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“The Ancestor Wood”
Trees, Forests and Precolonial Kanak Settlement
on New Caledonia Grande Terre:
Case study and anthracological approach in the Tiwaka Valley
(Northeastern Grande Terre).

VOLUME II : ATLAS

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Arbres, forêts et occupation kanak précoloniale sur la Grande
Terre de Nouvelle-Calédonie :
étude de cas et approche anthracologique dans la vallée de la Tiwaka
(Nord Est).

VOLUME II : ATLAS

Soutenue à la Sorbonne le 7 mai 2010 devant un jury composé de :

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Avertissement : contenu du CD associé

Le Cd joint contient la base de données interactive permettant d'accéder aux fiches anatomiques sous file maker pro et de lancer des requêtes en sélectionnant certains caractères discriminants.

Les fiches de description des indéterminés sont aussi jointes, sous forme de pdfs.

Les images des échantillons de référence, sous microscope en lumière réfléchiée et Microscope Electronique à Balayage, sont organisées par famille et espèce. Les images prises sous MEB portent automatiquement l'échelle, celles prises au microscope à réflexion ont été dénommées en fonction du grossissement utilisé : 10, 20, 50, 100 (fig. 1). Chaque photographie est aussi identifiée en fonction de la coupe qu'elle représente :

CT : Coupe Transversale

CLT : Coupe Longitudinale Tangentielle

CLR : Coupe Longitudinale Radiale

Il est prévu de compiler l'ensemble des images dans une base de données File Maker liée aux fiches anatomiques afin de faciliter l'identification.

Enfin, nous avons joint quelques images d'échantillons anthracologiques appartenant à des taxons courants, ainsi que celles de l'indéterminé de type 17, cf. Amborellaceae ou Winteraceae.

