?	?
Chloroleucon tortum (Martius) Pittier	I	119	23	C	2-7	F	2-7	~9
Chloroleucon **Britton & Rose ex Record 2/10**	**A-I**	**63-119**	**24**	**F-C**	**2-7(8)**	**R-F**	**2-7**	**3-9**
Leucochloron incuriale **(Vell.) Barneby & J.W. Grimes 1/4-5**	**I**	**109**	**37**	**F**	**2-4(7)**	**R**	**2-3**	**6-9**
Thailentadopsis Kosterm. 0/3	?	?	?	?	?	?	?	?
Faidherbia/Zapoteca Clade 2/2								
Faidherbia albida **(Del.) A. Chev. 1/1**	**I**	**127**	**14**	**F**	**2-7**	**O**	**2-5**	**3-6**
Zapoteca nervosa **(Urban) H. Hernandez 1/20**	**D/I**	**38**	**40+**	**O**	**2(5)**	**F**	**2-3**	**3-6**
Inga Alliance 7/10								
Archidendron bigeminum (L.) I.C. Nielsen	I	200	5	F	2-5	O/F	2-3	9-12
Archidendron borneense (Benth.) I.C. Nielsen	D	80	16	R	2-3	R	3	6-9
Archidendron clypearia (Jack) I.C. Nielsen	I	172	5	F	2-3	R	2-3	3-6
Archidendron ellipticum (Blume) I.C. Nielsen	D	187	6	O	2-4	O	3-5	3-6
Archidendron globosum (Blume) I.C. Nielsen	I	154	15	C	2-5	O	3-12	3-6
Archidendron hendersonii (F.v.Muell.) I.C. Nielsen (g)	?	132	2.2	F	2+	F	2+	?
Archidendron lucidum (Benth.) I.C. Nielsen	D	141	19	F/C	2-7	R	3-6	~6
Archidendron microcarpum (Benth.) I.C. Nielsen	D	184	8	R/O	2-3	N	0	~6
Archidendron pauciflorum (Benth.) I.C. Nielsen	D	189	9	O	2	R/O	2/3	~3
Archidendron **F.Muell. 6/94**	**D-I**	**80-200**	**5-16**	**R-C**	**2-7**	**R-O**	**2-12**	**3-9**
Calliandra houstoniana (Miller) Standley	I	106	29	C	2-10	C	2-7	6-9
Calliandra houstoniana (Miller) Standley var. *calothyrsus* (Meissner) Barneby	A	79	29	F	2-4(9)	R	3(6)	~6
Calliandra foliolosa Benth.	A/I	48	40+	O/F	2-7	R	2-3	3-6
Calliandra tweedii Benth.	A	57	89	C	2-6	F	2-6	4-6
Calliandra **Benth. 4/135**	**A/I**	**48-106**	**29-89**	**F/C**	**2-10**	**R-C**	**2-7**	**3-9**
Cedrelinga cateniformis **(Ducke) Ducke 1/1**	**A**	**330**	**10**	**F**	**2-10**	**R**	**2-5(7)**	**6-9**
Cojoba arborea (L.) Britton & Rose	I	151	20	F	2-4	O	3-5	<3
Cojoba zanonii (Barneby) Barneby & J.W. Grimes (f)	A	118	5-10	O/F	2-3			2-4
Cojoba **Britton & Rose 2/12**	**A/I**	**118-151**	**5-20**	**O-F**	**2-4**	**O**	**3-5**	**3-4**
Guinetia L. Rico & M. Sousa 0/1	?	?	?	?	?	?	?	?
Inga acuminata Benth.	I	128	10	O	2-3(7)	O	3(8)	~6
Inga adenophylla Pittier	A	123	20	O	3-8	F	3-5	9-12
Inga alba (Sw.) Willd.	A	192	7	F	2-3(4)	O	3	6-9
Inga allenii J. Leon (a)	A	155	10	F	2-5	F	2-3(8)	6-9
Inga aptera (Vinha) T.D. Pennington	D	50	11	O	2-7	O	3	6-9
Inga auristellae Harms	D	167	15	F	2-4(10)	O	3-6	3-6
Inga barbourii Standley	A	179	7	F	2-3	O	2	~6
Inga capitata Desv.	I	143	15	O/F	2-5(7)	R/O	3-8	3-9
Inga chartacea Poepp. & Endl.	I	151	30	C	2-3(8)	F	2-5	~9
Inga chocoensis Killip ex T. Elias	A	125	6	F	2-3(4)	F	2-6	~6
Inga chrysantha Ducke	D	182	7	F/C	2-6	O	3	6-9
Inga cinnamonea Spruce ex Benth.	A	123	6	O	2-4	N	0	~6
Inga congesta T.D. Pennington	D	76	12	F	2-7	F	5	6-9
Inga coruscans Humb. & Bonpl. ex Willd.	I	84	11	F/C	2-5	O	4-5	~6
Inga edulis Martius	I	193	10	F/C	2-3(7)	O	3-6	6-9

fibre wall thickness thin / med / thick	septate fibres Y/N	axial paren A/V/S/U/C/B/W	axial paren confluent R/O/F/C/VC	no. of vessels linked	axial paren banded Y/N/MB/CO	no. of cells/strand	ray height av. no. cells	range of ray height	rays/mm	ray width (cells)	rays homo Y/N	crystals N/F/A/R	gum N/R/AP/V/F
?	?	?	?	?	?	?	?	?	?	?	?	?	?
thin-thick	**?**	**V/A/C**	**?**	**?**	**N**	**2-4**	**?**	**?**	**4-12**	**1-3**	**Y**	**F, A**	**V**
med/thick	N	A	F	2-4	N	1-2	11	3-31	10	1(2)	Y	F, A	R, AP, V
thick	?	V-C	F	?	CO	?	?	?	?	?	?	F, A	R, V
med	N	A/C	C/VC	2-10+	CO	1(2)	13	2-35	5	1-3(4)	Y	F, A	R, AP, V
med/thick	**N**	**A/C**	**F-VC**	**2-10+**	**N (CO)**	**1-2**	**11-13**	**2-31**	**5-10**	**1-3(4)**	**Y**	**F, A**	**R, AP, V**
thick	**N**	**A**	**C**	**2-6**	**N**	**2-4**	**20**	**2-35**	**7**	**1-4(5)**	**Y**	**F, A**	**R, AP, V**
?	?	?	?	?	?	?	?	?	?	?	?	?	?
med	**N**	**B**	**VC**	**(many)**	**Y thick reg cnt**	**1-4**	**12**	**1-30**	**15**	**1-2**	**Y**	**N**	**R**
thick	**N**	**A**	**C**	**2-(many)**	**Y**	**?**	**7**	**2-15**	**8**	**1**	**Y**	**F**	**?**
med	Y	A	F/C	2-3	N	2-4	18	2-36	7	1-4	Y	F, A	R
thin	N	S	N	0	N	?	8	(1)2-19	8	1	Y	?	R, AP
v thin	N	S	N	0	N	2	10	2-22	8	1	Y	F	R, AP, V
med	N	A	O/F	2-3(7)	MB	1	10	2-18	7	1	Y	F, A	R, AP
thin	N	V	R	2	MB	?	12	2-19	6	1-2	Y	N	R, AP
?	?	C	C/VC	2-(many)	CO + MS	2-4	10	7-16	9	1	Y	F, A	
thin	N	V/A	C	2-(many)	CO	1-2	10	2-16	9	1	Y	?	R
thin/med	N	V/B	R/O	2	Y thin reg cnt	2-4	7	2-18	8	1	Y	F, A	R, AP
thin	N	V/A	F/C	2-3	N	2-4	10	2-16	9	1(2)	Y	F, A	R, AP
thin-med	**N**	**S/V/A/B**	**N-F/C**	**2-3+**	**N/Y thin**	**1-4**	**7-12**	**(1)2-36**	**6-9**	**1(2)**	**Y**	**F, A**	**R, AP, V**
thick	N	AW	C	2-5+	Y thin dis irr	1-4	8	2-24	12	1-3	Y	A	R, AP
thick	N	A/C	C	2-4(8)	N	1-2	12	2-28	12	1-3	Y	N	R
thick	N	B	VC	(many)	Y thin v.reg cnt	1-2	17	3-37	7	1-2	Y	F, A	R, AP, F
thick	N	B	VC	(many)	Y med reg	1-2	6	2-13	7	1(2)	Y	A	N
thick	**N**	**A-B**	**C-VC**	**2-(many)**	**some irr-reg**	**1-4**	**6-17**	**2-37**	**7-12**	**1-3**	**Y**	**F, A**	**R, AP, F**
med	**Y**	**A**	**F/C**	**2-4**	**N**	**<8**	**10**	**3-20**	**9**	**1**	**Y**	**N**	**N**
med	N	A	C	2-4	N	1-2	13	3-19	12	1-2	Y	F, A	R, AP
med	N	V/A	O/F		Y thin irr+MB	1-2(4)		8-17		1-2(3)	Y	A	N
med	**N**	**V/A**	**O-C**	**2-4**	**N/Y thin**	**1-2(4)**	**13**	**3-19**	**12**	**1-2(3)**	**Y**	**F, A**	**R, AP**
?	?	?	?	?	?	?	?	?	?	?	?	?	?
thick	Y	A	O	3	N	1-3	11	3-38	11	1-2	Y	F	R, AP
med/thick	Y	A	F	2-4	N	1-2	13	2-30	9	1-3	Y	F, A	R, AP
med/thick	Y	A	C	5	N	1-2	12	3-28	10	1-4(5)	Y	F	R, AP, F
med/thick	Y	A	O	3-4	N	1-4	13	2-37	9	(1)2-5	Y	F	R
med	?	AW	VC	2-(many)	Y irr dis	2-4	11	2-25	11	1(2)	Y	F, A	R, AP, V
thick	Y	A	C	2-4	N	1-2	12	2-22	9	1(2)	Y	F	R, AP
med	Y	V/A	C	2-4(9)	N	1-4	16	2-30	9	(1)2-4	Y	F	R
med/thick	Y	A	O/F	2-4	Y thick irr dis	2-4	14	2-39	9	1(2)	Y	F	R, AP, V
thick	Y	A	VC	2-6	N	2-5	14	2-26	8	1-2	Y	F, A	R, AP, V
med	Y	A(W)	O	2-3	N	1-3	14	2-36	9	(1)2-4	Y	F	R, AP
thick	Y	A	VC	2-(many)	N	1-4	18	3-56	9	1-3	Y	F, A	AP
med	Y	A	VC	2-(many)	CO	1-4	16	2-32	8	(1)3-4	Y	F, A	R, AP
thick	?	AW	F	2-4	N	1-4	10	1-17	11	1	Y	A	R
med	Y	A	C/VC	3-(many)	Y irr thick	1-4	12	2-41	15	(1)2-4	Y	F, A	R, AP
med	Y	A	F	2-3	N	2-4	17	3-55	7	(1)2-4	Y	N	R, AP

continued

Table 1
(continued)

Species	growth rings A/I/D	tangential vessel diameter av. (µm)	vessels/mm^2	radial multiples R/O/F/C/VC	no. of vessels/RM	clusters R/O/F/C/VC	no. of vessels/cluster	IVP diameter (µm)
Inga expansa Rusby	A	146	15	F	2-4	O	5	~9
Inga goldmanii Pittier	A	161	7	O	2-3	N	0	6-9
Inga golfodulcensis N. Zamora	D	194	6	O	2-6	N	0	6-9
Inga heterophylla Willd.	I	167	13	F/C	2-3(4)	F	2-5	~6
Inga ingoides (Rich.) Willd.	I	196	7	C	2-4	F	3	6-9
Inga jinicuil G. Don (a)	A/I	227	10	F	2-4(9)	O	3(6)	6-9
Inga lateriflora Miq.	I	205	9	F	2-5	O	4	6-9
Inga laurina (Sw.) Willd.	A	202	10	C	2-5	R	7	~6
Inga leiocalycina Benth.	I	182	8	O/F	2-4(5)	R/O	2-5	6-9
Inga leonis N. Zamora	I	184	7	O	2-3	O	3	~6
Inga litoralis N. Zamora	I	161	15	F	2-7	O	4	~6
Inga lopadadenia Harms	A	214	14	F	2-4(6)	R/O	3-4	~6
Inga macrophylla Humb. & Bonpl. ex Willd.	D	149	13	C	2-7	O	2-4	6-9
Inga marginata Willd.	I	158	18	C	2-10	O	3-10	6-9
Inga mortoniana J. Léon	A	131	7	F/C	2-4(5)	O	2-3	3-6
Inga nobilis Willd.	A	126	21	C	2-5	F	2-5	~6
subsp. *quaternata (*Poepp. & Endl.) T.D. Pennington	D	141	13	C	2-6(12)	O	3	3-6
Inga pezizifera Benth.	D	192	9	F	2-5	O	2-5	6-9
Inga pilosula (Rich.) J.F. Macbr. (a)	A	?	?	?	?	?	?	?
Inga poeppigiana Benth.	I	108	17	O/F	2-5	O	3-7	3-6
Inga punctata Willd.	D	137	N/S	F	2-6(8)	O	2-5	~9
Inga rubiginosa (Rich.) DC.	D	200	9	F	2-6	O	3-4	~6
Inga ruiziana G. Don	D	120	13	F	2-5	O	3-5	~6
Inga rusbyi Pittier	A	223	10	O	2-6	O	2-5	6-9
Inga saffordiana Pittier	?	128	13	F	2-3	O	2-3	6-9
Inga sessilis (Vell.) Martius	D	105	30+	C	2-8	F	2-5	6-9
Inga setosa G. Don	A	92	35	F/C	2-6	F	2-6	~6
Inga skutchii Standley	I	129	15	F	2-6	O	<30	~6
Inga splendens Willd.	I	192	8	F	2-4	O	2-3	6-9
Inga steinbachii Harms	D/I	121	15	F	2-4	O/F	2-4	3-6
Inga stenopoda Willd.	D	116	12	F/C	2-6	R	2-4	3-6
Inga stenoptera Benth.	I	141	11	F	2-3	O	2-5	6-9
Inga stipularis DC.	D	148	14	O	2-4	O	2-3	6-9
Inga striata Benth. (a)	I	189	13	F	2-4(9)	F	2-5	6-9
Inga tessmannii Harms	I	144	10	O/F	2-7	O	3-5(8)	~6
Inga thibaudiana DC.	I	207	7	O	2-4	R/O	3	6-9
Inga tonduzii J.D. Smith	I	184	7	O/F	2-4	R/O	2	6-9
Inga umbellifera (Vahl) Steud.	I	133	12	F	2-3	O	3	3-6
Inga umbratica Poepp. & Endl.	D	85	20	F	2-4	F	2-6	~6
Inga velutina Willd.	I	166	7	F	2-8	R/O	4-6	6-9
Inga vera Willd.	I	?	?	?	?	?	?	?
subsp. *vera*	?	110	17	?	3-4	?	?	?
***Inga* Scop./Miller 44/c.300**	**A-D**	**50-227**	**5-30+**	**O-C**	**2-12**	**N-F**	**2-10**	**3-9**
Macrosamanea Britton & Rose 0/11	?	?	?	?	?	?	?	?
***Marmaroxylon racemosum* (Ducke) Killip 1/9-13**	**I**	**163**	**7**	**O**	**2-3(5)**	**R**	**2-3**	**3-6**
Viguieranthus Villiers 0/23	?	?	?	?	?	?	?	?
***Zygia latifolia* (L.) Fawcett & Rendle 1/45-50**	**I**	**163**	**9**	**F/C**	**2-8**	**R/O**	**2-7**	**3-5**
Old World Group 5/5								
Archidendropsis basaltica (F.v. Mueller) I.C. Nielsen (k)	?	?	?	?	?	?	?	4-5
Archidendropsis granulosa (Guillamin) I.C. Nielsen (k)	?	?	?	?	?	?	?	5
Archidendropsis oblonga (Hemsley) I.C. Nielsen (k)	?	?	?	?	?	?	?	5
Archidendropsis thozetiana (F.v. Mueller) I.C. Nielsen (k)	?	?	?	?	?	?	?	4-5
Archidendropsis xanthoxylon (C. White & Francis) I.C. Nielsen (k)	?	?	?	?	?	?	?	4-5
***Archidendropsis* I.C. Nielsen 5/14**	**?**	**?**	**?**	**?**	**?**	**?**	**?**	**4-5**
***Falcataria moluccana* (Miq.) Barneby & Grimes 1/3**	**I**	**137**	**4**	**O**	**2-4**	**R**	**2**	**9-12**

fibre wall thickness thin / med / thick	septate fibres Y/N	axial paren A/V/S/U/C/B/W	axial paren confluent R/O/F/C/VC	no. of vessels linked	axial paren banded Y/N/MB/CO	no. of cells/strand	ray height av. no. cells	range of ray height	rays/mm	ray width (cells)	rays homo Y/N	crystals N/F/A/R	gum N/R/AP/V/F
thick	Y	A	C	2-7(11)	N	2-4	16	3-36	10	(1)2-4	Y	F, A	R, AP
med/thick	Y	A	F	2-5	N	2-4	14	2-29	7	1-4(5)	Y	F	R
thick	Y	AW	F	2-(many)	Y long thin	1-4	13	2-27	10	1-3	Y	F	R, AP
med	Y	A	F	2-4	N	1-2	12	2-16	10	1-3(4)	Y	F	R, AP
med	Y	A	F	2-3	N	1-4	17	2-28	7	(1)2-5(7)	Y	F	R, AP
med/thick	Y	A	C	2-5	N	1-3	14	1-30	10	2-3(4)	Y	F, A	R, AP
thin/med	Y	A(W)	F	2-3	N	2-4	13	2-22	10	1-3	Y	N	R, AP
thick	Y	A	F/C	3-4	N	2-4	16	2-40	14	1-2	Y	N	R, AP
thin/med	Y	A	F/C	2-4	N	2-4	14	1-43	8	1-4	Y	F	R
med/thick	Y	A	O	2-3	MB	2	15	1-26	8	1-2	Y	N	R, AP
thick	Y	A	VC	2-(many)	Y med irr	1-2	15	2-43	10	(1)2-4	Y	F, A	R, AP
med	Y	A	F	2-3(10)	N	2-4	13	2-21	9	1-3	Y	N	R, AP
med/thick	Y	A	F/C	2-3	MB	2-4	17	2-43	8	1-3	Y	F, A	R, AP, V
med/thick	Y	A/C	VC	2-(many)	CO	2-4	16	2-36	10	1-3(6)	Y	F, A	R, AP
med	Y	V/A	VC	2-3	N	2-3	15	4-38	10	1-3	Y	N	R, AP
med/thick	Y	A	VC	2-(many)	CO	1-4	13	2-32	11	1-3(4)	Y	F	R
thick	Y	A	VC	2-(many)	CO	1-4	18	2-45	12	1-3	Y	F, A	R, AP
thin	Y	A	O/F	2	N	1-4	13	2-24	8	1-2	Y	N	R
?	?	?	?	?	?	?	?	?	?	(1)2	?	?	?
thick	Y	A(W)	C	2-5	Y thin dis irr	2-4	13	2-28	10	1(2)	Y	F, A	R, AP, V
thick	Y	A	F	2-4	Y thin dis irr	2-3	14	3-38	9	1-3	Y	N	R, AP
med/thick	Y	A	F/C	2-3	N	1-4	15	3-35	7	1-2(3)	Y	F, A	R
thick	Y	A/C	VC	2-(many)	CO	1-4	12	3-28	12	1-2	Y	F	R, AP
med	Y	A	F	2-3	N	2-4	20	1-38	9	2-3(4)	Y	F	R
thick	Y	A	C	2-4	N	2-4	16	2-27	9	(1)2-4	Y	F	R
thick	Y	A	C/VC	2-(many)	Y thin dis irr	1-4	10	2-22	10	1(3)	Y	F, A	R, AP
thick	Y	A	VC	2-(many)	N	1-4	14	2-33	9	(1)2-4	Y	F	R, AP
thick	Y	A	C	2-4	MB	1-4	18	2-41	10	1(2)	Y	F, A	R, AP
med	Y	A	VC	2-9	N	2-4	20	3-52	8	3-4	Y	F, A	R, AP
thick	Y	A	C	2-9	N	2-4	19	2-29	6	(1)2-4(5)	Y	F, A	R, AP
med/thick	Y	A	C	2-(many)	N	1-4	18	2-49	9	3-4	Y	F, A	R
med/thick	Y	A	C	2-(many)	N	1-2	17	2-20	11	1-3	Y	F	R, AP
thick	Y	A	O	2	N	?	10	1-23	9	1(2)	Y	F	R, AP
med/thick	Y	A(W)	C	2-5	N	2-4	16	2-32	8	1-4	Y	F, A	R, AP
thick	Y	C	VC	(many)	MB	1-4	14	2-22	13	1(2)	Y	F, A	R
thin/med	Y	V/A	R	2	N	1-4	21	3-43	8	1-4	Y	N	R
med/thick	Y	A	F/C	2-5	N	1-4	15	2-25	9	1-3(4)	Y	A	R, AP, F
med/thick	Y	A	C/VC	2-5	N	2-4	14	1-21	10	2-3(4)	Y	F, A	R, AP
thick	Y	A	F/C	2-6	N	2-4	17	3-33	11	1-2(3)	Y	F, A	R
thick	Y	A/C	C/VC	2-(many)	Y med dis irr	2-4	17	1-27	9	2-4	Y	F	R, AP
?	?	?	?	?	?	?	?	?	?	3-5	?	?	?
thin	Y	A/C	?	?	N	2-4	?	?	?	1-2(3)	Y	F, A	R, V
thin-thick	**Y**	**V/A/C**	**R-VC**	**2-(many)**	**N/med dis irr**	**1-4**	**10-20**	**1-56**	**7-15**	**1-5**	**Y**	**F, A**	**R,AP,V,F**
?	?	?	?	?	?	?	?	?	?	?	?	?	?
thick	**N**	**A/C**	**C**	**2-7**	**Y thin dis irr**	**2-4**	**17**	**3-37**	**11**	**1-2(3)**	**Y**	**F, A**	**R, V**
?	?	?	?	?	?	?	?	?	?	?	?	?	?
thick	**N**	**A/C**	**C/VC**	**2-3(7)**	**Y dis irr**	**2-4**	**16**	**2-30**	**10**	**1(2)**	**Y**	**F, A**	**R, V**
thick	?	S/V	?	?	N	?	?	?	?	1-2	?	F	?
thin	?	S/V	?	?	MB	?	?	?	?	1-2	?	F	?
thin	?	S/V	?	?	N	?	?	?	?	1-2	?	F	?
thick	?	S/V	?	?	N	?	?	?	?	1-2	?	F	?
med	?	A/C	?	?	N	?	?	?	?	2	?	F	?
thin-thick	**?**	**S-C**	**?**	**?**	**N**	**?**	**?**	**?**	**?**	**1-2**	**?**	**F**	**?**
very thin	**N**	**A**	**F**	**2-6**	**N**	**2-4**	**18**	**2-38**	**8**	**1-4**	**Y**	**F, A**	**N**

continued

Table 1
(continued)

Species	growth rings A/I/D	tangential vessel diameter av. (µm)	vessels/mm^2	radial multiples R/O/F/C/VC	no. of vessels/RM	clusters R/O/F/C/VC	no. of vessels/cluster	IVP diameter (µm)
***Paraserianthes lophantha* (Willd.) I.C.Nielsen 1/1 (k)**	**?**	**?**	**?**	**?**	**?**	**?**	**?**	**6-8**
***Serianthes myriadenia* Planch. ex Benth. 1/18**	**I**	**191**	**11**	**O/F**	**2-5(16)**	**O**	**2-7**	**3-6**
***Wallaceodendron celebicum* Koorders 1/1**	**I**	**150**	**21**	**F**	**2-12**	**O**	**2-6**	**6-9**
Pithecellobium Alliance 3/5								
***Ebenopsis ebano* (Berlandier) Barneby & J.W. Grimes 1/3**	**I**	**79**	**50+**	**C**	**2-4**	**O**	**2**	**~9**
***Havardia pallens* (Benth.) Britton & Rose 1/5**	**D**	**76**	**30+**	**F/C**	**2-7**	**R/O**	**2-7**	**3-6**
Painteria Britton & Rose 0/3	?	?	?	?	?	?	?	?
Pithecellobium dulce (Roxb.) Benth.	A	109	12	O/F	2-3	R/O	2-3	9-12
Pithecellobium lanceolatum (Willd.) Benth. (b)	?	89	9	?	3	?	?	?
Pithecellobium unguis-cati (L.) Benth.	I	117	29	O	2-4	R	2	6-9
***Pithecellobium* Martius 4/18**	**A-D**	**89-117**	**9-19**	**O-F**	**2-7**	**R-O**	**2-6**	**3-12**
Sphinga Barneby & J.W. Grimes 0/3	?	?	?	?	?	?	?	?
Samanea Alliance 3/3								
***Hesperalbizia occidentalis* (Brandegee) Barneby & J.W. Grimes 1/1**	**D/I**	**137**	**6**	**F**	**2-3(7)**	**F/C**	**2-4(9)**	**6-9**
***Pseudosamanea guachapele* (Kunth) Harms 1/2 (b)**	**?**	**110**	**10**	**?**	**3-5**	**?**	**?**	**?**
Samanea saman (Jacq.) Merrill	A	219	7	F	2-3	R/O	2	9-12
Samanea saman (Jacq.) Merrill	A	118	3	F	2-3	O	3-5	6-9
Samanea saman (Jacq.) Merrill	I	142	29	F	2-6	O	2-5	~9
***Samanea* Merr. 1/3**	**A-I**	**118-142**	**3-29**	**F**	**2-6**	**O**	**2-5**	**6-9**
Unplaced genera 3/3								
Albizia adianthifolia (Schum.) W. Wight	I	177	7	F	2-4	F	2-5(11)	~6
Albizia adinocephala (Donnell Smith) Britton & Rose ex Record	I	141	7	O/F	2-5	R/O	2-3	6-9
Albizia amara (Roxb.) Boivin	I	135	6	O/F	2-5	F/C	2-9	6-9
Albizia anthelmintica Brongn.	I	102	10	C	2-7(13)	O	2-9	~6
Albizia brownii Walp.	A	194	4	R/O	2-3	R	2-3	6-9
Albizia chevalieri Harms	I	118	3	O	2-4(5)	O/F	2-7	6-9
Albizia chinensis (Osbeck) Merrill	A	147	3	F	3	N	0	~6
Albizia fastigiata Oliver	A	130	27	N	0	R	2-3	~6
Albizia ferruginea Benth.	I	225	3	O	2(6)	O	2-3	6-9
Albizia forbesii Benth.	D/I	83	14	F	4	F	2-3	3-6
Albizia glaberrima (Schum. & Thonn.) Benth.	I	190	3	R/O	3	R	2-7	~9
Albizia gummifera (J. Gmelin) C.A. Smith	D	155	5	O	2-4(6)	O	2-7	3-6
Albizia julibrissin Durazzini	D	196	15	F	2-3(7)	O	2-7	3-6
Albizia lebbeck (L.) Benth.	A/I	165	3	F	2-4(7)	R	2	6-9
Albizia lucidior (Steudel) I.C. Nielsen	I	196	5	R/O	2-6	N	0	6-9
Albizia niopoides (Benth.) Burkart	D/I	130	12	O/F	2-7	R/O	2-5(7)	3-6
Albizia odoratissima (L.f.) Benth.	I	191	6	F	2-4	O	2-3	9-12
Albizia pedicellaris (DC.) L. Rico	I	160	9	F/C	2-5	O	2-4(6)	4-6
Albizia petersiana (Bolle) Oliver	D/I	72	23	F	2-7	O	2-5(10)	3-6
Albizia polycephala (Benth.) Killip ex Record	A	169	12	O	2-3(6)	O	2-3	~6
Albizia procera (Roxb.) Benth.	I	200	3	O	2-4(10)	R	3-7	9-12
Albizia splendens Miq.	I	225	5	F	2-5	O	3-7	6-9
Albizia tomentosa (M. Mitchell) Standley	A/I	141	13	F/C	2-6	O/F	2-3	6-9
Albizia versicolor Oliver	I	189	3	F	2-8	F	2-8	6-9
Albizia zygia (DC.) J.F. Macbr.	I	149	6	F	2-5	O	2-6	6-9
***Albizia* Durazz. 27/120-140**	**A-D**	**72-225**	**3-27**	**R-F/C**	**2-7(13)**	**N-F**	**2-9(11)**	**3-9**

fibre wall thickness thin / med / thick	septate fibres Y/N	axial paren A/V/S/U/C/B/W	axial paren confluent R/O/F/C/VC	no. of vessels linked	axial paren banded Y/N/MB/CO	no. of cells/strand	ray height av. no. cells	range of ray height	rays/mm	ray width (cells)	rays homo Y/N	crystals N/F/A/R	gum N/R/AP/V/F
thin	**?**	**S/V**	**?**	**?**	**N**	**?**	**?**	**?**	**?**	**1-2**	**?**	**F**	**?**
thin/med	**N**	**A**	**O/F**	**2-4**	**N**	**2-4**	**12**	**2-17**	**5**	**1(2)**	**Y**	**F**	**R, AP**
med/thick	**N**	**A**	**O**	**2-3**	**N**	**2-4**	**10**	**4-18**	**8**	**1-2**	**Y**	**F, A**	**R, V**
thick	**Y**	**A**	**C**	**2-8**	**N**	**2-4**	**13**	**4-19**	**13**	**1(2)**	**Y**	**F, A**	**R**
med	**Y**	**V/A**	**F/C**	**2-5**	**MB**	**1-2**	**12**	**2-25**	**11**	**1**	**Y**	**F, A**	**R,AP,V,F**
?	?	?	?	?	?	?	?	?	?	?	?	?	?
med	N	V/A	N	N	N	1-2	14	1-33	13	1-4(5)	Y	F, A	R
thin	N?	A/C	?	?	N	2-4	?	?	?	1-2	Y		
thick	Y	A/C	VC	2-(many)	CO	1-2	6	2-12	8	1	Y	F, A	R,AP,V,F
thin-med	**N**	**V-C**	**N-C**	**2-(many)**	**N/CO**	**1-4**	**6-14**	**2-33**	**8-13**	**1(2-5)**	**Y**	**F, A**	**R, AP, V**
?	?	?	?	?	?	?	?	?	?	?	?	?	?
thin/med	**Y**	**V/A**	**O**	**2-3(8)**	**Y irr dis thin**	**2-4**	**11**	**2-20**	**9**	**1-4**	**Y**	**F, A**	**R, V**
thin/med	**Y**	**V/A/C**	**?**	**?**	**N**	**2-4**	**?**	**?**	**?**	**1-3**	**Y**	**F, A**	**R, AP**
thin	Y	A	F	2-5	N	2-4	19	6-37	4	2-4	Y	F, A	R
med	N	V	R/O	4	N	1-4	11	2-20	8	1-3	Y	A	R
thin	N	A	C	2-4	N	1-4	11	2-20	6	1-2(3)	Y	F, A	N
thin-med	**N**	**V-A**	**R-C**	**2-4**	**N**	**1-4**	**11**	**2-20**	**6-8**	**1-3**	**Y**	**F, A**	**R**
med	Y	A	C	2-6(10)	CO	1-3	13	3-23	5	(1)2-3	Y	N	R, AP
med/thick	Y	A	O	2-3	N	(1)2-4	18	4-60	8	(1)2-3	Y	F, A	R, AP, V
med	Y	A	F	2-3	Y reg 2-3cells	2-4	11	2-21	7	(1)2-3	Y	F, A	R
med	Y	A	C	2-4(10)	N	(1)2-6	12	3-26	12	1-3	Y	F, A	R, AP
thin	Y	A	O	2	N	(1)2-4	20	3-35	8	2-3	Y	F, A	N
med	Y	A	F	2-5	N	2-4	8	2-13	11	1-3	Y	A	AP
thin	N	V/A	?	?	N	2-4	11	3-30	6	1(2)	Y	F, A	R
thin	N	U/S	R/O	2	N	?	11	3-33	15	1-3	N	N	R, AP
med	Y	A	F/C	2-6	N	4-8	12	2-24	6	1-3(4)	Y	A	R
thick	Y	A	F	2-5	MB	2-6	9	4-30	9	1(2)	Y	F, A	R
med	Y	V	O	2-3	N	?	13	3-26	7	2-4	Y	A	R
very thin	Y	A	F	2-3	N	1-2	13	4-25	7	2-3	Y	F, A	N
very thin	N	S	-	0	N	2-4	15	4-31	7	1-3	Y	F	R
med	Y	V	R	2	MB?	1-4(5)	17	3-71	8	1-4	Y	F, A	R, V
thin	Y	A	F	4	N	2-4	15	3-27	7	1-3(4)	Y	F, A	R, AP, V
med	Y	A	F	2-4	N	2-6	14	2-44	9	(1)2-4	Y	F, A	N
med/thick	Y	A(W)	F/C	5	N	2-4	12	2-27	9	(1)2-3(4)	Y	F, A	R, AP
med	N	A	C	2-4	N	2-4	12	2-18	8	1(2)	Y	F, A	AP
thick	Y	A	C/VC	2-7(10)	N	2-4	7	2-21	11	1	Y	F	R, AP
med/thick	Y	V/A	C	2-6	N	2-4	15	3-39	7	1-3	Y	F, A	F, V
thin	N	A	R/O	2	N	2-6	13	2-29	8	1-3	Y	F, A	R, AP, V
thin/med	Y	A	C	2-4	N	3-6	15	3-31	4	1-3(4)	Y	F, A	R, AP
med	Y	A	F/C	2-5	N	2-4	14	2-44	6	(1)2-3	Y	F, A	R, AP, F
thin/med	Y	A	VC	2-3(7)	N	2-4	10	3-24	6	(2)3-4	Y	A	R
thin/med	Y	A	O	2-3	N	1-5	13	2-30	5	2-3	Y	N	V
thin-thick	**Y/N**	**V-A**	**R-C**	**2-7+**	**N(MB)**	**1-6**	**7-20**	**2-60**	**4-15**	**1-4**	**Y**	**F, A**	**R,AP,F,V**

continued

Table 1
(continued)

Species	growth rings A/I/D	tangential vessel diameter av. (µm)	vessels / mm^2	radial multiples R/O/F/C/VC	no. of vessels/RM	clusters R/O/F/C/VC	no. of vessels/cluster	IVP diameter (µm)
Enterolobium timbouva Martius	I	206	3	C	2-3	O	2-5	~6
Enterolobium contortisiliquum (Vell.) Morong	D	236	9	F	2-6	O	2-3	6-9
Enterolobium cyclocarpum (Jacq.) Griseb.	I	183	6	C	2-6	O	2-5	6-9
Enterolobium schomburgkii Benth.	D	151	8	F	2-3	R	2-3	3-6
***Enterolobium* Martius 4/11**	**I-D**	**151-236**	**3-9**	**F-C**	**2-6**	**R-O**	**2-5**	**3-9**
Lysiloma acapulcense (Kunth) Benth.	A	114	23	F	2-4 (10)	O	2-4 (8)	~3
Lysiloma latisiliquum (L.) Benth.	I	137	14	F	2-5	R/O	2-6	3-5
Lysiloma sabicu Benth.	I/A	128	19	F/C	2-3	R/O	2-4	3-5
***Lysiloma* Benth. 3/8-9**	**A-I**	**114-137**	**14-23**	**F-C**	**2-5(10)**	**R-O**	**2-6(8)**	**3-5**
TRIBE ACACIEAE 1/1								
Acacia* subg. *Aculeiferum* sect. *Filicinae								
Acacia angustissima (Miller) Kuntze	D	88	17	O	2-3	R/O	2-3	6-9
Acacia* subg. *Phyllodineae								
Acacia acuminata Benth.	D/I	74	50+	C/VC	2-5	R	2-5	~9
Acacia aneura F. Muell. ex Benth.	I	63	50+	C	2-6	F	2-7	~9
Acacia aulacocarpa A. Cunn. ex Benth. (e)	A/I	?	?	?	?	?	?	?
Acacia auriculiformis A. Cunn. ex Benth.	A	171	10	F	2-4	R/O	3-4	6-9
Acacia bakeri Maiden (e)	?	?	?	?	?	?	?	?
Acacia cambagei Muell. ex R.T. Baker (e)	?	?	?	?	?	?	?	?
Acacia confusa Merr.	A	94	26	C	2-4(11)	F/C	2-4(6)	6-9
Acacia crassicarpa A. Cunn. ex Benth. (e)	D	?	?	?	?	?	?	?
Acacia decurrens Willd. (e)	?	?	?	?	?	?	?	?
Acacia doratoxylon A. Cunn. (e)	D	?	?	?	?	?	?	?
Acacia harpophylla F. Muell. ex Benth. (e)	D	?	?	?	?	?	?	?
Acacia implexa Benth. (e)	?	?	?	?	?	?	?	?
Acacia koa A. Gray	I	110	17	C/VC	2(5)	F	3(10)	6-9
Acacia longifolia (Andrews) Willd.	D	100	25	F/C	2-5	O	2-4	4-6
Acacia mangium Willd. (e)	?	?	?	?	?	?	?	?
Acacia melanoxylon R. Br.	I	110	21	C	2-7	R/O	3-4	~9
Acacia penninervis Sieber ex DC.	D	109	31	C	2-9	O	3-7	4-6
Acacia richii A. Gray	A	97	36	F/C	2-4	O	2-4	~6
Acacia salicina Lindley (e)	?	?	?	?	?	?	?	?
Acacia saligna (Labill.) H.L.Wendl	A	113	33	VC	2-7	R	4	~9
Acacia* subg. *Aculeiferum								
Acacia dolichostachya S.F. Blake	D/I	124	34	F	2-4	R/O	2-7	~6
Acacia greggii A. Gray	D	N/S	N/S	F/C	2-4	C	2-7	~6
Acacia picachensis Brandegee	I	97	41	O/F	2-5	O	3-7	4-6
Acacia senegal Willd.	I	106	30	F	3-7	F	2-12	3-6
(Unplaced to subgenus)								
Acacia aroma Hook & Arn.	I	134	21	F	2-5	O	2-7	6-9
Acacia caffra Willd.	D	93	27	F	2-4	F	2-4(8)	9-12
Acacia catechu Willd.	D	156	17	F	2-6	O	3-6	6-9
Acacia choriophylla Benth.	I	79	23	F/C	2-4	R/O	2-5	6-9
Acacia cyanophylla Lindley	A	104	50+	C	2-7	R/O	2-7	~6
Acacia davyi N.E.Br.	D/I	115	50	F	2-5(8)	O	3-5	3-6
Acacia dealbata Link	D	99	20	F/C	2-4	R	2-3	6-9
Acacia ehrenbergiana Hayne	I	102	34	O/F	2-3(8)	O	2-3(5)	6-9
Acacia erythrophloea Brenan	I	88	N/S	F	2-3(7)	R	2-4	~9
Acacia etbaica Schweinf.	A/I	188	20	F/C	2-15	F/C	2-30	~9
Acacia exuvialis Verdoorn.	D	107	53	C	2-4	F/C	2-7	6-9
Acacia glomerosa Benth. (c)	?	109	11	?	3	?	?	?
Acacia hockii De Wild.	A	128	16	F	2-5	O	2-4	6-9
Acacia homalophylla A. Cunn. ex Benth.	D	115	46	C	2-7	R/O	3-5	~6
Acacia horrida Willd.	A	113	18	F	2-4	R/O	3-5	~6
Acacia inopinata Prain	D	135	23	F	2-6	O	2-6	~9

fibre wall thickness thin / med / thick	septate fibres Y/N	axial paren A/V/S/U/C/B/W	axial paren confluent R/O/F/C	no. of vessels linked	axial paren banded Y/N/MB/CO	no. of cells/strand	ray height av. no. cells	range of ray height	rays/mm	ray width (cells)	rays homo Y/N	crystals N/F/A/R	gum N/R/AP/V/F
thin	N	A	R	2	N	1-3	15	3-37	5	(1)2-3	Y	N	R
thin	N	A	F/C	2-6	MB	2-4	10	3-21	5	1(2)	Y	F, A	R, AP
thin	N	A	O/F	2-3	N	4-8	12	2-21	8	1-2	Y	F	V
med	Y	A	F	2-5	N	3-6	21	3-34	7	1-3	Y	A	R
thin-med	**Y/N**	**A**	**R-F/C**	**2-6**	**N (MB)**	**1-8**	**10-21**	**2-37**	**5-8**	**1-3**	**Y**	**F, A**	**R, AP, V**
med/thick	N	V/A	O/F	2-4/5	CO	?	14	2-23	8	1-5	Y	F, A	AP
med	N	A/C	VC	(many)	CO	2-4	12	2-21	13	1-2	Y	F, A	R,AP,V,F
thick	N	A/C	VC	(many)	CO	2-4	9	1-17	15	1(2)	Y	N	R,AP,V,F
med-thick	**N**	**V-C**	**O-VC**	**2-(many)**	**CO**	**2-4**	**9-14**	**1-23**	**8-15**	**1-2(5)**	**Y**	**F, A**	**R,AP,V,F**
med	N	V/A	R	2	N	1-4	13	4-36	6	1-3	Y	N	R, AP
thick	?	V/A	C	2-6	N	1-4	9	2-20	11	1(2)	Y	F, A	R, F, V
med/thick	N	N	N	0	N	0	8	2-17	9	1	Y	F	R, V
thin	?	V/A	?	?	N	?	?	?	?	1	Y	?	R
thin	N	V	R	2-3	N	1-2	12	4-31	5	1-2	Y	F, A	N
med/thick	?	B	?	?	Y thick reg cnt	2-4	?	?	?	(1)2	Y	F	?
thick	?	S/V	?	?	N	?	?	?	?	2	Y	F	R, AP, V
med	N	V/A	C/VC	2-6(15)	CO	1-2	12	2-25	11	1-2	Y	F, A	R
med	?	V/A	?	?	N	1-2	?	?	?	1-2	Y	F	V
med/thick	?	S/V	?	?	N	?	?	?	?	2-4	Y	F	R, V
med	?	S	?	?	N	?	?	?	?	1	Y	?	R, V
thick	?	S	?	?	N	?	?	?	?	1	Y	F, A	R
med	?	A/U	?	?	N	?	?	?	?	1	Y	F	R, V
thin/med	N	V/A	R	2	MB	1-2	14	2-29	7	1-3	Y	F, A	R, AP, V
thin	N	V	O	2-3(5)	N	1-2	10	2-21	8	1(2)	Y	F(few)	R, AP, V
med	?	A	?	?	N	?	?	?	?	1-2	Y	?	R
med	N	V/A	O/F	2-4	N	1-4	14	2-24	8	1-2	Y	F	R, V
med/thick	N	A	C	2-6	N	1-4	11	3-25	4	1-4	Y	?	R,AP,F,V
med	N	V	O	2-3	N	2-4	14	3-26	6	2-4	Y	F, A	R, V
med	?	AW	?	?	CO	?	?	?	?	2-3(4)	Y	?	R, V
med	N	V/A	O	2-3	N	1-2	12	2-23	9	1-3	Y	F, A	R, AP
med	Y	A	C/VC	2-3(6)	N	1-4	17	3-39	5	2-3	Y	F, A(lots)	V
med/thick	Y	A	C/VC	2-7+	Y thin irr	1-4	36	6-111	6	3-4	Y	?	R, AP, V
thick	Y	A	C	2-3	MB	2-4	15	3-37	9	1-3	Y	F, A?	R, AP
thick	N	A	C	2-7	CO	2-4	20	3-48	7	3-4	N	F, A	N
thick	Y	V/A	C/VC	2-7(14)	N	1-2	21	2-51	6	1-4	Y	F, A	R
med	N	A	C/VC	2-3(8)	MB	1-4	9	2-20	6	1-3(4)	Y	F, A	R
thick	?	A	C	2-5	MB	2-4	18	3-49	6	(2)3-5	Y	F, A	R, F, V
thick	Y	A(W)	C	2-5+	CO	2-4	27	3-61	8	(1)2-5	Y	F, A	R, V
med/thick	N	V/A	F/C	2-3	N	(1)2-4	13	2-24	9	1-3	Y	F, A	R, V, F
thick	Y	A	C/VC	2-5(11)	CO	1-4(6)	18	3-46	8	2-4	Y	F, A	R, AP, V
thin/med	N	V	R/O	2-3(4)	N	(1)2-4	15	2-57	8	(1)2-4	Y	F, A(few)	R
thick	?	A/C	C	2-(many)	MB	1-2	25	4-67	5	2-5(8)	Y	F, A	R, AP
med	?	B	C	~10	Y thick reg	2-4(5)	21	3-58	7	1-4	Y	F, A	N
thick	?	A/C	VC	2-4+	Y thin irr	2-4	27	3-59	4	(3)4-6(8)	Y	F, A(lots)	R, AP
thick	?	A/B	VC	2-(many)	Y med reg dis	1-2	12/29	4-190	7	1-2/4-7	Y	F, A	R, AP, F
thin	?	V/A/C	?	?	N	2-4	?	?	?	(1)2-4	Y	F, A	?
thick	?	A/B	VC	2-(many)	CO	2-6	24	3-72	6	(3)5-9	Y	F, A(few)	R, AP
thick	?	V/A	VC	2-5(10)	N	1-2	15	3-38	9	2(3)	Y	F, A(lots)	R
med	N	A/C	VC	2-9	CO	2?	29	6-121	5	3-5	Y	R	N
thick	N	A	C/VC	2-4	N	(1)2-6	29	3-50	5	2-4	Y	F, A	AP, V

continued

Table 1 (continued) Species	growth rings A/I/D	tangential vessel diameter av. (µm)	vessels / mm^2	radial multiples R/O/F/C/VC	no. of vessels/RM	clusters R/O/F/C/VC	no. of vessels/cluster	IVP diameter (µm)
Acacia karroo Hayne	D	115	27	F	2-4	O	3-4	~6
Acacia koaia Hillebrand	D/I	73	30+	F	2-5	N	0	~6
Acacia laeta R.Br. & Benth.	D	143	11	O/F	2-5	O/F	3-5	6-9
Acacia leucophloea Willd.	A	122	13	C	2-4	R/O	3-6	6-9
Acacia macracantha Humb. & Bonpl. ex Willd.	A/I	89	35	C	2-9	O	2-7	3-6
Acacia mellifera Benth.	D/I	131	16	F	2-4	O	5-7(12)	6-9
Acacia mollissima Willd.	D	125	33	C	2-9	O	3-6	6-9
Acacia nigrescens (Labill.) R.Br.	D	130	24	F/C	2-5	F	2-8	3-6
Acacia nilotica (L.) Delile	I	104	42	F	2-5	O	2-5	6-7
Acacia nilotica (L.) Delile subsp. *tomentosa* (Benth.) Brenan	I	134	39	F	2-4(7)	F/C	3-7	~9
Acacia nubica Benth.	D-I	99	25	O/F	2-4	O	2-7	4-12
Acacia pachyceras O.Schwartz var. *najdensis* (Chaudhary) Boulos	A	139	14	O/F	2-4	O	2-4	~9
Acacia polyacantha Willd.	D	173	7	O	2-4	R/O	2-4(9)	4-9
Acacia riparia Kunth	A/I	84	31	C/VC	2-7	O	3-6	~6
Acacia seyal Delile	I	113	21	O	2-3	R	3-5	~9
Acacia sieberiana DC.	A	140	18	F	2-4	O	2-6	9-12
Acacia sieberiana DC.	A/I	96	29	F	2-5	R	2-3	3-6
Acacia suma (Roxb.) Buch.-Ham. ex Voigt	D	149	21	O/F	2-3	R	3-4	3-6
Acacia tamarindifolia (L.) Willd. (e)	?	68	30	?	3-6	?	?	?
Acacia tortilis (Forssk.) Hayne	D	128	28	F	2-5	O	2-5(12)	6-9
Acacia tortilis (Forssk.) Hayne subsp. *raddiana* (Savi) Brenan	I	131	28	F	2-4	C	2-10	9-12
Acacia welwitschii Oliver	I	91	23	O	2-3	O	2-4	3-6
TRIBE MIMOZYGANTHEAE 0/1								
***Mimozyganthus carinatus* (Griseb.) Burkart 0/1 (h)**	**D**	**70**	**50**	**F**	**?**	**?**	**?**	**?**

Table 1. Summary of wood anatomical characteristics of Mimosoideae. Details are given of individual species, and data are grouped to give a generic description (bold text). The genus and species are given in bold where only one member of that genus has been examined. No attempt was made to group the *Acacia sensu lato* data because they are too variable, and the taxonomic uncertainty about the future of the genus also makes it unwise.

A key to abbreviations used in the table can be found below. Literature references were used where material was unavailable for examination: (a) Gasson 1997; (b) Cassens & Miller 1981; (c) Neumann *et al.* 2000; (d) Babos & Cumana 1992; (e) Ilic 1991; (f) Miller 1989; (g) Olver 1996; (h) Cozzo 1951; (i) Chauhan & Vijendra Rao 2003; (j) Brazier 1958; (k) Nielsen *et al.* 1983; (l) Sosef *et al.* 1998.

Key to abbreviations used in the various columns — Categories and descriptions used are defined in the *IAWA List of microscopic features for hardwood identification* (Wheeler *et al.* 1989).

Growth rings: A = absent, I = indistinct, D = distinct.

(Occurrence of) Radial multiples: R = rare (<10%), O = occasional (10–30%), F = frequent (30–60%), C = common (60–80%), VC = very common (>80%). Example: <10% means less than 10% of vessels and vessel groups were in radial multiples and so on. The same applies to clusters.

fibre wall thickness thin / med / thick	septate fibres Y/N	axial paren A/V/S/U/W/C/B	axial paren confluent R/O/F/C/VC	no. of vessels linked	axial paren banded Y/N/MB/CO	no. of cells / strand	ray height av. no. cells	range of ray height	rays / mm	ray width (cells)	rays homo Y/N	crystals N/F/A/R	gum N/R/AP/V/F
thick	?	A/C	VC	15+	MB+CO	2-4	21	2-47	6	(2)3-5	N	F, A	R, F, V
thick	N	S/V	R	2	N	1-4	10	3-26	6	1(2)	Y	F, A	V
thick	N	A	F	2-3	CO	1-2	19	2-30	6	1-4	Y	F, A	R, AP, F
thick	Y	A	VC	2-(many)	CO	2-4	27	3-53	6	(2)3-5	N	F	AP
thick	?	V/C	C/VC	(many)	Y med reg long	2-4	23	8-61	8	(3)4-5	Y	F, A?	R, AP
thick	N	A	C	2-5	N	(1)2-4	21	3-46	6	2-4	Y	F, A	R, AP
thin/med	N	A	O/F	2-3	N	2-4	17	2-49	7	1-2(3)	Y	F, A(few)	R, V
thick	Y	A	C/VC	2-6	CO	2-4	10	2-24	6	2-3	Y	F, A	R
med	?	V/A	VC	2-10	N	2-4	20	3-65	7	(3)4-5	Y	F, A	R, AP, F
thick	Y	A/U	VC	2-10	Y med irr dis	1-2?	21	4-45	6	2-3(4)	Y	N	R, AP
med/thick	N	A/C	VC	(many)	Y med reg long	1-2	32	4-90	5	(3)4-10	Y	F, A	AP?
thick	N	A	VC	2-(many)	CO	1-4	22	2-52	6	(3)4-7	Y	F, A	N
thin/med	N	V/A	F/C	2-3(10)	N	1-4	26	3-86	4	(1)3-7	Y	F, A	R, AP, F
med/thick	?	C	VC	10+	Y thin reg dis	2-4	20	5-43	7	4-5	Y	F, A	R, AP
med/thick	N	A/C	C	2-(many)	CO	1-2	22	(4)5-43	5	5-10	Y	F, A	R, AP, V
thick	N	A/C	C	2-9+	CO	2-4	23	4-75	6	4-7	Y	F, A	V
thick	?	A/C	C	2-10+	CO	2-4	18	3-39	4	6-8	Y	F, A	R
med/thick	?	A	F/C	2-5	MB	2	20	5-40	7	1-3	Y	F, A	R, F, G
thick	?	V	?	?	MB	2-4	?	?	?	1-2	Y	F	V
med/thick	?	B	VC	(many)	CO	2-4	26	3-71	5	4-7	Y	F, A	R
thick	Y	A/C	VC	2-(many)	Y thick	1-2	17	3-28	6	(3)4-7	N	F, A	R,AP,F,V
thick	N	A	C	2-6	Y thin irr dis	2-4	11	2-28	8	1-2(3)	Y	F, A	R, AP
med/thick		**B**	**?**	**?**	**Y med, MB**	**1-2**	**15**	**5-36**	**?**	**(1)2-3(4)**	**Y**	**F, A**	**?**

(Occurrence of) Clusters: R = rare (<10%), O = occasional (10–30%), F = frequent (30–60%), C = common (60–80%), VC = very common (>80%).

IVP = intervessel pitting measured horizontally in µm.

Septate fibres: Y = present, N = not seen.

Axial parenchyma: A = aliform, V = vasicentric, S = scanty, W = winged aliform, U = unilateral, C = confluent, B = banded.

Axial parenchyma confluent: R = rare, O = occasional, F = frequent, C = common, VC = very common.

No. of vessels linked: number of vessels tangentially included in confluent parenchyma.

Axial parenchyma banded: Y/N = yes/no, MB = marginal bands only, CO = banding through confluence only, reg = regular, irr = irregular, dis = discontinuous, cnt = continuous.

Rays: *homocellular* (Y), *heterocellular* (N).

Crystals (location of): N = not seen, F = chambered fibres, A = chambered axial parenchyma, R = chambered ray cells. All are prismatic crystals.

Gum (location of): N = none seen, R = ray cells, AP = axial parenchyma cells, V = vessels, F = fibres.

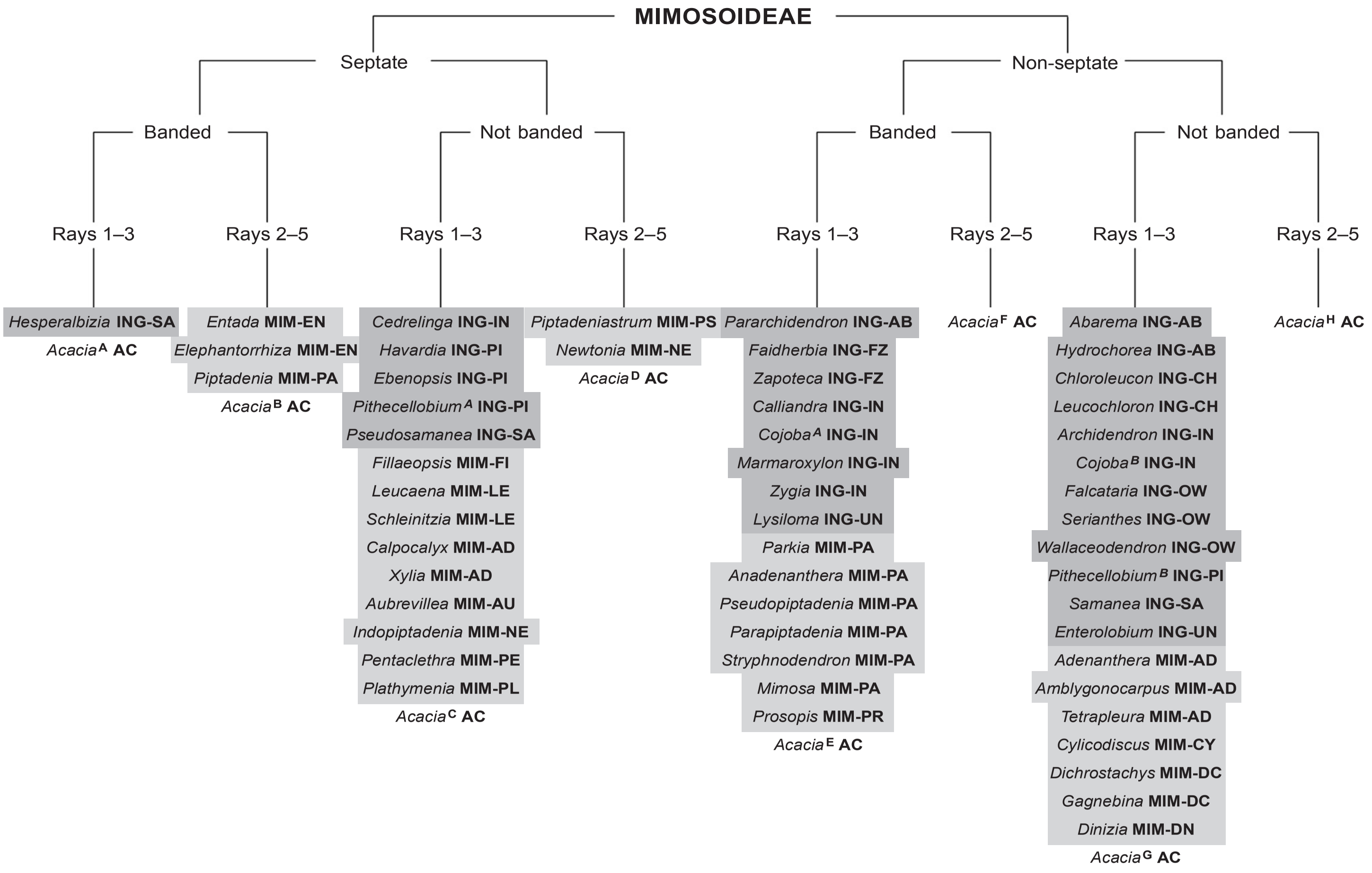

MIMOSOIDEAE
Septate
Non-septate
Banded
Not banded
Banded
Not banded
Rays 1–3
Rays 2–5
Rays 1–3
Rays 2–5
Rays 1–3
Rays 2–5
Rays 1–3
Rays 2–5
Hesperalbizia ING-SA
Acacia^{A} AC
Entada MIM-EN
Elephantorrhiza MIM-EN
Piptadenia MIM-PA
Acacia^{B} AC
Cedrelinga ING-IN
Havardia ING-PI
Ebenopsis ING-PI
Pithecellobium^{A} ING-PI
Pseudosamanea ING-SA
Fillaeopsis MIM-FI
Leucaena MIM-LE
Schleinitzia MIM-LE
Calpocalyx MIM-AD
Xylia MIM-AD
Aubrevillea MIM-AU
Indopiptadenia MIM-NE
Pentaclethra MIM-PE
Plathymenia MIM-PL
Acacia^{C} AC
Piptadeniastrum MIM-PS
Newtonia MIM-NE
Acacia^{D} AC
Pararchidendron ING-AB
Faidherbia ING-FZ
Zapoteca ING-FZ
Calliandra ING-IN
Cojoba^{A} ING-IN
Marmaroxylon ING-IN
Zygia ING-IN
Lysiloma ING-UN
Parkia MIM-PA
Anadenanthera MIM-PA
Pseudopiptadenia MIM-PA
Parapiptadenia MIM-PA
Stryphnodendron MIM-PA
Mimosa MIM-PA
Prosopis MIM-PR
Acacia^{E} AC
Acacia^{F} AC
Abarema ING-AB
Hydrochorea ING-AB
Chloroleucon ING-CH
Leucochloron ING-CH
Archidendron ING-IN
Cojoba^{B} ING-IN
Falcataria ING-OW
Serianthes ING-OW
Wallaceodendron ING-OW
Pithecellobium^{B} ING-PI
Samanea ING-SA
Enterolobium ING-UN
Adenanthera MIM-AD
Amblygonocarpus MIM-AD
Tetrapleura MIM-AD
Cylicodiscus MIM-CY
Dichrostachys MIM-DC
Gagnebina MIM-DC
Dinizia MIM-DN
Acacia^{G} AC
Acacia^{H} AC

Diagram — The distribution of wood anatomical characters of potential taxonomic use among the mimosoid genera examined. Bold text adjacent to genus names indicates the tribe and suprageneric group or alliance.

MIM = Tribe Mimoseae, ING = Tribe Ingeae, AC = Tribe Acacieae. — AB = Abarema alliance, AD = Adenanthera group, AU = Aubrevillea group, CH = Chloroleucon alliance, CY = Cylicodiscus group, DC = Dichrostachys group, DN = Dinizia group, FI = Fillaeopsis group, FZ = Faidherbia / Zapoteca clade, IN = Inga alliance, LE = Leucaena group, NE = Newtonia group, OW = Old World group, PA = Piptadenia group, PI = Pithecellobium group, PR = Prosopis group, PS = Piptadeniastrum group, SA = Samanea alliance, UN = Unplaced genera.

Pithecellobium$^{\mathbf{A}}$ = *Pithecellobium unguis-cati*, *Pithecellobium*$^{\mathbf{B}}$ = *Pithecellobium dulce*, *Pithecellobium lanceolatum* and *Pithecellobium microcarpum*. *Cojoba*$^{\mathbf{A}}$ = *Cojoba zanonii*, *Cojoba*$^{\mathbf{B}}$ = *Cojoba arborea.*

The species of *Acacia* examined are divided into groups A–H based on the characters used (where these characters are not distinguishable the species have not been included): *Acacia*$^{\mathbf{A}}$: *A. choriophylla* – *Acacia*$^{\mathbf{B}}$: *A. nilotica, A. tortilis, A. davyi, A. greggii, A. leucophloea, A. nigrescens* – *Acacia*$^{\mathbf{C}}$: *A. picachensis, A. hurango* – *Acacia*$^{\mathbf{D}}$: *A. dolichostachya* – *Acacia*$^{\mathbf{E}}$: *A. confusa, A. laeta, A. welwitschii* – *Acacia*$^{\mathbf{F}}$: *A. horrida, A. negevensis, A. senegal, A. seyal, A. sieberana, A. nubica* – *Acacia*$^{\mathbf{G}}$: *A. caffra, A. koa, A. angustissima, A. aneura, A. auriculiformis, A. cyanophylla, A. dealbata, A. koaia, A. longifolia, A. mellifera, A. mollissima, A. penninervis, A. richii, A. saligna* – *Acacia*$^{\mathbf{H}}$: *A. inopinata, A. polyacantha, A. melanoxylon.*

A GENERAL WOOD ANATOMICAL DESCRIPTION OF THE MIMOSOIDEAE

Growth rings are absent, indistinct or distinct, a character very variable between species. Most species are tropical or subtropical and have diffuse porous wood. Vessel diameter ranges from small to very large, frequency/mm^2 very low to very high. Vessel diameter and frequency are given for each species in Table 1. Radial multiples are rare to frequent, seldom common. Clusters occasional and variable in size. Intervessel pitting varies in size, but is always alternate, polygonal in outline and vestured. Vessel-ray pitting is similar to intervessel pitting in size and shape. Fibres often gelatinous, may be septate or non-septate with walls ranging from thin to very thick. Fibre wall pits are small and minutely bordered to simple, most frequent on the radial walls. Axial parenchyma aliform or vasicentric, frequently confluent, linking up to 15 vessels tangentially (commonly only 2–5). Banding is occasional and usually irregular, discontinuous and rarely completely apotracheal. Marginal bands present in some species, but rare. Scattered idioblastic axial parenchyma cells are found in some genera. These are enlarged cells that appear to have no cell contents and do not contain crystals. Axial parenchyma fusiform or in strands of 2–8 cells, but most commonly in strands of 2–4 cells. Ray height measured in average number of cells ranges from less than 10 to more than 20 cells, but in most species average ray height ranges between 10–20 cells. Ray width is variable: most species have some uniseriate rays, and narrow multiseriate rays of 1–2/3 cells wide. Some genera lack uniseriate rays but (with the exception of many *Acacia* species) their rays are narrow and 2–5 cells wide (the largest rays observed in a few *Acacia* species are 4–10 cells wide). There are between 4 and 12 rays per mm. Generally, all elements are not storied, although irregular storeying of rays is occasional. Rays are nearly always homocellular. Calcium oxalate crystals are common and found predominantly in chambered fibres, and to a lesser degree in chambered axial parenchyma cells. Deposits are gum and starch, no silica was observed. Gum is very common and was found in nearly all samples, in ray cells and occasionally in vessels, axial parenchyma and fibres.

OBSERVATIONS AND DISCUSSION OF CHARACTERS

Characters are discussed in the same order as those of the Caesalpinioideae in the paper by Gasson *et al.* (2003) so a direct comparison can easily be made. There has been no complete overview of all papilionoid woods but, where possible, comparison is also made with this subfamily.

Porosity and helical thickenings

Virtually all mimosoid woods have diffuse porous wood (which corresponds to their mainly tropical distribution). Diffuse porosity is the most common arrangement of vessels in dicotyledon wood, and is characteristic of nearly all Caesalpinioideae (Baretta-Kuipers 1981; Gasson *et al.* 2003). None of the Mimosoideae we examined had wood that was distinctively semi-ring- or ring-porous, although semi-ring porosity was found in the temperate species *Albizia julibrissin* Durazzini by Itoh (1997) and *Prosopis alpataco* Phil. by Villagra and Roig Juñent (1997). Unusual distributions of vessels are rarely found in Mimosoideae, and where present are normally due to the lianoid nature of the specimen (*e.g.* Fig. 63 & 64). We also did not observe helical thickenings in any of the species examined, but they are recorded as variable in the following species descriptions in InsideWood (2004 onwards): *Acacia gerrardi* Benth., *A. raddiana* Savi, *A. tortilis* (Forssk.) Hayne, *Prosopis juliflora* (Sw.) DC. and *P. pubescens* Benth. Ring porosity and helical thickenings are found in some Papilionoideae (Fujii *et al.* 1994; Gasson 1994) and Caesalpinioideae (Gasson *et al.* 2003).

Intervessel pitting

Intervessel pitting is consistent in shape throughout the Mimosoideae: pits are alternate and polygonal in outline. All pits are vestured (Fig. 352–363), a feature present in almost all leguminous taxa except a few Caesalpinioideae (Gasson 1994; Herendeen 2000; Gasson *et al.* 2003). Pit size ranges mainly between 6–9 µm, but the extremes are 3–12 µm. Vessel ray pitting is similar to intervessel pitting in shape and size.

Axial parenchyma

In leguminous wood the majority of axial parenchyma is paratracheal. In the Mimosoideae patterns of distribution range between almost absent, scanty paratracheal, vasicentric, aliform, winged aliform, confluent and banded. In rare cases apotracheal banding does occur (*e.g.* in *Faidherbia albida* (Del.) A. Chev.), although due to the frequency of vessels the axial parenchyma usually encounters/encompasses at least one vessel. The majority of mimosoids have aliform axial parenchyma with varying degrees of confluence. Banding is present in some species of Mimoseae and is more frequent in the Ingeae with c. 40% of genera containing one or more banded species. The extent, regularity and width of these bands varies. Most banding is irregular, discontinuous and narrow. The taxonomic importance of banding is equivocal because it is not normally consistent between species of the same genus. Banding is frequent in the Acacieae, where confluent parenchyma is common to very common.

In longitudinal sections the axial parenchyma can be seen in strands that range from fusiform to up to 8 cells long. Exclusively fusiform parenchyma is found only in *Piptadenia obliqua* J.F. Macbr. (Mimoseae), *Archidendron ellipticum* (Blume) I.C. Nielsen (Ingeae) and *Chloroleucon tortum* (Martius) Pittier (Ingeae), and strands up to 8 cells long occur in *Cedrelinga cateniformis* (Ducke) Ducke (Ingeae) and *Enterolobium cyclocarpum* (Jacq.) Griseb. (Ingeae). The most common number of cells per strand is 2–4, and much variation can occur in a single sample. With the exception of *Faidherbia albida* (Ingeae), all mimosoids have unstoried axial parenchyma.

Scattered idioblastic axial parenchyma cells were observed in many of the mimosoids, though they are not always consistent between species of the same genus. These cells are fusiform and may be quite prominent in TLS. *Dinizia excelsa* Ducke has a striking appearance with many idioblastic axial parenchyma cells, often in long radial chains (Fig. 52 & 53 – this genus is likely to be moved to the Caesalpinioideae some time in the future (Luckow *et al.* 2000, 2003). The taxonomic significance of idioblastic axial parenchyma should be investigated more thoroughly.

Fibres

Septate fibres occur in widely separated families which indicates that they do not follow a general pattern of xylem evolution (Kribs 1928). Baretta-Kuipers (1981) noted that the occurrence of septate fibres is of taxonomic importance in the legumes, and that they are more frequent in the Mimosoideae than in either of the other two subfamilies. Septate fibres were observed in 35% of the genera examined, confirming that they are frequent across the Mimosoideae. The distribution of septate fibres varies between the tribes: 21% of Ingeae genera are septate compared to approximately 50% of the Mimoseae (however, 65% of the informal Mimoseae groups are comprised solely or predominantly of septate genera). The *Acacia* species examined are a mixture: 10 species were found to be septate, 26 non-septate and the status of the remaining 27 species unknown. It was difficult to ascertain whether certain species had septate fibres or not, normally in cases where fibres are thick-walled and there is a high frequency of gelatinous fibres. Both of these features are common in the Acacieae, but to a lesser extent in the Ingeae and Mimoseae where fibres frequently have thinner walls. The large number of literature references consulted for this tribe did not always provide information on all the features examined in this study, so some species lack data. The occurrence of septate fibres is a very useful taxonomic feature and supports nearly all of the genera and groups recognised in the systematic treatment of the Mimosoideae. The character has previously been used to differentiate between mimosoid species in studies by Baretta-Kuipers (1973, 1981) and Cassens & Miller (1981).

Rays

There is little variation in the height and width of rays in the majority of mimosoid genera. Rays are normally 10–20 cells high, which is relatively short in comparison to most non-leguminous taxa. Only in the Acacieae do very high rays up to 190 cells occur occasionally. Short rays have been considered by Kribs (1928) and Baretta-Kuipers (1981) to indicate a greater degree of specialisation. Ray height tends to be consistent within a taxon, and the number of rays per millimetre is usually medium (6–12/mm). Ray width is more variable but still retains a high consistency between species of the same genus. The most common width is uniseriate to triseriate rays. Uniseriate rays may occur exclusively in some species, or are predominant with only a few biseriate rays present, or they may be absent altogether. Uniseriate rays are present (though at differing frequencies) in all Ingeae species, and are also very common in Mimoseae species. Whilst the presence of uniseriate rays is common in the Acacieae, and they are present in all species of *Acacia* subg. *Phyllodineae* (*Racosperma*), many *Acacia sensu lato* have only multiseriate rays. Though typically only 5 cells across, frequently rays are quite wide (again, this is relative to the other leguminous subfamilies which contain taxa with much wider rays than are observed in the Mimosoideae) and can reach up to 10 cells wide. In *Inga* there is a tendency towards biseriate to multiseriate rays, and very commonly there will also be very short uniseriate rays, the frequency of which varies. This could be a useful differential character for this large genus.

Axial canals

In legumes, normal axial canals are found only in the Caesalpinioideae, although traumatic canals occur more widely. Within the Caesalpinioideae, the presence of axial canals is restricted to the *Prioria* clade and to Detarieae *s.s.* (Banks & Gasson 2000; Gasson *et al.* 2003) and has a diagnostic and systematic significance. Neither axial canals nor traumatic canals were observed in any of the mimosoid species examined.

Silica bodies

Silica bodies have not been recorded in any Mimosoideae or Papilionoideae. They are commonly found in the axial parenchyma and ray cells of several caesalpinioid genera and have taxonomic significance in that subfamily.

Calcium oxalate crystals

In the Caesalpinioideae, crystals are predominantly in chambered axial parenchyma, commonly in ray cells and occasionally in chambered fibres (Gasson *et al.* 2003). Crystals are abundant in chambered axial parenchyma and ray cells in some papilionoid taxa. Prismatic crystals in ray cells are rarely found in the Mimosoideae and were observed in only two species: *Prosopis farcta* (Banks & Sol.) J.F. Macbr. (Mimoseae) and *Acacia horrida* Willd. (Acacieae). Crystals are most common within chambered fibres, and frequent in chambered axial parenchyma cells. Their highest frequency is at the boundaries where fibres and axial parenchyma meet, which makes it difficult to identify which cell type they are in. The occurrence of crystals is too widespread to be of taxonomic significance within the subfamily. Occasionally crystals occur in discontinuous tangential bands (within chambered fibres) that are visible in TS.

Storeying and ray composition

Storeying of tissues has been regarded traditionally as an advanced characteristic (Kribs 1928; Baretta-Kuipers 1981). Whereas storeying of all elements is common in papilionoids and frequent in caesalpinioids, it is absent in mimosoids with the exception of *Faidherbia albida* (Del.) A. Chev. Some local irregular storeying of rays can be found in a few mimosoid species, but there is rarely irregular storeying of axial parenchyma, and only in *Faidherbia albida* are all elements storeyed. Despite this, Baretta-Kuipers (1981) suggested that the ray characteristics of the Mimosoideae are the most advanced of all the legumes because all rays are homocellular which is believed to be highly specialised. Rays in the species examined are composed entirely of procumbent cells (with the notable exceptions of the tribe Mimoseae species *Elephantorrhiza burkei* Benth., *Entada abyssinica* Steud. *ex* A. Rich., *Piptadenia flava* (DC.) Benth., *Mimosa arenosa* (Willd.) Poiret and *Mimosa pigra* L. which have slightly square cells at the margins, perhaps associated with their lianoid nature).

Anomalous secondary thickening

This character was only seen in *Entada* (Fig. 64) in the Mimosoideae examined. Anomalous secondary thickening in the Leguminosae can be found frequently in several species of the caesalpinioid genus *Bauhinia*, and in some Dalbergieae and Millettieae of subfamily Papilionoideae (Gasson *et al.* 2003, 2004 and references within).

OBSERVATIONS AND DISCUSSION OF TRIBES AND GROUPS

TRIBE MIMOSEAE

In Legumes of the World (Lewis *et al.* 2005), the tribe Mimoseae is retained by Luckow "simply as a matter of convenience". This is because all recent molecular data have shown the Mimoseae to be polyphyletic (Grimes 1995; Luckow *et al.* 2000, 2003; Miller *et al.* 2003) (see the Cladogram on page 9). The Acacieae and Ingeae appear to be derived from within Mimoseae, and there are suggestions that Mimoseae may not be monophyletic with regard to the Caesalpinioideae (Luckow *et al.* 2000). Although the classification of the Mimoseae will change greatly in the future as more phylogenetic studies are undertaken, the published phylogenies of Luckow *et al.* (2003) seem to support most of the suprageneric groups recognised in the classification of Lewis and Elias (1981), and only a few changes have been made. Currently, 40 genera and c. 870 species are recognised in the tribe. With the exception of *Mimosa* (c. 500 species) these genera are relatively small and many are monospecific. They are divided into 14 informal groups (Luckow in Lewis *et al.* 2005). The tribe Parkieae is also included within the Mimoseae as a result of recent molecular analyses, which also indicated that its two constituent genera (*Pentaclethra* and *Parkia*) were not sister taxa (Doyle *et al.* 2000; Luckow *et al.* 2000).

Wood anatomy appears to support the 14 informal Mimoseae groups due to similarities between the constituent genera. In most of the groups, all genera have either septate or non-septate fibres, and often the features of axial parenchyma banding and ray width are also consistent. Tribe Mimoseae differs from the Ingeae in the proportions of genera with and without septate fibres, and the presence of genera with exclusively multiseriate rays. However, there are species that are anatomically very similar across the tribal boundaries. The suprageneric groups in the Mimoseae can be broadly divided into five divisions on the basis of wood anatomy:

Mimoseae Division 1 (septate, banded, uniseriate rays absent): Entada group, *Piptadenia* spp.;
Mimoseae Division 2 (septate, not banded, uniseriate rays present): Fillaeopsis group, Leucaena group, Aubrevillea group, Pentaclethra group, Plathymenia group, *Calpocalyx* spp., *Xylia* spp.;
Mimoseae Division 3 (septate, not banded, uniseriate rays absent): Piptadeniastrum group, Newtonia group;
Mimoseae Division 4 (non-septate, banded, uniseriate rays present): Prosopis group, Piptadenia group;
Mimoseae Division 5 (non-septate, not banded, uniseriate rays present): Dichrostachys group, Cylicodiscus group, Dinizia group, Adenanthera group.

These divisions do not correspond exactly to the current taxonomic groupings because the genus *Piptadenia* is placed in Division 1, separate from the rest of the Piptadenia group, and the genera *Calpocalyx* and *Xylia* are placed in Division 2, separate from the rest of the Adenanthera group.

Tribe Mimoseae: Adenanthera group (Fig. 1–27)

There are currently six genera in this group: *Adenanthera* (Fig. 1–4), *Amblygonocarpus* (Fig. 5–10), *Calpocalyx* (Fig. 11–18), *Tetrapleura* (Fig. 19–23), *Xylia* (Fig. 24–27), and *Pseudoprosopis* (the only genus in the group not examined). All genera share a similar geographical distribution encompassing Africa, Asia and Australia. Phylogenetic studies have largely supported the relationship of these genera. Luckow *et al.* (2000) dismantled the Xylia group and placed *Calpocalyx* and *Xylia* into the Adenanthera group. However, although the wood anatomy of *Calpocalyx* and *Xylia* is very similar, both are different from other members of the Adenanthera group (as earlier suggested by Lewis & Elias (1981) who placed these two genera in their separate Xylia group based on morphological data).

There are several literature references for wood anatomical descriptions of genera in this group: *Calpocalyx, Tetrapleura* and *Xylia* can be found in Normand & Paquis (1976); *Adenanthera* and *Xylia* in Ramesh Rao & Purkayastha (1972), Soerianegara & Lemmens (1993) and Chauan & Vijendra Rao (2003); *Adenanthera* in Brazier (1958), Cheng (1980) and Tanaka & Bernard (1995); *Xylia* in Pearson & Brown (1932), Brazier & Franklin (1961), Quirk (1983) and Sudo (1998); *Amblygonocarpus* in Brazier & Franklin (1961) and Berti & Edlmann Abbate (1988).

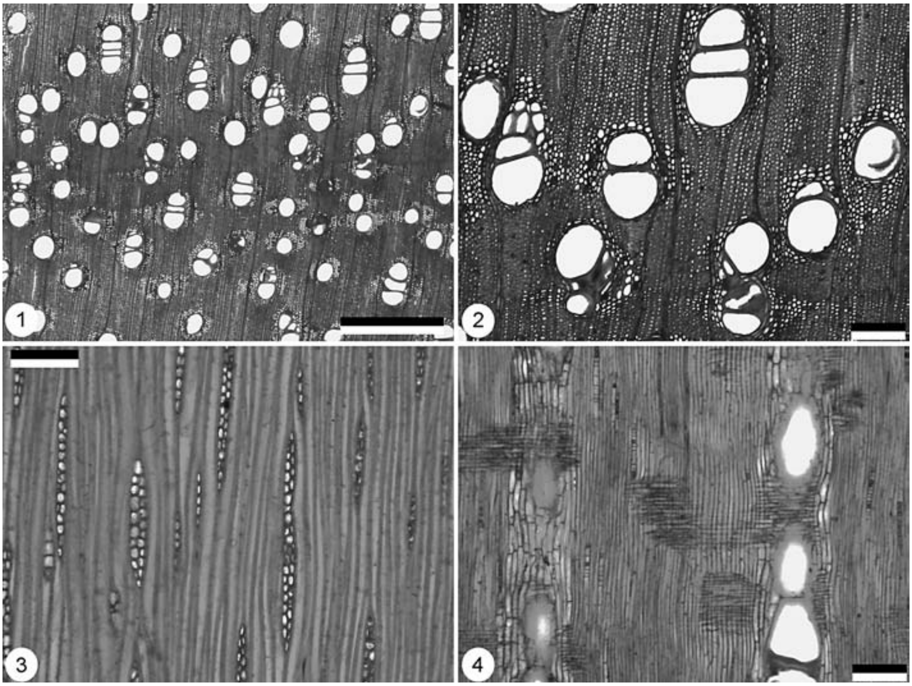


Fig. 1–4. ***Adenanthera pavonina*** L., SJRw 880. **Adenanthera group (Mimoseae)**. – 1 & 2 TS. Vessels solitary and in radial multiples and rarely clusters. Axial parenchyma vasicentric to aliform, not clearly defined. – 3 TLS. Rays 1–2 cells wide, unstoried. – 4 RLS. Rays homocellular, occasional cells filled with gum. — Scale is 1000 µm for 1; 200 µm for 2 & 4; 100 µm for 3.

Vessels in radial multiples and clusters are rare to frequent in all genera, but where present are normally composed of more than four vessels. Fibres are consistently medium- to thick-walled, but, although *Calpocalyx, Xylia* and *Adenanthera microsperma* Teijsm. have septate fibres, the rest of the *Adenanthera* species, *Amblygonocarpus* and *Tetrapleura* are non-septate. Axial parenchyma ranges from vasicentric to confluent, with no banding. Rays are commonly uniseriate and the occurrence of rays 2–3 cells wide fluctuates between species. Scattered idioblastic axial parenchyma cells are often present. *Xylia* has tangential bands of calcium oxalate crystals in chambered fibres demarcating growth ring margins.

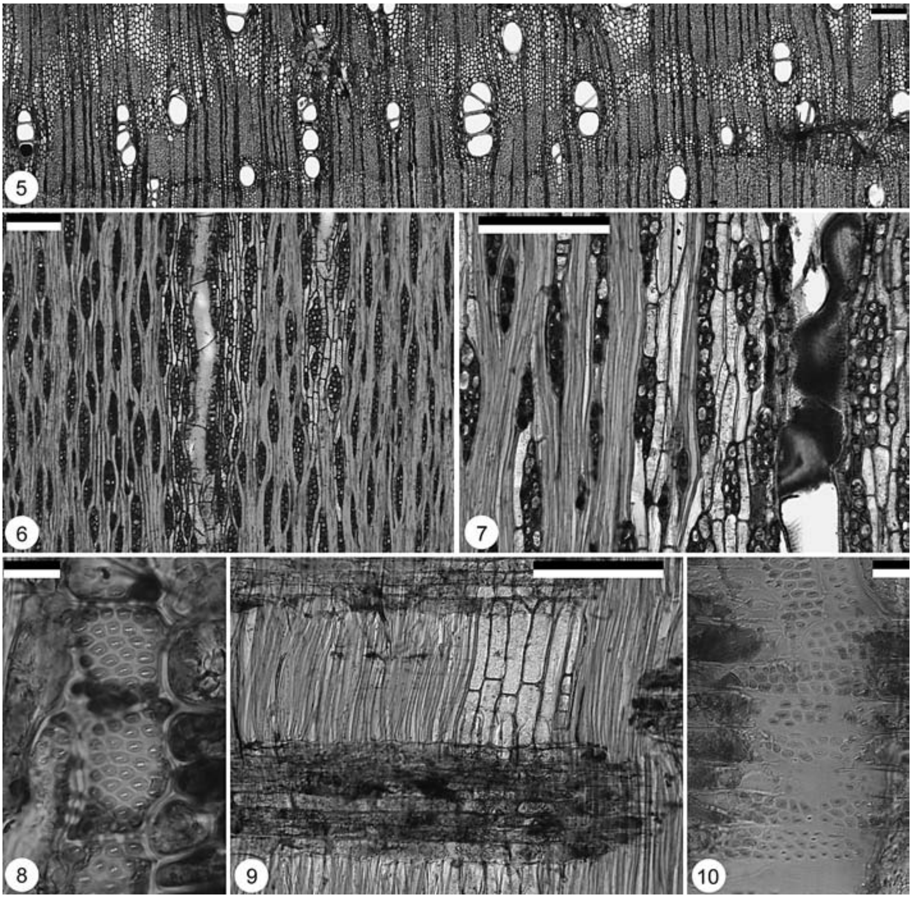


Fig. 5–10. ***Amblygonocarpus andongensis*** (Oliver) Exell & Torre (syn. *Amblygonocarpus obtusangulus* (Oliver) Harms), FHOw 15227, Zimbabwe. **Adenanthera group (Mimoseae)**. – 5 TS. Vessels solitary and/or in radial multiples. Axial parenchyma vasicentric to aliform, frequently confluent, occasionally in irregular discontinuous tangential bands. – 6–8 TLS. Rays uni- to biseriate. Axial parenchyma fusiform or in strands of 2–4. – 8. Intervessel pitting alternate and vestured. – 9 & 10. Rays homocellular, cells often containing gum. – 10. Vessel-ray pitting similar to intervessel pitting. — Scale is 200 μm for 5–7 & 9; 20 μm for 8 & 10.

These characters show that *Calpocalyx* and *Xylia* are similar to many other Mimoseae group genera, but the rest of the Adenanthera group is most similar to the *Dinizia* and *Dichrostachys* groups.

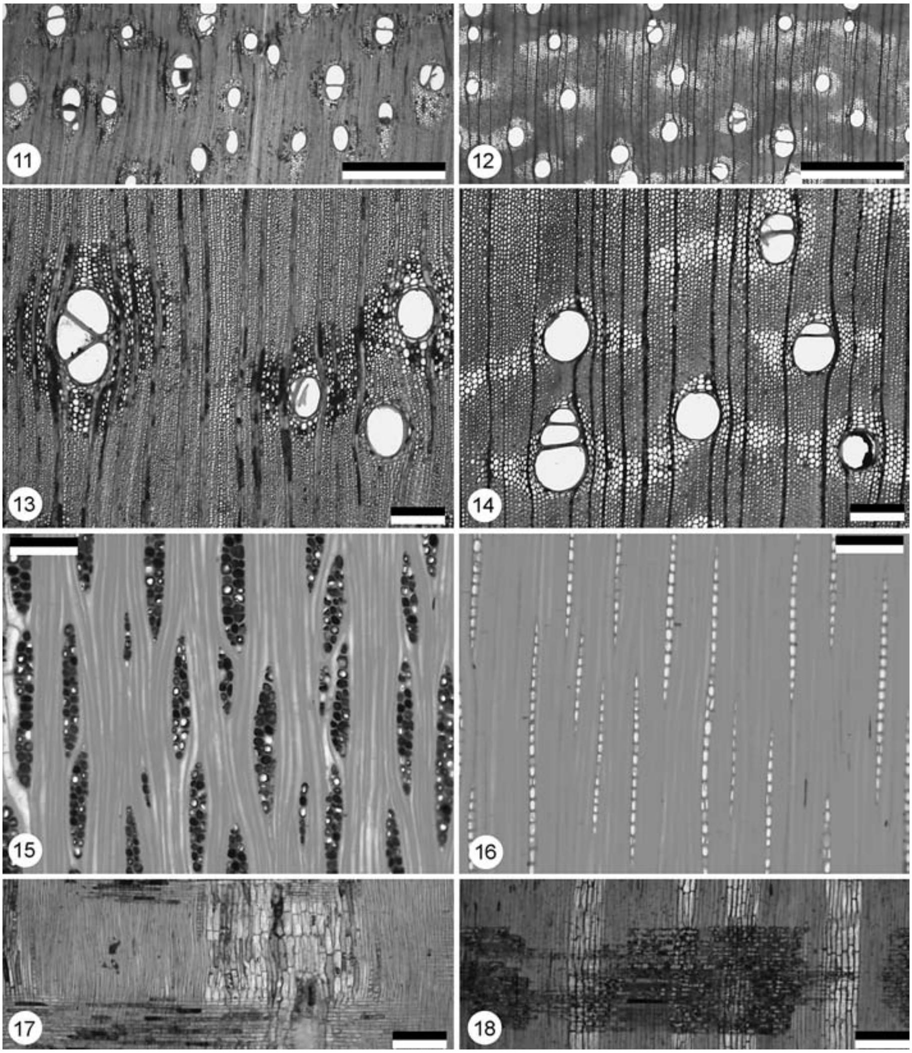


Fig. 11–18. ***Calpocalyx***. - 11, 13, 15 & 17: *Calpocalyx brevibracteatus* Harms, Kw 1361, Gold Coast. **Adenanthera group (Mimoseae)**. - 12, 14, 16 & 18: *Calpocalyx heitzii* Pellegrin, Inst. for Lab. Anat., Spanish Guinea. – 11–14 TS. Axial parenchyma aliform and confluent, cells occasionally containing gum (Fig. 11, 13). – 15 & 16 TLS. Rays vary from uniseriate (Fig. 16) to 2–3 cells wide (Fig. 15), unstoried. – 17 & 18 RLS. Rays homocellular, often containing gum. — Scale is 1000 µm for 11 & 12; 200 µm for 13, 14, 17 & 18; 100 µm for 15 & 16.

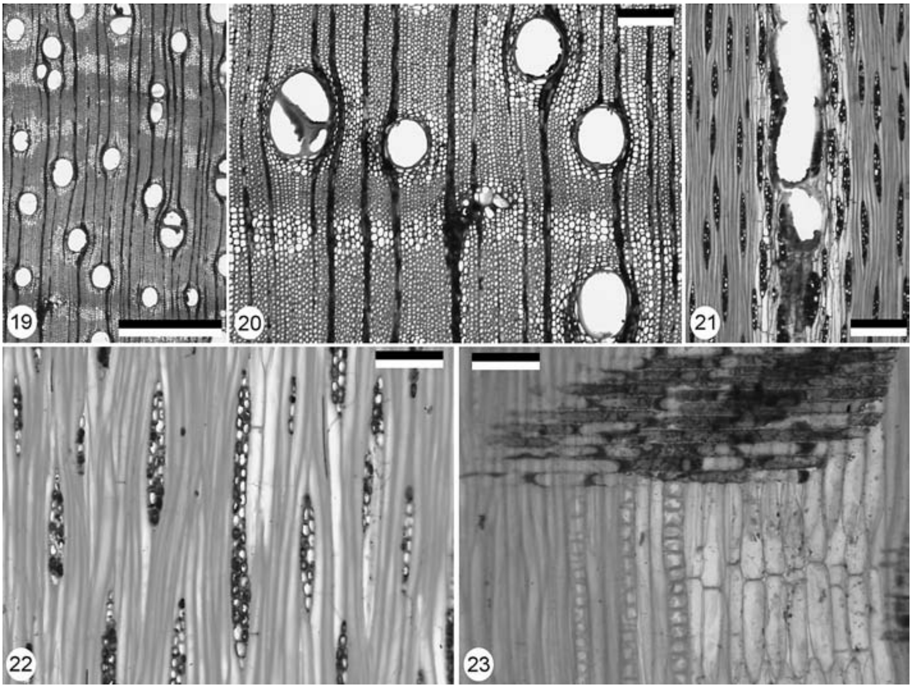


Fig. 19–23. ***Tetrapleura tetraptera*** (Schum. & Thonn.) Taubert. **Adenanthera group (Mimoseae)**. – 19 & 20 TS. Axial parenchyma vasicentric to aliform, occasionally in irregular bands. – 21 & 22 TLS. Rays uni- to biseriate. Axial parenchyma fusiform or in strands of 2–4 cells. – 23 RLS. Rays homocellular, often containing gum. Calcium oxalate crystals in chambered fibres. — Scale is 1000 µm for 19; 200 µm for 20 & 21; 100 µm for 22 & 23.

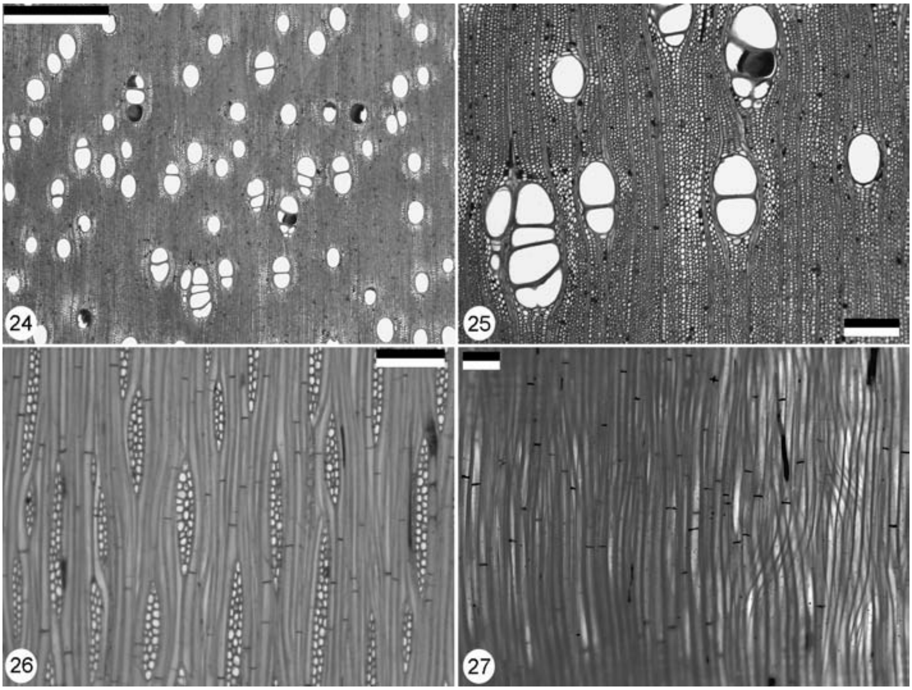


Fig. 24–27. ***Xylia evansii*** Hutch., Kw 2031, Sierra Leone. **Adenanthera group (Mimoseae)**. – 24 & 25 TS. Vessels solitary, occasionally in radial multiples or rarely in clusters. Axial parenchyma scanty paratracheal to vasicentric. – 26 TLS. Rays 2–3 cells wide, unstoried. Fibres septate. – 27 RLS. Rays homocellular, fibres septate. — Scale is 1000 µm for 24; 200 µm for 25; 100 µm for 26; 50 µm for 27.