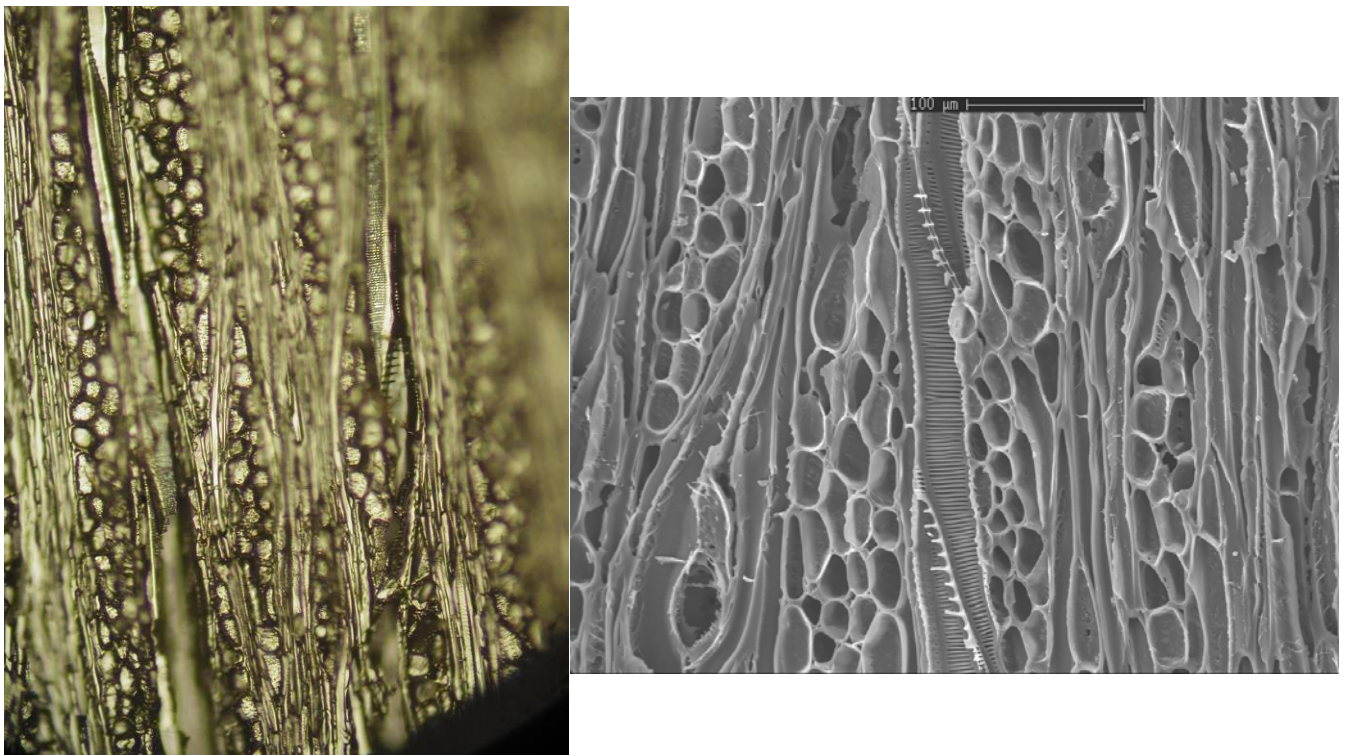


Figure 1 : vues en coupe longitudinale tangentielle d'une Rhizophoracée, *Bruiguiera gymnorhiza* (palétuvier rouge). Rayons multisériés, vaisseaux à perforations et ponctuations scalariformes. A gauche : image au microscope à réflexion, grossissement x20 ; à droite : image au MEB.

Introduction:

Cet atlas anthracologique rassemble les descriptions anatomiques du bois ou des racines carbonisés de 130 taxons botaniques de Nouvelle-Calédonie, répartis en 51 familles et 111 genres. Ces échantillons proviennent majoritairement de Dicotylédones ligneuses (119 taxons), mais aussi de Monocotylédones (9 taxons) et de Ptéridophytes (2 taxons).

Des fragments du bois, du stipe ligneux ou, parfois, du tubercule de ces plantes peuvent se conserver après carbonisation sous forme de charbons dans les sols archéologiques. Leur collecte lors des fouilles permet, après échantillonnage et observation au microscope, de proposer une détermination systématique en comparant la structure anatomique observée à celle d'espèces actuelles connues, soit par l'accès à des échantillons provenant de collections de référence disponibles, soit en ayant recours aux atlas ou publications sur l'anatomie du bois de certains taxons. Le volume que nous présentons a ainsi pour but d'être un outil pour l'anthracologie - ou identification et analyse des charbons de bois anciens issues de fouilles archéologiques - en Nouvelle-Calédonie et, dans une moindre mesure, dans d'autres îles du Pacifique. Il est organisé en fiches descriptives sur papier et sous forme de base de données informatisée sous File Maker Pro Database (fp7), associées à des fichiers photographiques sur support numérique.

Il existe peu de publications disponibles sur l'anatomie détaillée du bois produit par les espèces ligneuses de Nouvelle-Calédonie ou des îles du Pacifique, permettant une identification des charbons archéologiques. Les principaux ouvrages sur la région ayant servi de référence à ce travail sont :

- le *Manuel d'identification des bois de Polynésie* de P. Détienne et P. Jacquet (1999) décrivant le bois de 92 espèces de Polynésie Française,

-le *CSIRO Atlas of Hardwoods* et le *CSIRO Wood Identification Program* par J. Ilic (1991, 1999) rassemblant les planches photographiques de 1754 espèces d'une part et les descriptions anatomiques de 249 espèces d'autre part – dont 177 originaires du Pacifique – dans une clef d'identification numérique,

- l'ouvrage du CIRAD-Forêt sur les bois de Nouvelle-Calédonie à usage commercial (1992) comportant les descriptions des grands traits anatomiques de 44 taxons réalisées à nouveau par P. Détienne et P. Jacquet, fondé sur le travail plus large, mais plus ancien, de P. Sarlin (1954)

Il existe enfin un nombre difficile à déterminer, en raison de leur ancienneté et de leur dispersion, d'articles abordant de façon plus ou moins précise la structure anatomique du bois d'essences calédoniennes, dont les plus complets sont ceux publiés par S. Carlquist. Ces publications représentent une base essentielle à notre travail d'identification anthracologique. Bien qu'ils fournissent une description précieuse de l'anatomie, ces articles botaniques se concentrent cependant sur des taxons rares ou présentant des caractères singuliers, et sur certains points anatomiques très précis, parfois non observables sur les charbons archéologiques (membranes des perforations scalariformes par exemple). Les ouvrages régionaux sont de leur côté plus orientés sur les utilisations commerciales du bois, la rareté des illustrations rendant difficile leur utilisation pour la comparaison avec les charbons archéologiques. De plus, un seul de ces ouvrages (CIRAD 1992) se concentre sur la Nouvelle-Calédonie, dont la flore est remarquablement riche et singulière.