Tribe Mimoseae: Aubrevillea group (Fig. 28–35, 352)

This group comprises only the African genus *Aubrevillea*, of which there are two species (both examined). Vessel clusters are absent or rare in both species, fibre wall thickness is medium-thick. Fibres are septate (Fig. 34). Axial parenchyma varies from vasicentric to confluent within the same sample; confluent parenchyma is common

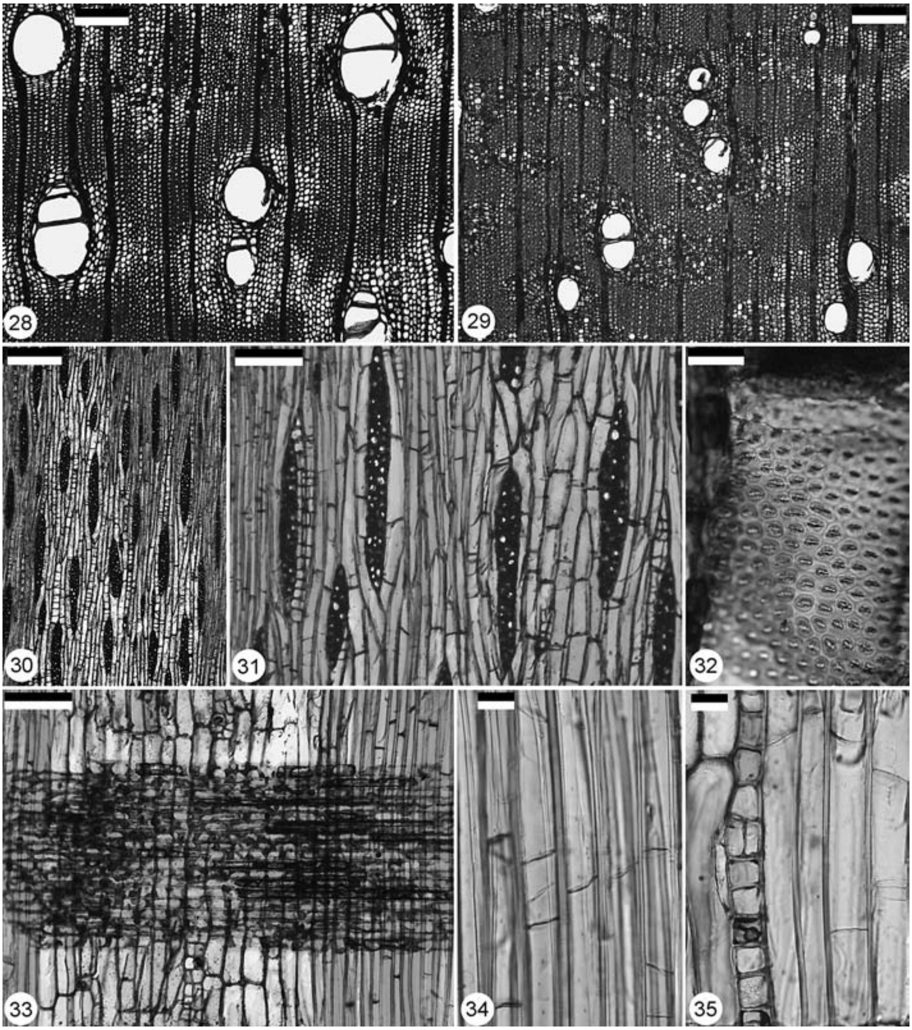


Fig. 28–35. ***Aubrevillea*. Aubrevillea group (Mimoseae)**. - 28, 31–35: *Aubrevillea platycarpa* Pellegrin, MADw 22098. - 29 & 30: *Aubrevillea kerstingii* (Harms) Pellegrin, SJRw 17062. – 28 & 29 TS. Axial parenchyma aliform to confluent, some diffuse apotracheal cells. – 30–32 TLS. Rays 2–3 cells wide, unstoried. Axial parenchyma in strands of 4–8 cells, occasionally containing calcium oxalate crystals. Intervessel pitting medium, alternate and vestured. – 33–35 RLS. Rays homocellular, often containing gum. Fibres septate. Axial parenchyma chambered, normally containing crystals but occasionally empty (Fig. 35). — Scale is 200 μm for 28-30; 100 μm for 31 & 33; 20 μm for 32, 34 & 35.

but not extensive enough to be banded. There is some apotracheal axial parenchyma in *Aubrevillea kerstingii* (Harms) Pellegrin (Fig. 29). Rays are 2–4 cells wide, with occasional uniseriate rays in *Aubrevillea kerstingii*. The group/genus is similar to the Pentaclethra and Plathymenia groups and the genera *Calpocalyx* and *Xylia*. Wood anatomical descriptions of *Aubrevillea* can be found in Normand & Paquis (1976).

Tribe Mimoseae: Cylicodiscus group (Fig. 36–40)

This group is monospecific, comprising *Cylicodiscus gabunensis* Harms. Vessels are wide and few/mm^2, with clusters absent in the slide examined (Fig. 36 & 37). Axial parenchyma is aliform and occasionally confluent, not banded, with rays 2 to 3 (rarely a maximum of 4) cells wide. The thickness of the fibre walls makes it difficult to determine whether fibres are septate or not. Without knowledge of this character it is not possible to place the group with any confidence. Gill *et al.* (1983) reported that the fibres are non-septate, which (together with non-banded axial parenchyma and presence of uniseriate rays) would place this group close to the Dichrostachys, Dinizia and Adenanthera groups. Wood anatomical descriptions can be found in Kribs (1959), Normand & Paquis (1976) and Berti & Edlmann Abbate (1988).

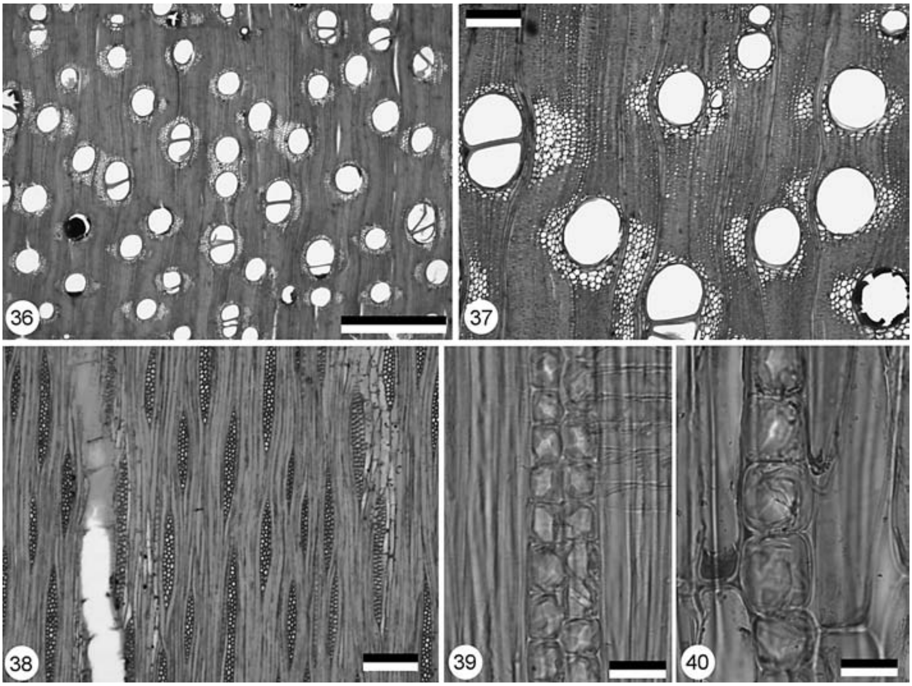


Fig. 36–40. ***Cylicodiscus gabunensis*** Harms, Gold Coast 1945. **Cylicodiscus group (Mimoseae)**. – 36 & 37 TS. Vessels solitary or in short radial multiples of 2–3. Axial parenchyma vasicentric, aliform and confluent. – 38 TLS. Rays 2–3 cells wide, unstoried. Axial parenchyma in strands of 2–4 cells. – 39 & 40 RLS. Calcium oxalate crystals in chambered fibres (Fig. 39) and chambered axial parenchyma (Fig. 40). — Scale is 1000 µm for 36; 200 µm for 37 & 38; 20 µm for 39 & 40.

Tribe Mimoseae: Dichrostachys group (Fig. 41–51)

Luckow (1995) devoted a paper to the phylogenetic relationships between the genera of this group, which has led (amongst other things) to the removal of *Desmanthus* and *Neptunia*. The group now comprises four genera: *Alantsilodendron, Calliandropsis, Gagnebina* and *Dichrostachys*. *Alantsilodendron* (Villiers 1994) and *Calliandropsis*

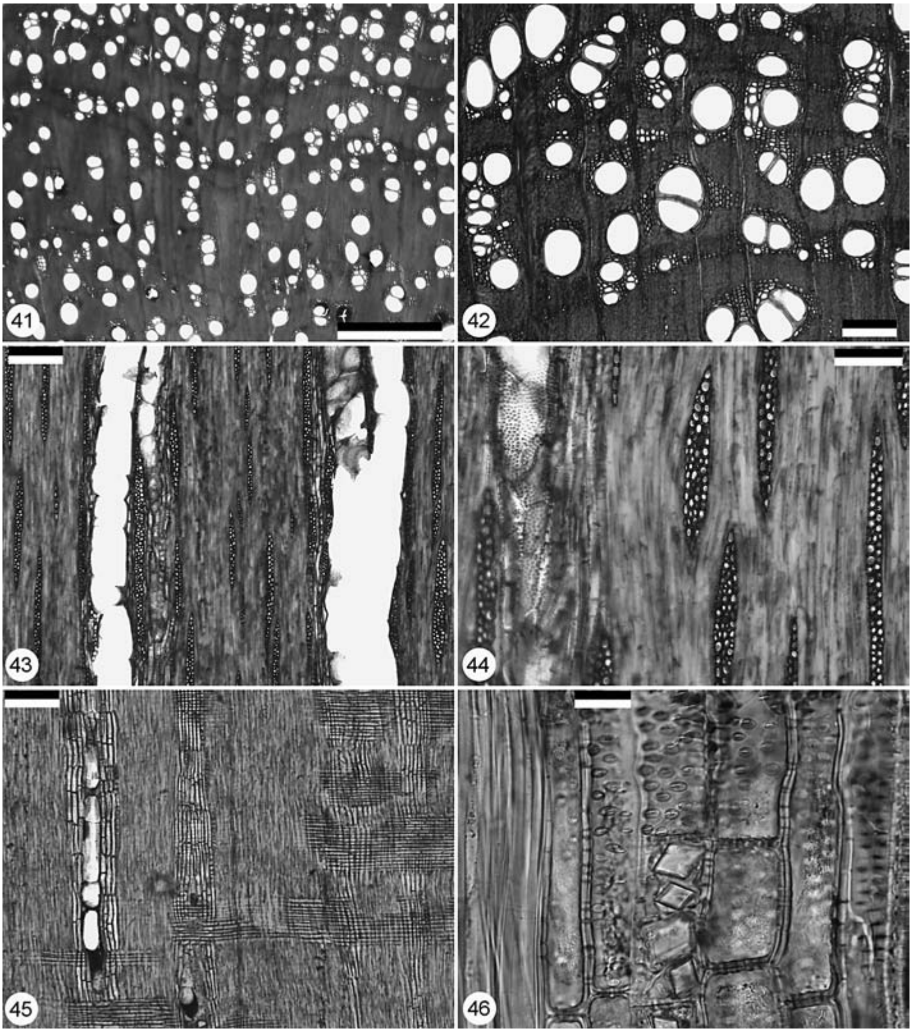


Fig. 41–46. ***Dichrostachys cinerea*** (L.) Wight & Arn., Swaziland ADH 6.9.90. **Dichrostachys group (Mimoseae)**. – 41 & 42 TS. Vessels solitary or in radial multiples and clusters. Fibres thick-walled. Axial parenchyma scanty paratracheal, diffuse apotracheal parenchyma occasional. – 43 & 44 TLS. Rays 2–4 cells wide, unstoried. – 45 & 46 RLS. Rays homocellular, vessel-ray pitting alternate and medium sized. Calcium oxalate crystals in chambered axial parenchyma and chambered fibres. — Scale is 1000 µm for 41; 200 µm for 42 & 45; 100 µm for 43 & 44; 20 µm for 46.

(Hernandez & Guinet 1990) are recently described genera that have been placed in the Dichrostachys group based on molecular evidence (Hughes *et al.* 2003). Unfortunately, specimens of these genera were unavailable for this study and coverage of the group is based on only two species (*Dichrostachys cinerea* (L.) Wight & Arn. (Fig. 41–46) and *Gagnebina pterocarpa* Baill. (Fig. 47–51)). Comparisons with other Mimoseae groups suggest relationships with the Dinizia, Adenanthera and Cylicodiscus groups. Descriptions of *Dichrostachys* can be found in Ramesh Rao & Purkayastha (1972),

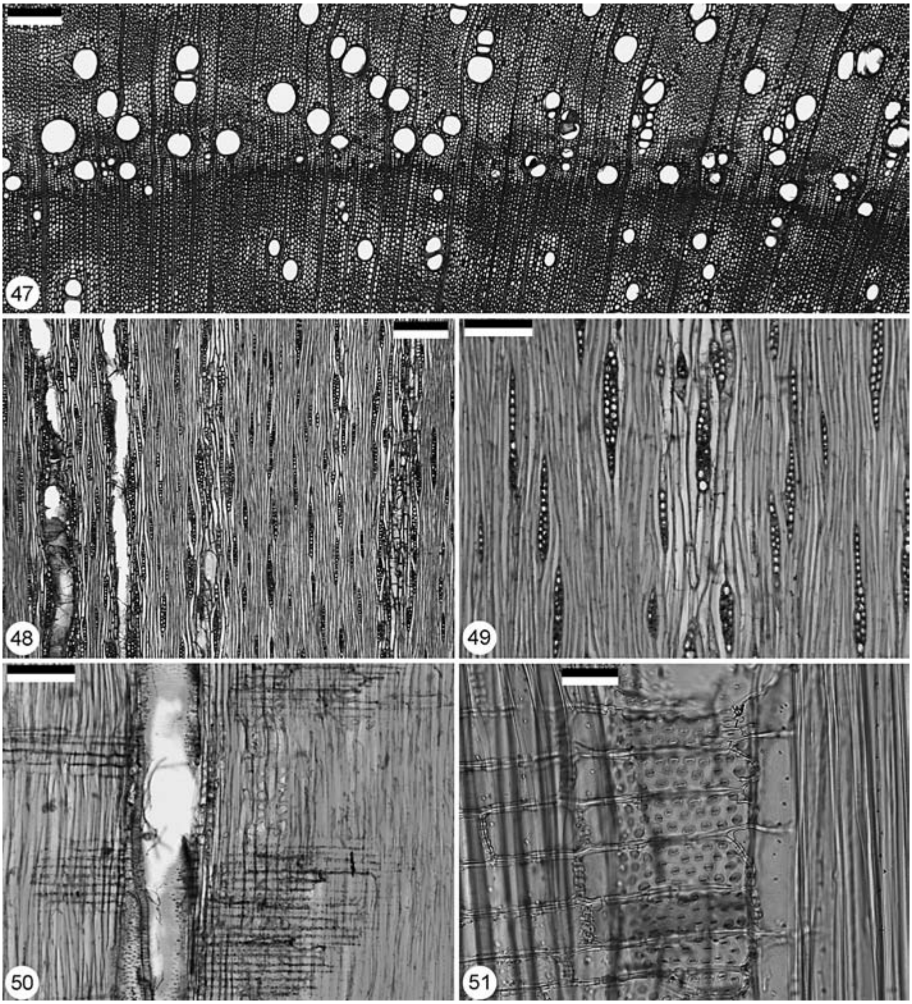


Fig. 47–51. ***Gagnebina pterocarpa*** Baill., Mauritius. **Dichrostachys group (Mimoseae)**. – 47 TS. Growth ring boundaries distinct. Vessels variable in size. Axial parenchyma not clearly defined, mainly vasicentric to confluent. – 48 & 49 TLS. Rays uni- to biseriate, axial parenchyma in strands of 2 cells. – 50 & 51 RLS. Rays homocellular, crystals in chambered axial parenchyma and chambered fibres. Vessel-ray pitting alternate and small. — Scale is 200 μm for 47 & 48; 100 μm for 49 & 50; 20 μm for 51.

Prior & Gasson (1990), Höhn (1999) and Chauan & Vijendra Rao (2003); descriptions of *Gagnebina* in Gasson *et al*. (1998).

Average vessel diameter is 48 µm in *Gagnebina* and 111 µm in *Dichrostachys*, which has vessels of two distinct sizes. Both have 23–24 vessels/mm^2 (Fig. 41, 42 & 47). Radial multiples are frequent and clusters common, fibre wall thickness ranges from thin to thick. Fibres are non-septate. Axial parenchyma ranges from scanty paratracheal to confluent. Ray width is variable: *Dichrostachys cinerea* has rays 2–4 cells wide (Fig. 43 & 44) whereas *Gagnebina pterocarpa* has rays 1–3 cells in width (Fig. 48 & 49). Scattered idioblastic axial parenchyma cells are found in *Dichrostachys cinerea*, and there are many gummy deposits in all cell types.

Tribe Mimoseae: Dinizia group (Fig. 52–56)

Dinizia excelsa is another monospecific group and may in the future be moved into the Caesalpinioideae on the basis of molecular (Luckow *et al*. 2000, 2003) and morphological evidence. However, its wood anatomy is similar to other mimosoids. Average vessel diameter is 167 µm and there are few vessels (8/mm^2). Fibres are thick-walled and non-septate. Axial parenchyma is lozenge and winged aliform, and clearly defined (Fig. 52 & 53). Confluent parenchyma is common linking up to 6 vessels tangentially. Scattered idioblastic axial parenchyma cells are very common, and axial parenchyma cells can also be seen in short radial chains in TS (Fig. 52 & 53). Rays are 1–3 cells wide (Fig. 55). *Dinizia* wood has also been described by Record & Hess (1943), Détienne & Jacquet (1983), Mainieri *et al*. (1983) and Mainieri & Chimelo (1989).

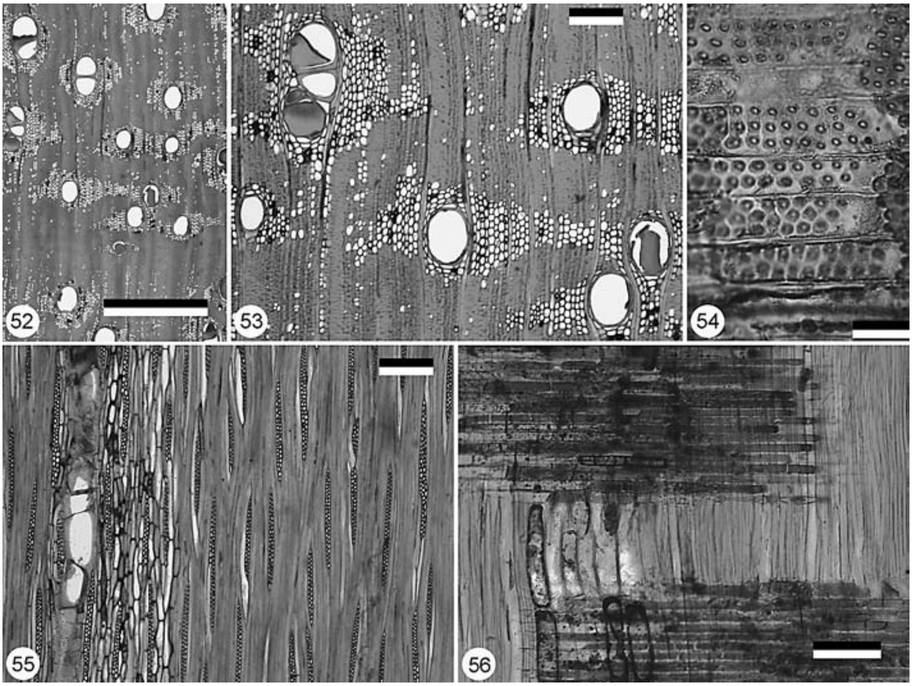


Fig. 52–56. ***Dinizia excelsa*** Ducke, Kw 2119, British Guiana. **Dinizia group (Mimoseae)**. – 52 & 53 TS. Axial parenchyma aliform. Diffuse idioblastic axial parenchyma cells common. – 55 TLS. Rays biseriate, unstoried. Axial parenchyma in strands of 2–4 cells, idioblastic cells prominent. – 54 & 56 RLS. Rays homocellular and frequently filled with gum. Vessel-ray pitting alternate and small. — Scale is 1000 µm for 52; 200 µm for 53 & 55; 100 µm for 56; 20 µm for 54.

Tribe Mimoseae: Entada group (Fig. 57–69)

The wood anatomy of the two genera in this group, *Entada* (Fig. 63–69) and *Elephantorrhiza* (Fig. 57–62), is very similar. Out of the six *Entada* species studied, four had very abundant tightly packed vessels of two distinct sizes. These samples were probably taken from lianas. The wood anatomy of *Entada* is described by Williams (1936), Höhn (1999), Ella (2000) and Neumann *et al.* (2000).

Both genera have septate fibres and axial parenchyma often in regular bands. Average vessel diameter in *Elephantorrhiza* is 154 µm, and between 262 and 461 µm in *Entada* (Fig. 57, 58, 63–65). Clusters and radial multiples are frequent. Ray height ranges from 3–66 cells in both genera. In *Entada* (Fig. 66) the rays are multiseriate, exceptionally up to 8 cells wide. Rays in *Elephantorrhiza* are no more than 4 cells wide with uniseriate rays also present (Fig. 59 & 60). Highly unusual for the Mimosoideae, rays are occasionally heterocellular: in both *Elephantorrhiza burkei* Benth. (Fig. 62) and *Entada abyssinica* Steud. *ex* A. Rich. there are square cells at the margins of rays. These were not seen in any of the other *Entada* species examined.

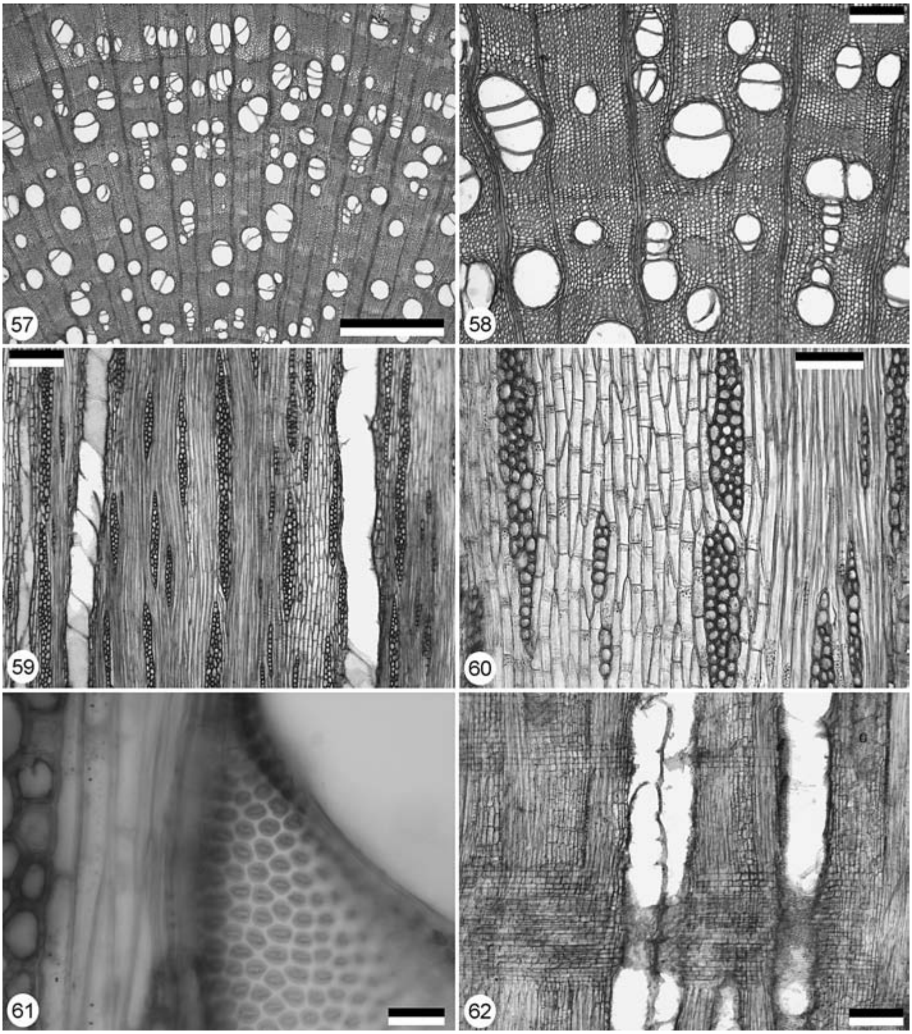


Fig. 57–62. ***Elephantorrhiza burkei*** Benth., PSB 1998. **Entada group (Mimoseae)**. – 57 & 58 TS. Vessels mostly in radial multiples or in clusters. Axial parenchyma either indistinct or confluent, occasionally forming irregular tangential bands. Growth ring boundaries visible. – 59–61 TLS. Rays 2–4 cells wide, occasionally uniseriate rays. Axial parenchyma in strands of 2–4 cells. Intervessel pitting alternate and medium, polygonal in outline. – 62 RLS. Rays slightly heterocellular. — Scale is 1000 μm for 57; 200 μm for 58, 59 & 62; 100 μm for 60; 20 μm for 61.

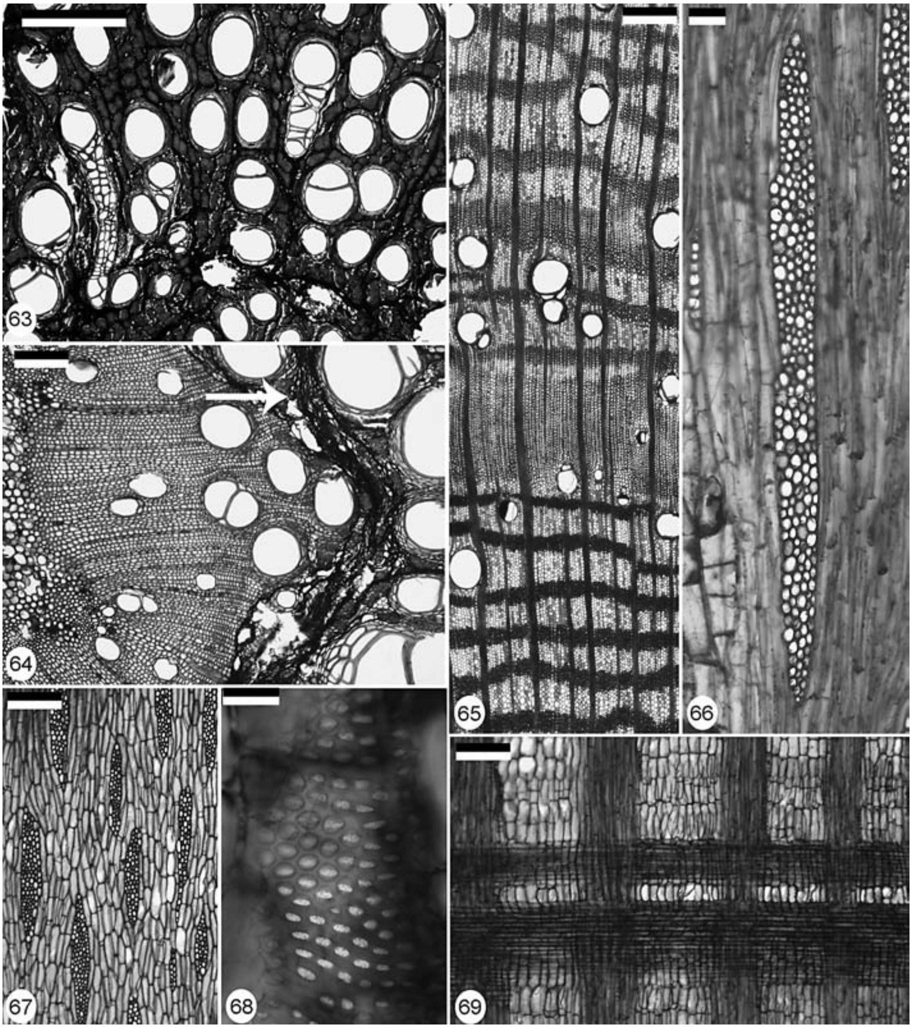


Fig. 63–69. ***Entada***. **Entada group (Mimoseae)**. - 63: *Entada rheedii* Spreng., Shak 95, Sierra Leone. - 64: *Entada phaseoloides* (L.) Merr., Kw 21695, Malaya. - 65–69: *Entada abyssinica* Steud. *ex* A. Rich., Kw 7978, Tanzania. – 63–65 TS. Vessels of very variable diameter, of two distinct sizes in Fig. 63, clusters and long radial multiples frequent. Fig. 63 & 64 are lianas. Fig. 64 shows abrupt transition from a free-standing stem to a lianoid one, included phloem is arrowed. Fig. 65 has distinctly banded axial parenchyma. – 66–68 TLS. Rays multiseriate (4–5 cells wide), unstoried. Axial parenchyma in strands of 2–4 cells, intervessel pitting alternate, vestured. – 69 RLS. Rays homocellular. — Scale is 1000 μm for 63; 200 μm for 64, 65, 67 & 69; 20 μm for 66 & 68.

Tribe Mimoseae: Fillaeopsis group (Fig. 70–76, 353, 354)

Fillaeopsis discophora Harms, from Africa, is the sole species in this group. The only outstanding feature is the presence of large vessels at low frequency/mm^2 (Fig. 70). The fibres are thin- to thick-walled and the fibres are septate. Axial parenchyma is vasicentric and occasionally confluent linking up to 3 vessels. Rays are 1–3 cells wide (Fig. 71 & 73). These characters are similar to members of the Aubrevillea, Leucaena, Pentaclethra and Plathymenia groups.

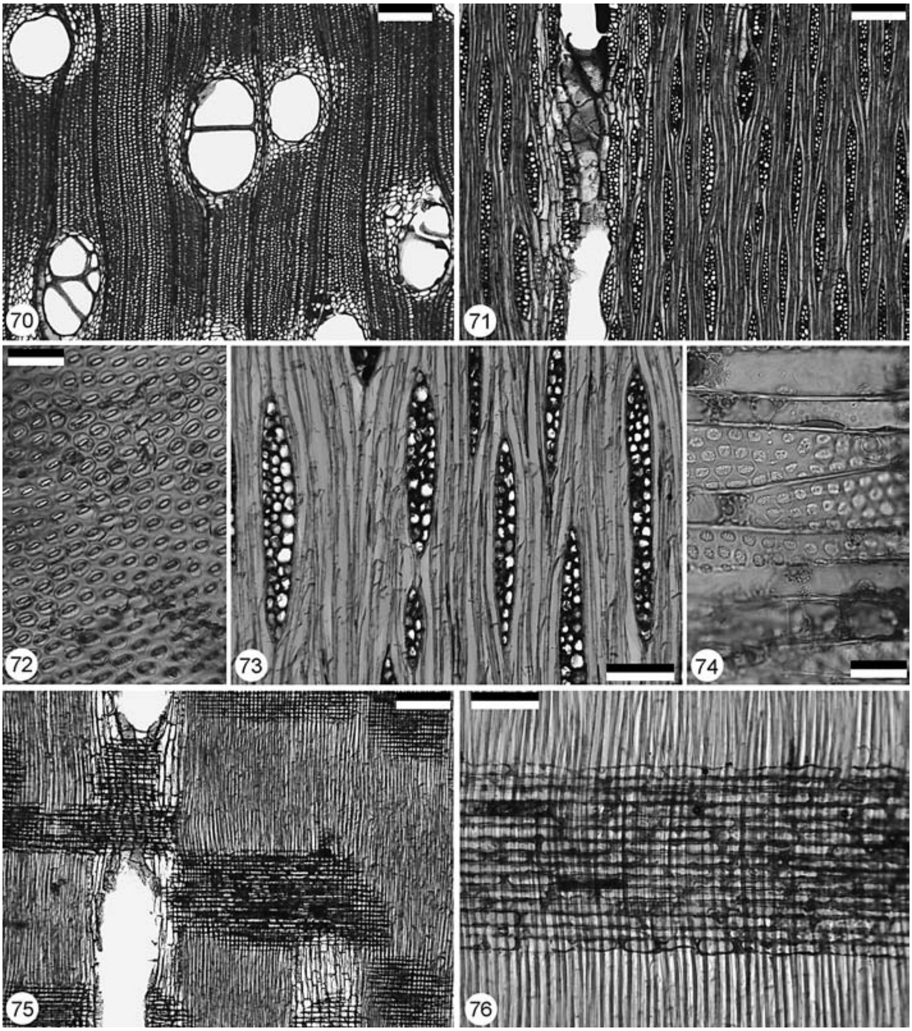


Fig. 70–76. ***Fillaeopsis discophora*** Harms, MADw 25768. **Fillaeopsis group (Mimoseae)**. – 70 TS. Vessels medium to large, axial parenchyma vasicentric to aliform. – 71–73 TLS. Rays uni- to triseriate, unstoried. Intervessel pitting medium sized, alternate, vestured. – 74–76 RLS. Vessel-ray pitting vestured, similar to intervessel pitting. Rays homocellular, occasionally containing gum. — Scale is 200 µm for 70, 71 & 75; 100 µm for 73 & 76; 20 µm for 72 & 74.

Tribe Mimoseae: Leucaena group (Fig. 77–84, 355–357)

Of the four genera in this group, only slides of *Leucaena* were examined; a literature reference was found for *Schleinitzia novo-guineensis* (Warb.) Verdc. (Babos & Cumana 1992). *Schleinitzia* was reinstated as a distinct genus by Verdcourt (1977) after having been placed in several other Mimoseae genera (such as *Leucaena, Piptadenia* and *Prosopis*). *Desmanthus* is comprised entirely of herbaceous species, and though

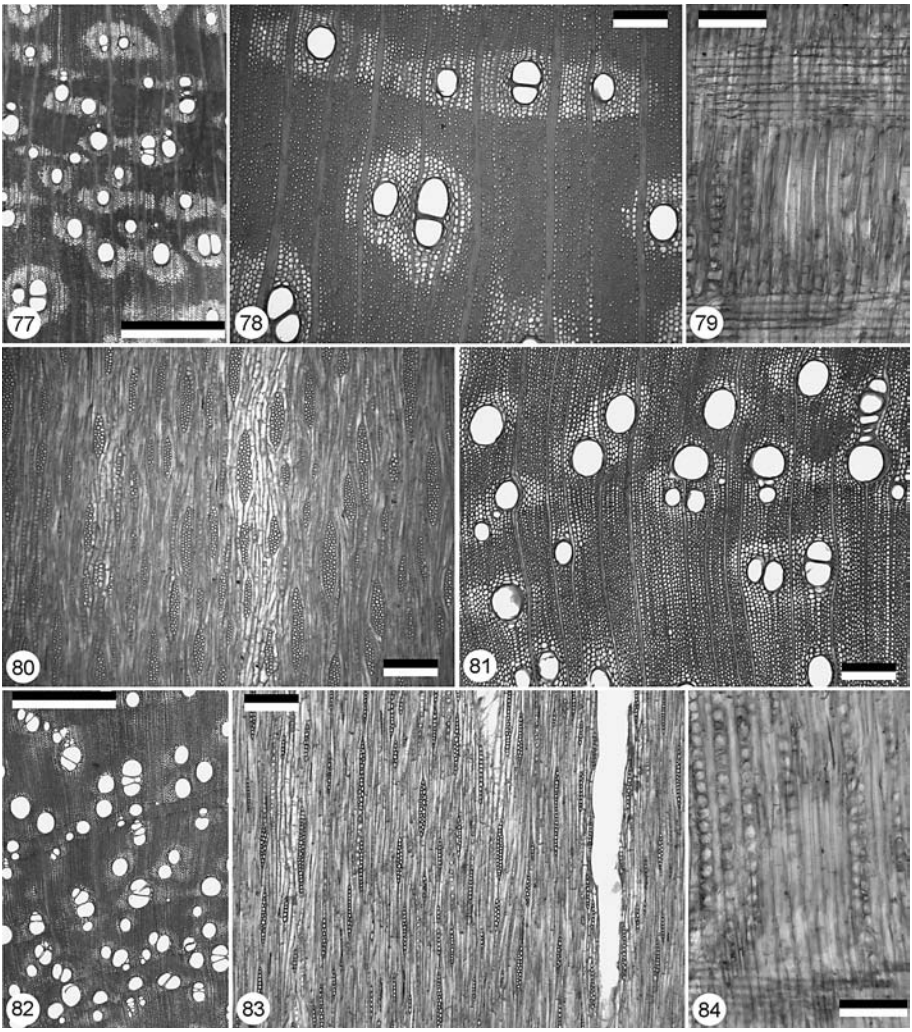


Fig. 77–84. ***Leucaena*. Leucaena group (Mimoseae)**. - 77–80: *Leucaena pallida* Britton & Rose, Kw 1327. - 81–84: *Leucaena confertiflora* S. Zárate, Kw 1319. – 77, 78, 81 & 82 TS. Vessels solitary or in radial multiples. Axial parenchyma aliform to confluent, often linking several vessels tangentially, may be clearly (Fig. 77 & 78) or poorly (Fig. 81 & 82) defined. – 80 & 83 TLS. Rays vary from 1–2 cells wide (Fig. 83) to 1–4 cells wide (Fig. 80), unstoried. – 79 & 84 RLS. Rays homocellular. Calcium oxalate crystals frequent in chambered fibres. — Scale is 1000 μm for 77 & 82; 200 μm for 78, 80, 81 & 83; 100 μm for 79 & 84.

Kanaloa is a shrub it is monospecific and endemic to Hawaii and a wood sample was unavailable. *Kanaloa* is a recently described genus (Lorence & Wood 1994) and has been placed in the Leucaena group on the basis of phylogenetic analyses (Hughes *et al.* 2003). *Schleinitzia* was included in the group by Lewis and Elias (1981); molecular data have confirmed its position as sister to *Leucaena* (Harris *et al.* 1994).

Wood anatomical descriptions of *Leucaena* have been presented by Kanehira (1921), Record & Hess (1943), Cozzo (1951), Ramesh Rao & Purkayastha (1972), Détienne & Jacquet (1983), Martawijaya *et al.* (1989), Babos & Cumana (1992), Soerianegara & Lemmens (1993) and Chauan & Vijendra Rao (2003).

Vessel diameter ranges from 87–174 µm (Fig. 77, 78, 81 & 82). The occurrence of clusters and radial multiples is very variable, so is fibre wall thickness. All *Leucaena* species have septate fibres but this information was not given for *Schleinitzia* in the reference used. Axial parenchyma is vasicentric or aliform in *Leucaena*, scanty in *Schleinitzia*, and neither genus shows any banding. Ray height ranges from 13–29 cells, 1–2 cells wide in *Schleinitzia* and commonly 1–3 cells wide in *Leucaena*, although *Leucaena shannonii* J.D. Smith has multiseriate rays 3–5 (7) cells wide. Gum is sparse (if present at all) which is quite unusual. Some of the *Leucaena* species examined have calcium oxalate crystals in long tangential bands within chambered fibres. Scattered idioblastic axial parenchyma cells are frequent. The Leucaena group is similar to the Aubrevillea, Pentaclethra, Plathymenia and Fillaeopsis groups of Mimoseae.

Tribe Mimoseae: Newtonia group (Fig. 85–89)

This group has been reorganised since Lewis & Elias' (1981) treatment of the Mimoseae, and now comprises three genera: *Indopiptadenia* and *Lemurodendron* (both monospecific), and *Newtonia*. Based on recent phylogenetic studies, *Piptadeniastrum* and *Cylicosdiscus* have been removed from the Newtonia group and new groups proposed for each of these monospecific genera (Luckow *et al.* 2003). These phylogenetic studies also suggest that the recently described genus *Lemurodendron* (Villiers 1989) should be placed in the Newtonia group. Slides of only two out of fifteen species of *Newtonia* have been examined, and a literature reference found for *Indopiptadenia oudhensis* Brenan (Chauhan & Vijendra Rao 2003). The wood of *Newtonia* has been described by Brazier (1958), Brazier & Franklin (1961), Fouarge & Gérard (1964), Normand & Paquis (1976) and Détienne *et al.* (1982).

Both of the *Newtonia* species examined lack growth rings, although these are reported as distinct in *Indopiptadenia*. Average vessel diameter ranges from 100–174 µm (Fig. 85 & 86). Some fibres are septate. Axial parenchyma is vasicentric to aliform; no confluent parenchyma was found in *Newtonia buchanani* (Baker) G. Gilbert & Boutique but occasionally occurs in *Newtonia duparquetiana* (Baillon) Keay and was reported as occasional in *Indopiptadenia*. In both *Newtonia* species rays were 1–4 cells wide (Fig. 88). *Indopiptadenia* has mostly biseriate rays, occasionally uniseriate, unstoried. Apart from this difference in ray width the two genera have similar wood anatomical characteristics. The combination of non-septate fibres, unbanded parenchyma and rays of 2–4 cells wide in *Newtonia* is similar to that in *Piptadeniastrum* which suggests a relationship between these two genera. The non-septate fibres, unbanded parenchyma and uni- to biseriate rays of *Indopiptadenia* are similar to members of the Adenanthera, Fillaeopsis, Leucaena, Aubrevillea, Pentaclethra and Plathymenia groups of tribe Mimoseae.

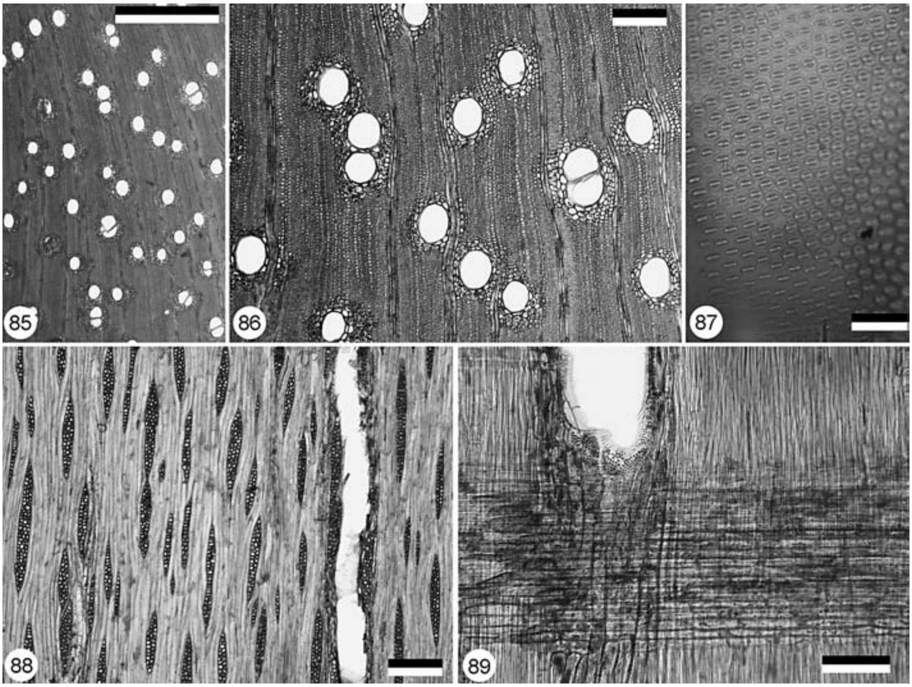


Fig. 85–89. ***Newtonia duparquetiana*** (Baillon) Keay. Cameroon. **Newtonia group (Mimoseae)**. – 85 & 86 TS. Vessels mostly solitary or in radial multiples of 2–3. Axial parenchyma vasicentric and aliform, clearly defined. – 87 & 88 TLS. Rays 1–4 cells wide, intervessel pitting medium sized, alternate. – 89 RLS. Rays homocellular. — Scale is 1000 µm for 85; 200 µm for 86, 88 & 89; 20 µm for 87.

Tribe Mimoseae: Pentaclethra group (Fig. 90–95)

Pentaclethra, comprising three species, is the only genus in this group. The genus is amphi-Atlantic occurring in Africa and tropical America. Combined molecular and morphological analyses currently place *Pentaclethra* in a basally branching position in the Mimosoideae. Analyses of chloroplast DNA sequence data (Luckow *et al.* 2003) place the genus in an unresolved polytomy with other Mimosoideae and members of the Dimorphandra group of Caesalpinieae. Wood anatomical descriptions are given by Kribs (1928), Record & Hess (1943), Kribs (1959), Lindeman *et al.* (1963), Fouarge & Gérard (1964), Normand & Paquis (1976), Détienne *et al.* (1982), Gill *et al.* (1983) and Détienne & Jacquet (1983).

Growth ring boundaries distinct to indistinct, radial multiples occasional and clusters rare. Fibre walls thin to thick and fibres septate. Axial parenchyma vasicentric to aliform, occasionally to commonly confluent, linking up to four vessels. No banding is evident but marginal bands of axial parenchyma are found in *Pentaclethra macroloba* Kuntze. *Pentaclethra macrophylla* Benth. has irregularly storied rays and axial parenchyma. Rays are uniseriate or, infrequently, biseriate. Many diffuse idioblastic axial parenchyma cells occur (Fig. 90–93).

The presence of scattered idioblastic axial parenchyma cells may be a significant characteristic, but based on its other characteristics *Pentaclethra* is most similar to the Plathymenia, Aubrevillea, Leucaena and Fillaeopsis groups of tribe Mimoseae.

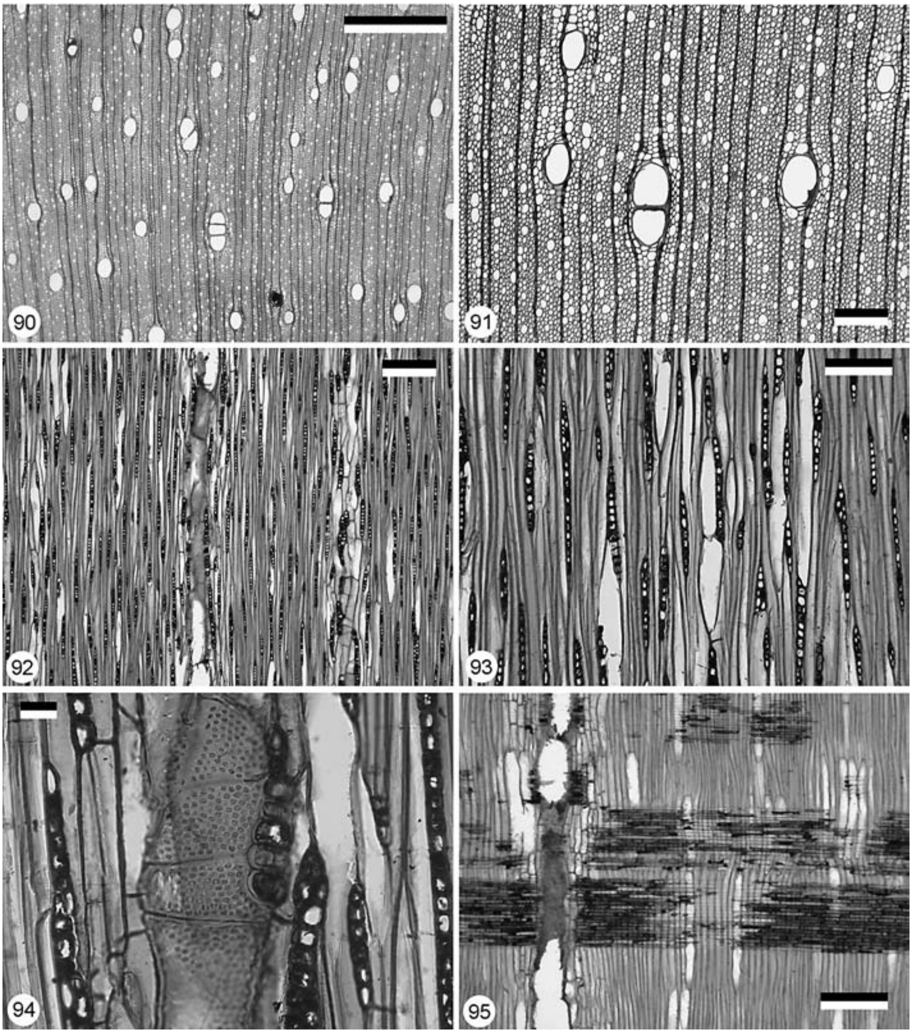


Fig. 90–95. ***Pentaclethra macroloba*** Kuntze, Kw 8083. **Pentaclethra group (Mimoseae)**. – 90 & 91 TS. Vessels mostly solitary or in short radial multiples. Axial parenchyma very scanty, diffuse idioblastic axial parenchyma cells common. – 92–94 TLS. Rays uniseriate, unstoried. Axial parenchyma fusiform or in strands of 2 cells, idioblastic cells prominent. – 95 RLS. Rays homocellular, commonly containing gum. — Scale is 1000 µm for 90; 200 µm for 91, 92 & 95; 100 µm for 93; 20 µm for 94.

Tribe Mimoseae: Piptadenia group (Fig. 96–131)

With eight genera, the Piptadenia group is the largest in tribe Mimoseae: *Anadenanthera* (Fig. 96–100)*, Mimosa* (Fig. 101–109)*, Parapiptadenia* (Fig. 110–116)*, Piptadenia* (Fig. 121–126)*, Pseudopiptadenia* and *Stryphnodendron* (Fig. 127–131) have been examined, but *Adenopodia* and *Microlobius* have not. A literature reference (Brazier 1958) was found for *Microlobius foetidus* (Jacq.) M. Sousa & G. Andrade subsp. *paraguensis* (Benth.) M. Sousa & G. Andrade, although it is referred to by its synonym *Goldmania paraguensis* (Benth.) Brenan. It is probably due to the large number of constituent species that the Piptadenia group is not as homogeneous as the other Mimoseae groups; the genus *Mimosa* alone comprises c. 500 species. There is a lot of variation between individual species of the same genus, even of the key characters, which is quite atypical of the Mimosoideae. Based on molecular analyses (Doyle *et al.* 2000; Luckow *et al.* 2000), the two genera formerly in the tribe Parkieae, *Parkia* and *Pentaclethra*, were found not to be sister taxa: *Parkia* (Fig. 117–120) is now placed sister to the Piptadenia group, while *Pentaclethra* is in its own monogeneric group.

Further information on *Parkia* can be found in the monograph of the genus by Hopkins (1986), and there are wood anatomical descriptions in Lindeman *et al.* (1963),

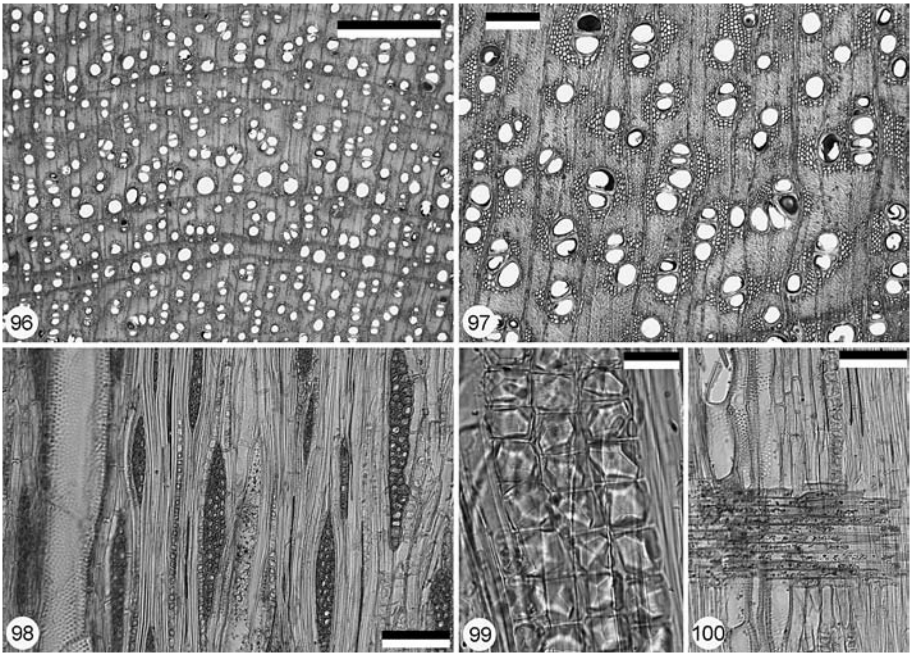


Fig. 96–100. ***Anadenanthera colubrina*** (Vell.) Brenan var. ***cebil*** (Griseb.) Altschul (syn. *A. macrocarpa* (Benth.) Brenan), Brazil 483. **Piptadenia group (Mimoseae)**. – 96 & 97 TS. Growth ring boundaries distinct. Axial parenchyma aliform to confluent, fibres very thick-walled. – 98 & 99. Rays 1–3 cells wide, calcium oxalate crystals in chambered fibres very common. – 100 RLS. Rays homocellular, often containing gum. — Scale is 1000 μm for 96; 200 μm for 97; 100 μm for 98 & 100; 20 μm for 99.

Fouarge & Gérard (1964), Normand & Paquis (1976), Ramesh Rao & Purkayastha (1972), Détienne *et al.* (1982), Mainieri *et al.* (1983), Mainieri & Chimelo (1989), Mallque & Kikata (1994), Tanaka & Bernard (1995), Höhn (1999), Neumann *et al.* (2000) and Chauan & Vijendra Rao (2003). There have been many wood anatomical descriptions of the other members of this group: descriptions of *Mimosa* have been made by Cozzo (1951), Barajas-Morales & Gomez (1989) and Babos & Cumana (1992); descriptions of *Piptadenia* by Record & Mell (1924), Williams (1936), Cozzo (1951), Tortorelli (1956), Brazier (1958), Kribs (1959), Lindeman *et al.* (1963), Mainieri *et al.* (1983), Barajas-Morales & Gomez (1989), Mainieri & Chimelo (1989) and Babos & Cumana (1992); *Stryphnodendron* by Lindeman *et al.* (1963), Détienne *et al.* (1982) and Détienne & Jacquet (1983); *Anadenanthera* by Kribs (1959) and Détienne & Jacquet (1983); *Parapiptadenia* by Mainieri & Chimelo (1989); *Pseudopiptadenia* by Brazier (1958) and Barros & Callado (1997), although Brazier refers to the species examined by the synonymous generic name '*Monoschisma* Brenan'.

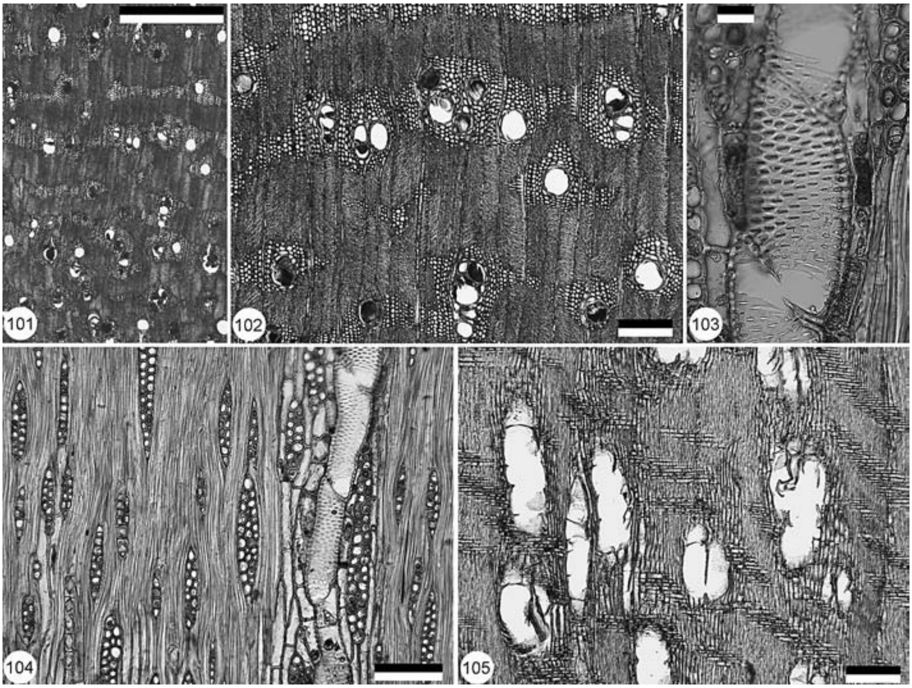


Fig. 101–105. ***Mimosa tenuiflora*** (Willd.) Poiret (syn. *M. hostilis* (C. Martius) Benth.), Kw 482, Brazil. **Piptadenia group (Mimoseae)**. – 101 & 102 TS. Axial parenchyma aliform to confluent, commonly linking several vessels. Some apotracheal patches of axial parenchyma present. Vessels frequently occluded with gum. – 103 & 104 TLS. Rays 1–3 cells wide, unstoried. Intervessel pitting small to medium and alternate. – 105 RLS. Rays homocellular. — Scale is 1000 µm for 101; 200 µm for 102 & 105; 100 µm for 104; 20 µm for 103.

Vessels are mostly small to medium and have a high frequency/mm^2, although *Parkia* has large vessels at low frequency/mm^2 (Fig. 117). Radial multiples and clusters range from rare to common, and can be large or small. Intervessel pit size is variable (Fig. 103, 108 & 112). All genera have a mixture of species with septate and non-septate fibres, except *Parkia* and *Stryphnodendron*, in which all species examined have septate fibres, and *Microlobius*, which is reported by Brazier (1958) to have non-septate fibres. Axial parenchyma ranges from scanty to banded. Most species are not banded, but in many cases confluent parenchyma links many vessels leading to an almost banded appearance (Fig. 102). Rays are commonly 2–3 cells wide, and in every species examined uniseriate rays are present. Irregular storeying is found in *Parkia* and *Stryphnodendron* (Fig. 125, 126, 129 & 130).

With the exception of its unusually large vessels, there is nothing to suggest that *Parkia* should not be placed in the Piptadenia group.

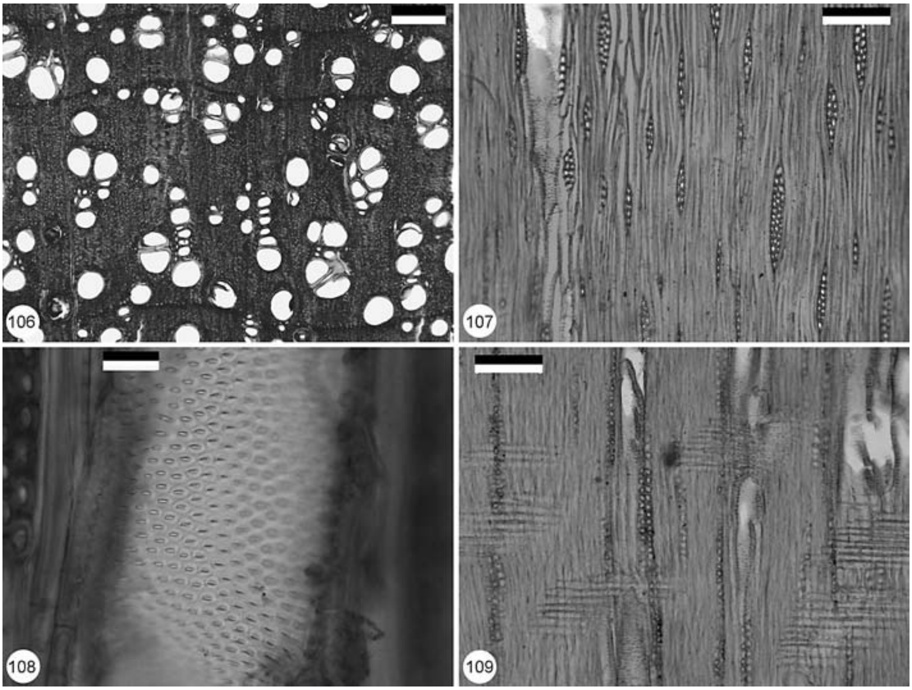


Fig. 106–109. ***Mimosa ophthalmocentra*** Martius, Brazil. **Piptadenia group (Mimoseae)**. – 106 TS. Growth ring boundaries distinct, axial parenchyma scanty paratracheal. Long radial multiples present. – 107 & 108 TLS. Rays 1–3 cells wide, often quite low. Intervessel pitting alternate, small. – 109 RLS. Rays homocellular, calcium oxalate crystals common in chambered fibres. — Scale is 200 µm for 106 & 108; 100 µm for 107; 20 µm for 109.

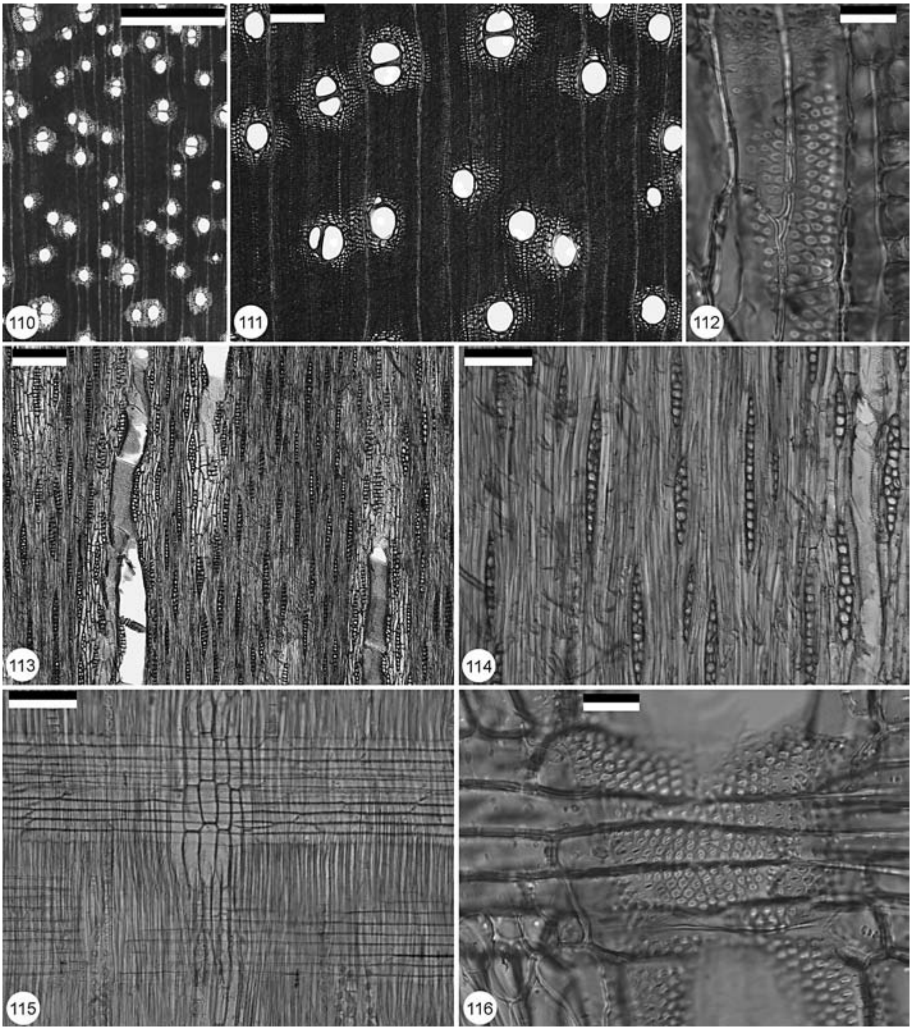


Fig. 110–116. ***Parapiptadenia pterosperma*** (Benth.) Brenan, Kw 1612, Brazil. **Piptadenia group (Mimoseae)**. – 110 & 111 TS. Fibres very thick walled, axial parenchyma clearly defined aliform and confluent. Vessels frequently in radial multiples of 2 vessels. – 112–114 TLS. Rays uni- to biseriate, unstoried. Intervessel pitting small to medium and alternate. – 115 & 116 RLS. Rays homocellular. Vessel-ray pitting similar to intervessel pitting. — Scale is 1000 µm for 110; 200 µm for 111 & 113; 100 µm for 114 & 115; 20 µm for 112 & 116.

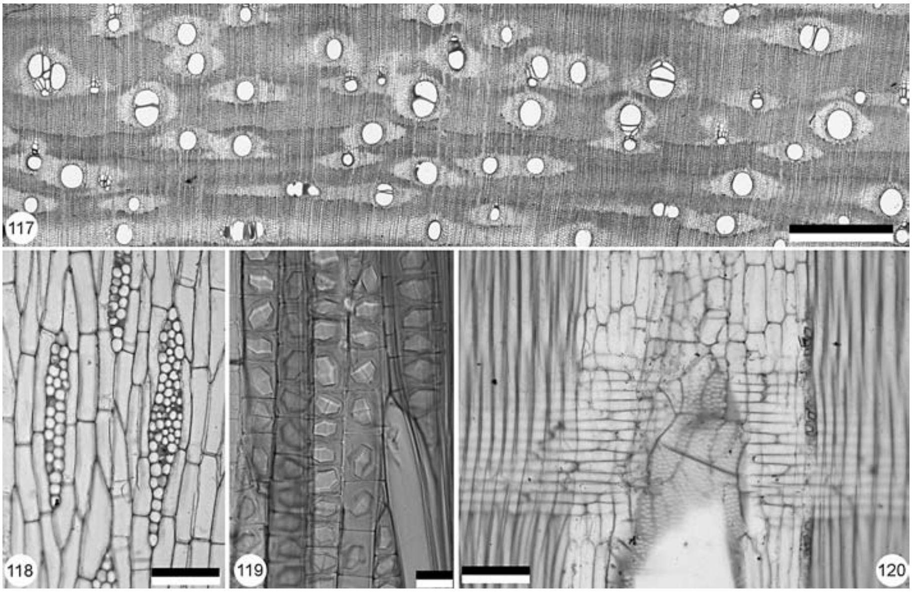


Fig. 117–120. ***Parkia pendula*** (Willd.) Benth., 1926, Burma. **Piptadenia group (Mimoseae)**. – 117 TS. Vessels solitary or in short radial multiples and clusters. Axial parenchyma clearly defined aliform with some confluence and banding. – 118 & 119 TLS. Rays 2–5 cells wide, unstoried. Axial parenchyma in strands of 2–4. Calcium oxalate crystals frequent in chambered fibres and axial parenchyma. – 120 RLS. Ray homocellular. — Scale is 1000 μm for 117; 100 μm for 118 & 120; 20 μm for 119.

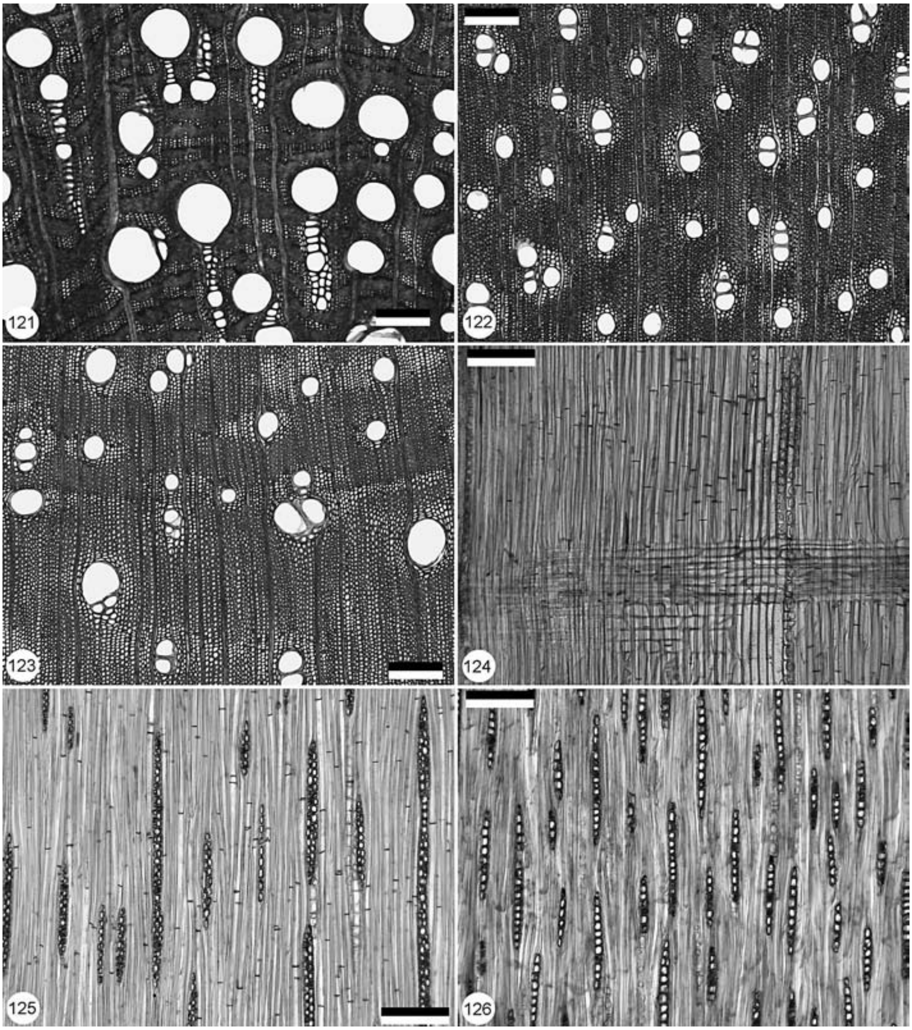


Fig. 121–126. ***Piptadenia***. **Piptadenia group (Mimoseae)**. - 121: *Piptadenia trisperma* (Vell.) Benth., Kw 2908, Brazil. - 122 & 126: *Piptadenia obliqua* J.F. Macbr., Kw 1232, El Salvador. - 123–125: *Piptadenia paniculata* Benth., Shak 45, Brazil. – 121–123 TS. – 121: Vessels in two distinct diameter classes, radial multiples frequent. Axial parenchyma vasicentric, irregularly banded in Fig. 121 & 123, some confluent in Fig. 122 & 123. – 125 & 126 TLS. Rays either wholly uniseriate or 1–2 cells wide. Fibres septate. – 124 RLS. Rays homocellular, calcium oxalate crystals present in chambered fibres and/or axial parenchyma. Fibres septate (Fig. 124 & 125), very thick-walled and possibly non-septate in Fig. 126. — Scale is 200 μm for 121–123; 100 μm for 124–126.

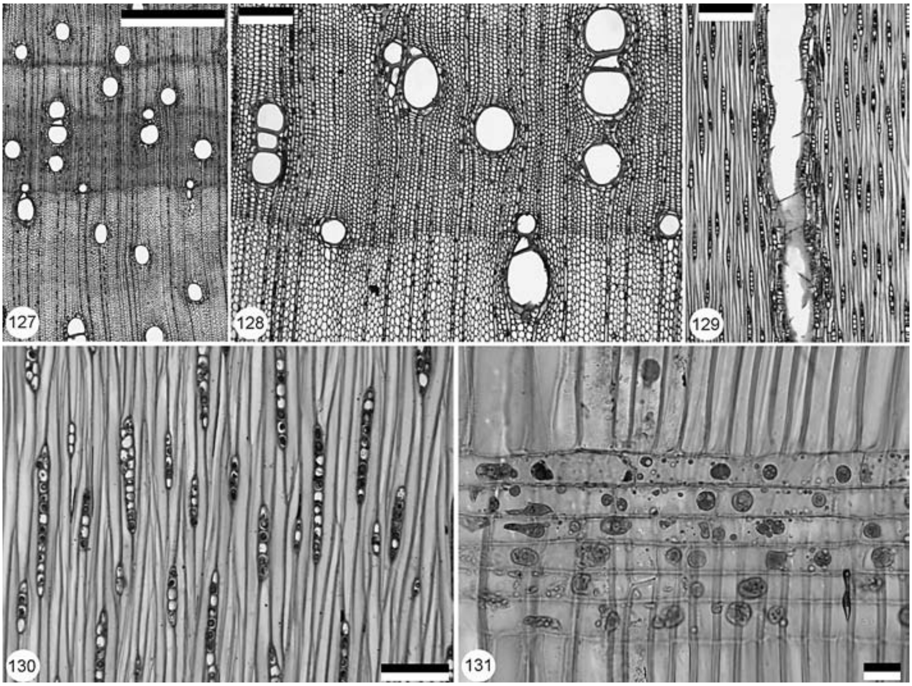


Fig. 127–131. ***Stryphnodendron adstringens*** (Martius) Colville (syn. *S. guianense* Martius), No. 11 Herbarium Brasília, Paraná. **Piptadenia group (Mimoseae)**. – 127 & 128 TS. Growth ring boundaries distinct. Vessels occasionally in short radial multiples. Axial parenchyma scanty paratracheal. – 129 & 130 TLS. Rays uniseriate with some biseriate regions and very irregular storeying in places. – 131 RLS. Rays homocellular, often containing gum. — Scale is 1000 µm for 127; 200 µm for 128 & 129; 100 µm for 130; 20 µm for 131.

Tribe Mimoseae: Piptadeniastrum group (Fig. 132–137)

Separated from the Newtonia group on the basis of molecular evidence (Luckow *et al.* 2000, 2003), *Piptadeniastrum* is a monospecific genus from Africa. Wood anatomical descriptions of *Piptadeniastrum* can be found in Brazier (1958), Brazier & Franklin (1961), Normand & Paquis (1976) and Berti & Edlmann Abbate (1988).

Growth rings are distinct, vessel diameter medium-large and at low frequency / mm^2. Clusters and radial multiples are occasional and short (Fig. 132 & 133). Fibres are septate (Fig. 136) and axial parenchyma vasicentric to aliform and confluent linking up to 3 vessels tangentially. Rays are 10–69 cells high and 2–5 cells wide (Fig. 134 & 135). The wood anatomy of this species is very similar to that of *Newtonia* suggesting a close relationship with it. Both *Piptadeniastrum* and *Newtonia* have wide vessels and tall, wide rays, strengthening any hypothesised association.

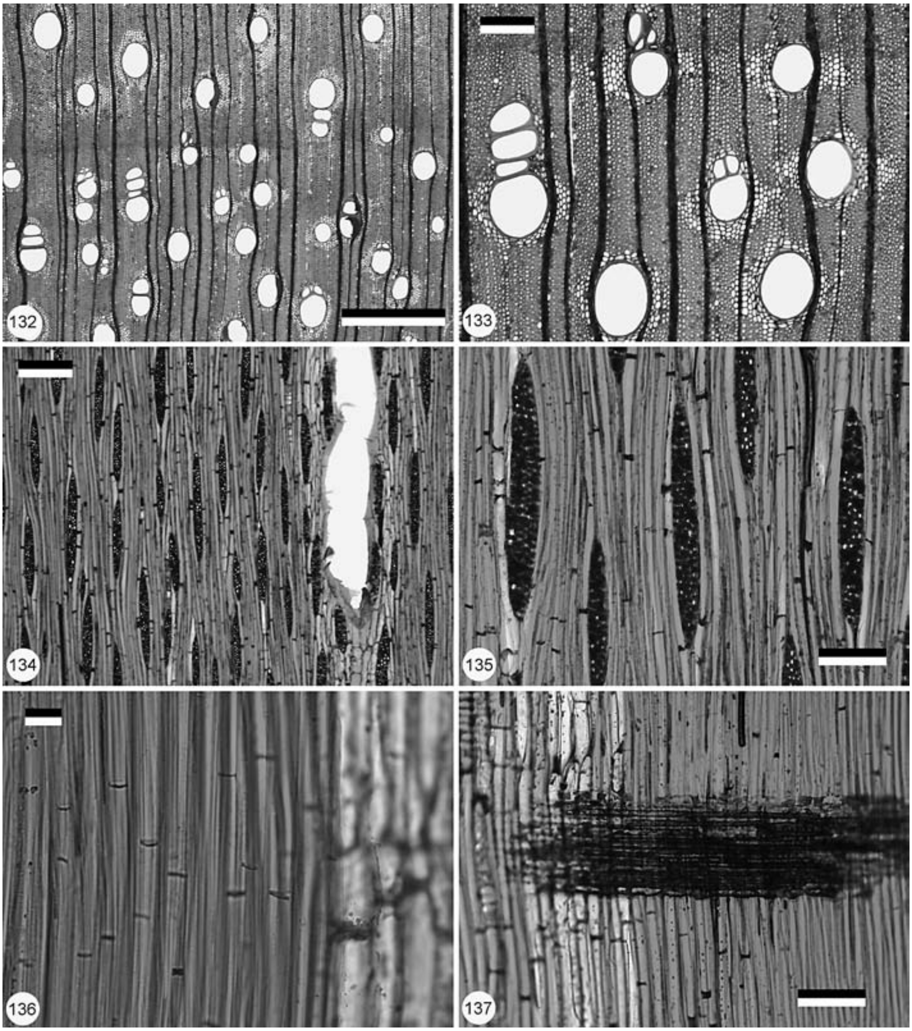


Fig. 132–137. ***Piptadeniastrum africanum*** (Hook. f.) Brenan, Ghana 1945. **Piptadeniastrum group (Mimoseae)**. – 132 & 133 TS. Axial parenchyma scanty paratracheal, vasicentric and aliform. – 134–136 TLS. Rays multiseriate, fibres thick-walled and septate. – 137 RLS. Rays homocellular and commonly containing gum. – Scale is 1000 μm for 132; 200 μm for 133 & 134; 100 μm for 135 & 137; 20 μm for 136.

Tribe Mimoseae: Plathymenia group (Fig. 138–144)

Plathymenia reticulata Benth. is the only species in this group. Wood anatomy is similar to the Aubrevillea, Pentaclethra, Leucaena and Fillaeopsis groups. *Plathymenia* wood has been described by Record & Mell (1924), Record & Hess (1943), Kribs (1959), Brazier & Franklin (1961), Mainieri *et al.* (1983) and Détienne & Jacquet (1983).

Growth rings are distinct, vessels medium-sized (average 178 µm in diameter), clusters rare to occasional (Fig. 138). Fibres are septate with medium-thick walls. Axial parenchyma is vasicentric to aliform and confluent in places and not banded. Rays 1–3 cells wide (Fig. 139 & 140).

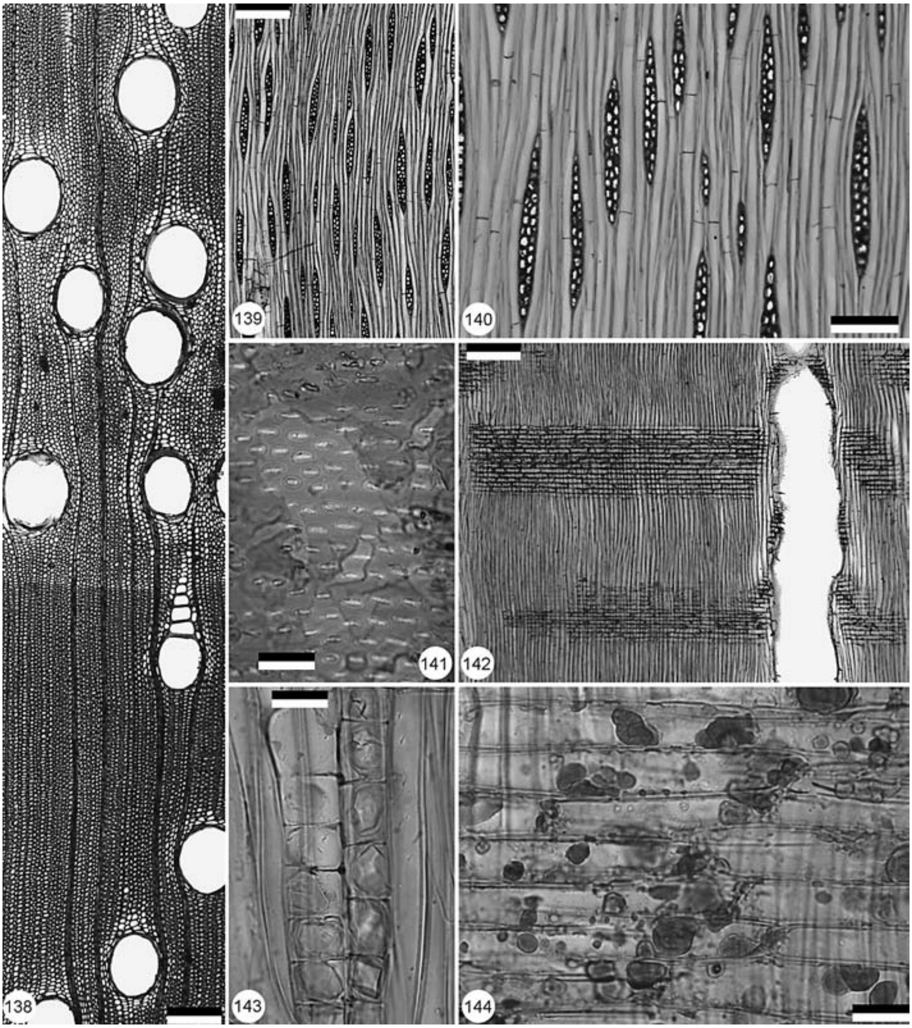


Fig. 138–144. ***Plathymenia reticulata*** Benth., No. 1, Brazil. **Plathymenia group (Mimoseae)**. – 138 TS. Growth ring boundary visible. Vessels large, mostly solitary. Axial parenchyma scanty paratracheal and vasicentric. – 139–141 TLS. Rays uni- to biseriate, occasionally 3 cells wide, unstoried. Fibres septate, intervessel pitting alternate and vestured. – 142–144 RLS. Rays homocellular, cells often containing gum. Calcium oxalate crystals in chambered fibres. — Scale is 200 µm for 138, 139 & 142; 100 µm for 140; 20 µm for 141, 143 & 144.

Tribe Mimoseae: Prosopis group (Fig. 145–154)

Of the five genera comprising this group, only *Prosopis* has been examined; material was not available for *Neptunia, Piptadeniopsis, Prosopidastrum* and *Xerocladia*. The genus *Neptunia* is unsuitable for analysis as all 12 species are aquatic or semi-aquatic and have very little secondary thickening. The relationship of *Neptunia* as sister to *Prosopidastrum* has been confirmed in recent analyses (Luckow *et al.* 2003) but relationships between the other genera are unresolved. Ten species of *Prosopis*, out of the 44 currently recognised, were studied, so coverage of the genus itself is poor. Descriptions of *Prosopis* wood have also been made by Record & Mell (1924), Record & Hess (1943), Cozzo (1951), Tortorelli (1956), Kribs (1959), Brazier & Franklin (1961), Ramesh Rao & Purkayastha (1972), Détienne & Jacquet (1983), Fahn *et al.* (1986), Barajas-Morales & Gomez (1989), Babos & Cumana (1992), Mallque & Kikata (1994), Höhn (1999), Neumann *et al.* (2000) and Chauan & Vijendra Rao (2003).

In *Prosopis* average vessel diameter ranged from 120–176 µm and vessel frequency was high (Fig. 145, 146, 150 & 151). Many tiny vessels were also common in several of the specimens, but these were so small they were not included in the measurements. Radial multiples (often including the tiny vessels) are frequent, but the incidence of clusters varies between the species. Intervessel pit size ranges from 4–9 µm and fibre walls are thin to thick. All species have non-septate fibres. Axial parenchyma ranges between vasicentric, aliform and confluent and approximately half of the species have banding. Rays are 2–78 cells high, multiseriate (1–7 cells wide). Calcium oxalate crystals often occur in tangential bands in chambered fibres and axial parenchyma (Fig. 149), *Prosopis farcta* is exceptional because crystals are also found within ray cells, a feature we did not observe in any other mimosoid species except *Acacia horrida* Willd. (Fig. 340). Scattered idioblastic axial parenchyma cells are frequent.

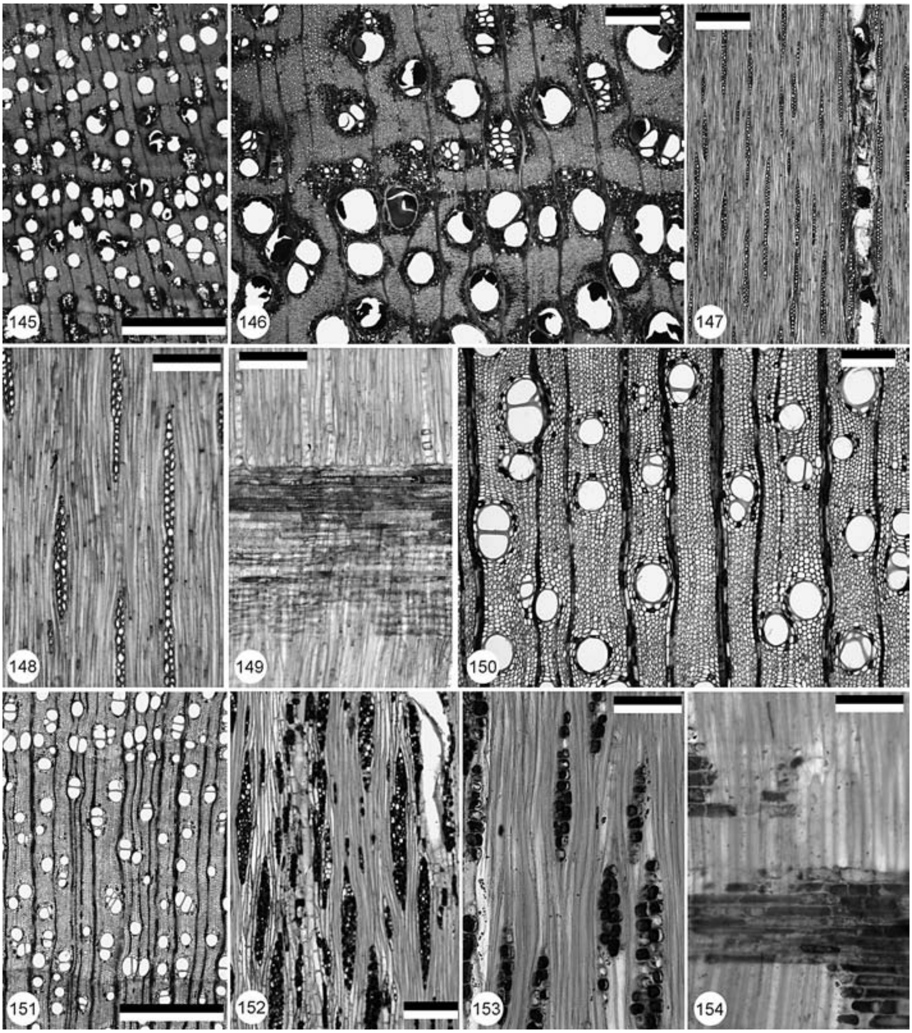


Fig. 145–154. ***Prosopis***. **Prosopis group (Mimoseae)**. - 145–149: *Prosopis chilensis* (Molina) Stuntz emend. Burkart, 1961, Arizona. - 150–154: *Prosopis farcta* (Banks & Sol.) J.F. Macbr. (syn. *P. stephaniana* (Willd.) Sprengel), V&Co, 34-1913, Jerusalem. – 145, 146, 150 & 151 TS. Vessels in two distinct diameter classes in Fig. 145 & 146, solitary or in short radial multiples and clusters. Vessels occasionally occluded with gum. Axial parenchyma vasicentric. – 147, 148, 152 & 153 TLS. Rays 1–3 cells wide, unstoried. – 149 & 154 RLS. Rays homocellular, often containing gum. Calcium oxalate crystals in chambered fibres. — Scale is 1000 µm for 145 & 151; 200 µm for 146, 147, 150 & 152; 100 µm for 148, 149, 153 & 154.

TRIBE INGEAE

All recent phylogenetic analyses of the Mimosoideae concur that the Ingeae and Acacieae are derived from within the Mimoseae (Doyle *et al.* 2000; Luckow *et al.* 2000). More molecular data are needed to determine the relationships within the Ingeae. Currently, 36 genera and c. 950 species are recognised (Lewis & Rico 2005). Approximately 300 of these species are members of the genus *Inga*, c. 140 are in *Albizia* (although this genus is not monophyletic) and 135 in *Calliandra*. Several genera have recently been described, and a number of old generic names reinstated. The treatment of the Ingeae by Barneby and Grimes (1996) concentrated on neotropical taxa and divided the tribe into five informal groups: the so-called Abarema, Samanea, Chloroleucon, Pithecellobium, and Inga alliances. Lewis and Rico (2005) added the Old World alliance and placed the other palaeotropical genera within the Barneby & Grimes alliances where published data supported such relationships. The genera *Albizia, Enterolobium* and *Lysiloma* could not be placed without further analysis. Different degrees of support for these alliances emerge when examinations are made of the wood anatomy.

Out of the 24 Ingeae genera examined, 19 have non-septate fibres and 5 have septate fibres. This means that c. 80% of the genera studied were non-septate, which contrasts with the Mimoseae where there is an even split between the genera (50% septate, 50% non-septate). Banded axial parenchyma is much more common than in the Mimoseae, and there are no genera with exclusively multiseriate rays; uniseriate rays are present in all genera.

Using the wood anatomical characters of septate fibres *vs* non-septate fibres, presence or absence of banded parenchyma and ray width we have divided the Ingeae genera into four 'divisions', which are not entirely congruent with the alliances shown in the Diagram on p. 26. Individual genera are used here because there is more variation within the alliances currently recognised by systematists compared to tribe Mimoseae where there is enough consistency within the groups to use them.

Ingeae Division 1 (septate fibres, banded parenchyma, uniseriate rays present):
Hesperalbizia;
Ingeae Division 2 (septate fibres, parenchyma not banded, uniseriate rays present):
Cedrelinga, Ebenopsis, Havardia, Pithecellobium, and *Pseudosamanea*;
Ingeae Division 3 (non-septate fibres, banded parenchyma, uniseriate rays present):
Archidendron, Calliandra, Cojoba, Faidherbia, Lysiloma, Marmaroxylon, Pararchidendron, Zapoteca, and *Zygia*;
Ingeae Division 4 (non-septate fibres, parenchyma not banded, uniseriate rays present):
Abarema, Chloroleucon, Enterolobium, Falcataria, Hydrochorea, Leucochloron, Pithecellobium, Samanea, Serianthes, and *Wallaceodendron*.

Tribe Ingeae: Abarema alliance (Fig. 155–173)

The differences in the geographical distribution of the three genera in this alliance are reflected in slight differences in their wood anatomy. *Abarema* (Fig. 155–160) and *Hydrochorea* (Fig. 161–165) have a neotropical distribution, and *Pararchidendron* (Fig. 166–173) is Asian. All of the *Abarema* and *Hydrochorea* species examined were once placed in a broadly defined *Pithecellobium*; *Hydrochorea* was described by Barneby & Grimes in 1996. Whilst *Abarema* and *Hydrochorea* have many characteristics in common, *Pararchidendron* is not so similar. Due to its banded parenchyma it resembles a different set of genera of Ingeae (*i.e.* the genera in Ingeae Division 3). *Abarema* wood is described by Record & Hess (1943), Cassens & Miller (1981), Détienne *et al.*

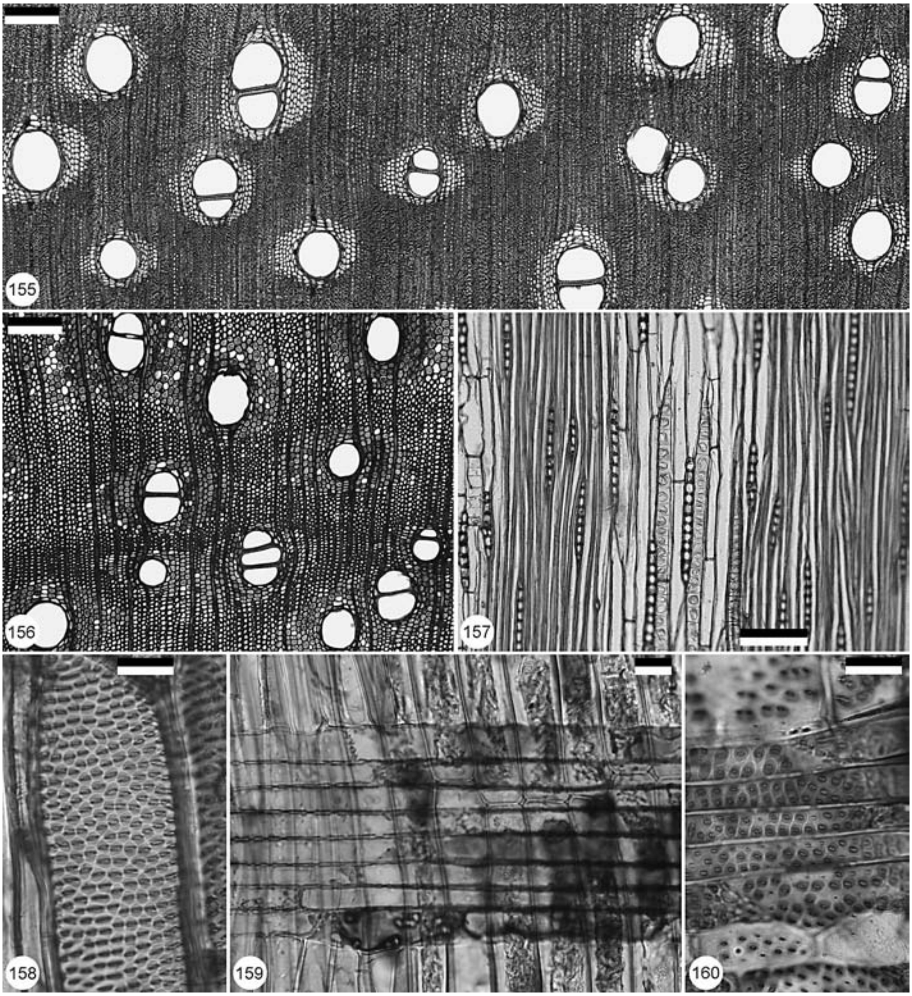


Fig. 155–160. ***Abarema***. **Abarema alliance (Ingeae)**. - 155 & 157: *Abarema jupunha* (Willd.) Britton & Killip (syn. *Pithecellobium jupunha* (Willd.) Urban), SUR-20, Surinam. - 156, 158–160: *Abarema glauca* (Urban) Barneby & J.W. Grimes (syn. *Pithecellobium glaucum* Urban), FTG 651208. – 155 & 156 TS. Axial parenchyma aliform, well defined, all vessels of similar size. – 157 & 158 TLS. - 157: Rays uniseriate and unstoried. Crystals in chambered fibres. - 158: Intervessel pitting alternate and polygonal in outline, vestured. – 159 & 160 RLS. Rays homocellular, vessel-ray pitting alternate. Some gummy deposits in ray cells. — Scale is 200 μm for 155 & 156; 100 μm for 157; 20 μm for 158–160.

(1982), Détienne & Jacquet (1983), Soerianegara & Lemmens (1993) and Miller & Détienne (2001). *Pararchidendron* wood is described by Nielsen *et al.* (1983) and Olver (1996). *Hydrochorea corymbosa* (L.C. Rich.) Barneby & J.W. Grimes and *H. gongrijpii* (Kleinhoonte) Barneby & J.W. Grimes are described by Détienne *et al.* (1982), although under the generic name '*Arthrosamanea*'.

Pararchidendron has a high frequency of small to medium-sized vessels (average diameter 109 µm), and radial multiples and clusters are frequent to common (Fig. 166). This contrasts with *Abarema* and *Hydrochorea* (both have an average vessel diameter of 153–178 µm) which have a greater proportion of solitary vessels (Fig. 155, 156, 161 & 162). All have non-septate fibres. Axial parenchyma is aliform to confluent, and *Abarema* also has patches of diffuse apotracheal axial parenchyma. Only *Pararchidendron* has discontinuous, irregular bands of axial parenchyma of medium width. All three genera have shorter than average rays (2–21 cells high), which are predominantly uniseriate and occasionally biseriate (Fig. 157, 164, 165, 168–170), and sometimes irregularly storied (Fig. 164, 170).