- **Végétation de la Nouvelle-Calédonie et constitution de la collection de référence**

En plus des 1600 espèces environ classées comme introduites par les hommes – dont une majorité d'arbres - (cf. McKee 1985), près de 3260 espèces de plantes vasculaires considérées comme indigènes ont été décrites : 259 Ptéridophytes dont 13 Cyathaceae ou « fougères arborescentes » qui produisent un stipe (ou rhizome dressé de type ligneux), 44 Gymnospermes dont une Cycadaceae et 43 conifères, 550 Monocotylédones parmi lesquelles 4 genres présentent des espèces à port arboré, 2499 Dicotylédones dont une grande partie (non chiffrée par la littérature botanique) d'arbres ou arbustes (Jaffré et al. 2004, p.8-33). En plus de cette grande diversité – compte tenu d'une surface émergée de 19 000 km² – la flore de l'archipel est marquée par des taux d'endémismes spécifiques très élevés : 39,8% des Ptéridophytes, 45,5% des Monocotylédones, 83,9% des Dicotylédones et toutes les espèces de Gymnospermes sauf le *Cycas* (Jaffré et al. 2004, p.8-33). Ce fort endémisme spécifique est accompagné par une endémicité moindre bien que toujours remarquable au niveau générique – de 2,4% pour les Ptéridophytes à 20% pour les Gymnospermes (id.).

Ces deux caractéristiques et la grande originalité de la flore calédonienne sont dues à l'histoire géologique complexe de l'archipel. L'origine commune ancienne de la Nouvelle-Calédonie, l'Australie et la Papouasie Nouvelle-Guinée comme partie orientale du Gondwana est responsable des affinités floristiques, notamment au niveau générique, que l'archipel partage avec ces territoires. La séparation et l'isolement de la Grande Terre de Nouvelle-Calédonie dès le Crétacé ou le Jurassique, puis la mise en place des roches ultramafiques à partir de la fin de l'Eocène, expliqueraient pour leurs parts l'importance de groupes considérés comme primitifs, l'absence ou la sous-représentation de certains taxons pantropicaux – mis à part les espèces côtières bien représentées, mais aussi le taux d'endémisme et la spéciation intense observée dans certaines familles (Jaffré *et al.* 1994 ; Jaffré *et al.* 2004). Toutes ces particularités seraient liées à des évolutions et phénomènes d'adaptation qui furent réalisées en « vase clos » et à partir d'un fond floristique très ancien, jusqu'au premier peuplement humain à l'Holocène récent, amenant avec lui un cortège de plantes économiques et symboliques encore mal déterminé.

Face à ces particularités, il apparaissait nécessaire de constituer une collection de référence qui soit spécifique à la Nouvelle-Calédonie ainsi qu'une base de données anatomiques rassemblant descriptions systématiques précises et images de chaque plan anatomique, qui soit spécialement conçue pour répondre aux déterminations anthracologiques. Le nombre d'espèces nous a aussi obligée à effectuer une sélection parmi la flore calédonienne pour répondre au mieux à ces objectifs. Une liste d'espèces principales, relevées après étude de la littérature botanique, écologique et ethnobotanique, mais aussi par observations directes sur le terrain, a été dressée (voir volume I). Celle-ci a permis de guider la collecte en définissant plus de deux cents espèces à rassembler en priorité pour constituer la première partie d'une collection destinée à s'enrichir sur le long terme. Les taxons de la collection actuelle sont ainsi caractérisés par des traits ayant rapport avec la problématique anthracologique et archéologique du travail (cf. volume I) : chefs de file des unités de végétation présentes dans notre aire de fouilles (importance des

taxons de forêt humide), espèces ayant une signature écologique contrastée, plantes à valeur ou utilisation sociale documentée, taxons relevés sur des sites archéologiques et à large distribution régionale.

Dans la grande majorité des cas, les échantillons de bois ont été collectés avec un spécimen d'herbier numéroté et une fiche de collecte pour chacun. L'herbier est conservé au laboratoire « archéozoologie, archéobotanique : sociétés, pratiques, environnement » (UMR 7209 CNRS-MNHN). La collection existe en trois exemplaires situés dans ce même laboratoire à Paris, au Department of Archaeology and Natural History de la Research School of Pacific and Asian Studies à l'Université Nationale Australienne à Canberra, et au Département d'Archéologie de Nouvelle-Calédonie à Nouméa. Les identifications botaniques ont été réalisées sur site ou à l'herbier de l'IRD à Nouméa, avec le concours de spécialistes : D. et I. Létocart et J. Munziger en Nouvelle-Calédonie, J.Y. Meyer et J. Florence lors des collectes réalisées en Polynésie.