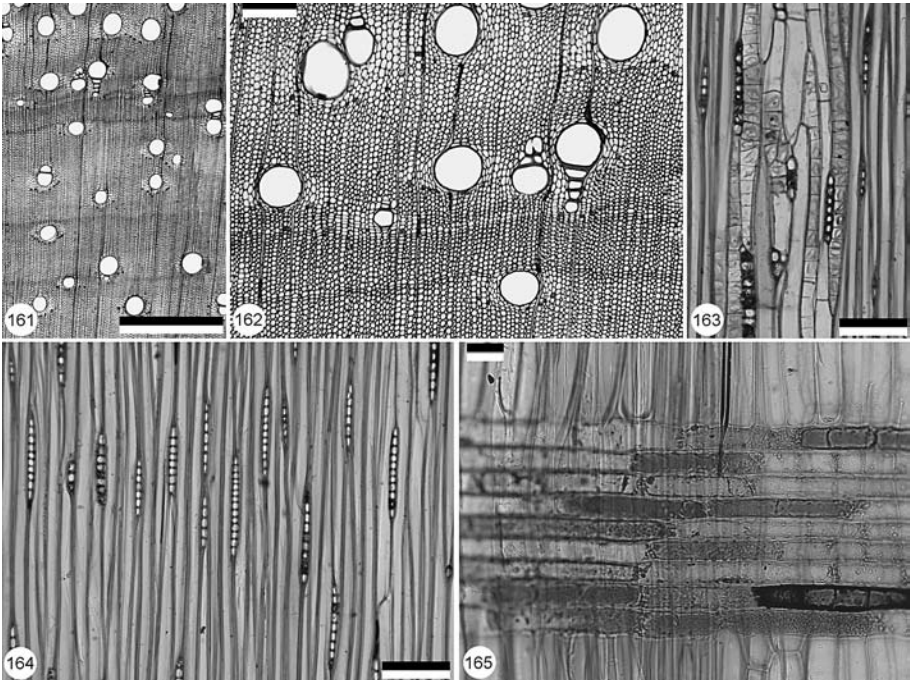


Fig. 161–165. ***Hydrochorea corymbosa*** (Rich.) Barneby & J.W. Grimes (syn. *Pithecellobium corymbosum* (Rich.) Benth.), No. 360, Surinam. **Abarema alliance (Ingeae)**. – 161 & 162 TS. Growth ring boundaries distinct. Axial parenchyma aliform, bordered by calcium oxalate crystals in chambered fibres and axial parenchyma. – 163 & 164 TLS. Rays uniseriate, irregularly storied in places. – 165 RLS. Rays homocellular, often containing gum. — Scale is 1000 µm for 161; 200 µm for 162; 100 µm for 163 & 164; 20 µm for 165.

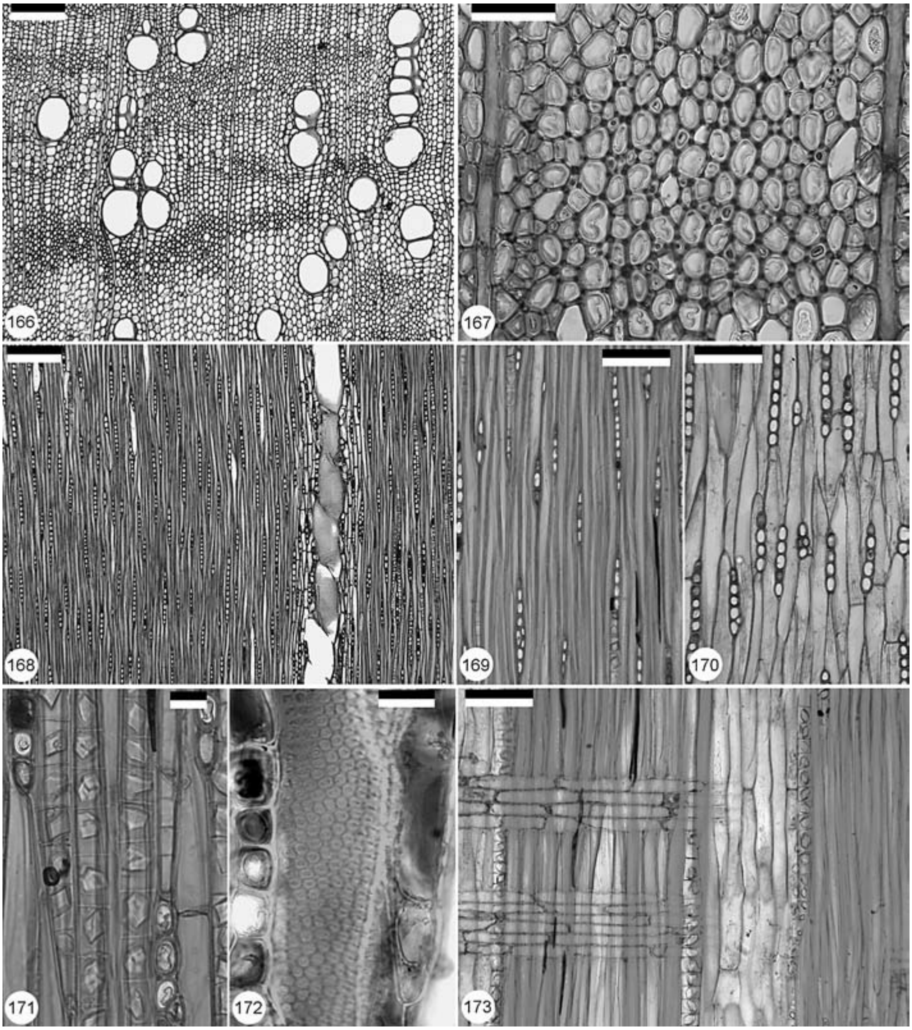


Fig. 166–173. ***Pararchidendron pruinosum*** (Benth.) I.C.Nielsen, Australia, M.K. 1956. **Abarema alliance (Ingeae)**. – 166 & 167 TS. Vessels solitary or in radial multiples. Paratracheal axial parenchyma pattern not clearly defined, aliform to confluent. Diffuse idioblastic axial parenchyma cells. Fibre walls often gelatinous. – 168–172 TLS. Rays uniseriate and very short. Axial parenchyma fusiform or in strands of 2 cells. Mostly unstoried, but irregular storeying in places (Fig. 170). Intervessel pitting alternate. Calcium oxalate crystals in chambered fibres. – 173 RLS. Rays homocellular. — Scale is 200 μm for 166 & 168; 100 μm 169, 170 & 173; 50 μm for 167; 20 μm for 171 & 172.

Tribe Ingeae: Chloroleucon alliance (Fig. 174–184)

There are five genera in this alliance: *Blanchetiodendron, Cathormion, Chloroleucon, Leucochloron* and *Thailentadopsis*. Both *Leucochloron* and *Blanchetiodendron* are recently described genera (Barneby & Grimes 1996). *Leucochloron* was previously placed in *Pithecellobium sensu lato*. The two genera examined – *Chloroleucon* (Fig. 174–178) and *Leucochloron* (Fig. 179–184) – are so similar in wood anatomical features that a close phylogenetic relationship seems likely. Both also have a similar neotropical distribution (*Leucochloron* restricted to Brazil and Bolivia, pers. comm. Hughes 2005). The anatomy of *Chloroleucon* was studied by Cassens and Miller (1981) in their treatment of the *Pithecellobium* complex, and also by Record and Hess (1943). Barajas-Morales (1985) describes the wood anatomy of *Chloroleucon mangense* (Jacq.) Britton & Rose also, but refers to it by its synonymous name *Pithecellobium mangense* (Jacq.) Macbr. Olver (1996) provides descriptions of *Chloroleucon* and *Leucochloron*. Wood anatomical descriptions of *Cathormion* are given by Normand & Paquis (1976) and Soerianegara & Lemmens (1993).

Vessels are frequently in long radial multiples. Fibres are non-septate in both *Leucochloron* and *Chloroleucon*, but both septate and non-septate in *Cathormion* (Sosef

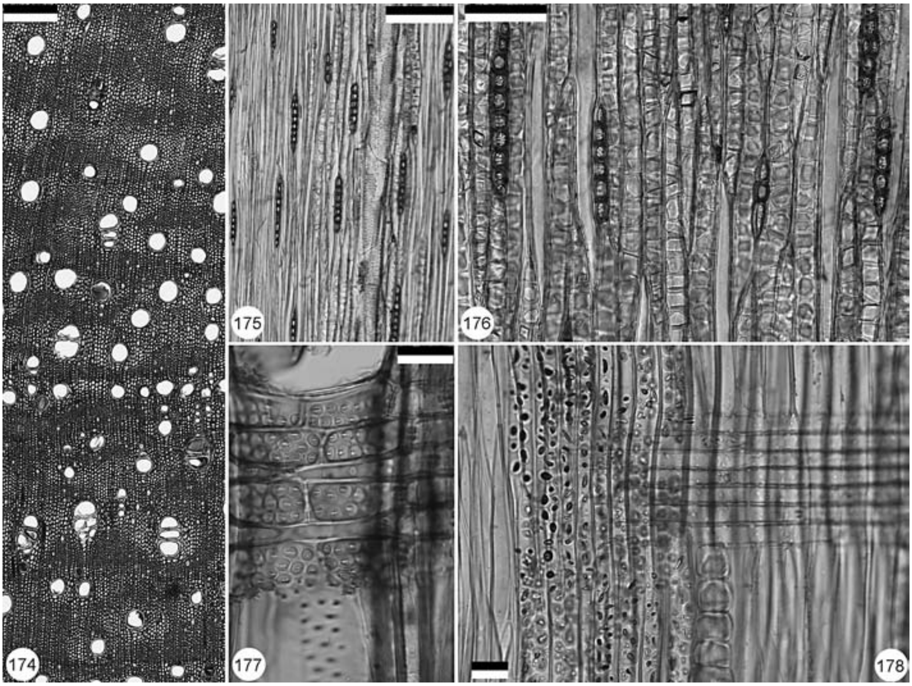


Fig. 174–178. ***Chloroleucon mangense*** (Jacq.) Britton & Rose (syn. *Pithecellobium mangense* (Jacq.) Macbr.), DH16, 1972, Brazil. **Chloroleucon alliance (Ingeae)**. – 174 TS. Axial parenchyma confluent to banded, vessels mostly solitary and in short radial multiples. – 175 & 176 TLS. Rays uniseriate, irregularly storied in places. Calcium oxalate crystals very common in chambered fibres and axial parenchyma. – 177 & 178 RLS. Vessel-ray pitting alternate, rays homocellular. Starch present in fibres and axial parenchyma. — Scale is 200 μm for 174; 100 μm for 175; 50 μm for 176; 20 μm for 177 & 178.

et al. 1998). Axial parenchyma aliform to confluent, linking many vessels tangentially, though not extensively enough to be banded (Fig. 174, 179 & 180). Rays are mainly uniseriate in *Chloroleucon mangense* (Fig. 175), and 1–3 (5) cells wide in the other species (Fig. 181 & 183).

This combination of characteristics (non-septate fibres, axial parenchyma not banded, presence of uniseriate rays) is common to most of the Ingeae genera examined.

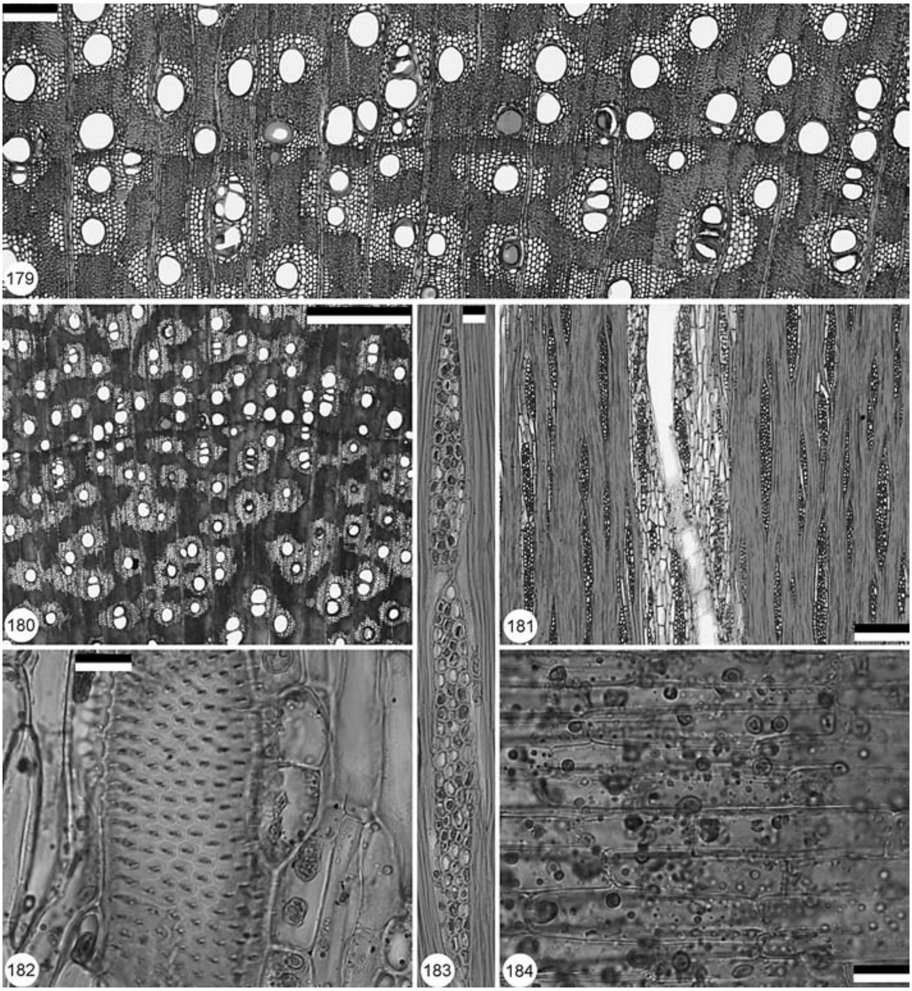


Fig. 179–184. ***Leucochloron incuriale*** (Vell.) Barneby & J.W. Grimes (syn. *Pithecellobium incuriale* (Vell. Conc.) Benth.), Parana no. 39, Herbarium Brasilia. **Chloroleucon alliance (Ingeae)**. – 179 & 180 TS. Growth ring boundaries distinct. Vessels solitary and in radial multiples, often filled with gum. Axial parenchyma is aliform to confluent with up to five vessels linked tangentially. – 181–183 TLS. Rays 1–4 cells wide, uniseriate rays rare. Axial parenchyma in strands of 2–4, intervessel pitting small to medium and alternate. – 184 RLS. Rays homocellular, cells often containing gummy deposits. — Scale is 1000 µm for 180; 200 µm for 179 & 181; 20 µm for 182–184.

Tribe Ingeae: *Faidherbia* (Fig. 185–191) & *Zapoteca*

Faidherbia (Fig. 185–191) was considered a member of the tribe Acacieae until Polhill (1994) moved it to the Ingeae. Molecular data place the genus as sister to *Zapoteca*, and in turn these are sister to the rest of the Ingeae (including *Acacia* subg. *Phyllodineae*) (Luckow *et al*. 2003). *Zapoteca* was described by Hernandez (1986) as a segregate of *Calliandra*. The genus comprises 20 neotropical species. This contrasts with the African distribution of *Faidherbia*.

Faidherbia has vessels of medium diameter and frequency whilst *Zapoteca* has narrow vessels at very high frequency (perhaps because the sample was taken from a very narrow branch). Fibres are non-septate in both genera. Banding is present in both; however, whereas banding in *Zapoteca* is narrow and mostly due to confluent axial parenchyma, banding in *Faidherbia* is wide, regular and a striking characteristic of the species (Fig. 185 & 190). Rays are exclusively uniseriate in *Faidherbia* (Fig. 186–188) and 1–2 cells wide in *Zapoteca*. Ray frequency in *Faidherbia* is high. No other mimosoid genus has all elements storied. Combined with the regular apotracheal banding, this suggests that the position of *Faidherbia* within the subfamily warrants reexamination.

Wood anatomical descriptions of *Faidherbia* are given by Lebacq (1957), Cutler (1969), Fahn *et al*. (1986), Jagiella & Kürschner (1987), Höhn (1999) and Neumann *et al*. (2000). In many of these publications, *Faidherbia albida* is referred to under its synonym *Acacia albida* Del. No descriptions of *Zapoteca* wood could be found, and unfortunately sections from the narrow branch we examined were unsuitable for photography.

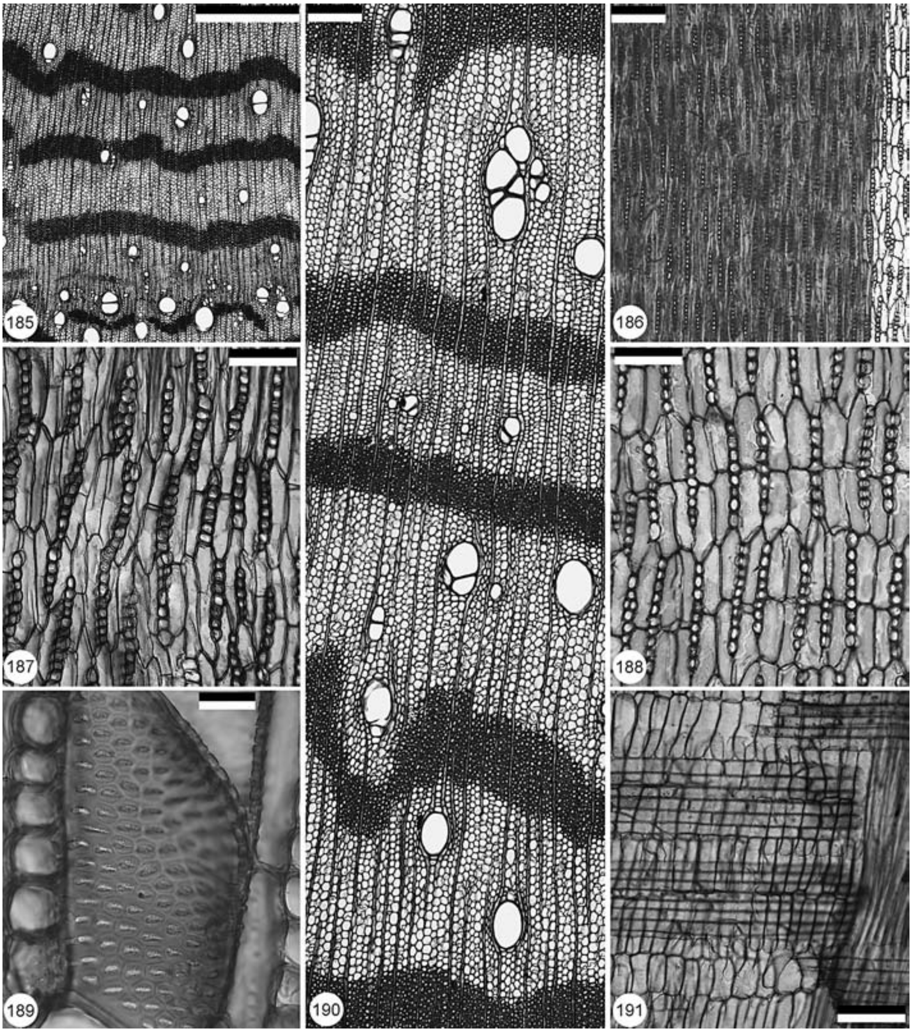


Fig. 185–191. ***Faidherbia albida*** (Del.) A. Chev. (syn. *Acacia albida* Del.), Kw 7557, Niger. ***Faidherbia/Zapoteca*** **clade (Ingeae)**. – 185 & 190 TS. Vessels solitary or in short radial multiples. Axial parenchyma in wide tangential bands. – 186–189 TLS. Rays uniseriate, all elements regularly storied. Axial parenchyma in 2-celled strands. Intervessel pitting alternate, medium sized and vestured. – 191 RLS. Rays homocellular. — Scale is 1000 µm for 185; 200 µm for 186 & 190; 100 µm for 187, 188 & 191; 20 µm for 189.

Tribe Ingeae: Inga alliance (Fig. 192–239, 358, 359)

This is the largest alliance in the Ingeae, comprising 10 genera, all neotropical except *Viguieranthus* (mainly Madagascar) and *Archidendron* (Australia and Asia). *Inga* is the largest genus with c. 300 species, of which we have examined 44. Despite considerable variation in wood anatomy, all *Inga* species have septate fibres. The alliance can be divided into genera with septate fibres (*Inga* (Fig. 217–226) and *Cedrelinga* (Fig. 206–211)) and those with non-septate fibres (*Archidendron* (Fig. 192–198, 358), *Calliandra* (Fig. 199–205, 359), *Cojoba* (Fig. 212–216), *Marmaroxylon* (Fig. 227–232) and *Zygia* (Fig. 233–239)). The monospecific genus *Obolinga* (Barneby 1989) was subsumed into *Cojoba* (Barneby & J.W. Grimes 1997); this is well supported by wood anatomy as there is much similarity between '*Obolinga*' (now *Cojoba zanoni* (Barneby) Barneby & J.W. Grimes) and other *Cojoba* species, as recognised in a paper by Miller (1989).

Distribution of axial parenchyma varies. It can be vasicentric to confluent, with the incidence of confluence ranging from rare to common. Banding is present in *Zygia, Marmaroxylon, Cojoba, Calliandra* and several species of *Inga*, and the bands tend to be discontinuous and irregular (Fig. 199, 217 & 233). Although *Archidendron* does not appear to be banded, there is a tendency for the confluent parenchyma to link many vessels. Rays are uniseriate in *Cedrelinga* (Fig. 208), uniseriate to biseriate in *Zygia* and *Archidendron* (Fig. 194, 235 & 236), and 1–4 cells wide in *Calliandra* and *Marmaroxylon* (Fig. 202, 203, 229 & 230).

Ray width in *Inga* is very variable and has been used to divide the genus into sections (Baretta-Kuipers 1973). Baretta-Kuipers used the presence and frequency of uniseriate rays to classify the species, but we found this too variable to be useful. A noticeable characteristic of *Inga* is the presence of very short uniseriate rays at variable frequencies between the species.

Broad coverage of the genus *Inga* is given by Gasson (1997) who suggests using ray width and the presence of idioblastic axial parenchyma cells to differentiate between species. Descriptions of *Inga* can also be found in Record & Mell (1924), Kribs (1928, 1959), Williams (1936), Record & Hess (1943), Cozzo (1951), Tortorelli (1956), Lindeman *et al.* (1963), Détienne *et al.* (1982), Détienne & Jacquet (1983), Mainieri *et al.* (1983), Mainieri & Chimelo (1989), Soerianegara & Lemmens (1993), Mallque & Kikata (1994) and Miller & Détienne (2001); descriptions of *Calliandra* in Williams (1936), Cozzo (1951), Détienne & Jacquet (1983) and Sosef *et al.* (1998); descriptions of *Cojoba* in Record & Hess (1943), Kribs (1959) and Cassens & Miller (1981); *Zygia* in Record & Hess (1943), Lindeman *et al.* (1963), Détienne *et al.* (1982) and Détienne & Jacquet (1983); *Marmaroxylon* in Record & Hess (1943), Détienne *et al.* (1982) and Détienne & Jacquet (1983); *Cedrelinga* in Record & Hess (1943), Détienne & Jacquet (1983), Mainieri *et al.* (1983), Mallque & Kikata (1994) and Olver (1996); *Archidendron* in Nielsen *et al.* (1983), Nielsen & Baretta-Kuipers (1984), Tanaka & Bernard (1995), Olver (1996) and Soerianegara & Lemmens (1993). Cassens and Miller (1981) provide descriptions of *Cojoba, Inga* and *Zygia* in a paper on the wood anatomy of the *Pithecellobium sensu lato* complex which includes genera now scattered throughout the tribe Ingeae. Care should be taken with all these references because many name changes have taken place within and between genera, for example within *Inga* (see Pennington 1997).

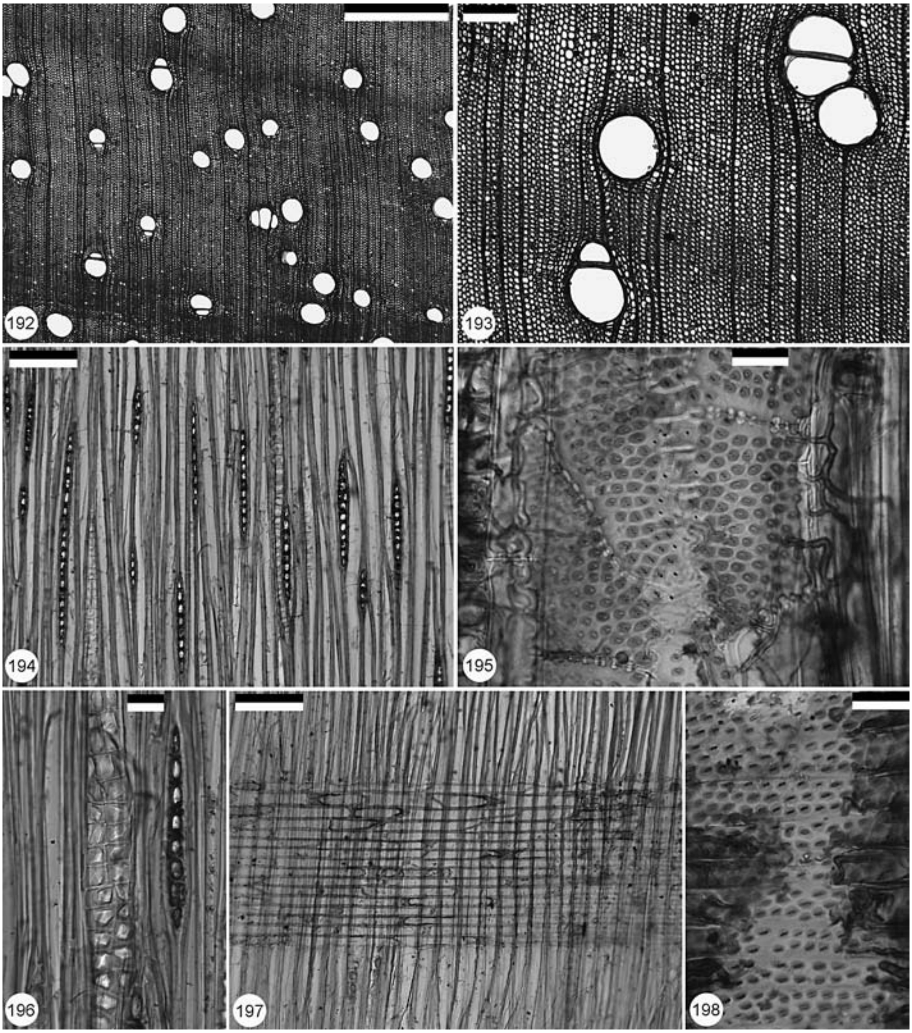


Fig. 192–198. ***Archidendron ellipticum*** (Blume) I.C.Nielsen (syn. *Abarema elliptica* (Blume) Kosterm.), Kw 21601, Sarawak. **Inga alliance (Ingeae)**. – 192 & 193 TS. Vessels solitary or in short radial multiples and clusters. Axial parenchyma poorly defined, vasicentric. – 194–196 TLS. Rays uniseriate, unstoried. Intervessel pitting is alternate and small to medium sized. Crystals in chambered fibres. – 197 & 198 RLS. Rays homocellular, vessel-ray pitting similar to intervessel pitting. — Scale is 1000 μm for 192; 200 μm for 193; 100 μm for 194 & 197; 20 μm for 195, 196 & 198.

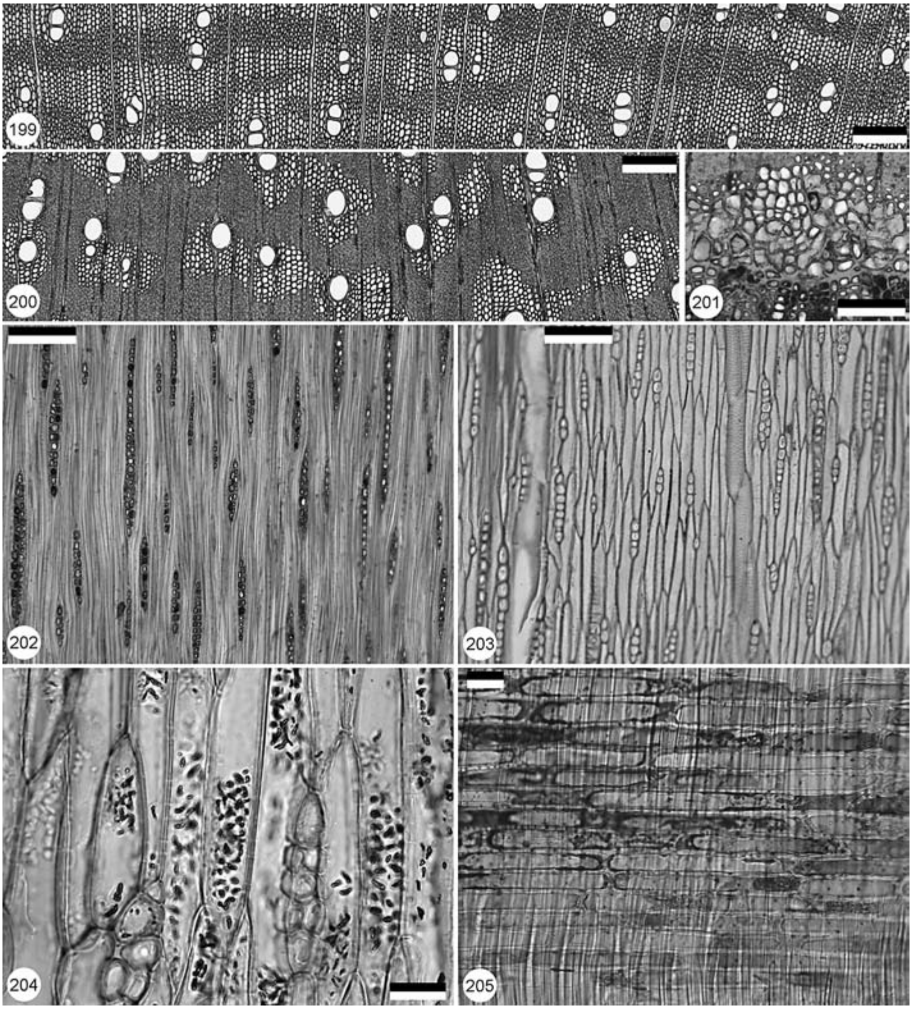


Fig. 199–205. ***Calliandra*. Inga alliance (Ingeae)**. - 199, 203 & 204: *Calliandra tweedii* Benth., M.K. 1951, Brazil. - 200, 201, 202 & 205: *Calliandra houstoniana* (Miller) Standley var. *calothyrsus* (Meissner) Barneby (syn. *Calliandra calothyrsus* Meissner), SK83, Nicaragua. – 199–201 TS. Axial parenchyma confluent to banded, vessels solitary and in short radial multiples. Pith fleck visible in Fig. 201. – 202–204 TLS. Rays uni- to biseriate, unstoried. Axial parenchyma fusiform, often containing starch granules (Fig. 204). – 205 RLS. Rays homocellular, often containing gummy deposits. — Scale is 200 µm for 199 & 200; 100 µm for 201–203; 20 µm for 204 & 205.

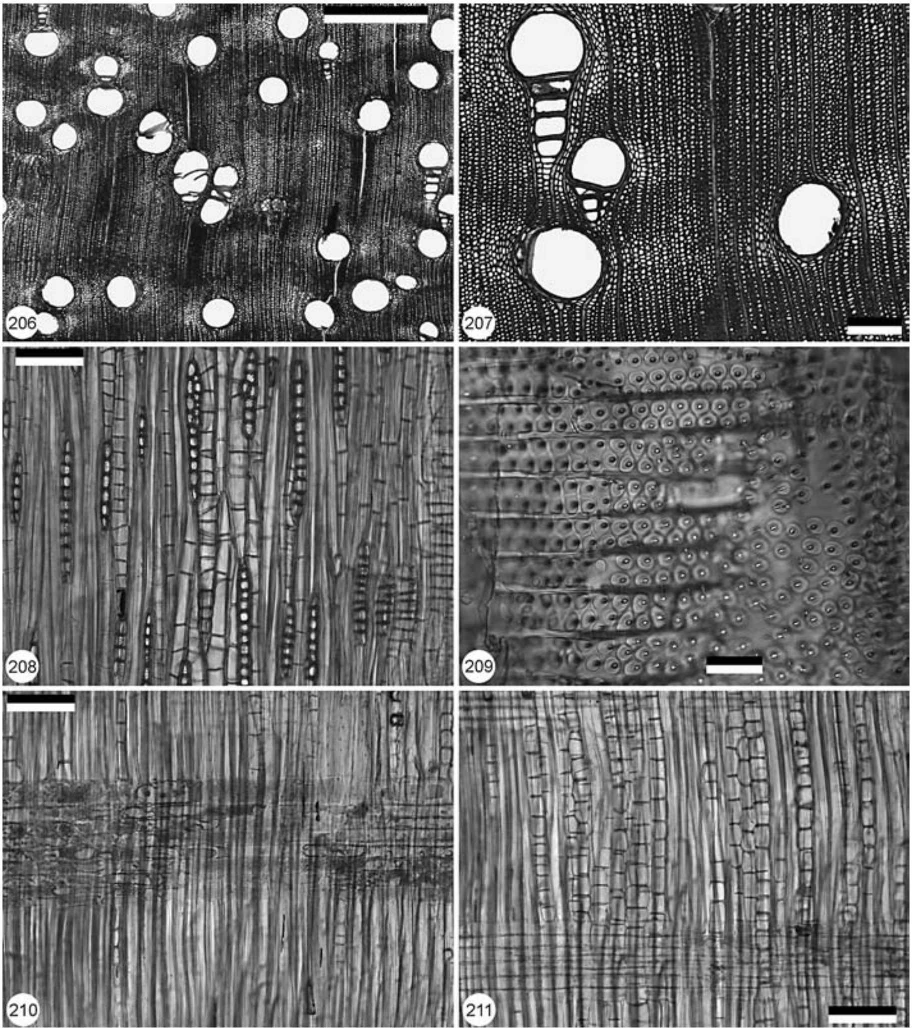


Fig. 206–211. ***Cedrelinga cateniformis*** (Ducke) Ducke, Kw 7968, Surinam. **Inga alliance (Ingeae)**. – 206 & 207 TS. Vessels solitary and in radial multiples. Axial parenchyma scanty or aliform, not clearly defined. – 208 TLS . Rays uniseriate with some regions biseriate, irregularly storied in places. Axial parenchyma in strands ranging from fusiform to many-celled, fibres with many chambers not containing crystals. – 209–211 RLS. Rays homocellular, cells often containing gum. Intervessel and vessel-ray pitting alternate (Fig. 209). Calcium oxalate crystals occasionally present in chambered fibres (Fig. 211). — Scale is 1000 μm for 206; 200 μm for 207; 100 μm for 208, 210 & 211; 20 μm for 209.

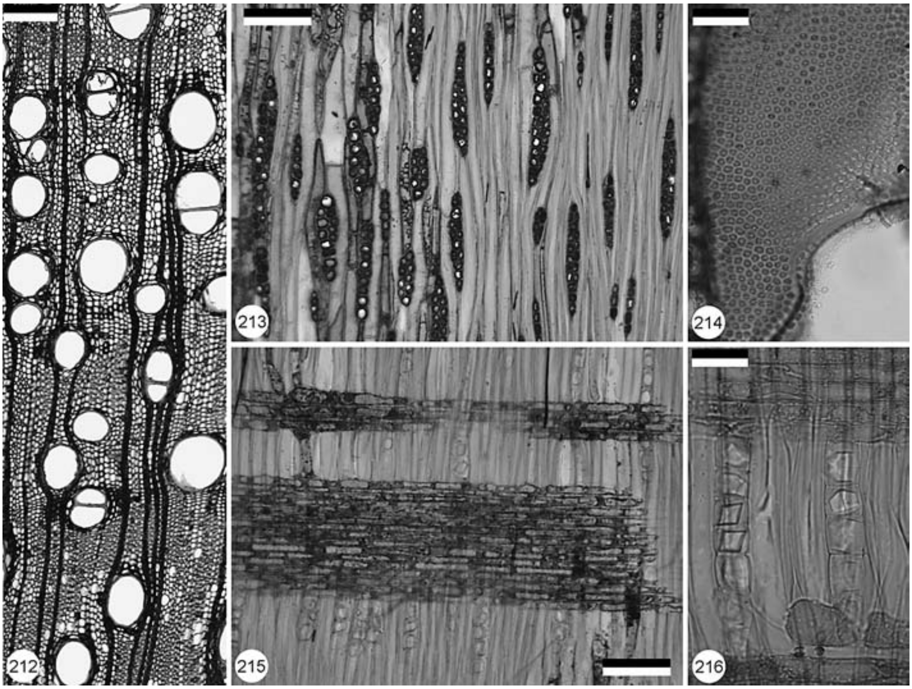


Fig. 212–216. ***Cojoba arborea*** (L.) Britton & Rose, SJRw 34700, Central America. **Inga alliance (Ingeae)**. – 212 TS. Vessels solitary and in pairs, axial parenchyma indistinctly aliform. – 213 & 214 TLS. Rays 1–3 cells wide, unstoried. Axial parenchyma fusiform or in strands of 2 cells. Intervessel pitting small and alternate. – 215 & 216 RLS. Rays homocellular, cells often containing gum, calcium oxalate crystals frequent in chambered fibres. – Scale is 200 µm for 212; 100 µm for 213 & 215; 20 µm for 214 & 216.

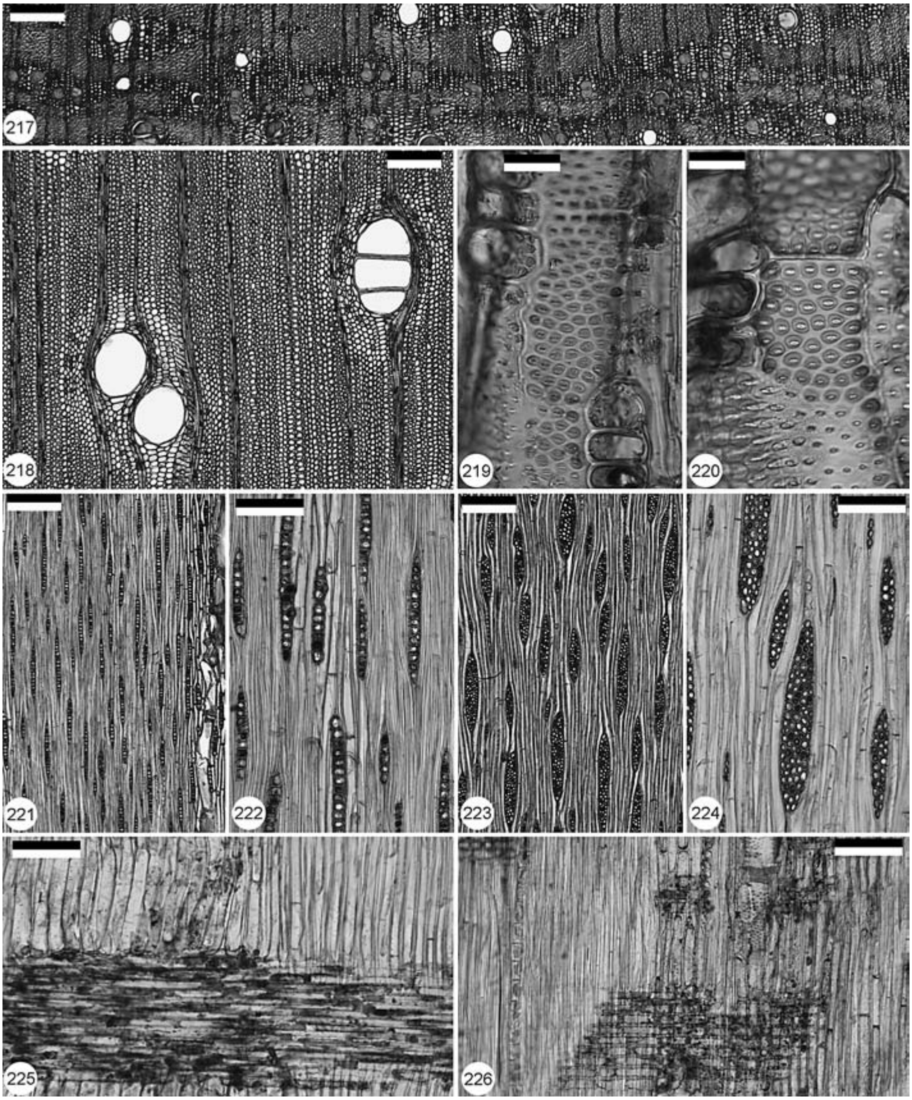


Fig. 217–226. ***Inga*. Inga alliance (Ingeae)**. - 217, 219, 221, 222 & 226: *Inga aptera* (Vinha) T.D. Pennington (syn. *Affonsea bahiensis* Vinha), Peru. - 218, 220, 223, 224 & 225: *Inga ingoides* (Rich.) Willd., Kw 12470. – 217 & 218 TS. Vessels mostly solitary and in short radial multiples, occasionally occluded with gum. Axial parenchyma varies between vasicentric, confluent and banded (Fig. 217) to indistinct and scanty paratracheal (Fig. 218). – 219–224 TLS. - 219 & 220: Intervessel pitting alternate, vestured. - 221 & 222: Rays mainly uniseriate. - 223 & 224: Rays 2–5 cells wide, septate fibres. – 225 & 226 RLS. Rays homocellular, often containing gum. Calcium oxalate crystals frequent in chambered fibres. — Scale is 200 µm for 217, 218, 221 & 223; 100 µm for 222, 224, 225 & 226; 20 µm for 219 & 220.

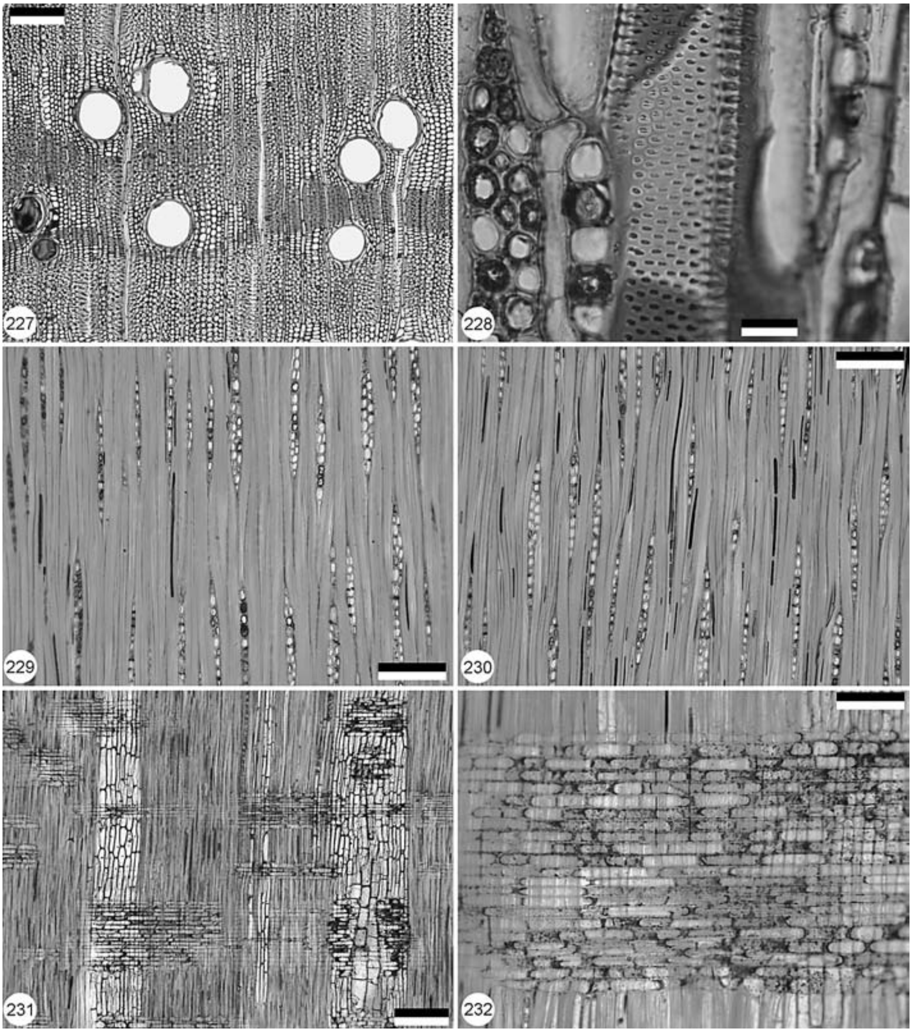


Fig. 227–232. ***Marmaroxylon racemosum*** (Ducke) Killip (syn. *Pithecellobium racemosum* Ducke), SJRw 22055, Tropical SE America. **Inga alliance (Ingeae)**. – 227 TS. Axial parenchyma aliform-confluent. – 228–230 TLS. Rays 1–2 cells wide, some areas irregularly storied (Fig. 229) whilst others are unstoried (Fig. 230). Intervessel pitting alternate, vestured (Fig. 228). – 231 & 232 RLS. Rays homocellular, often containing gum. Calcium oxalate crystals in chambered fibres. — Scale is 200 µm for 227 & 231; 100 µm for 229, 230 & 232; 20 µm for 228.

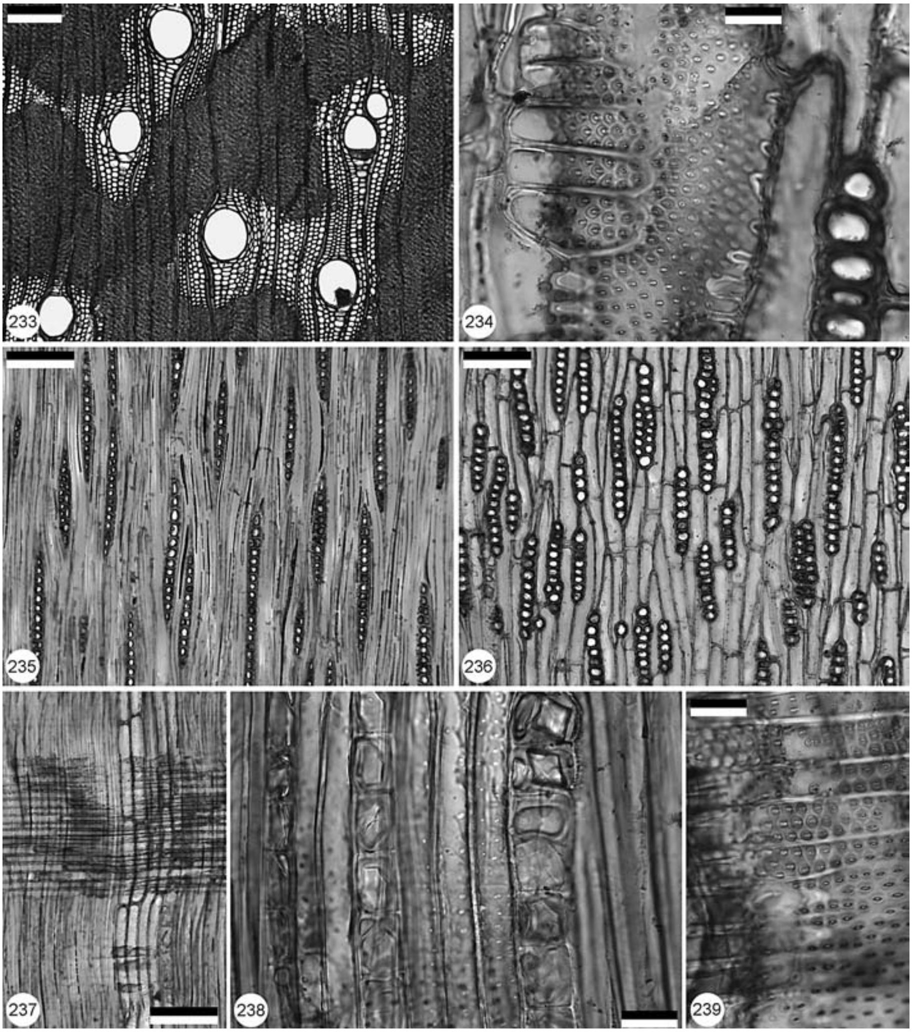


Fig. 233–239. ***Zygia latifolia*** (L.) Fawcett & Rendle (syn. *Pithecellobium cauliflorum* (Willd.) C. Martius), Kw 8120, Surinam. **Inga alliance (Ingeae)**. – 233 TS. Fibres thick-walled, axial parenchyma aliform to confluent and well defined. – 234–236 TLS. Rays uniseriate, some regions biseriate, unstoried. Axial parenchyma in strands of 2–4 cells. Intervessel pitting alternate, small, and vestured. – 237–239 RLS. - 237: Rays homocellular. - 238: Calcium oxalate crystals in chambered fibres. - 239: Vessel-ray pitting similar to intervessel pitting. — Scale is 200 μm for 233; 100 μm for 235, 236 & 237; 20 μm for 234, 238 & 239.

Tribe Ingeae: Old World group (Fig. 240–257)

The three genera examined from this group have few species: *Wallaceodendron* (Fig. 253–257) is monospecific, *Falcataria* (Fig. 240–247) has three species (one examined), *Serianthes* (Fig. 248–252) comprises 18 species (of which only one was available for study). The group also contains *Archidendropsis* and *Paraserianthes*. All genera are

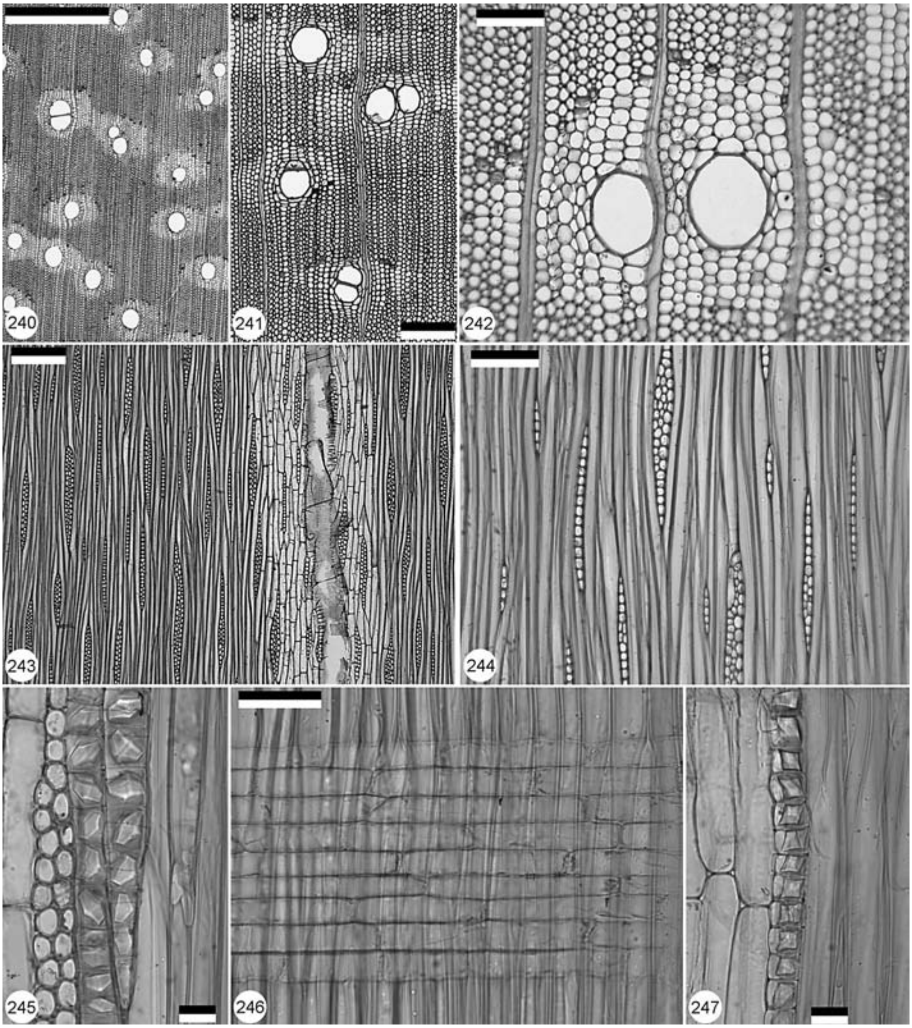


Fig. 240–247. ***Falcataria moluccana*** (Miq.) Barneby & J.W. Grimes (syn. *Albizia falcata sensu auct.*), Kw 4514, F.M.S. **Old World group (Ingeae)**. – 240–242 TS. Vessels predominantly solitary. Axial parenchyma aliform and confluent. Crystals in fibres or axial parenchyma surround the edge of the paratracheal axial parenchyma. – 243–245 TLS. Rays uniseriate and 2–3 cells wide. All elements unstoried. Calcium oxalate crystals in chambered fibres (Fig. 245) and axial parenchyma (Fig. 247). – 246 & 247 RLS. Rays homocellular. — Scale is 1000 µm for 240; 200 µm for 241 & 243; 100 µm for 242 & 244; 50 µm for 246; 20 µm for 245 & 247.

restricted to Asia, the Pacific and Australasia. *Falcataria* was raised to generic rank by Barneby and Grimes (1996) having been a section of *Paraserianthes*. The three genera examined are similar in wood anatomy. Wood anatomical descriptions of *Wallaceodendron* are given by Kribs (1959), Nielsen *et al.* (1983), Quirk (1983), Olver (1996) and Sudo (1998); *Paraserianthes* by Nielsen *et al.* (1983) and Soerianegara & Lemmens (1993); *Falcataria* by Nielsen *et al.* (1983), Peh & Khoo (1984), Martawijaya *et al.* (1989), Soerianegara & Lemmens (1993) and Tanaka & Bernard (1995); *Archidendropsis* by Nielsen *et al.* (1983); *Serianthes* by Nielsen *et al.* (1983) and Olver (1996). In many cases, *Falcataria moluccana* (Miq.) Barneby & J.W. Grimes is described under its synonym *Paraserianthes falcataria* (L.) I.C. Nielsen.

Growth rings indistinct, vessel diameters medium to occasionally large (average diameter ranges from 137–191 μm). Fibre wall thickness ranges from very thin in *Falcataria* (Fig. 240–242) to medium-thick in *Wallaceodendron* (Fig. 253). Axial parenchyma aliform, occasionally to frequently confluent, not banded. Fibres non-septate. Rays predominantly uniseriate; in *Falcataria* ray width can reach 4 cells (Fig. 243 & 244). Some irregular storeying is present in *Serianthes* (Fig. 250).

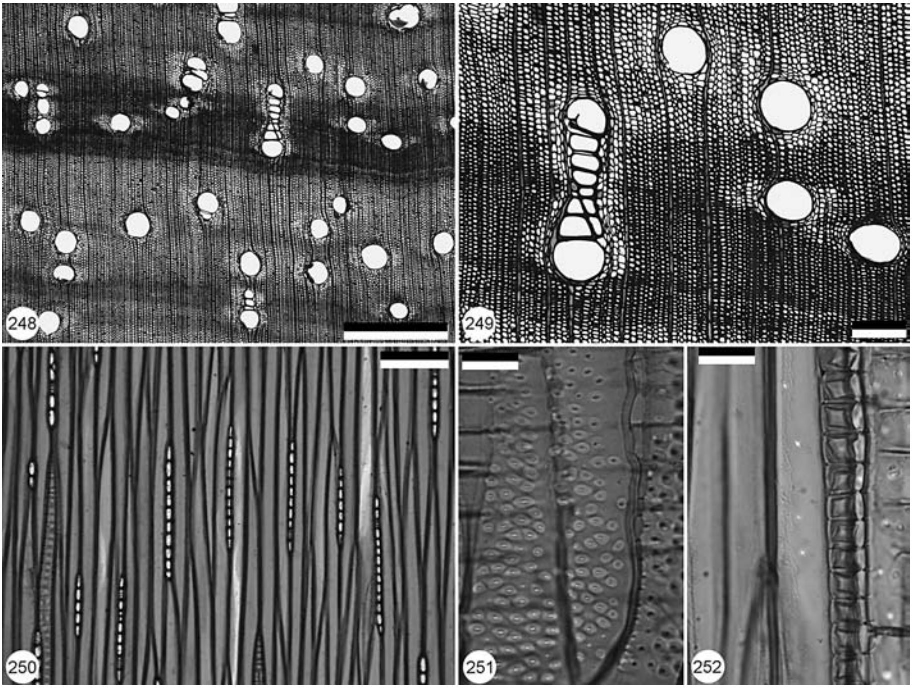


Fig. 248–252. ***Serianthes myriadenia*** Planch. *ex* Benth., Fiji 1410-1. **Old World group (Ingeae)**. – 248 & 249 TS. Growth rings distinct. Axial parenchyma vasicentric to aliform, poorly defined, vessels occasionally in long radial multiples. – 250 TLS. Rays uniseriate, some irregularly storied. – 251 & 252 RLS. - 251: Vessel-ray pitting alternate. - 252: Calcium oxalate crystals in chambered fibre. — Scale is 1000 μm for 248; 200 μm for 249; 100 μm for 250; 20 μm for 251 & 252.

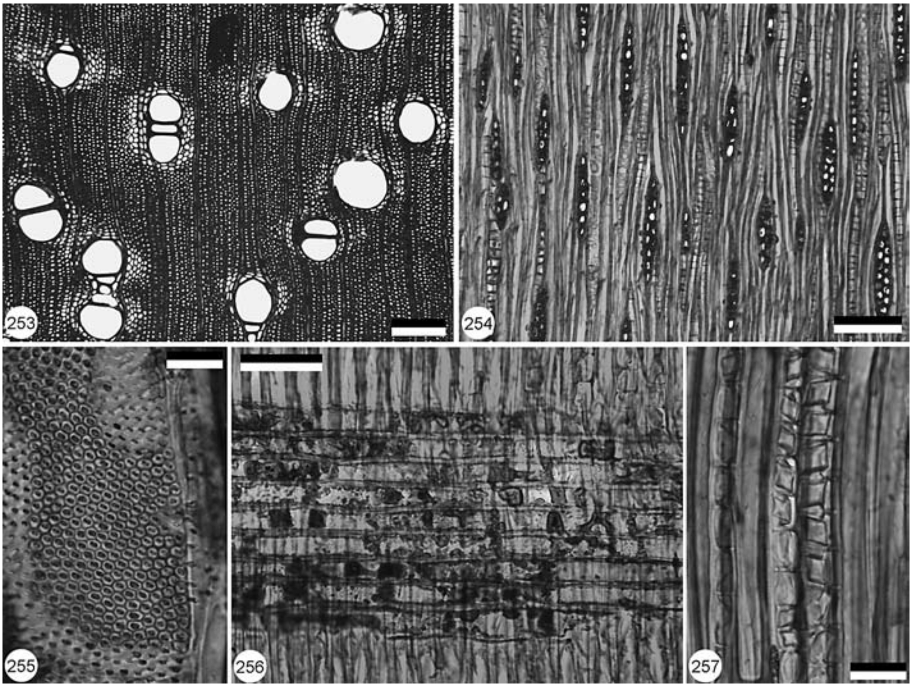


Fig. 253–257. ***Wallaceodendron celebicum*** Koorders, Kw 8235. **Old World group (Ingeae)**. – 253 TS. Axial parenchyma aliform. – 254 & 255 TLS. Rays uni- to biseriate, very short, unstoried. Intervessel pitting alternate, small and polygonal in outline. – 256 & 257 RLS. Rays homocellular, often containing gum. Calcium oxalate crystals frequent in chambered fibres (also in Fig. 254). — Scale is 200 µm for 253; 100 µm for 254; 50 µm for 256; 20 µm for 255 & 257.

Tribe Ingeae: Pithecellobium alliance (Fig. 258–276, 361–363)

The genus *Pithecellobium* has been reclassified many times in recent years, to the extent that many Ingeae genera contain at least one species that has (at one time or another) been classified in *Pithecellobium sensu lato*. The genus *sensu stricto* now contains 18 species, all neotropical. Incorporated in this alliance are *Painteria* and *Sphinga*, two

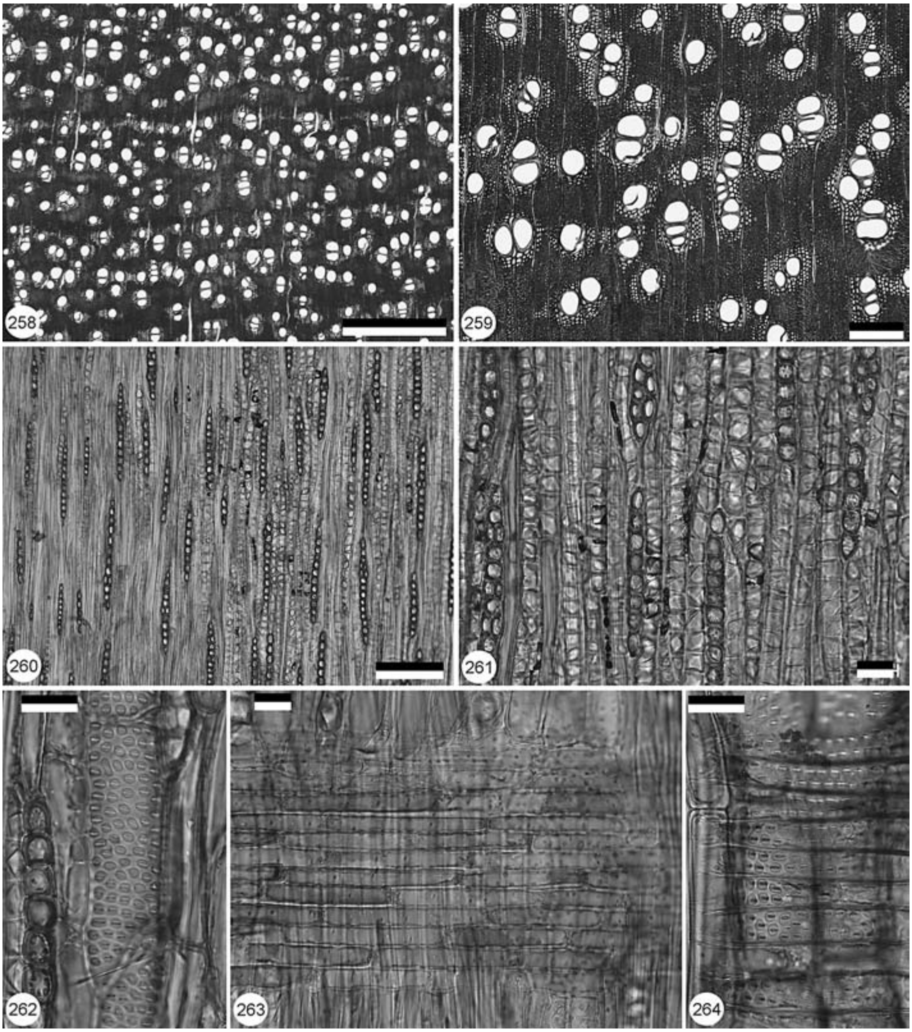


Fig. 258–264. ***Ebenopsis ebano*** (Berlandier) Barneby & J.W. Grimes (syn. *Pithecellobium flexicaule* (Benth.) Coulter), FTG X-5-52. **Pithecellobium alliance (Ingeae)**. – 258 & 259 TS. Vessels solitary and in radial multiples. Axial parenchyma vasicentric, confluent where vessels are close. Fibre walls very thick. – 260–262 TLS. Rays uniseriate and unstoried. Calcium oxalate crystals in chambered fibres very common. Intervessel pitting medium, vestured and alternate. – 263 & 264 RLS. Rays homocellular, vessel-ray pitting similar to intervessel pitting. — Scale is 1000 µm for 258; 200 µm for 259; 100 µm for 260; 20 µm for 261–264.

recently described/reinstated genera (Barneby & Grimes 1996), neither of which have been examined in this study. *Havardia* and *Ebenopsis* were placed as sister taxa by Grimes (1995), a relationship confirmed by Luckow *et al.* (2003).

Wood anatomical descriptions for *Pithecellobium sensu lato* have been given by Record & Mell (1924), Kribs (1928), Williams (1936), Record & Hess (1943), Cozzo (1951), Tortorelli (1956), Lindeman *et al.* (1963), Ramesh Rao & Purkayastha (1972), Cheng (1980), Cassens & Miller (1981), Mainieri *et al.* (1983), Détienne & Jacquet (1983), Barajas-Morales & Gomez (1989), Mattos-Filho (1989), Babos & Cumana (1992), Olver (1996) and Chauan & Vijendra Rao (2003). *Ebenopsis* has been described by Record & Hess (1943), Cassens & Miller (1981) and Olver (1996); *Havardia* by Cassens & Miller (1981).

The alliance is split in two: *Havardia* (Fig. 265–269), *Ebenopsis* (Fig. 258–264) and *Pithecellobium unguis-cati* (L.) Benth. have septate fibres, whereas the rest of the *Pithecellobium* species examined are non-septate. Vessel frequency is high in *Havardia* and *Ebenopsis* (Fig. 258, 259 & 265), but lower in *Pithecellobium* (Fig. 270 & 271). Axial parenchyma is vasicentric to aliform, commonly confluent in *Pithecellobium*

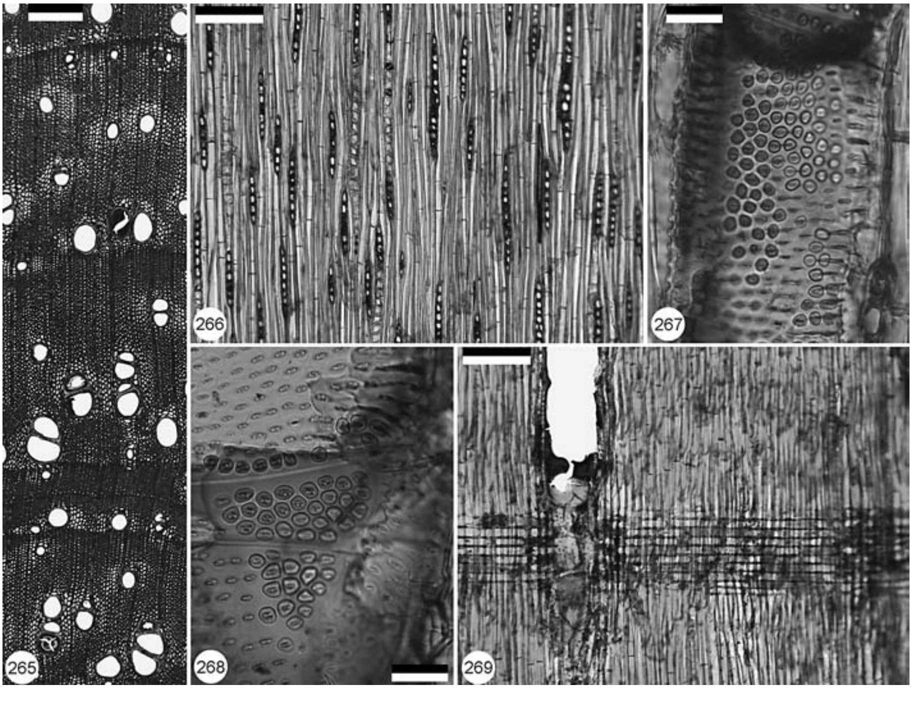


Fig. 265–269. ***Havardia pallens*** (Benth.) Britton & Rose, MADw 10179. **Pithecellobium alliance (Ingeae)**. – 265 TS. Growth ring boundaries distinct, vessels solitary or in radial multiples. Axial parenchyma vasicentric to aliform with indistinct boundaries. – 266 & 267 TLS. Rays uniseriate and unstoried, crystals in chambered fibres. Fibres septate. Intervessel pitting alternate. – 268 & 269 RLS. Vessel-ray pitting similar to intervessel pitting, vestured. Rays homocellular, gum in ray cells and occasionally in vessels. — Scale is 200 µm for 265; 100 µm for 266 & 269; 20 µm for 267 & 268.

(*Pithecellobium microcarpum* Benth. has very narrow regular bands). Ray width is also variable: uniseriate in *Ebenopsis* (Fig. 260 & 261) and *Pithecellobium unguis-cati*, predominantly uniseriate with some biseriate rays in *Havardia* (Fig. 266) and *Pithecellobium lanceolatum* (Willd.) Benth., and the rest have rays 1–4 cells wide. All *Pithecellobium* species examined have patches of apotracheal axial parenchyma.

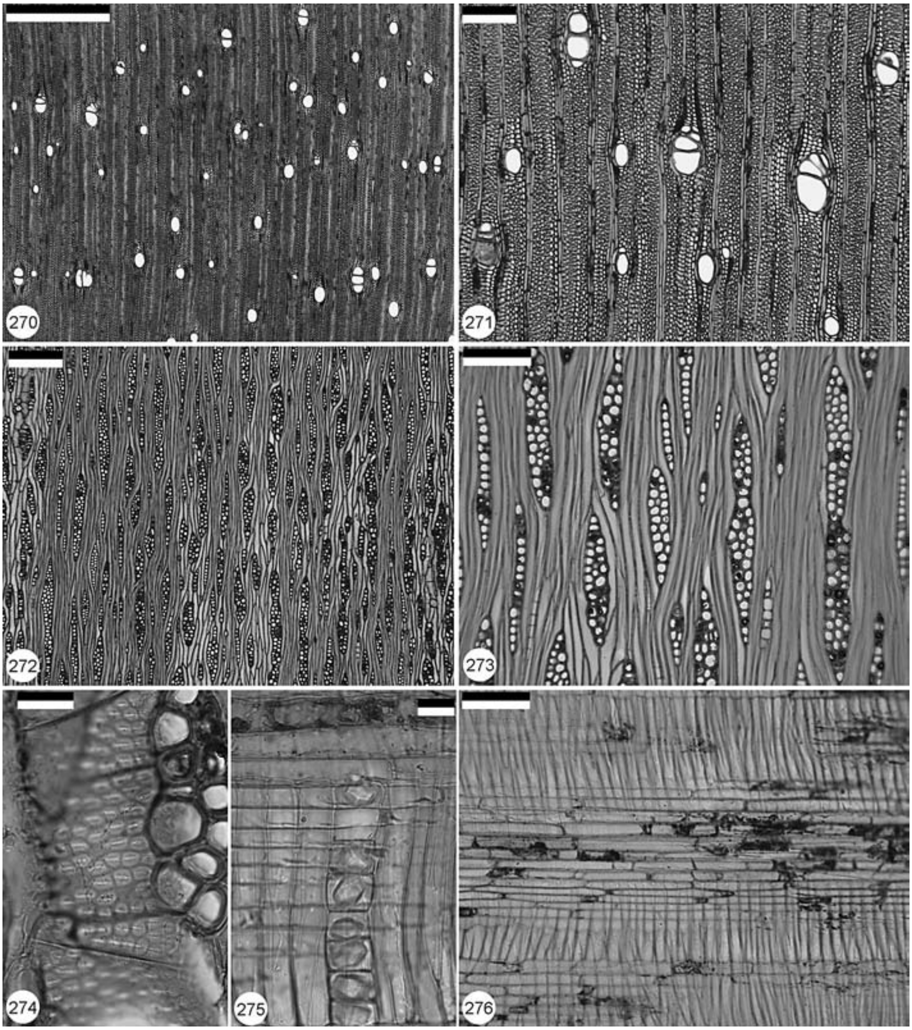


Fig. 270–276. ***Pithecellobium unguis-cati*** (L.) Benth., USA. **Pithecellobium alliance (Ingeae)**. – 270 & 271 TS. Vessels solitary and in very short radial multiples. Axial parenchyma scanty paratracheal and vasicentric. – 272–274 TLS. Rays 1–3 cells wide and unstoried. Axial parenchyma fusiform or in strands of 2 cells. Intervessel pitting alternate, vestured, polygonal in outline (Fig. 274). – 275 & 276 RLS. Rays homocellular, sometimes containing gum. Calcium oxalate crystals in chambered fibres. — Scale is 1000 µm for 270; 200 µm for 271 & 272; 100 µm for 273 & 276; 20 µm for 274 & 275.

Tribe Ingeae: Samanea alliance (Fig. 277–290)

Information is available for all three genera in this alliance: *Hesperalbizia* (Fig. 277–283) and *Samanea* (Fig. 284–290) were examined and a literature reference used for *Pseudosamanea* (Cassens & Miller 1981 – who also give a description of *Samanea*). Descriptions of the wood of *Samanea* are given by Brazier & Franklin (1961), Sudo (1998) and Chauan & Vijendra Rao (2003); descriptions of both *Samanea* and *Pseudosamanea* by Record & Hess (1943), Cozzo (1951), Kribs (1959), Détienne & Jacquet (1983) and Olver (1996). All three genera are neotropical. Species of *Samanea* have been placed in several different genera over the past few years, which may help to explain some of the discrepancies in the slides examined. Of the seven slides of *Samanea saman* (Jacq.) Merrill in the Kew collection, the five from Jamaica and the one from Bolivia are similar. They all possess septate fibres, whereas the *Samanea saman* from Singapore Botanic Garden, and also *Hesperalbizia* and *Pseudosamanea* are non-septate. There are other differences between the Singapore *Samanea saman* and the others: it has larger vessels and taller and wider rays. Most probably the Singapore specimen was misidentified. *Samanea*, *Hesperalbizia* and *Pseudosamanea* are all very similar.

Radial multiples are frequent, axial parenchyma is vasicentric to aliform (Fig. 277, 284–286), rays are 1–4 cells wide and unstoried (Fig. 281, 287 & 288). *Hesperalbizia* has thin, discontinuous, irregular parenchyma bands, more vessel clusters, and common diffuse idioblastic axial parenchyma cells (Fig. 277 & 278).

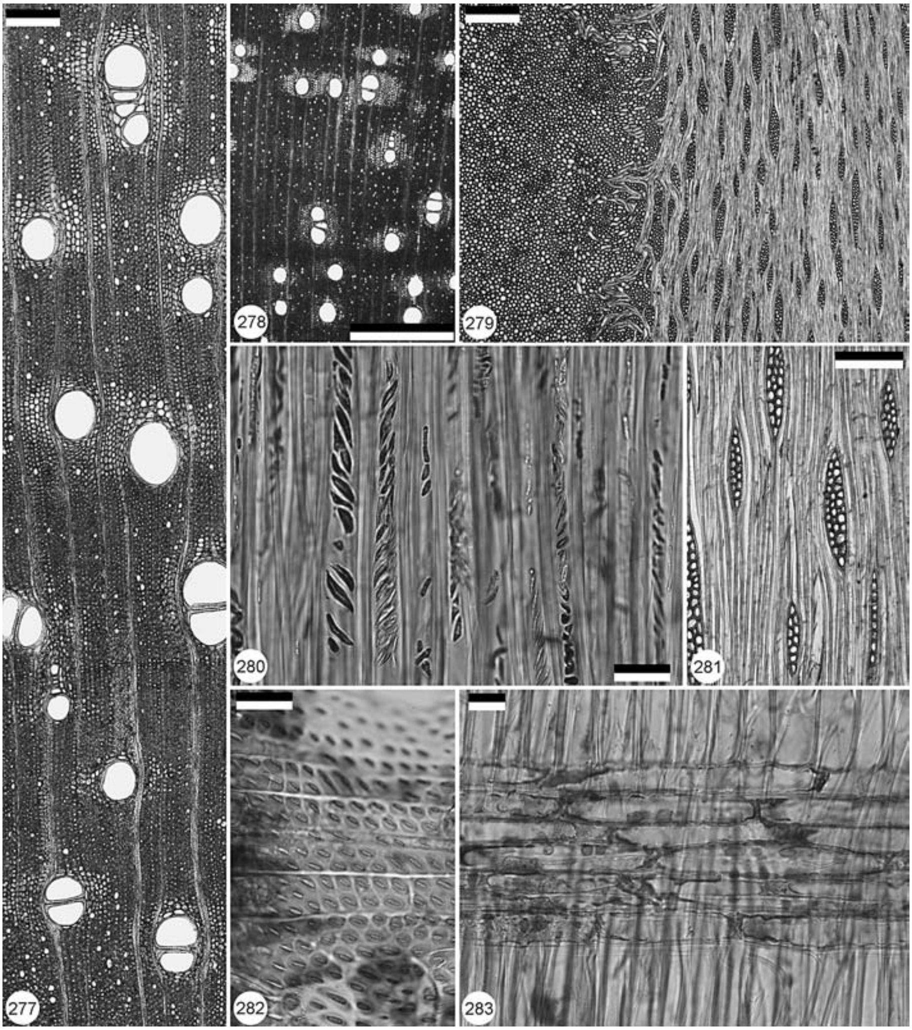


Fig. 277–283. ***Hesperalbizia occidentalis*** (Brandegee) Barneby & J.W. Grimes, Kw 1334, Mexico. **Samanea alliance (Ingeae)**. – 277 & 278 TS. Axial parenchyma vasicentric and aliform, without clearly defined boundaries. Diffuse idioblastic axial parenchyma common. – 279–281 TLS. Rays 1–4 cells wide, unstoried, one very large ray (leaf-trace?) in Fig. 279. Starch grains present in fibres. – 282 & 283 RLS. Rays homocellular with some gummy deposits. Vessel-ray pitting alternate. — Scale is 1000 µm for 278; 200 µm for 277 & 279; 100 µm for 281; 20 µm for 280, 282 & 283.

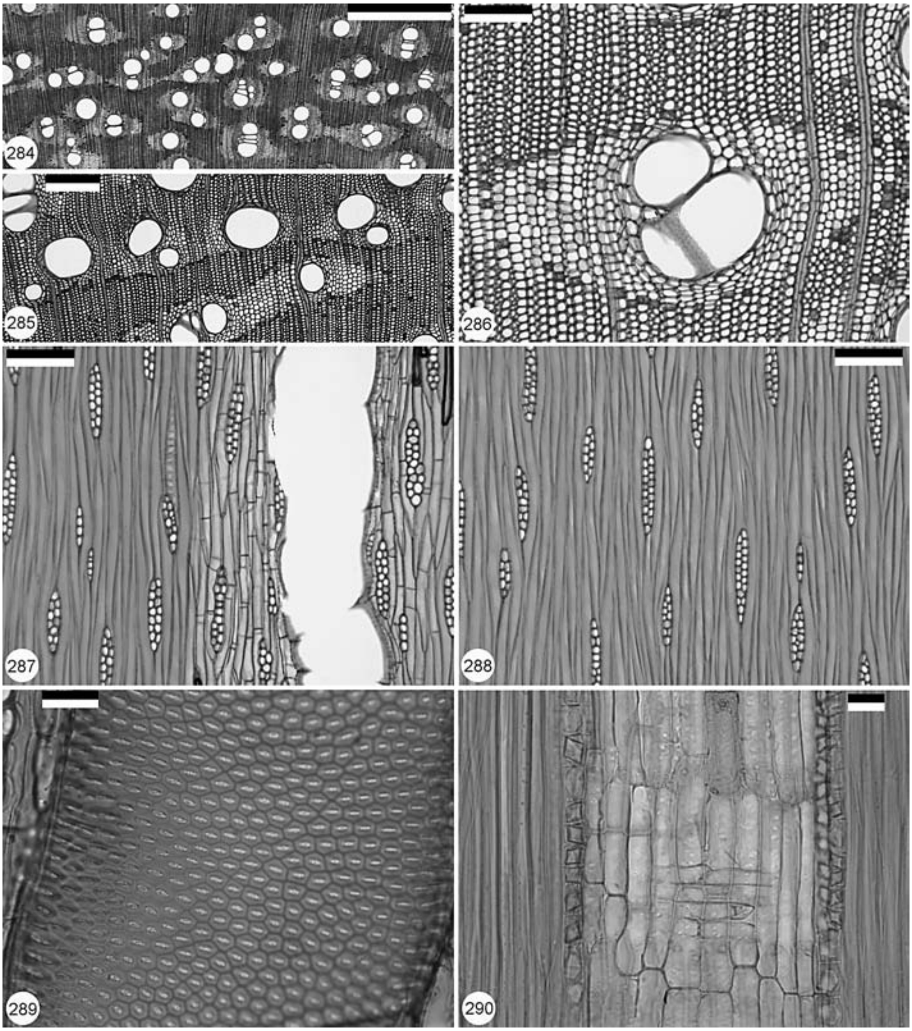


Fig. 284–290. ***Samanea saman*** (Jacq.) Merrill, ICTA, Trinidad. **Samanea alliance (Ingeae)**. – 284–286 TS. Growth rings distinct, often marked by bands of fibres with calcium oxalate crystals in chambers. Axial parenchyma aliform to confluent, often surrounded by crystalliferous chambered fibres or axial parenchyma (hard to distinguish which). – 287–288 TLS. Rays 1–2-seriate. Axial parenchyma in strands of 2–4 cells in Fig. 287. – 289: Intervessel pitting alternate, vestured, polygonal in outline. – 290 RLS. Crystals in chambered axial parenchyma and/or fibre cells (see also Fig. 285 & 286). — Scale is 1000 μm for 284; 200 μm for 285; 100 μm for 286–288; 20 μm for 289 & 290.

Tribe Ingeae: Unplaced genera (Fig. 291–311)

When Barneby and Grimes (1996) divided the neotropical Ingeae into generic alliances, there were three remaining genera of uncertain position: *Albizia, Enterolobium* and *Lysiloma*.

Albizia (Fig. 291–297), a large pantropical genus comprising c 140 species, was found by Grimes (1995) and Luckow *et al.* (2003) to be polyphyletic. There has been a great deal of rearrangement of the taxa in *Albizia*; the wood anatomy is variable. This variation is immediately obvious: there is a mix of septate and non-septate species. Of the 24 species studied, 5 have non-septate fibres and 19 septate ones.

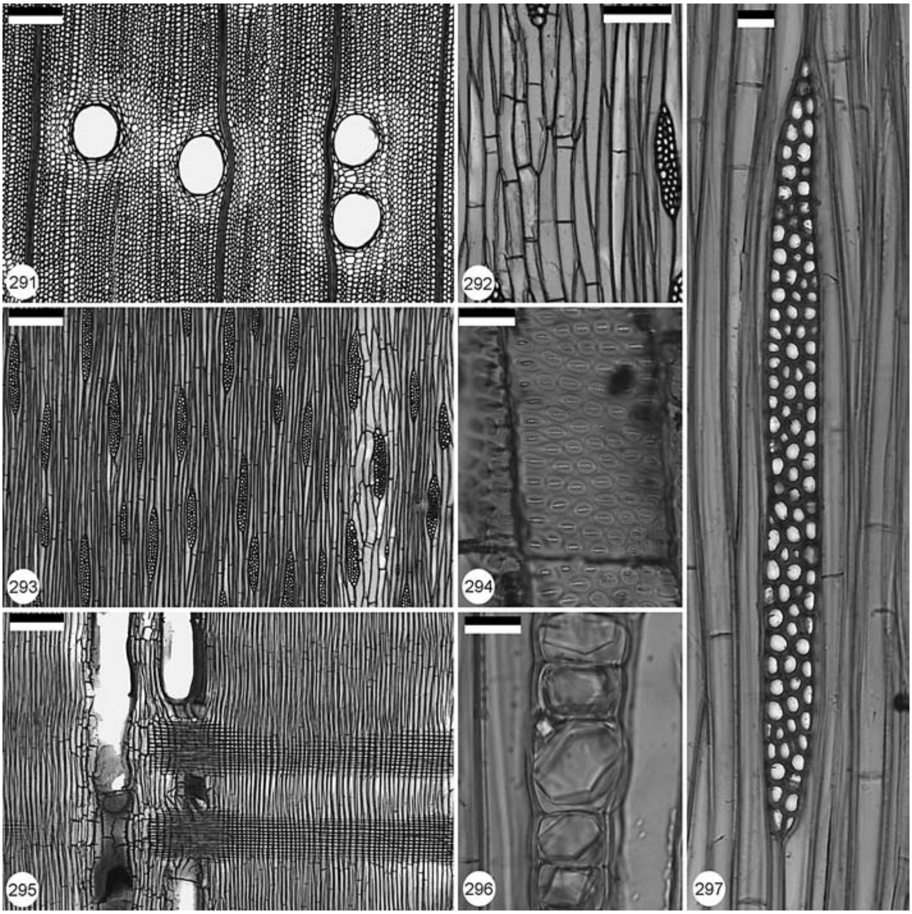


Fig. 291–297. ***Albizia brownii*** Walp., FHOw 850. **Unplaced genera (Ingeae)**. – 291 TS. Vessels predominantly solitary, axial parenchyma aliform and confluent, poorly defined. – 292–294 & 297 TLS. Rays 3–4 cells wide, tall and unstoried. Axial parenchyma in strands of 2–4 cells. - 294: Intervessel pitting alternate and vestured. – 295 & 296 RLS. Rays homocellular, fibres septate. Calcium oxalate crystals in chambered fibres and axial parenchyma. — Scale is 200 µm for 291, 293 & 295; 100 µm for 292; 20 µm for 294, 296 & 297.

Axial parenchyma is usually aliform, occasionally vasicentric, and no banding is seen (except in *Albizia amara* (Roxb.) Boivin) although confluent parenchyma frequently links 2 to 7 vessels tangentially. Rays are commonly 2–3 cells wide (Fig. 293 & 297), in some species uniseriate rays may be present (or, rarely, predominant). Due to the absence of banded parenchyma and common occurrence of septate fibres, *Albizia* most closely matches genera from the *Pithecellobium* alliance, although *Albizia* has wider

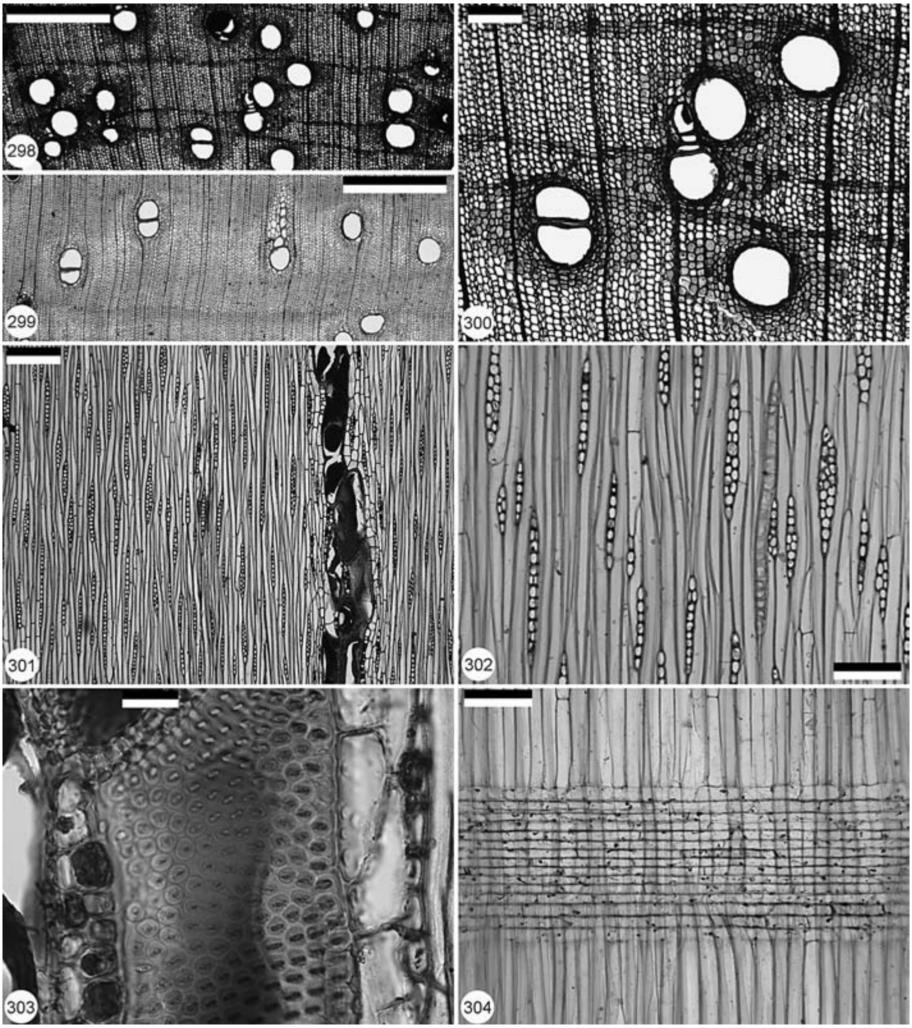


Fig. 298–304. ***Enterolobium*. Unplaced genera (Ingeae)**. - 298 & 300: *Enterolobium contortisiliquum* (Vell.) Morong, Kw 6963, FTG. - 299, 301–304: *Enterolobium cyclocarpum* (Jacq.) Griseb., Kw 465. – 298–300 TS. Axial parenchyma aliform, occasionally in narrow marginal bands (Fig. 300). – 301–303 TLS. Rays uni- to biseriate, unstoried, axial parenchyma in strands of 2–6 cells. Intervessel pitting alternate, vestured. – 304 RLS. Rays homocellular. — Scale is 1000 µm for 298 & 299; 200 µm for 300 & 301; 100 µm for 302 & 304; 20 µm for 303.

rays. It seems probable that wood anatomy can assist in defining monophyletic elements within *Albizia sensu lato*.

There are many descriptions of the wood anatomy of *Albizia sensu lato*, including Kanehira (1921), Pearson & Brown (1932), Record & Hess (1943), Cozzo (1951), Kribs (1959), Brazier & Franklin (1961), Fouarge & Gérard (1964), Ramesh Rao & Purka-

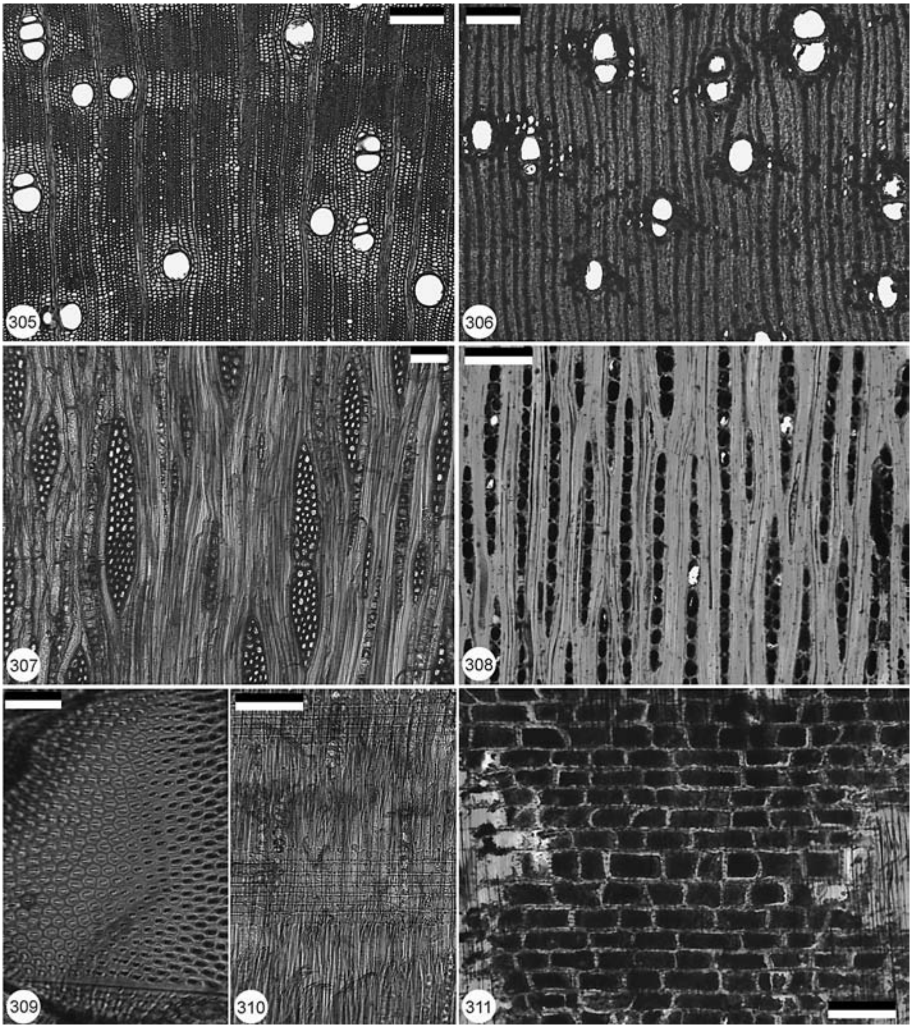


Fig. 305–311. ***Lysiloma*. Unplaced genera (Ingeae)**. - 305, 307, 309 & 310: *Lysiloma acapulcense* (Kunth) Benth., Kw 1942, El Salvador. - 306, 308 & 311: *Lysiloma latisiliquum* (L.) Benth., 1955, West Indies. – 305 & 306 TS. Vessels solitary and in short radial multiples. Axial parenchyma aliform to confluent, some irregular banding (Fig. 305). – 307–309 TLS. Rays range from wholly uniseriate (Fig. 308) to 1–4 cells wide (Fig. 307). Ray cell size varies between different species. Intervessel pitting alternate, vestured, polygonal in outline. – 310 & 311 RLS. Rays homocellular, often containing gum. Calcium oxalate crystals frequent in chambered fibres. — Scale is 200 μm for 305 & 306; 100 μm for 307, 308, 310 & 311; 20 μm for 309.

yastha (1972), Normand & Paquis (1976), Cheng (1980), Cassens & Miller (1981), Gill *et al.* (1983), Détienne & Jacquet (1983), Quirk (1983), Parsa Pajaih & Schweingruber (1985), Berti & Edlmann Abbate (1988), Barajas-Morales & Gomez (1989), Martawijaya *et al.* (1989), Babos & Cumana (1992), Soerianegara & Lemmens (1993), Mallque & Kikata (1994), Tanaka & Bernard (1995), Olver (1996), Höhn (1999) and Chauan & Vijendra Rao (2003). However, due to the large number of taxonomic rearrangements that have occurred in *Albizia* it is necessary to check whether the species examined are still assigned to *Albizia*.

Enterolobium (Fig. 298–304) comprises 11 neotropical species, of which four have been examined. Fibres are non-septate, with the exception of *Enterolobium schomburgkii* Benth. Axial parenchyma is aliform but not banded. Rays are 1–3 cells wide (Fig. 301 & 302) and unstoried. *Enterolobium* is similar to the Chloroleucon alliance and Old World group. It was described by Record & Mell (1924), Cozzo (1951), Tortorelli (1956), Kribs (1959), Lindeman *et al.* (1963), Cheng (1980), Détienne *et al.* (1982), Détienne & Jacquet (1983), Mainieri *et al.* (1983), Mainieri & Chimelo (1989) and Babos & Cumana (1992).

Lysiloma (Fig. 305–311) has 8–9 Central American and Caribbean species. Intervessel pitting is mostly less than 5 µm (Fig. 309), axial parenchyma vasicentric to confluent (Fig. 305 & 306). Fibres are non-septate. Ray frequency is high and rays range from predominantly uniseriate to predominantly 3–5 cells wide (Fig. 307 & 308). Scattered idioblastic axial parenchyma cells are present. *Lysiloma* is similar to the *Faidherbia–Zapoteca* clade, but also resembles members of the Inga alliance. *Lysiloma* wood was described by Record & Mell (1924), Record & Hess (1943), Brazier & Franklin (1961) and Barajas-Morales & Gomez (1989).

TRIBE ACACIEAE

The removal of *Faidherbia albida* from the Acacieae has left the tribe, at least temporarily, monogeneric. There are c. 1450 species of *Acacia*, and the distribution of the genus is pantropical. Three subgenera are currently recognised within *Acacia*: subg. *Acacia* (pantropical), subg. *Aculeiferum* (pantropical), and subg. *Phyllodineae* (Australia, Asia, Madagascar). In 1986 Pedley suggested that these subgenera be given generic rank, adopting the names *Senegalia* Rafinesque for subg. *Aculeiferum*, and *Racosperma* C. Martius for subg. *Phyllodineae*. There have been many recent molecular analyses of the Acacieae (including Robinson & Harris 2000), which have shown that *Acacia sensu lato* is not a monophyletic group. It is now shown that subg. *Phyllodineae* (syn. *Racosperma*) is nested within the Ingeae, and subg. *Acacia* appears more closely related to the Mimoseae (Chappill & Maslin 1995; Miller *et al.* 2003). Additionally, molecular data have indicated that *Acacia sensu lato* should be segregated into at least 5 genera: *Racosperma* (syn. *Acacia* subg. *Phyllodineae*), *Acacia sensu stricto, Senegalia* (syn. *Acacia* subg. *Aculeiferum*), *Acaciella* (syn. *Acacia* subg. *Aculeiferum* sect. *Filicinae*), and an unnamed '*Acacia coulteri* group' (Maslin *et al.* 2003; Miller & Bayer 2003). Whilst it is accepted that *Acacia sensu lato* should be divided, there has been disagreement as to which of the segregates should retain the generic name

Acacia (Pedley 1986, 1987; Orchard & Maslin 2003; Luckow 2005); if *Acacia* subg. *Phyllodineae* becomes *Acacia sensu stricto*, based on a new type specimen, following the vote of the nomenclatural session of the IBC in Vienna (2005), then *Acacia* subg. *Acacia* will become *Vachellia*.

For this study, however, the traditional treatment of *Acacia sensu lato* has been used, and where the information is available the species examined have been sorted into subgeneric groups. Of the 62 *Acacia* species examined, one is known to belong to *Acacia* subg. *Aculeiferum* sect. *Filicinae* (*Acaciella*), 20 to *Acacia* subg. *Phyllodineae* (*Racosperma*) and 4 to *Acacia* subg. *Aculeiferum* (*Senegalia*). The remaining 36 species are treated as *Acacia sensu lato*.

One difficulty with describing the wood anatomy of the Acacieae is the common occurrence of gelatinous, often thick-walled fibres (*e.g.* Fig. 312 & 315), making it hard to distinguish whether or not the fibres are septate. This is a crucial characteristic used to differentiate between species in the Mimosoideae, so the inability to score it is problematic. Furthermore, where the presence/absence of septate fibres can be determined with any certainty, it appears that *Acacia sensu lato* contains a mixture of septate and non-septate species. The presence or absence of septate fibres may support the splitting of *Acacia sensu lato*, although the absence of septate fibres could be confirmed for only half the species of *Acacia* subg. *Phyllodineae* (*Racosperma*) examined, and details of the character were often absent in the literature. Most other mimosoid genera are homogeneous for this character, so it may be safe to infer that the subgenus is composed entirely of non-septate species. Within the group of *Acacia* subg. *Phyllodineae* (*Racosperma*) species examined, there is a predominance of uniseriate and biseriate rays that are also common in the Ingeae (where molecular data nest this subgenus) and the Mimoseae. Support for *Acacia* subg. *Aculeiferum* (*Senegalia*) is also good: of the four species examined three possess septate fibres. *Acacia angustissima* (Mill.) Kuntze (*Acacia* subg. *Aculeiferum* sect. *Filicinae* (*Acaciella*)) is non-septate.

Wood anatomical descriptions of *Acacia* have been presented by Kanehira (1921), Pearson & Brown (1932), Williams (1936), Record & Hess (1943), Cozzo (1951), Tortorelli (1956), Kribs (1959), Brazier & Franklin (1961), Fasolo *et al.* (1963), Ramesh Rao & Purkayastha (1972), Cheng (1980), Alston (1982), Détienne & Jacquet (1983), Gill *et al.* (1983), Quirk (1983), Peh & Khoo (1984), Fahn *et al.* (1986), Jagiella & Kürschner (1987), Barajas-Morales & Gomez (1989), Mainieri & Chimelo (1989), Martawijaya *et al.* (1989), Prior & Gasson (1990), Lemmens *et al.* (1995), Höhn (1999), Neumann *et al.* (2000) and Chauan & Vijendra Rao (2003).

Tribe Acacieae: *Acacia* (Fig. 312–351, 362, 363)

Acacia angustissima (Mill.) Kuntze (subg. *Aculeiferum* sect. *Filicinae,* syn. *Acaciella angustissima* (Mill.) Britton & Rose): Fig. 312–318;
Acacia subg. *Phyllodineae* (syn. *Racosperma*): Fig. 319–329;
Acacia subg. *Aculeiferum* sect. *Aculeiferum* (syn. *Senegalia*): Fig. 330–336, 362, 363;
Acacia horrida Willd.: Fig. 337–341;
Acacia nubica Benth.: Fig. 342–346;
Acacia tortilis (Forssk.) Hayne: Fig. 347–351.

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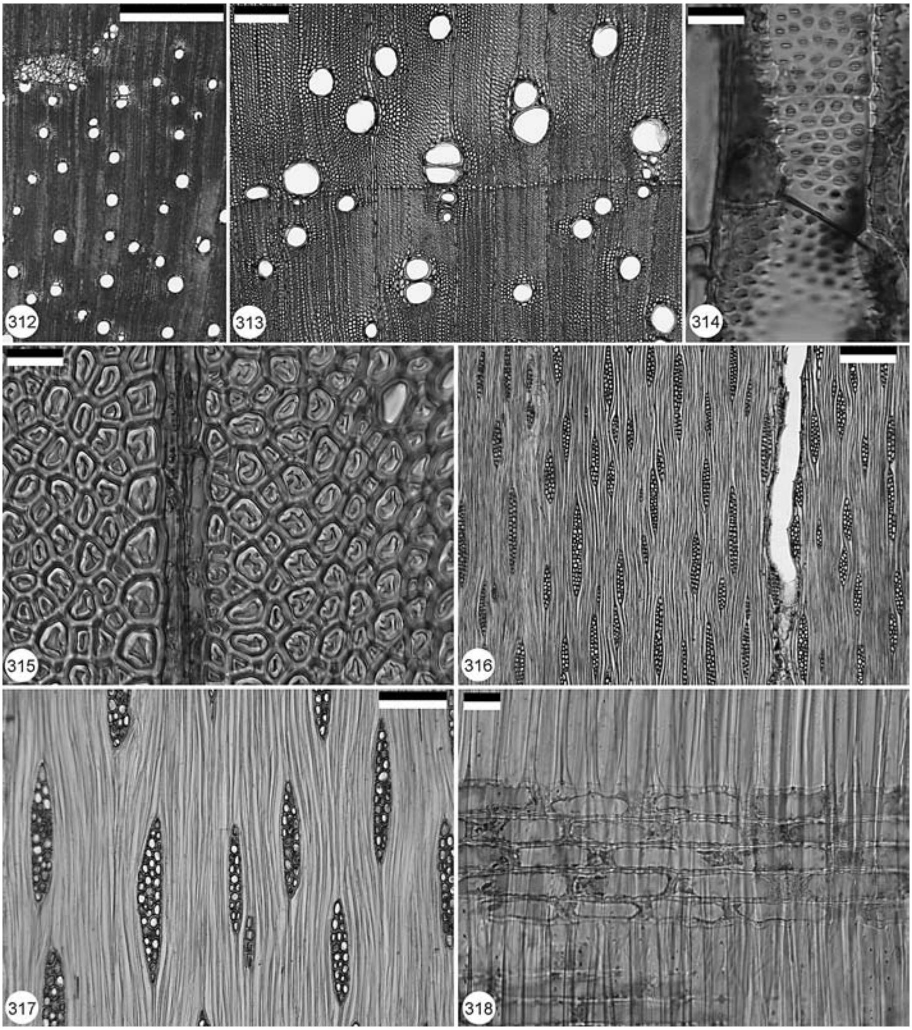

Fig. 312–318. ***Acacia* subg. *Aculeiferum* sect. *Filicinae*** (syn. *Acaciella* - **Acacieae**). *Acacia angustissima* (Mill.) Kuntze, FHOw 1373, Nicaragua. – 312, 313 & 315 TS. Growth ring boundaries distinct. Pith fleck in Fig. 312. Axial parenchyma scanty paratracheal and vasicentric, also a uniseriate marginal band in Fig. 313. Fibre walls often gelatinous (Fig. 315). – 314, 316 & 317 TLS. Rays 2–3 cells wide, unstoried. Intervessel pitting alternate, vestured. – 318 RLS. Rays homocellular. — Scale is 1000 µm for 312; 200 µm for 313 & 316; 100 µm for 317; 20 µm for 314, 315 & 318.

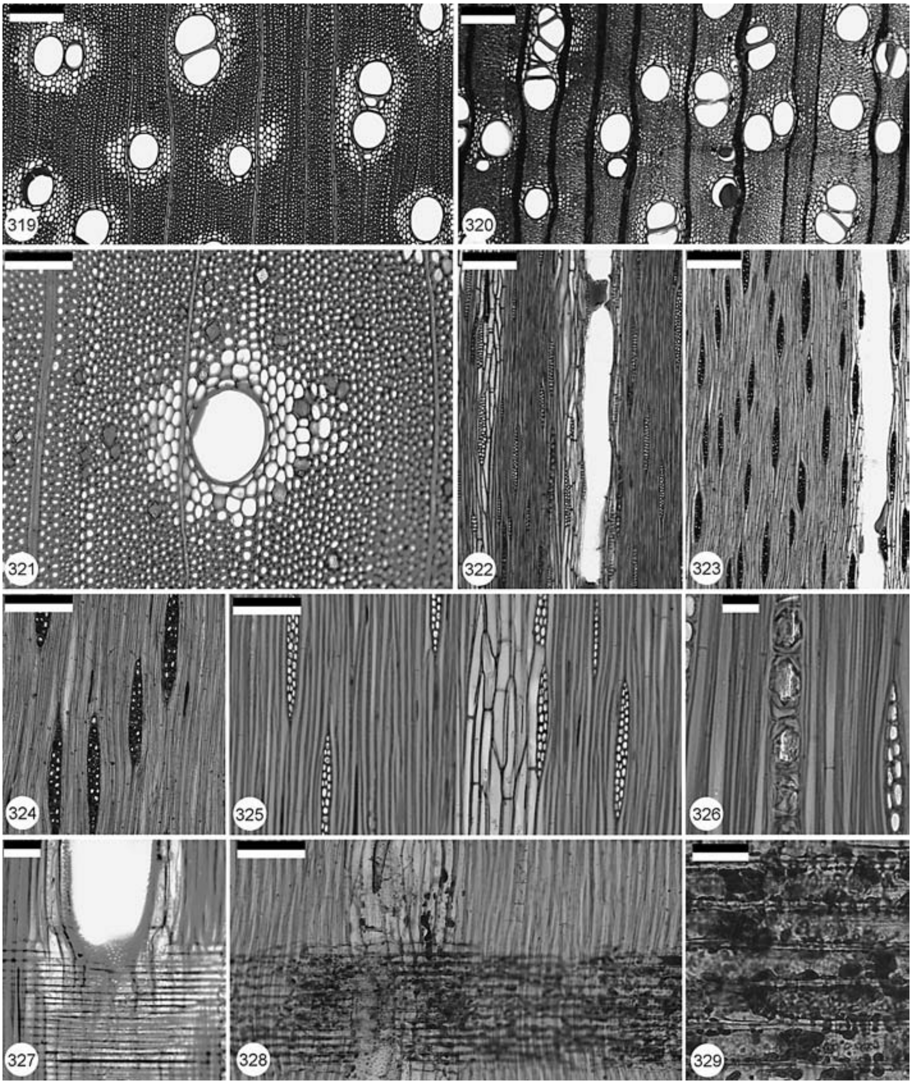

Fig. 319–329. ***Acacia*** **subg.** ***Phyllodineae*** (syn. *Racosperma* **- Acacieae**). - 319, 321, 322, 326 & 327: *Acacia auriculiformis* A. Cunn. *ex* Benth., No. 414 Botanical Gardens Singapore; 320, 323–325, 328 & 329: *Acacia richii* A. Gray, MusIV Japan. – 319–321 TS. Vessels solitary, in pairs and frequently in radial multiples. Axial parenchyma vasicentric and aliform with some confluence. Calcium oxalate crystals frequently occur in chambered axial parenchyma and fibres surrounding the edge of the aliform pattern, and are also diffusely scattered (Fig. 326). – 322–326 TLS. Rays mostly biseriate, occasionally uniseriate. Axial parenchyma in strands of 2 cells. – 327–329 RLS. Rays homocellular, often containing gum. — Scale is 200 µm for 319, 320, 322 & 323; 100 µm for 321, 324, 325 & 328; 50 µm for 327; 20 µm for 326 & 329.

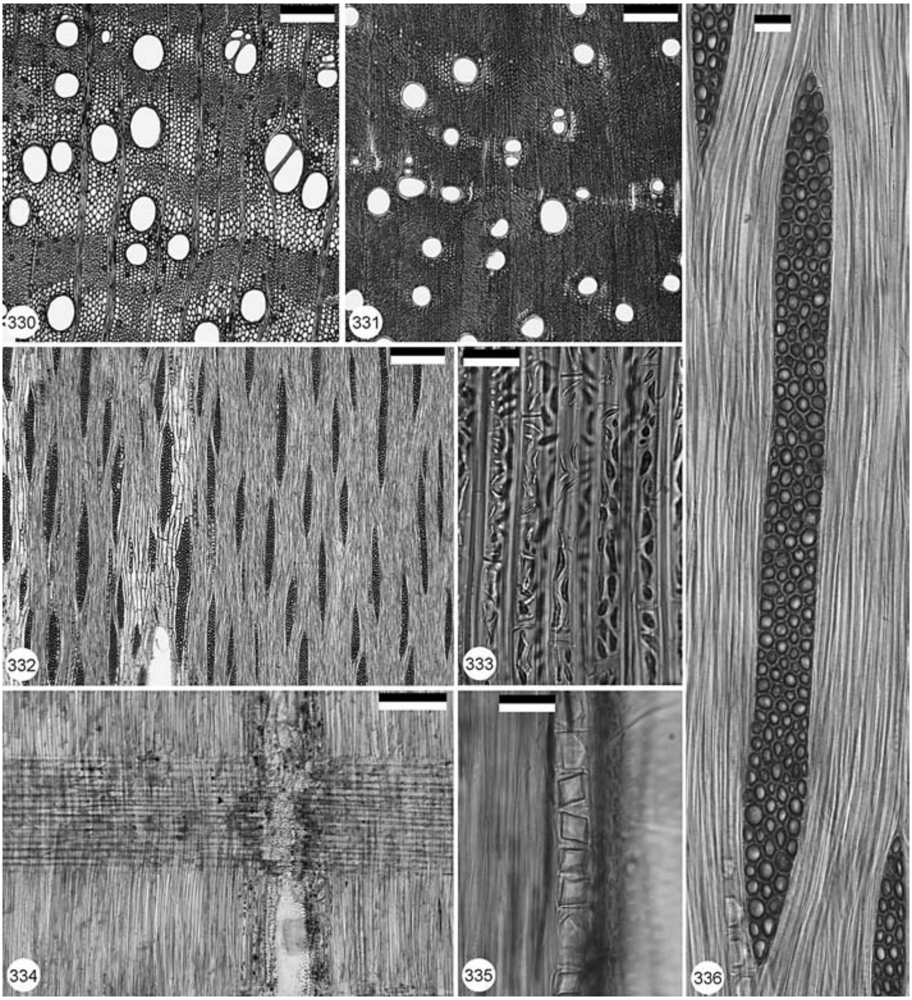

Fig. 330–336. ***Acacia* subg. *Aculeiferum* sect. *Aculeiferum*** (syn. *Senegalia* **- Acacieae**). – 330, 332, 335 & 336: *Acacia senegal* Willd., FHOw 10, Sudan; 331, 333 & 334: *Acacia picachensis* Brandegee, Honduras. – 330 & 331 TS. Growth ring boundaries indistinct (Fig. 331). Axial parenchyma aliform to confluent. – 332, 333 & 336 TLS. Rays 3–5 cells wide. Starch present in fibres (Fig. 333). – 334 & 335 RLS. Rays homocellular. Calcium oxalate crystals in chambered fibres. — Scale is 200 µm for 330–332; 100 µm for 334; 20 µm for 333, 335 & 336.

Vessels tend to be narrower than in other mimosoids and vessel frequency is high. Radial multiples are frequent to common and can form long chains. Incidence of clusters varies from rare to frequent, and intervessel pit size ranges from minute to medium (Fig. 314 & 351). Although occasionally thin-walled, fibres are predominantly medium to thick-walled (Fig. 312, 315, 331, 342 & 347). Axial parenchyma is scanty to confluent, often linking many vessels tangentially, but banding is occasional. Many species possess unusually tall rays (Fig. 346, 341, 343 & 349). Rays are mostly multiseriate (the largest being 5–9 cells wide; Fig. 343). *Acacia* subg. *Phyllodineae* (*Racosperma*; Fig. 319 & 329) has predominantly uniseriate rays, with only a couple of species having multiseriate rays. Storeying is absent, except in three species of *Acacia* subg. *Phyllodineae* (*Racosperma*), where there is irregular storeying in places. Calcium oxalate crystals are common in chambered fibres and (to a lesser degree) axial parenchyma (Fig. 321, 326, 335 & 341), with the exception of *Acacia horrida* which has crystals only in ray cells (Fig. 338–340). Other characters such as scattered idioblastic axial parenchyma cells and pith flecks (Fig. 312) are frequent, and tangential bands of crystals are common.

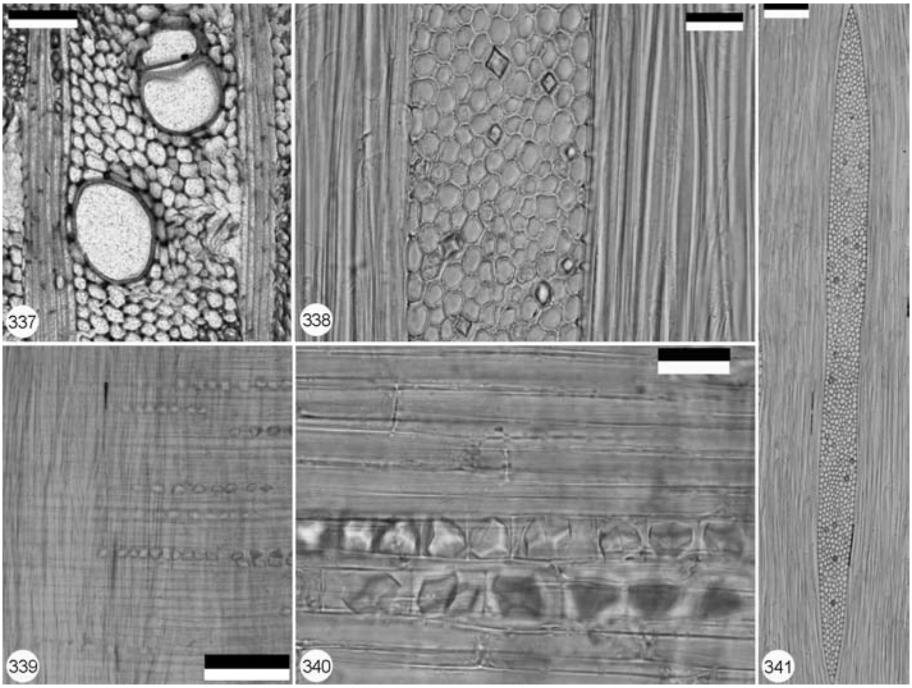

Fig. 337–341. ***Acacia horrida*** Willd., Kw 7656, Zimbabwe. (**Acacieae**). – 337 TS. – 338 & 341 TLS. Rays 5–10 cells wide, tall (Fig. 341 shows an exceptionally tall ray). Ray cells contain calcium oxalate crystals (see also RLS). – 339 & 340 RLS. Rays homocellular, cells often containing crystals in radial alignment. — Scale is 100 µm for 337 & 339; 20 µm for 338, 340 & 341.

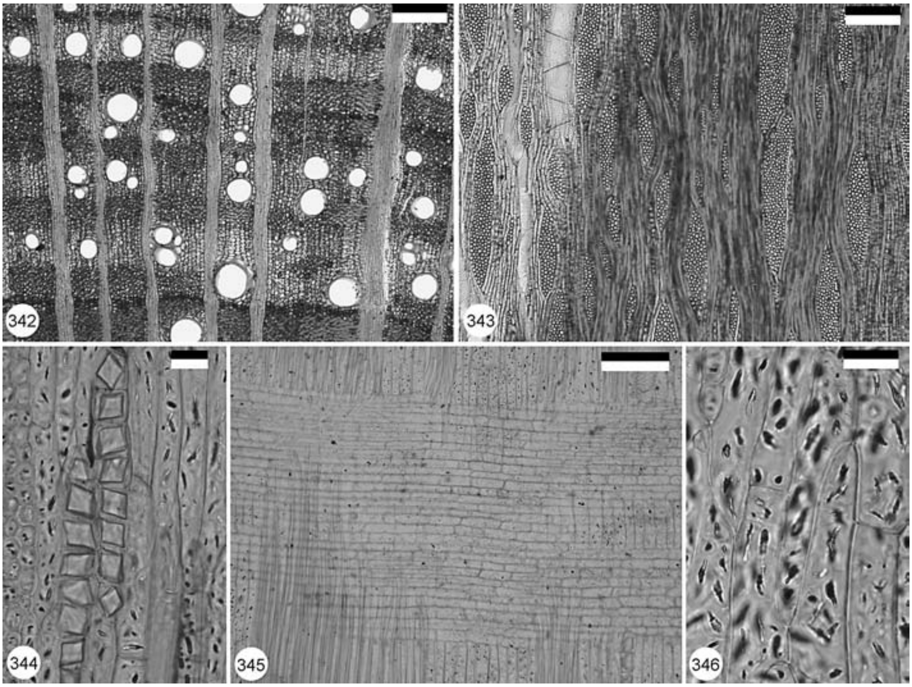

Fig. 342–346. ***Acacia nubica*** Benth., Darfur Prov., Sudan. (**Acacieae**). – 342 TS. Axial parenchyma in bands, fibres thick-walled. Vessels mainly solitary. Growth ring boundaries distinct. – 343 & 344 TLS. Rays from 3 to 10 cells wide. Crystals present in chambered axial parenchyma and fibre cells. – 345 & 346 RLS. - 345: Ray homocellular. - 346: Starch granules in axial parenchyma. — Scale is 200 µm for 342 & 343; 100 µm for 345; 20 µm for 344 & 346.

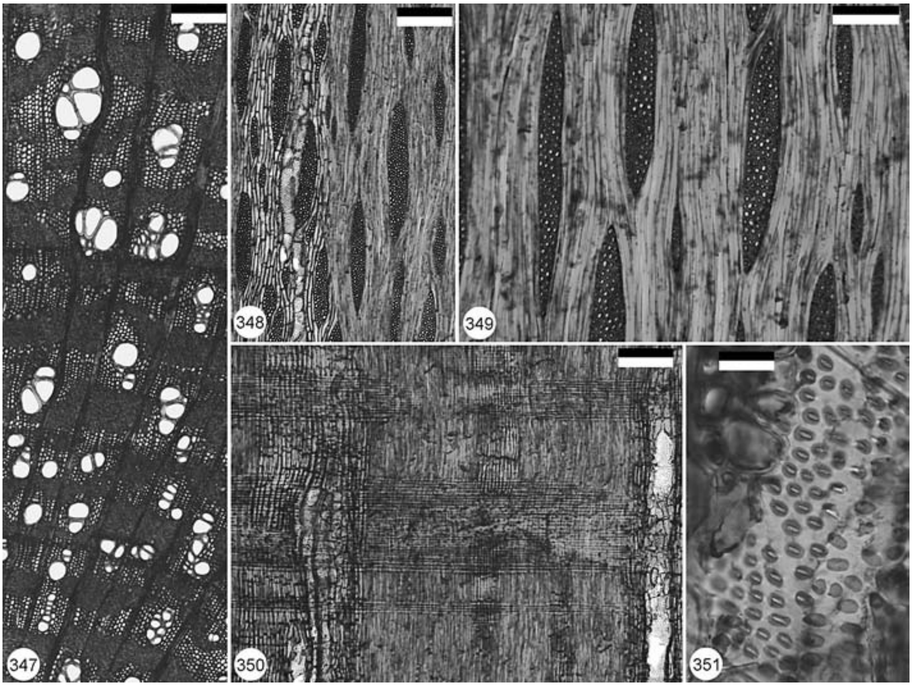

Fig. 347–351. ***Acacia tortilis*** (Forssk.) Hayne, Shak 29, Swaziland. (**Acacieae**). – 347 TS. Axial parenchyma indistinctly aliform and in irregular, discontinuous bands. Fibre walls thick. – 348 & 349 TLS. Rays 2–7 cells wide, unstoried, tall. Axial parenchyma in strands of 2–4 cells. – 350 RLS. Rays homocellular. – 351 TLS. Intervessel pitting alternate, vestured. — Scale is 200 µm for 347, 348 & 350; 100 µm for 349; 20 µm for 351.

TRIBE MIMOZYGANTHEAE

Mimozyganthus carinatus (Griseb.) Burkart was originally described in the genus *Mimosa* but given tribal status in 1939 by Burkart. There have been proposals over the years to expand the tribe to include *Dinizia* but it remains monospecific. Suggestions have been made that *Mimozyganthus* should be placed close to the Leucaena group of the Mimoseae (Luckow *et al.* 2005), and it is the opinion of Fortunato (2005) that "*there is no doubt that tribe Mimozygantheae should be disbanded.*"

No samples were available for analysis; however, Cozzo (1951) described *Mimozyganthus carinatus*. He observed distinct growth rings, small vessels at high frequency/mm^2 with the incidence of radial multiples and clusters frequent. Axial parenchyma is fairly abundant and well-developed, in bands of medium thickness (although thick concentric bands are present in the earlywood). Rays are commonly 2–4 cells wide, rarely uniseriate. Storeying is absent. Calcium oxalate crystals are very common in chambered axial parenchyma and fibre cells. Unfortunately, information about the presence of septate fibres was not given so it was not possible to place the genus in the Diagram (p. 26).

CONCLUSIONS

There is relatively little variation in the wood anatomy of the subfamily Mimosoideae; especially when comparisons are made with the Caesalpinioideae and Papilionoideae which have much more diversity (Fujii *et al.* 1994; Gasson 1994, 1996, 1999, 2000; Gasson & Webley 1999; Gasson & Wray 2001; Gasson *et al.* 2003, 2004). The wood of the Mimosoideae can be distinguished from that of the Caesalpinioideae and Papilionoideae (as observed by Baretta-Kuipers 1981), although there is a striking similarity to a few members of the Caesalpinioideae, in particular with the Dimorphandra group of tribe Caesalpinieae. It would be difficult (or impossible), however, to identify a mimosoid plant to genus based solely on its wood anatomy, especially if its geographical origin is unknown. The most useful diagnostic characters were identified as: the presence of septate fibres (which are uncommon in the other two subfamilies), distribution of axial parenchyma, especially the degree of banding, and ray width. These characters tend to be conserved within genera and also between members of the same generic group; therefore they are of taxonomic use at these levels. However, these characters are not of taxonomic value at the tribal level where there is too much variation and tribal overlap. Much of this variation (or 'noise') at the tribal level may be due to ecology and habitat, the influences of which can lead to marked differences in wood anatomy. It is important not to over-emphasise any taxonomic significance because many of the taxa appear very similar. Our survey has encompassed the range of wood anatomical variation in the mimosoids, but we have not been able to examine in detail enough of the species in some of the larger genera. The wood anatomical relationship between Mimosoideae and a small number of Caesalpinioideae in the Dimorphandra group of tribe Caesalpinieae needs to be explored. Genera that would benefit from a more detailed study would be *Acacia sensu lato*, *Mimosa*, *Calliandra* and *Albizia*. With a better understanding of taxonomic relationships amongst genera and suprageneric groups inevitable in the future it is possible that wood anatomy in the subfamily Mimosoideae might be of increased taxonomic significance at these hierarchical levels.

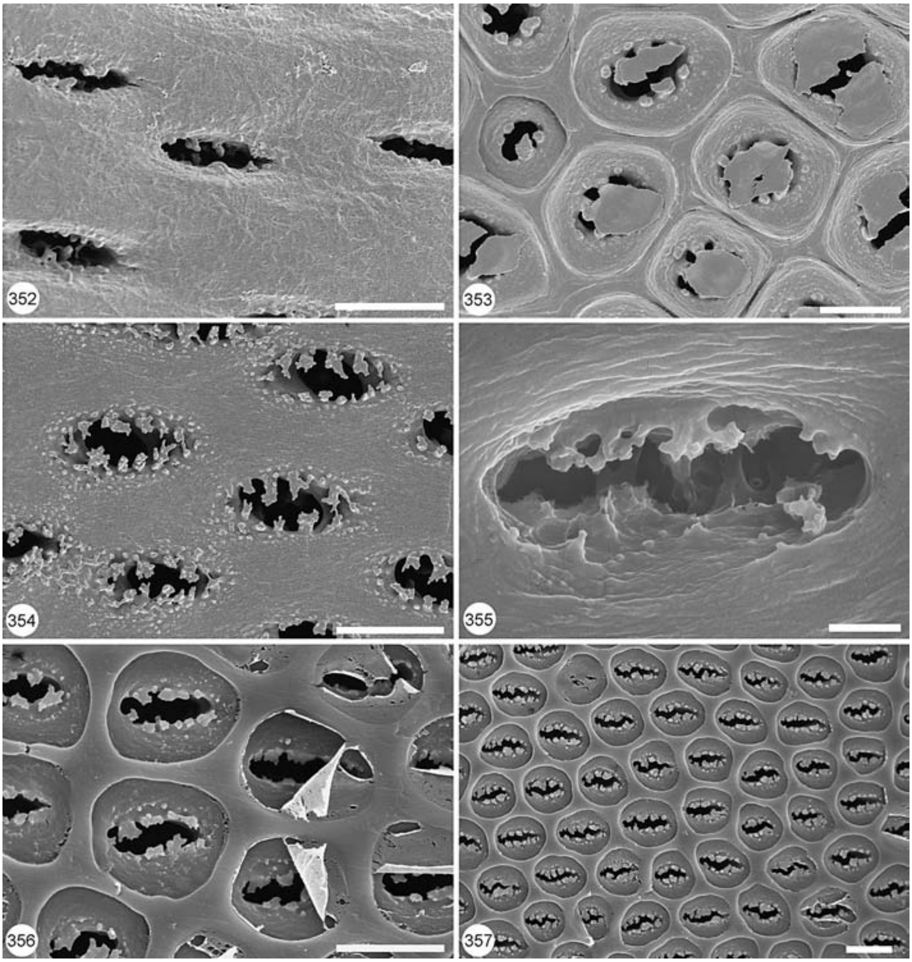

Fig. 352–357. Vestured pits in three genera from tribe Mimoseae. – 352. *Aubrevillea platycarpa* Pellegr., MADw 22098 (Aubrevillea group). – 353 & 354. *Fillaeopsis discophora* Harms, MADw 32703 (Fillaeopsis group). – 355–357. *Leucaena macrophylla* Benth., Kw 1338 (Leucaena group). – 352, 354 & 355. View of pits from lumen side of vessel. – 353, 356 & 357. View of pits in outer vessel wall (*i.e.* middle lamella side). — Scale is 5 µm for 352–354, 356 & 357; 1 µm for 355.

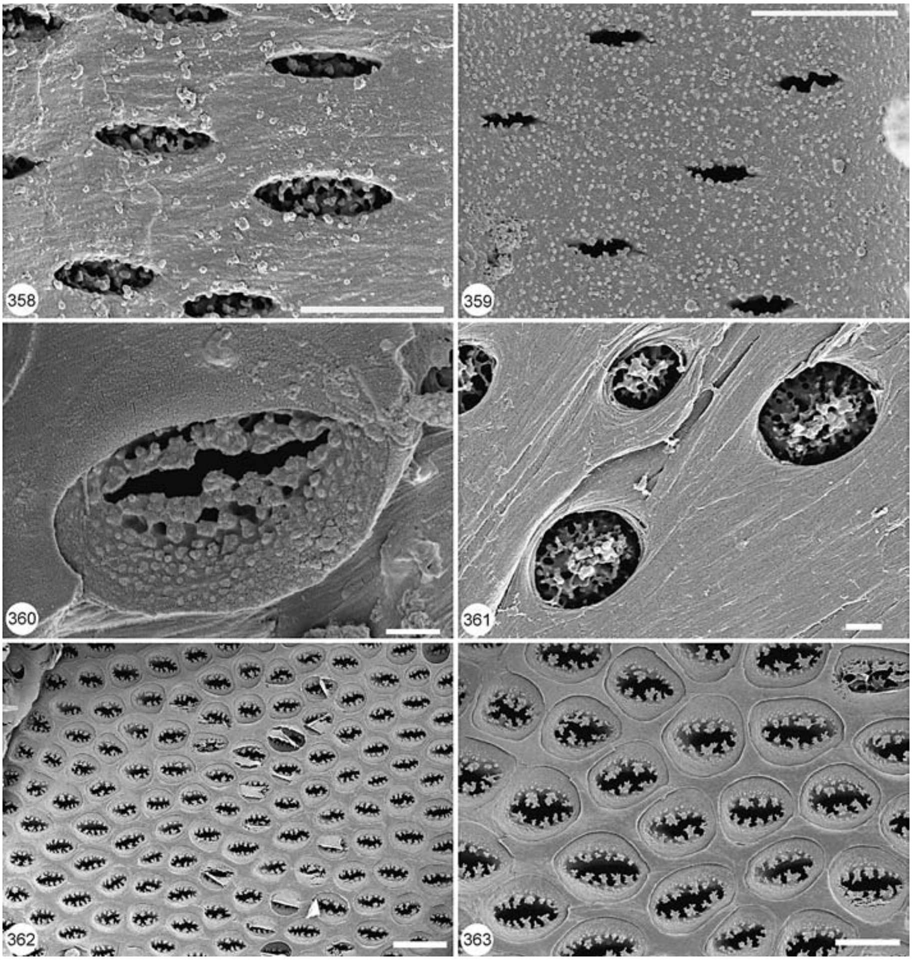

Fig. 358–363. Vestured pits in four genera from tribe Ingeae and one species from tribe Acacieae. – 358. *Archidendron borneense* (Benth.) I.C. Nielsen, Kw 74648 (Inga alliance - Ingeae). – 359. *Calliandra foliolosa* Benth. (syn. *Calliandra sancti-pauli* Hassk.), Kw 7959 (Inga alliance - Ingeae) – 360. *Havardia pallens* (Benth.) Britton & Rose, MADw 10179 (Pithecellobium alliance - Ingeae). – 361. *Pithecellobium microcarpum* Benth., Kw 8155 (Pithecellobium alliance - Ingeae). – 362 & 363. *Acacia senegal* Willd. (*Acacia* subg. *Aculeiferum,* syn. *Senegalia* - Acacieae), FHOw 10, Honduras. – 358 & 359. View of pits from lumen side of vessel. – 360–363. View of pits in outer vessel wall (*i.e.* middle lamella side). — Scale is 10 µm for 362; 5 µm for 358, 359 & 363; 1 µm for 360 & 361.

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REFERENCES

Alston, A.S. 1982. Timbers of Fiji: properties and potential uses. Department of Forestry, Suva, Fiji.

Babos, K. & L.J.C. Cumana. 1992. Xylotomical study of some Venezuelan tree species (Mimosaceae I–IV). Acta Bot. Hung. 37: 183–238.

Banks, H. & P. Gasson. 2000. Pollen morphology and wood anatomy of the Crudia group (Leguminosae, Caesalpinioideae, Detarieae). Bot. J. Linnean Soc. 134: 19–59.

Barajas-Morales, J. 1985. Wood structural differences between trees of two tropical forests in Mexico. IAWA Bull. n.s. 6: 355–364.

Barajas-Morales, J. & C.L. Gomez. 1989. Anatomia de maderas de Mexico: especies de una selva baja caducifolia. Universidad Nacional Autónoma de México.

Baretta-Kuipers, T. 1973. Some aspects of wood anatomical research in the genus *Inga* (Mimosaceae) from the Guianas and especially Suriname. Acta. Bot. Neerl. 22: 193–205.

Baretta-Kuipers, T. 1981. Wood anatomy of Leguminosae: its relevance to taxonomy. In: R.M. Polhill & P.H. Raven (eds.), Advances in Legume Systematics 2: 677–705. Royal Botanic Gardens, Kew.

Barneby, R.C. 1989. Volume 3b: Fabales. In: A. Cronquist (ed.), Intermountain flora: vascular plants of the intermountain west, USA. New York Botanical Gardens.

Barneby, R.C. & J.W. Grimes. 1996. Silk tree, guanacaste, monkey's earring: a generic system for the synandrous Mimosaceae of the Americas: part 1. *Abarema, Albizia* and allies. Mem. New York Bot. Gard. 74 (1). New York.

Barneby, R.C. & J.W. Grimes. 1997. Silk tree, guanacaste, monkey's earring: a generic system for the synandrous Mimosaceae of the Americas: part 2. *Pithecellobium, Cojoba* and *Zygia*. Mem. New York Bot. Gard. 74 (2). New York.

Barros, C.F. & C.H. Callado. 1997. Timbers of the Atlantic rainforest: wood anatomy of species from remnant forests in Rio de Janeiro State, Brazil. Vol. I. Jardim Botanico de Rio de Janeiro.

Berti, R.N. & M.L.E. Edlmann Abbate. 1988. Legnami tropicali importati in Italia: anatomia e identificazione. Volume I: Africa. Ribera Editore-Milano.

Brazier, J.D. 1958. The anatomy of some timbers formerly included in *Piptadenia*. Tropical Woods 108: 46–64.

Brazier, J.D. & G.L. Franklin. 1961. Identification of hardwoods: a microscopic key. For. Prod. Res. Bull. No. 46. London.

Bruneau, A., F. Forest, P.S. Herendeen, B.B. Klitgaard & G.P. Lewis. 2001. Phylogenetic relationships in the Caesalpinioideae (Leguminosae) as inferred from chloroplast trnL intron sequences. Syst. Bot. 26: 487–514.

Cassens, D.L. & R.B. Miller. 1981. Wood anatomy of the new world *Pithecellobium* (sensu lato). J. Arnold Arbor. 62: 1–44.

Chappill, J.A. & B.R. Maslin. 1995. A phylogenetic assessment of tribe Acacieae. In: M. Crisp & J.J. Doyle (eds.), Advances in Legume Systematics 7, Phylogeny: 77–99. Royal Botanic Gardens, Kew.

Chauan, L. & R. Vijendra Rao. 2003. Wood anatomy of legumes of India: their identification, properties and uses. Bishen Singh Mahendra Pal Singh, India.

Cheng, J.Q. 1980. Chinese tropical and sub-tropical timbers: their distinction, properties and application. Institute of Timber Industry, Chinese Academy of Forestry.

Cozzo, D. 1951. Anatomia del leño secundario de las leguminosas mimosoideas y caesalpinioideas Argentinas. Revista del Instituto Nacional de Investigation de las Ciencias Naturales "Bernardino Rivadavia" Ci. Bot. 2: 63–146.

Cutler, D.F. 1969. The vegetative anatomy of *Acacia albida* Del. Kew Bull. 23: 203–208.

Détienne, P. & P. Jacquet. 1983. Atlas des bois de l'Amazonie. Centre Technique Forestier Tropical, France.

Détienne, P., P. Jacquet & A. Mariaux. 1982. Manuel d'identification des bois tropicaux. Tome 3: Guyane Française. Centre Technique Forestier Tropical, France.

Doyle, J.J., J.A. Chappill, D.C. Bailey & T. Kajita. 2000. Towards a comprehensive phylogeny of legumes: evidence from rbcL sequences and non-molecular data. In: P.S. Herendeen & A. Bruneau (eds.), Advances in Legume Systematics 9: 1–20. Royal Botanic Gardens, Kew.

Elias, T.S. 1981a. Mimosoideae. In: R.M. Polhill & P.H. Raven (eds.), Advances in Legume Systematics 1: 143–151. Royal Botanic Gardens, Kew.

Elias, T.S. 1981b. Parkieae. In: R.M. Polhill & P.H. Raven (eds.), Advances in Legume Systematics 1: 153. Royal Botanic Gardens, Kew.

Elias, T.S. 1981c. Mimozygantheae. In: R.M. Polhill & P.H. Raven (eds.), Advances in Legume Systematics 1: 154. Royal Botanic Gardens, Kew.

Ella, A.B. 2000. Stem anatomy of some important Philippine forest woody vines. In: Y.S. Kim (ed.), New horizons in wood anatomy. Chonnam National University Press, Kwangju.

Fahn, A., E. Werker & P. Baas. 1986. Wood anatomy and identification of trees and shrubs from Israel and adjacent regions. The Israel Academy of Sciences and Humanities, Jerusalem.

Fasolo, U., M.L. Edlmann Abbate & G.C. Cellai. 1963. Atlante micrografico del legni dell'Africa Orientale Italiana. Erbario coloniale, Florence.

Fortunato, R.H. 2005. Tribe Mimozygantheae. In: G. Lewis, B. Schrire, B. Mackinder & M. Lock (eds.), Legumes of the world: 184–185. Royal Botanic Gardens, Kew.

Fouarge, J & G. Gérard. 1964. Bois du Mayumbe. Publ. Inst. Nat. Etude Agron. du Congo, Bruxelles.

Fujii, T., P. Baas, P. Gasson & J.W.A. Ridder-Numan. 1994. Wood anatomy of the *Sophora* group (Leguminosae). In: I.K. Ferguson & S.C. Tucker (eds.), Advances in Legume Systematics 6, Structural Botany: 205–249. Royal Botanic Gardens, Kew.

Gasson, P. 1994. Wood anatomy of the tribe Sophoreae and related Caesalpinioideae and Papilionoideae. In: I.K. Ferguson & S. Tucker (eds.), Advances in Legume Systematics 6, Structural Botany: 165–203. Royal Botanic Gardens, Kew.

Gasson, P. 1996. Wood anatomy of the tribe Swartzieae with comments on related Papilionoid and Caesalpinioid Leguminosae. IAWA J. 17: 45–75.

Gasson, P. 1997. Wood and bark anatomy. In: T.D. Pennington, The genus *Inga*: 9–30. Royal Botanic Gardens, Kew.

Gasson, P. 1999. Wood anatomy of the tribe Dipterygeae with comments on related Papilionoid and Caesalpinioid Leguminosae. IAWA J. 20: 361–375.

Gasson, P. 2000. Does wood anatomy support tribal and generic classification in papilionoid Leguminosae? In: P.S. Herendeen & A. Bruneau (eds.), Advances in Legume Systematics 9: 201–215. Royal Botanic Gardens, Kew.

Gasson, P., P. Jarvis & W. Page. 1998. Wood anatomy of 12 species with potential for reintroduction on Round Island, Mauritius. IAWA J. 19: 393–413.

Gasson, P., C. Trafford & B. Matthews. 2003. Wood anatomy of the Caesalpinioideae. In: B.B. Klitgaard & A. Bruneau (eds.), Advances in Legume Systematics 10, Higher Level Systematics: 63–93. Royal Botanic Gardens, Kew.

Gasson, P. & P. Webley. 1999. Wood anatomy of *Exostyles venusta* (Swartzieae, Papilionoideae, Leguminosae). IAWA J. 20: 1–8.

Gasson, P. & E.J. Wray. 2001. Wood anatomy of *Cyathostegia mathewsii*. IAWA J. 22: 193–199.

Gasson, P., E.J. Wray & B. Schrire. 2004. Wood anatomy of the tribe Millettieae with comments on related Papilionoid Leguminosae. IAWA J. 25: 485–545.

Gill, L.S., J.E. Onuja & S.W.H. Husaini. 1983. Observations on the tracheary elements of some Nigerian leguminous woods. Legume Research 6: 9–17.

Gregory, M. 1994. Bibliography of systematic wood anatomy of dicotyledons. IAWA Journal, Supplement 1.

Grimes, J. 1995. Generic relationships of Mimosoideae tribe Ingeae, with emphasis on the New World *Pithecellobium*-complex. In: M. Crisp & J.J. Doyle (eds.), Advances in Legume Systematics 7: Phylogeny: 101–121. Royal Botanic Gardens, Kew.

Harris, S.A., C.E. Hughes, R. Ingram & R.J. Abbott. 1994. A phylogenetic analysis of *Leucaena* (Leguminosae: Mimosoideae). Plant Systematics and Evolution 191: 1–26.

Herendeen, P.S. 2000. Structural evolution in the Caesalpinioideae (Leguminosae). In: P.S. Herendeen & A. Bruneau (eds.), Advances in Legume Systematics 9: 45–64. Royal Botanic Gardens, Kew.

Herendeen, P.S., G.P. Lewis & A. Bruneau. 2003. Floral morphology in Caesalpinioid legumes: testing the monophyly of the “Umtiza clade”. Int. J. Pl. Sci. 164: 393–407.

Hernandez, H.M. 1986. *Zapoteca*: a new genus of neotropical Mimosoideae. Ann. Missouri Bot. Gard. 73: 755–763.

Hernandez, H.M. & Ph. Guinet. 1990. *Calliandropsis*: a new genus of legume from Mexico. Kew Bull. 45: 609–620.

Höhn, A. 1999. Wood anatomy of selected West African species of Caesalpinioideae and Mimosoideae (Leguminosae): a comparative study. IAWA J. 20: 115–146.

Hopkins, H.C.F. 1986. Monograph 43, Parkia (Leguminosae: Mimosoideae). Flora Neotropica, New York Botanical Garden, New York.

Hughes, C.E., C.D. Bailey, S. Krosnick & M.A. Luckow. 2003. Relationships among genera of the informal Dichrostachys and Leucaena groups (Mimosoideae) inferred from nuclear ribosomal ITS sequences. In: B.B. Klitgaard & A. Bruneau (eds.), Advances in Legume Systematics 10, Higher Level Systematics: 221–238. Royal Botanic Gardens, Kew.

Ilic, J. 1991. CSIRO Atlas of hardwoods. Springer-Verlag, Australia.

InsideWood. 2004–onwards. Published on the Internet. http://insidewood/ lib.ncsu.edu/search (January 2006).

Itoh, T. 1997. Anatomical descriptions of Japanese hardwood III. Wood Research and Technical Notes 33: 83–201.

Jagiella, C. & H. Kürschner. 1987. Atlas der Hölzer Saudi Arabiens. Dr. Ludwig Reichert Verlag, Wiesbaden.

Jansen, S., P. Kitin, H. De Pauw, M. Idris, H. Beeckman & E. Smets. 1998. Preparation of wood specimens for transmitted light microscopy and scanning electron microscopy. Belgian J. Bot. 131: 41–49.

Kanehira, R. 1921. Anatomical characters and identification of Formosan woods with critical remarks from the climatic point of view. Govt. of Formosa, Taihoku.

Kribs, D.A. 1928. The Persaud collection of British Guiana woods. Tropical Woods 13: 7–46.

Kribs, D.A. 1959. Commercial foreign woods on the American market. Edwards Brothers Inc., Ann Arbor, Michigan.

Lebacq, L. 1957. Atlas anatomique des bois du Congo Belge, Vol. 3. Publ. Inst. Nat. Etude Agron. du Congo, Bruxelles.

Lemmens, R.H.M.J., I. Soerianegara & W.C. Wong (eds.). 1995. Plant resources of South-east Asia (PROSEA). No. 5 (2) Minor commercial timbers. Backhuys Publishers, Leiden.

Lewis, G.P. 2005. Tribe Acacieae. In: G. Lewis, B. Schrire, B. Mackinder & M. Lock (eds.), Legumes of the world: 187–191. Royal Botanic Gardens, Kew.

Lewis, G.P. & T.S. Elias. 1981. Mimoseae. In: R.M. Polhill & P.H. Raven (eds.), Advances in Legume Systematics 1: 155–168. Royal Botanic Gardens, Kew.

Lewis, G.P. & L. Rico Arce. 2005. Tribe Ingeae. In: G. Lewis, B. Schrire, B. Mackinder & M. Lock (eds.), Legumes of the world: 193–213. Royal Botanic Gardens, Kew.

Lewis, G., B. Schrire, B. Mackinder & M. Lock (eds.). 2005. Legumes of the world. Royal Botanic Gardens, Kew.

Lindeman, J.C., A.M.W. Mennega & W.H. Hekking. 1963. Bomenboek voor Suriname. Uitgave Dienst 's Lands Bosbeheer Suriname, Paramaribo.

Lorence, D.H. & D. Wood. 1994. *Kanaloa*: a new genus from Hawaii. Novon 4: 137–145.

Luckow, M. 1995. A phylogenetic analysis of the Dichrostachys group (Mimosoideae: Mimoseae). In: M.D. Crisp & J.J. Doyle (eds.), Advances in Legume Systematics 7: Phylogeny: 63–76. Royal Botanic Gardens, Kew.

Luckow, M. 2005. Tribe Mimoseae. In: G. Lewis, B. Schrire, B. Mackinder & M. Lock (eds.), Legumes of the world:163–183. Royal Botanic Gardens, Kew.

Luckow, M., R.H. Fortunato, S.H. Sede & T. Livschultz. 2005. The phylogenetic affinities of two mysterious monotypic mimosoids from Southern South America. Systematic Botany 30 (3): 585–602.

Luckow, M., J.T. Miller, D.J. Murphy & T. Livschultz. 2003. A phylogenetic analysis of the Mimosoideae (Leguminosae) based on chloroplast DNA sequence data. In: B.B. Klitgaard & A. Bruneau (eds.), Advances in Legume Systematics 10, Higher Level Systematics: 197–220. Royal Botanic Gardens, Kew.

Luckow, M., P.J. White & A. Bruneau. 2000. Relationships among the basal genera of mimosoid legumes. In: P.S. Herendeen & A. Bruneau (eds.), Advances in Legume Systematics 9: 165–180. Royal Botanic Gardens, Kew.

Mainieri, C. & J.P. Chimelo. 1989. Fichas de caracteristicas das madeiras Brasileiras. CRM-Publicaçoes, Brazil.

Mainieri, C., J.P. Chimelo. & V.A. Alfonso. 1983. Manual de identificação das principais madeiras comerciais brasileiras. Companhia de Promoção de Pesquisa Científica e Technológica do estado de São Paulo.

Mallque, M.A. & Y. Kikata. 1994. Atlas of Peruvian woods. National Agrarian University, La Molina, Peru & Nagoya University, Japan.

Martawijaya, A., I. Kartasujana, Y.I. Mandang, S.A. Prawira & K. Kadir, K. 1989. Atlas Kayu Indonesia, Vol. II. Departemen Kehuanan Badan Penelitan dan Pengembangan Kehutanan Bogor, Indonesia.

Maslin, B.R., J.T. Miller & D.S. Seigler. 2003. Overview of the generic status of *Acacia* (Leguminosae, Mimosoideae). Austr. Syst. Bot. 16: 1–18.

Mattos-Filho, A. 1989. Estudo morfológico da madeira do par de espécies vicariantes de *Pithecellobium anajuliae* Rizz. e *Pithecellobium tortum* Mart. (Leguminosae–Mimosoideae). Rev. Brasil. Biol. 48: 143–154.

Miller, J.T. & R.J. Bayer. 2000. Molecular phylogenetics of *Acacia* (Fabaceae: Mimosoideae) based on the chloroplast trnK and nuclear histone H3-D DNA sequences. In: P.S. Herendeen & A. Bruneau (eds.), Advances in Legume Systematics 9: 181–200. Royal Botanic Gardens, Kew.

Miller, J.T. & R.J. Bayer. 2003. Molecular phylogenetics of *Acacia* subgenera *Acacia* and *Aculeiferum* (Fabaceae: Mimosoideae) based on the chloroplast matK coding sequence and flanking trnK intron spacer regions. Austr. Syst. Bot. 16: 27–33.

Miller, J.T., J.W. Grimes, D.J. Murphy, R.J. Bayer & P.Y. Ladiges. 2003. A phylogenetic analysis of the Acacieae and Ingeae (Mimosoideae: Fabaceae) based on trnK, matK, psbA-trnH, and trnL/trnF sequence data. Syst. Bot. 28: 558–566.

Miller, R.B. 1989. Wood anatomy of *Obolinga* (Mimosaceae). Brittonia 41: 178–182.

Miller, R.B & P. Détienne. 2001. Major timber trees of Guyana: wood anatomy. Tropenbos International, Wageningen, The Netherlands.

Neumann, K., W. Schoch, P. Détienne & F.H. Schweingruber. 2000. Woods of the Sahara and the Sahel: an anatomical atlas. Birmensdorf, Eidg. Forschungsanstalt WSL. Haupt, Bern, Stuttgart, Wien.

Nielsen, I. 1981. Ingeae. In: R.M. Polhill & P.H. Raven (eds.), Advances in Legume Systematics 1: 173–190. Royal Botanic Gardens, Kew.

Nielsen, I. & T. Baretta-Kuipers. 1984. The genus *Archidendron* (Leguminosae–Mimosoideae). Opera Bot. 76: 1–120.

Nielsen, I., Ph. Guinet & T. Baretta-Kuipers. 1983. Studies in the Malesian, Australian and Pacific Ingeae (Leguminosae–Mimosoideae): the genera *Archidendropsis, Wallaceodendron, Paraserianthes, Pararchidendron* and *Serianthes* (part I). Adansonia 3: 303–329.

Normand, D. & J. Paquis. 1976. Manuel d'identification des bois commerciaux. 2: Afrique guinéo-congolaise. Centre Technique Forestier Tropical, France.

Olver, C. 1996. Wood anatomy of the *Pithecellobium* complex: a sampling. Thesis (MSc; unpublished). University of Reading.

Orchard, A.E. & B.R. Maslin. 2003. Proposal to replace the name *Acacia* (Leguminosae, Mimosoideae) with a conserved type. Taxon 52: 362–363.

Parsa Pajaih, D. & F.H. Schweingruber. 1985. Atlas des bois du nord de l'Iran. Institut Féderal de Recherches Forestières, Birmensdorf, Suisse.

Pearson, R.S. & H.P. Brown. 1932. Commercial timbers of India. Govt. of India Central Publication Branch, Calcutta.

Pedley, L. 1986. Derivation and dispersal of *Acacia* (Leguminosae) with particular reference to Australia, and the recognition of *Senegalia* and *Racosperma*. Bot. J. Linnean Soc. 132: 219–254.

Pedley, L. 1987. In defence of *Racosperma*. Bulletin of the International Group for the Study of the Mimosoideae 9: 42–48.

Peh, T.B. & K.C. Khoo. 1984. Timber properties of *Acacia mangium, Gmelina arborea, Paraserianthes falcataria* and their utilisation aspects. The Malaysian Forester 47: 285–303.

Pennington, T.D. 1997. The genus *Inga*. Royal Botanic Gardens, Kew.

Polhill, R.M. 1981. Papilionoideae. In: R.M. Polhill & P.H. Raven (eds.), Advances in Legume Systematics 1: 191–204. Royal Botanic Gardens, Kew.

Polhill, R.M. 1994. Complete synopsis of legume genera. In: Phytochemical dictionary of the Leguminosae, Vol. 1: xlix–lvi. ILDIS (International Legume Database and Information Service) and CHCD (Chapman and Hall Chemical Database). Chapman & Hall, London.

Polhill, R.M., P.H. Raven & C.H. Stirton. 1981. Evolution and systematics of the Leguminosae. In: R.M. Polhill & P.H. Raven (eds), Advances in Legume Systematics 1: 1–26. Royal Botanic Gardens, Kew.

Prior, J.A.B. & P.E. Gasson. 1990. Comparative wood anatomy of Afromontane and Bushveld species from Swaziland, South Africa. IAWA Bull. n.s. 11: 319–336.

Quirk, J.T. 1983. Data for a computer-assisted wood identification system. I: Commercial legumes of tropical Asia and Australia. IAWA Bull. n.s. 4: 118–130.

Ramesh Rao, K. & S.K. Purkayastha. 1972. Indian woods: their identification, properties and uses. Vol. III (Leguminosae to Combretaceae). Dehra Dun, India.

Record, S.J. & R.W. Hess. 1943. Timbers of the New World. Yale University Press.

Record, S.J. & C.D. Mell. 1924. Timbers of tropical America. Yale University Press, New Haven.

Robinson, J. & S.A. Harris. 2000. A plastid DNA phylogeny of the genus *Acacia* Miller (Acacieae, Leguminosae). Bot. J. Linnean Soc. 132: 195–222.

Schrire, B.D., M. Lavin & G.P. Lewis. 2005. Global distribution patterns of the Leguminosae: insights from recent phylogenies. Biol. Skr. 55: 375–122.

Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1993. Plant resources of South-east Asia (PROSEA). No. 5 (1) Major commercial timbers. Backhuys Publishers, Leiden.

Sosef, M.S.M., L.T. Hong & S. Prawirohatmodjo (eds.). 1998. Plant resources of South-east Asia (PROSEA). No. 5 (3) Lesser known timbers. Backhuys Publishers, Leiden.

Stern, W.L. 1988. Index xylariorum: Institutional wood collections of the world. IAWA Bull. n.s. 9: 203–252.

Sudo, S. 1998. Timbers from tropical South east Asia. Chikyusha, Japan.

Tanaka, S. & I. Bernard. 1995. Wood anatomy and identification of legume timbers (Leguminosae) in Sabah. FRC Research Papers, No. 1. Forest Department, Sabah, Malaysia.

Tortorelli, L.A. 1956. Maderas y bosques Argentinos. Editorial ACME, S.A.C.I., Buenos Aires.

Vassal, J. 1981. Acacieae. In: R.M. Polhill & P.H. Raven (eds.), Advances in Legume Systematics 1: 169–172. Royal Botanic Gardens, Kew.

Verdcourt, B. 1977. New taxa of Leguminosae from New Guinea. Kew Bull. 32: 225–251.

Villagra, P.E. & F.A. Roig Juñent. 1997. Wood structure of *Prosopis alpataco* and *P. argentina* growing under different edaphic conditions. IAWA J. 18: 37–51.

Villiers, J.F. 1989. *Lemurodendron*, genre nouveau de Léguminosae de Madagascar. Bull. Mus. Nat. Hist. Nat. B, Adansonia 11: 3–10.

Villiers, J.F. 1994. *Alantsilodendron*, a new genus of Leguminosae–Mimosoideae from Madagascar. Bull. Mus. Nat. Hist. Nat. B, Adansonia 16: 65–70.

Wheeler, E.A., P. Baas & P.E. Gasson. 1989. IAWA list of microscopic features for hardwood identification. IAWA Bull. n.s. 10: 219–332.

Williams, L. 1936. Woods of Northeastern Peru. Field Museum of Natural History, Chicago.

Appendix — Collection details of material examined.

Species	Name on slide (if different)	Slide details	Slide coll. no.
TRIBE MIMOSEAE			
Adenanthera bicolor Moon		Kw 7827, Malaya	26333
Adenanthera microsperma Teijsm.		Kw 7832, Java	26344
Adenanthera pavonina L.		Imp. For. Inst. Oxf. 1996	19280
Adenanthera pavonina L.		Burma, 11400	19282
Adenanthera pavonina L.		Singapore, 13-1924	19284
Adenanthera pavonina L.		SJRw 880	19283
Adenanthera pavonina L.		Trop. Asai Imp. Inst. 67-1929	19281
Amblygonocarpus andongensis (Oliver) Exell & Torre	*Amblygonocarpus obtusangulus* (Oliver) Harms	N. Rhodesia, FHOw 18227	19328
Calpocalyx aubrevillei Pellegr.		Kw 7960, Kambui Forest Reserve	26341
Calpocalyx brevibracteatus Harms		Gold Coast, No. 1361	19337
Calpocalyx brevibracteatus Harms		K-1361, Ghana	19339
Calpocalyx dinklagei Harms		Kw 7961, Cameroons	26339
Calpocalyx heitzii Pellegr.		Spanish Guinea, Inst. For. Lab. Anat., Madrid, 1970	19340
Tetrapleura tetraptera (Schum. & Thonn.) Taubert		Uganda, For. Dept. (D541)	19679
Tetrapleura tetraptera (Schum. & Thonn.) Taubert		Nigeria, 5175	19680
Xylia evansii Hutch.		Sierra Leone, Jordan, 2031	19688
Xylia evansii Hutch.		Gold Coast, 1945	19687
Xylia xylocarpa (Roxb.) Taubert	*Xylia dolabriformis* Benth.	A. Howard's coll., No. 611, India	19683
Xylia xylocarpa (Roxb.) Taubert	*Xylia dolabriformis* Benth.	India	19685
Xylia xylocarpa (Roxb.) Taubert	*Xylia dolabriformis* Benth.	Indo-China, Garlick, 1959	19686
Xylia xylocarpa (Roxb.) Taubert	*Xylia dolabriformis* Benth.	Gamble's coll., India	19682
Xylia xylocarpa (Roxb.) Taubert	*Xylia dolabriformis* Benth.	India, Gamble 12	19682
Aubrevillea kerstingii (Harms) Pellegrin		SJRw 17062	26349
Aubrevillea platycarpa Pellegrin		MADw 22098	26348
Cylicodiscus gabunensis Harms		K-891, Ghana	19348
Cylicodiscus gabunensis Harms		Gold Coast	19349
Dichrostachys cinerea (L.) Wight & Arn.		Swaziland, J. Prior, Shak 10	19352
Dichrostachys cinerea (L.) Wight & Arn.		India, D4447, Gamble, 12.1902	19351
Dichrostachys cinerea (L.) Wight & Arn.		Swaziland, J. Prior, ADH 6.9.90	19350
Dichrostachys cinerea (L.) Wight & Arn.	*Dichrostachys nutans* (Pers.) Benth.	FHOw 5660, Uganda	19395
Gagnebina pterocarpa Baill.		Mauritian Wildlife Fund, No. 5, PQJ 20	19405
Gagnebina pterocarpa Baill.		Madagascar, Kw 2156	19406
Dinizia excelsa Ducke		British Guiana, IFI 11533	19397

Species	Name on slide (if different)	Slide details	Slide coll. no.
Dinizia excelsa Ducke		Kw 2119, British Guiana	19398
Elephantorrhiza burkei Benth.		PSB 1998, 1983-4631	19399
Entada abyssinica Steud. *ex* A. Rich.		Tanzania, Kw 7978	14717
Entada gigas (L.) Fawcett & Rendle	*Entada scandens* (L.) Benth.	India, Kw 7986	15244
Entada mannii (Oliver) Tisser		Tanzania, Kw 7980	15243
Entada phaseoloides (L.) Merr.		Malaya, Kw 21695	14715
Entada phaseoloides (L.) Merr.		Borneo, Kw 7984	14723
Entada rheedii Spreng.		Sierra Leone, Shak 95	19941
Entada rheedii Spreng.		Brunei, Kw 74557	14716
Fillaeopsis discophora Harms		MADw 32703	26350
Fillaeopsis discophora Harms		MADw 25768	
Leucaena collinsii Britton & Rose		Guatemala, Kw 1365	19532
Leucaena confertiflora S. Zárate		Mexico, Kw 1319	19533
Leucaena confertiflora S. Zárate		Mexico, Kw 1321	19534
Leucaena diversifolia (Schldl.) Benth.		Oaxaca, Mexico, Kw 1310	19535
Leucaena diversifolia (Schldl.) Benth.		El Salvador, Kw 1233	19536
Leucaena esculenta (Sessé & Moc. *ex* DC.) Benth.		Mexico, FHOw 1511, 1991	19537
Leucaena macrophylla Benth.		var *helsonii*, Oaxaca, Mexico, Kw 1338	19540
Leucaena pallida Britton & Rose	*Leucaena esculenta* (Sessé & Moc. *ex* DC.) Benth. subsp. *paniculata*	Guaje Puebla, Kw 1327	19538
Leucaena shannonii J.D. Smith		El Salvador, Kw 1248	19539
Leucaena trichodes (Jacq.) Benth.		W-16520, USNM	19541
Newtonia buchananii (Baker) G. Gilbert & Boutique		Nyasaland	19552
Newtonia duparquetiana (Baillon) Keay		Cameroon, PSB 1998	19553
Pentaclethra macroloba Kuntze		Kw 8083, Surinam	14714
Pentaclethra macroloba Kuntze		No. 344, Surinam	19568
Pentaclethra macroloba Kuntze		USNM, W-15609	19567
Pentaclethra macroloba Kuntze	*Pentaclethra filamentosa* Benth.	Kw 71360	14713
Pentaclethra macrophylla Benth.		Kw 21715, Liberia	14712
Pentaclethra macrophylla Benth.		Gold Coast, 46-1906	19569
Anadenanthera colubrina (Vell.) Brenan var. *cebil* (Griseb.) Altschul	*Anadenanthera macrocarpa* (Benth.) Brenan	Pernambuco, Brazil, 483	19329
Anadenanthera colubrina (Vell.) Brenan var. *cebil* (Griseb.) Altschul	*Piptadenia macrocarpa* Benth.	Amazon, Brazil, 488	19572
Anadenanthera peregrina (L.) Speg. var. *falcata* (Benth.) Altschul		Sao Paulo State, Brazil, Shak 47	19330

Species	Name on slide (if different)	Slide details	Slide coll. no.
Mimosa rhododactyla B.L. Robinson var. *benthamii* (J.F. Macbr.) Barneby	*Mimosa benthamii* J.F. Macbr.	Mexico, Kw 1786	19549
Mimosa orthocarpa Benth.	*Mimosa glandulosa* C. Sm.	Kw 71421, New Caledonia	26340
Mimosa ophthalmocentra Benth.		L. da Silva, Pernambuco, Brazil	
Mimosa tenuiflora (Willd.) Poiret	*Mimosa hostilis* (C. Martius) Benth.	Pernambuco, Brazil, Kw 482	19551
Parapiptadenia excelsa (Griseb.) Burkart	*Piptadenia excelsa* (Griseb.) Lillo	Kw 8096, Argentina	26343
Parapiptadenia pterosperma (Benth.) Brenan		G.P.Lewis 1612, Brazil	19556
Parapiptadenia rigida (Benth.) Brenan	*Piptadenia rigida* Benth.	Kw 8174	
Parkia biglobosa (Jacq.) R.Br. *ex* G. Don	*Parkia africana* R. Br.	Trop. W. Africa	19557
Parkia bicolor A. Chev.		Gold Coast, 1945	19558
Parkia bicolor A. Chev.		PSB 1998	19559
Parkia leiophylla Kurz		Kw 7327, Burma	19560
Parkia nitida Miq.		Surinam, No. 85	19561
Parkia pendula (Willd.) Benth.		Surinam, No. 32	19562
Parkia singularis Miq.		FMS, No. 3762	19565
Parkia timoriana (DC.) Merrill	*Parkia roxburghii* G. Don	1926, Burma	19563
Parkia timoriana (DC.) Merrill	*Parkia roxburghii* G. Don	Singapore, 6/1927, No. 3413	19564
Parkia ulei (Harms) Kuhlmann		Surinam, No. 316	19566
Piptadenia gonoacantha J.F. Macbr.		Shak 48, 25.9.90, Brazil, Forest Vine	19571
Piptadenia obliqua J.F. Macbr.		El Salvador, Kw 1232	19573
Piptadenia paniculata Benth.		Brazil, Shak 45	19574
Piptadenia pteroclada Benth.	*Pityrocarpa pteroclada* (Benth.) Brenan	Colombia, No. 361	19608
Piptadenia trisperma (Vell.) Benth.		Brazil	19576
Piptadenia trisperma (Vell.) Benth.		HC de Lima, Kw 2908	19577
Piptadenia viridiflora (Kunth) Benth.		Mexico, Kw 1772	19578
Pseudopiptadenia suaveolens (Miq.) J.W. Grimes	*Newtonia suaveolens* (Miq.) Brenan	No. 228, Surinam	19554
Pseudopiptadenia suaveolens (Miq.) J.W. Grimes	*Piptadenia suaveolens* Miq.	Kw 8109, Surinam	26342
Stryphnodendron adstringens (Martius) Colville		Parana, No. 11, Herbarium Brasilia	19677
Stryphnodendron polyphyllum Martius		Brazil, Sao Paulo, Shak 44, 15.9.90	19678
Piptadeniastrum africanum (Hook. f.) Brenan		W.Africa	19580
Piptadeniastrum africanum (Hook. f.) Brenan		Ghana, 59-1900	19581
Piptadeniastrum africanum (Hook. f.) Brenan		Ghana, 1945	19579
Piptadeniastrum africanum (Hook. f.) Brenan		W.Africa, Martin, 1948	19583
Piptadeniastrum africanum (Hook. f.) Brenan		Uganda For. Dept. 1954	19582
Plathymenia reticulata Benth.		No. 1, Brazil	19650
Prosopis africana (Guillemin & Perrottet) Taubert		Forest Dept. Sudan, RBHw11524	19652
Prosopis africana (Guillemin & Perrottet) Taubert		27.1922, Nigeria	19653

Species	Name on slide (if different)	Slide details	Slide coll. no.
Prosopis chilensis (Molina) Stuntz emend. Burkart		Arizona, USA, 3.1961	19654
Prosopis farcta (Banks & Sol.) J.F. Macbr.	*Prosopis stephaniana* (Willd.) Sprengel	Jerusalem, 34-1913	19665
Prosopis flexuosa DC.		49, Argentine	19655
Prosopis glandulosa Torrey		Yucatan, Mexico, 1283	19656
Prosopis juliflora (Sw.) DC.		K5997, USA	19658
Prosopis juliflora (Sw.) DC.		K6000, USA	19659
Prosopis juliflora (Sw.) DC.		California, 72, 29.1957	19660
Prosopis kuntzei Harms		29, Argentine	19661
Prosopis nigra (Griseb.) Hieronymus		14, Argentine	19662
Prosopis pubescens Benth.		K6003, USA	
Prosopis pubescens Benth.	*Prosopis odorata* Torrey & Fremont	California, 73, 29.1957	19663
Prosopis pubescens Benth.	*Prosopis odorata* Torrey & Fremont	31-1936, California	19664
Prosopis ruscifolia Griseb.		5, Argentine	19666
TRIBE INGEAE			
Abarema alexandri (Urban) Barneby & J.W. Grimes	*Pithecellobium alexandri* (Urban) Urban	Kw 8113, Jamaica	26345
Abarema glauca (Urban) Barneby & J.W. Grimes	*Pithecellobium glaucum* Urban	FTG 651208	19589
Abarema jupunba (Willd.) Britton & Killip	*Pithecellobium jupunha* (Willd.) Urban	Surinam	19593
Abarema jupunba (Willd.) Britton & Killip	*Pithecellobium jupunha* (Willd.) Urban	Surinam, No. 20	19594
Abarema jupunba (Willd.) Britton & Killip	*Pithecellobium jupunha* (Willd.) Urban	Kw 8141	21257
Abarema jupunba (Willd.) Britton & Killip	*Pithecellobium jupunha* (Willd.) Urban	British Guiana, FHOw 13072	19595
Abarema langsdorfii (Benth.) Barneby & J.W. Grimes	*Pithecellobium langsdoffii* Benth.	Kw 8172, Brazil	26338
Abarema macradenia (Pittier) Barneby & J.W. Grimes	*Pithecellobium macradenium* Pittier	Costa Rica, Kw 8151	21258
Abarema macradenia (Pittier) Barneby & J.W. Grimes	*Pithecellobium macradenium* Pittier	W-125, USNM	19596
Hydrochorea corymbosa (L.C. Rich.) Barneby & Grimes	*Pithecellobium corymbosum* (Rich.) Benth.	Surinam, No. 360	19586
Hydrochorea gonggrijpii (Kleinhoonte) Barneby & Grimes	*Pithecellobium gonggrijpii* Kleinhoonte	Surinam, Kw 8139	21672
Hydrochorea gonggrijpii (Kleinhoonte) Barneby & Grimes	*Pithecellobium gonggrijpii* Kleinhoonte	Surinam, No. 88	19591
Pararchidenron pruinosum (Benth.) I.C. Nielsen		Australia	19609
Chloroleucon mangense (Jacq.) Britton & Rose		Chiquimula, Guatemala, 1227	19342
Chloroleucon mangense (Jacq.) Britton & Rose	*Pithecellobium mangense* (Jacq.) Macbr.	W-15629, USNM	19597
Chloroleucon tortum (Martius) Pittier	*Pithecellobium tortum* Martius	Argentine	19606
Chloroleucon tortum (Martius) Pittier	*Pithecellobium tortum* Martius	Argentine, 8175	19607
Leucochloron incuriale (Vell.) Barneby & J.W. Grimes	*Pithecellobium incuriale* (Vell. Conc.) Benth.	Parana, No. 39, Herbarium Brasilia	19592
Faidherbia albida (Del.) A. Chev.	*Acacia albida* Del.	Palestine, Kew Mus. No. 7557	19165
Faidherbia albida (Del.) A. Chev.	*Acacia albida* Del.	Togo, Kersting, 1909. DH8	19167
Zapoteca nervosa (Urban) H. Hernandez	*Calliandropsis nervosus* (Britton & Rose) H.M. Hern.& Guinet	Mexico, 1784, 75901	15245

Species	Name on slide (if different)	Slide details	Slide coll. no.
Archidendron bigeminum (L.) I.C. Nielsen	*Pithecellobium bigeminum* (L.) Mart.	CO	21674
Archidendron borneense (Benth.) I.C. Nielsen		Kw 74648, Brunei	26331
Archidendron clypearia (Jack) I.C. Nielsen		Desch. 5611, FMS	19331
Archidendron ellipticum (Blume) I.C. Nielsen	*Abarema elliptica* (Blume) Kosterm.	Sarawak, 21601, PQJ7	19197
Archidendron globosum (Blume) I.C. Nielsen	*Pithecellobium affine* Baker *ex* Benth.	C5373, Burma	19584
Archidendron lucidum (Benth.) I.C. Nielsen	*Pithecellobium lucidum* Benth.	Kw 8150, Hong Kong	26335
Archidendron microcarpum (Benth.) I.C. Nielsen	*Pithecellobium microcarpum* Benth.	Kw 8155, East Borneo	26346
Archidendron pauciflorum (Benth.) I.C. Nielsen	*Pithecellobium lobatum* Benth.	Singapore, Kw 8144	21673
Calliandra houstoniana (Miller) Standley		Chiapas, Mexico, 1351	19334
Calliandra houstoniana (Miller) Standley var. *calothyrsus* (Meissner) Barneby	*Calliandra calothyrsus* Meissner	Nicaragua, D.J. McQueen, FHOw 3, 1991	19333
Calliandra foliolosa Benth.	*Calliandra sancti-pauli* Hassk.	Kw 7959, Java	26347
Calliandra tweedii Benth.		Brazil, M.K. 1951	19335
Cedrelinga cateniformis (Ducke) Ducke		Cat. No. 7968, Surinam	19341
Cojoba arborea (L.) Britton & Rose		SJRw 33748	19346
Cojoba arborea (L.) Britton & Rose		West Indies	19347
Cojoba arborea (L.) Britton & Rose		Central America, SJRw 34700	19344
Cojoba arborea (L.) Britton & Rose		SJRw 13022, Central America	19343
Inga acuminata Benth.		Costa Rica, Kw 13565	19407
Inga adenophylla Pittier		Bolivia, Kw 13286	19408
Inga alba (Sw.) Willd.		Costa Rica, Kw 13562	19410
Inga alba (Sw.) Willd.		No. 24, Surinam	19411
Inga alba (Sw.) Willd.		Amazon Peru, 12619	19409
Inga aptera (Vinha) T.D. Pennington	*Affonsea bahiensis* Vinha	Brazil, RH 11, CEPECw196	19285
Inga auristellae Harms		French Guyana, Kw 13844	19412
Inga auristellae Harms		Amazon Peru, Kw 12545	19413
Inga barbourii Standley		Costa Rica, Kw 13596	19414
Inga capitata Desv.		Kw 5401, U3746, Lindemann, Surinam	19415
Inga capitata Desv.		Amazon Peru, Kw 12532	19416
Inga capitata Desv.		341, Surinam	19417
Inga capitata Desv.	*Inga falcistipula* Ducke	Kw 48801, U16999, Trop. S. America	19428
Inga chartacea Poepp. & Endl.		Amazon Peru, Kw 12534	19419
Inga chocoensis Killip *ex* T. Elias		Costa Rica, Kw 13636	19420
Inga chrysantha Ducke	*Inga ricardorum* Bernardi & R. Spichiger	Amazon Peru, Kw 12515	19458
Inga cinnamonea Spruce *ex* Benth.		Amazon Peru, Kw 12478	19418
Inga congesta T.D. Pennington	*Affonsea bullata* Benth.	Rio State, Brazil, Shak 49	19286
Inga coruscans Humb. & Bonpl. *ex* Willd.		Costa Rica, Kw 13569	19421

Species	Name on slide (if different)	Slide details	Slide coll. no.
Inga coruscans Humb. & Bonpl. *ex* Willd.		USNM, W-16458	19422
Inga edulis Martius		Amazon Peru, Kw 12471	19423
Inga edulis Martius		Surinam, No. 315	19425
Inga edulis Martius		Amazon Peru, Kw 12523	19426
Inga expansa Rusby		Bolivia, Kw 13480	19427
Inga goldmanii Pittier		Costa Rica, Kw 13561	19430
Inga golfoldulcensis N. Zamora		Costa Rica, Kw 13572	19429
Inga heterophylla Willd.		No. 250, Suriname	19431
Inga heterophylla Willd.		Santa Cruz, Kw 13293	19432
Inga ingoides (Rich.) Willd.		Amazon Peru Kw 12470	19434
Inga ingoides (Rich.) Willd.		Amazon Peru, Kw 12473	19435
Inga ingoides (Rich.) Willd.		Bolivia, Kw 13256	19436
Inga jinicuil G. Don	*Inga paterno* Harms	FTG 67372	19453
Inga lateriflora Miq.		No. 149, Surinam	19437
Inga laurina (Sw.) Willd.		Kw 8011, Singapore	19438
Inga leiocalycina Benth.		Ecuador, Kw 13719	19439
Inga leiocalycina Benth.		Amazon Peru, Kw 12522	19440
Inga leiocalycina Benth.	*Inga tenuirama* Harms	Tropical SW. America, Kw 8022	19515
Inga leonis N. Zamora		Costa Rica, Kw 13594	19441
Inga litoralis N. Zamora		Costa Rica, Kw 13559	19442
Inga lopadadenia Harms		Amazon Peru, Kw 12466	19443
Inga macrophylla Humb. & Bonpl. *ex* Willd.		Amazon Peru, Kw 12472	19444
Inga marginata Willd.		Amazon Peru, Kw 12500	19447
Inga mortoniana J. Léon		Costa Rica, Kw 13604	19448
Inga nobilis Willd.		Bolivia, Kw 13226	19449
Inga nobilis Willd.		Santa Cruz, Kw 13226	19450
Inga nobilis Willd.		Amazon Peru, Kw 12503	19451
Inga nobilis Willd. *subsp. quaternata* (Poepp. & Endl.) T.D. Pennington	*Inga quaternata* Poepp. & Endl.	Bolivia, Kw 13316	19457
Inga pezizifera Benth.		No. 230, Surinam	19454
Inga poeppigiana Benth.		Brazil, Kw 8016	19455
Inga punctata Willd.		Bolivia, Kw 13474	19456
Inga rubiginosa (Rich.) DC.		No. 162, Surinam	19450
Inga ruiziana G. Don		Bolivia, Kw 13485	19460
Inga rusbyi Pittier		Ecuador, Kw 13787	19461
Inga saffordiana Pittier		Costa Rica, P.E. Owen 21	19462
Inga sessilis (Vell.) Martius		Brazil, Kw 21696	19463

Species	Name on slide (if different)	Slide details	Slide coll. no.
Inga setosa G. Don		Bolivia, Kw 13570	19464
Inga skutchii Standley		Costa Rica, Kw 13570	19465
Inga splendens Willd.		Amazon Peru, Kw 12520	19466
Inga steinbachii Harms	*Inga trigyna* Rusby	Bolivia, Kw 13480	19519
Inga stenopoda Willd.		Bolivia, Kw 13241	19468
Inga stenopoda Willd.		Bolivia, Kw 13241	19469
Inga stenopoda Willd.		Bolivia, Kw 13254	19472
Inga stenopoda Willd.		Bolivia, Kw 13246	19473
Inga stenopoda Willd.		Bolivia, Kw 13249	19474
Inga stenoptera Benth.		Amazon Peru, Kw 12547	19476
Inga stenoptera Benth.		Amazon Peru, Kw 12607	19477
Inga stenoptera Benth.		Amazon Peru, Kw 12490	19475
Inga stipularis DC.		French Guyana, Kw 13847	19514
Inga striata Benth.	*Inga nuda* Salz. *ex* Benth.	Brazil, CEPECw 167, T.S. dos Santos	19452
Inga tessmannii Harms		Ecuador, Kw 13776	19516
Inga thibaudiana DC.		Amazon Peru, Kw 12533	19517
Inga tonduzii J.D. Smith		Costa Rica, Kw 13593	19518
Inga umbellifera (Vahl) Steud.		Costa Rica, Kw 13567	19520
Inga umbratica Poepp. & Endl.		Amazon Peru, Kw 12541	19521
Inga velutina Willd.		Amazon Peru, Kw 12486	19522
Inga vera Willd.		Nicaragua, Kw 1394	19525
Inga vera Willd.		Bolivia, Kw 13263	19526
Inga vera Willd.		Amazon Peru, Kw 12493	19527
Marmaroxylon racemosum (Ducke) Killip		Trop. SE America, Yale No. 22055	19541
Marmaroxylon racemosum (Ducke) Killip	*Pithecellobium racemosum* Ducke	No. 72, Surinam	19604
Zygia latifolia (L.) Fawcett & Rendle	*Pithecellobium cauliflorum* (Willd.) C. Martius	Surinam, Kw 8120	19585
Falcataria moluccana (Miq.) Barneby & J.W. Grimes	*Albizia falcata sensu auct.*	Desch 4514, FMS	19296
Serianthes myriadenia Planch. *ex* Benth.		Fiji, Kw 2933	19675
Serianthes myriadenia Planch. *ex* Benth.		Fiji, 1410-1	19673
Wallaceodendron celebicum Koorders		Philippines, 1926	19651
Wallaceodendron celebicum Koorders		Kw 8235	15247
Ebenopsis ebano (Berlandier) Barneby & J.W. Grimes	*Pithecellobium flexicaule* (Benth.) Coulter	FTG, X-5-52	19588
Havardia pallens (Benth.) Britton & Rose		MADw 18342	
Havardia pallens (Benth.) Britton & Rose		MADw 10179	26351
Pithecellobium dulce (Roxb.) Benth.		Bot. Gdns. Calcutta	19587
Pithecellobium ungius-cati (L.) Benth.		Kw 8191, USA	26337
Hesperalbizia occidentalis (Brandegee) Barneby & Grimes		Oaxaca, Mexico, 1334	19311

Species	Name on slide (if different)	Slide details	Slide coll. no.
Samanea saman (Jacq.) Merrill	*Albizia saman* (Jacq.) Merrill	Bolivia, 13462, RH48	19323
Samanea saman (Jacq.) Merrill		Jamaica, 1951	19669
Samanea saman (Jacq.) Merrill		A5, ICTAU, Trinidad	19671
Samanea saman (Jacq.) Merrill		B6, Bodles, Jamaica	19667
Samanea saman (Jacq.) Merrill		B8, Hope, Jamaica	19668
Samanea saman (Jacq.) Merrill		ICTA, Trinidad, 1957	19672
Samanea saman (Jacq.) Merrill		No. 506, Bot. Gdns, Singapore	19670
Albizia adianthifolia (Schum.) W. Wight		Zambia 4542	19287
Albizia adinocephala (Donnell Smith) Britton & Rose *ex* Record		Mexico (Oaxaca)	19288
Albizia adinocephala (Donnell Smith) Britton & Rose *ex* Record		Sudan, Herb. No. 18, Neumann	19290
Albizia amara (Roxb.) Boivin		Sri Lanka Coll, Worthington 3026 7849	2236
Albizia amara (Roxb.) Boivin		Salem, DH20	19289
Albizia anthelmintica Brongn.		FHOw 13664, British Somaliland	19291
Albizia anthelmintica Brongn.		Tanganyika, Brongn. 7853	86
Albizia brownii Walp.		Katanga, Africa	19292
Albizia brownii Walp.		Africa, FHOw 850	19293
Albizia chevalieri Harms		FTG 15695, Nigeria	19295
Albizia chinensis (Osbeck) Merrill	*Albizia stipulata* Boivin	Burma, IFI 754	19324
Albizia fastigata Oliver		Rhodesia	19297
Albizia ferruginea Benth.		Trop Africa, FPRL 221A	19298
Albizia ferruginea Benth.		FHOw 7049, Uganda	19299
Albizia forbesii Benth.		Kruger Park, J. Prior, Shak 22	19300
Albizia glabberima (Schum. & Thonn.) Benth.		FPRL 24409, Uganda	19301
Albizia gummifera (J. Gmelin) C.A. Smith		FHOw 12783, Sierra Leone	19303
Albizia gummifera (J. Gmelin) C.A. Smith		FHOw 4402	19302
Albizia julibrissin Durazzini		FHOw 2087	19304
Albizia lebbeck (L.) Benth.		E. Indies	19306
Albizia lebbeck (L.) Benth.		Queensland, 1862	19308
Albizia lebbeck (L.) Benth.		Burma, E.8205	19305
Albizia lebbeck (L.) Benth.		India	19307
Albizia lucidior (Steudel) I.C. Nielsen *ex* H. Hara		Burma, FNH Coll.	19309
Albizia niopoides (Benth.) Burkart	*Albizia caribaea* (Urban) Britton & Rose	FTG X-4-339	19294
Albizia niopoides (Benth.) Burkart		Oaxaca, Mexico, 1343	19310
Albizia odoratissima (L.f.) Benth.		India, FHOw 1417	19312
Albizia odoratissima (L.f.) Benth.		No. 423, Botanic Gardens Singapore	19313

Species	Name on slide (if different)	Slide details	Slide coll. no.
Albizia pedicellaris (DC.) L. Rico	*Pithecellobium pedicellare* (DC.) Benth.	Brazil, Kw 72778	19600
Albizia pedicellaris (DC.) L. Rico	*Pithecellobium pedicellare* (DC.) Benth.	Surinam, No. 237	19601
Albizia pedicellaris (DC.) L. Rico	*Pithecellobium pedicellare* (DC.) Benth.	Surinam, No. 125	19602
Albizia petersiana (Bolle) Oliver		Kruger Park, J.Prior, Shak 17	19314
Albizia polycephala (Benth.) Killip *ex* Record	*Pithecellobium polycephalum* Benth.	Kw 72701	21259
Albizia polycephala (Benth.) Killip *ex* Record	*Pithecellobium polycephalum* Benth.	Brazil, CEPECw69, Bahia	19603
Albizia procera (Roxb.) Benth.		Burma, FNH Coll.	19319
Albizia procera (Roxb.) Benth.		FHOw 2325	19320
Albizia procera (Roxb.) Benth.		Siam, No. 23	19321
Albizia procera (Roxb.) Benth.		Bataan Philippines	19317
Albizia procera (Roxb.) Benth.		Andaman Islands	19318
Albizia splendens Miq.		Malaya	19610
Albizia tomentosa (M. Micheli) Standley	*Albizia purpusii* Britton & Rose	Chiapas, Mexico, 1292	19322
Albizia tomentosa (M. Micheli) Standley		Oaxaca, Mexico, 1335	19325
Albizia versicolor Oliver		Tanzania, 7947	2234
Albizia zygia (DC.) J.F. Macbr.		Uganda, 1953, 756ALZY	1926
Enterolobium contortisiliquum (Vell.) Morong		FTG 6963	19401
Enterolobium cyclocarpum (Jacq.) Griseb.		Bot. Gdns Singapore, No. 465	19402
Enterolobium schomburgkii Benth.		USNM, W-72	19403
Enterolobium timbouva Martius		32, Argentine	19404
Lysiloma acapulcense (Kunth) Benth.		Santa Ana, El Salvador, Kw 1742	19543
Lysiloma latisiliquum (L.) Benth.	*Lysiloma bahamensis* (L.) Benth.	Central America, Univ. of Miama	19544
Lysiloma latisiliquum (L.) Benth.	*Lysiloma latisiliqua* (L.) Benth.	West Indies, Trade 1955	19545
Lysiloma sabicu Benth.		W. Indies	19547
TRIBE ACACIEAE			
Acacia angustissima (Miller) Kuntze		Nicaragua, Hughes, FHOw 1373	19169
Acacia acuminata Benth.		1968, W.Australia	19164
Acacia aneura F.Muell. *ex* Benth.		F.v.M. 73-1891, 17000A, New South Wales	19168
Acacia auriculiformis A. Cunn. *ex* Benth.		No. 414, Botanic Gardens, Singapore	19170
Acacia confusa Merr.		Mus IV, Formosa	19187
Acacia koa A. Gray		Hawaii, Sm. Inst. No. 8764	19215
Acacia koa A. Gray		5784, Kauai, Hawaii	19216
Acacia longifolia (Andrews) Willd.		New South Wales, Rodway, 2226	19222
Acacia melanoxylon R. Br.		FHOw 1103	19224
Acacia melanoxylon R. Br.		FHOw 1127	19225

Species	Name on slide (if different)	Slide details	Slide coll. no.
Acacia melanoxylon R. Br.		BPB Mus. No. 57 Hawaii, Kw 7691	19226
Acacia melanoxylon R. Br.		BPB Mus. No. 9, Kw 7690	19227
Acacia melanoxylon R. Br.		Australia	19229
Acacia melanoxylon R. Br.		Forestry Commission, New South Wales, Tol. 80	19228
Acacia penninervis Sieber *ex* DC.		New South Wales, Australia	19248
Acacia richii A. Gray		Mus. IV, Japan	19253
Acacia saligna (Labill.) H.L. Wendl.		Hamblin 274, 1979	19255
Acacia dolichostachya S.F. Blake		Mexico	19193
Acacia gregii A. Gray		BWCw 8583, USA	19204
Acacia picachensis Brandegee		Honduras, FHOW 10	19249
Acacia senegal Willd.			19256
Acacia senegal Willd.		Sudan, Darfur, Herbar- Nr. 85	19257
Acacia senegal Willd.		DH12, Nubien 1864, Schweinfurth	19258
Acacia aroma Hook. & Arn.	*Acacia huarango* Ruiz & J.F. Macbr.	FTG 73260A	19211
Acacia caffra Willd.		FHOw 5437	19171
Acacia catechu Willd.		Kw 7593	19175
Acacia catechu Willd.		1878, Kangra, India, sapwood	19174
Acacia choriophylla Benth.		FTG 64280, Aug 1992, Fisher	19186
Acacia cyanophylla Lindley		FHOw 2197	19188
Acacia davyi N.E. Br.		Swaziland, J. Prior, Shak 4	19181
Acacia davyi N.E. Br.		Swaziland, J. Prior, Shak 62	19090
Acacia dealbata Link		FHOw 4567	19192
Acacia ehrenbergiana Hayne		Khartoum, Sudan	19196
Acacia ehrenbergiana Hayne		Tunisia, Kew Mus. No. 7623	19194
Acacia ehrenbergiana Hayne		Tunisia, Kew Mus. No. 7622	19195
Acacia erythrophloea Brenan		Tanzania, Kew 7626	19198
Acacia etbaica Schweinf.		FHOw 13640, British Somaliland	19199
Acacia exuvialis Verdoorn		Kruger Park, Shak 19	19200
Acacia hockii De Wild.		Tanzania, 7649	19205
Acacia homalophylla A. Cunn. *ex* Benth.		Howell & Co.	19206
Acacia horrida Willd.		Zimbabwe, Kew 7656, FHOw 24792	19210
Acacia inopinata Prain		Imperial Forestry Institute Oxford, 3045	19212
Acacia karoo Prain		Kruger Park, Prior, Shak 65	19213
Acacia koaia Hillebrand		BPB Mus. No. 9, Kw 7660, Hawaii	19217
Acacia laeta R. Br. & Benth.		Sudan, Khartoum	19218
Acacia laeta R. Br. & Benth.		Kw 38239, CFIO 24788, Tunisia	19220

Species	Name on slide (if different)	Slide details	Slide coll. no.
Acacia leucophloea Willd.		FHOw 2309	19221
Acacia macracantha Humb. & Bonpl. *ex* Willd.		24 Argentine	19223
Acacia mellifera Benth.		Darfur Prov. Sudan, G.E. Wickers	19230
Acacia mellifera Benth.		Sudan, Forest Dept. Khartoum	19231
Acacia mollissima Willd.		FHOw 11075, Australia	19233
Acacia nigrescens (Labill.) R. Br.		Swaziland, J. Prior, Shak 15	19237
Acacia nilotica (L.) Delile		Libya, Kew Mus. No. 7717	19238
Acacia nilotica (L.) Delile		FTG 671001, SF30	19239
Acacia nilotica (L.) Delile		India, SJRw 3776	19242
Acacia nilotica (L.) Delile		Libya 29-4-56	19243
Acacia nilotica (L.) Delile		Sudan, Darfur (Els Faslier)	19244
Acacia nilotica (L.) Delile		Swaziland, J. Prior, 1985, Shak 12	19240
Acacia nilotica (L.) Delile subsp. *tomentosa* (Benth.) Brenan		FTG	19207
Acacia nubica Benth.		Sudan, Darfur Prov., G.E. Wickens	19245
Acacia nubica Benth.		Sudan, Darfur	19246
Acacia nubica Benth.	*Acacia pterygocarpa* Hochst. *ex* Benth.	Arabia, Kew 7754	19251
Acacia pachyceras O. Schwartz var. *najdensis* (Chaudhary) Boulos		FHOw 2140	19235
Acacia polyacantha Willd.	*Acacia campylacantha* Hochst. *ex* A. Rich.	F.H.I. 16202, Nigeria	19172
Acacia riparia Kunth		Argentine, No. 4	19254
Acacia seyal Delile			19260
Acacia seyal Delile		Palestine, 34-1913	19261
Acacia sieberiana DC.		FHI 1617, Nigeria	19262
Acacia sieberiana DC.		Sudan, Khartoum, Soba-Arboretum	19263
Acacia sieberiana DC.		Sudan, Parfur Prov., G.E.Wickens	19264
Acacia suma (Roxb.) Buch.-Ham. *ex* Voight		India, Gamble C1310	19266
Acacia suma (Roxb.) Buch.-Ham. *ex* Voight		India, Gamble, C1308	19265
Acacia tortilis (Forssk.) Hayne		Swaziland, J. Prior, Shak 55	19270
Acacia tortilis (Forssk.) Hayne		Sudan, Wickens	19267
Acacia tortilis (Forssk.) Hayne		DM 13/21	18374
Acacia tortilis (Forssk.) Hayne subsp. *raddiana* (Savi) Brenan	*Acacia raddiana* Savi	RBHW 16331	19252
Acacia welwitschii Oliver		Kruger Park, J. Prior, Shak 23	19275