- **Base de données anthracologiques : présentation et utilisation**

Des échantillons de chaque taxon ont ensuite été carbonisés selon un protocole précis (cf. seconde partie du volume I, d'après Scheel-Ybert 1998 et Moutarde 2006). Bien que la carbonisation ne transforme pas la forme, l'arrangement ou le nombre des éléments anatomiques (critères d'identification des essences), la taille de certaines cellules peut être altérée par les phénomènes de déshydratation subis par le charbon, et certains tissus très fragiles peuvent parfois disparaître totalement (certaines zones de parenchyme étendue dans les stipes ligneux de monocotylédones, les zones de phloème). Il nous est donc apparu plus utile de produire des images et descriptions à partir de charbons actuels plutôt que de bois frais pour l'identification de charbons archéologiques. Pour les mêmes raisons, notre base de données anatomiques s'est concentrée sur les caractères qualitatifs cités plus haut, et ne comporte comme données quantitatives que celles concernant le nombre de cellules ou d'éléments (nombre de cellules de parenchyme par rayons, nombre de vaisseaux par amas, nombre de barres par perforation scalariforme, etc.). Les données de mesure de taille n'ont pas été prises en compte en raison, d'une part, de la trop grande variabilité intra-spécifique qui est apparu dans nos observations, d'autre part, des effets de la carbonisation sur la taille des cellules, d'autant plus que celle-ci est réalisée sous des conditions inconnues pour les charbons archéologiques.

Les caractères discriminants retenus pour la description des essences sont ceux répertoriés par l'International Association of Wood Anatomists (1989), exceptés les caractères quantitatifs qui viennent d'être abordés. En plus de cette référence, et des atlas régionaux cités en introduction, nous avons utilisé des ouvrages généraux et des articles spécialisés sur la structure du bois ou des stipes de type ligneux de Monocotylédones et Ptéridophytes (Metcalfé and Chalk 1950 ; Ogura 1972 ; Lucansky 1974, 1977 ; Carlquist 1981, 1988, 1989 ; Fahn 1990 ; Schweingruber 1990 ; Tomlinson 1990 ; Hather 1993 ; Bowes 1996 ; Carlquist and Schneider 2001 ; Schweingruber et al. 2006).

De plus, deux travaux de thèse de doctorat pionniers en anthracologie dans leurs régions et ayant eu à créer leur propre atlas ont été des références fondamentales pour notre travail (Scheel-Ybert 1998 ;

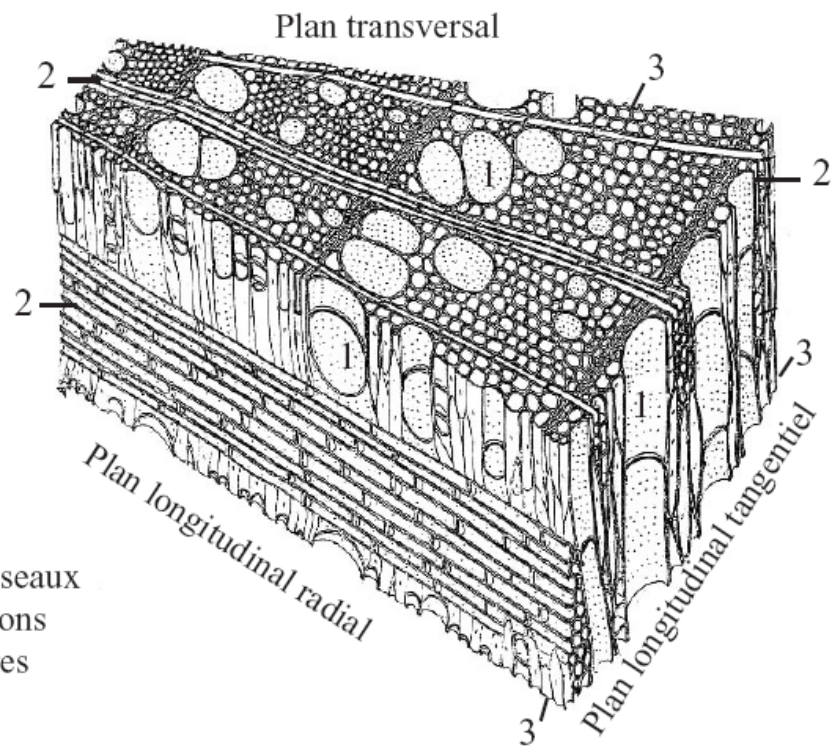
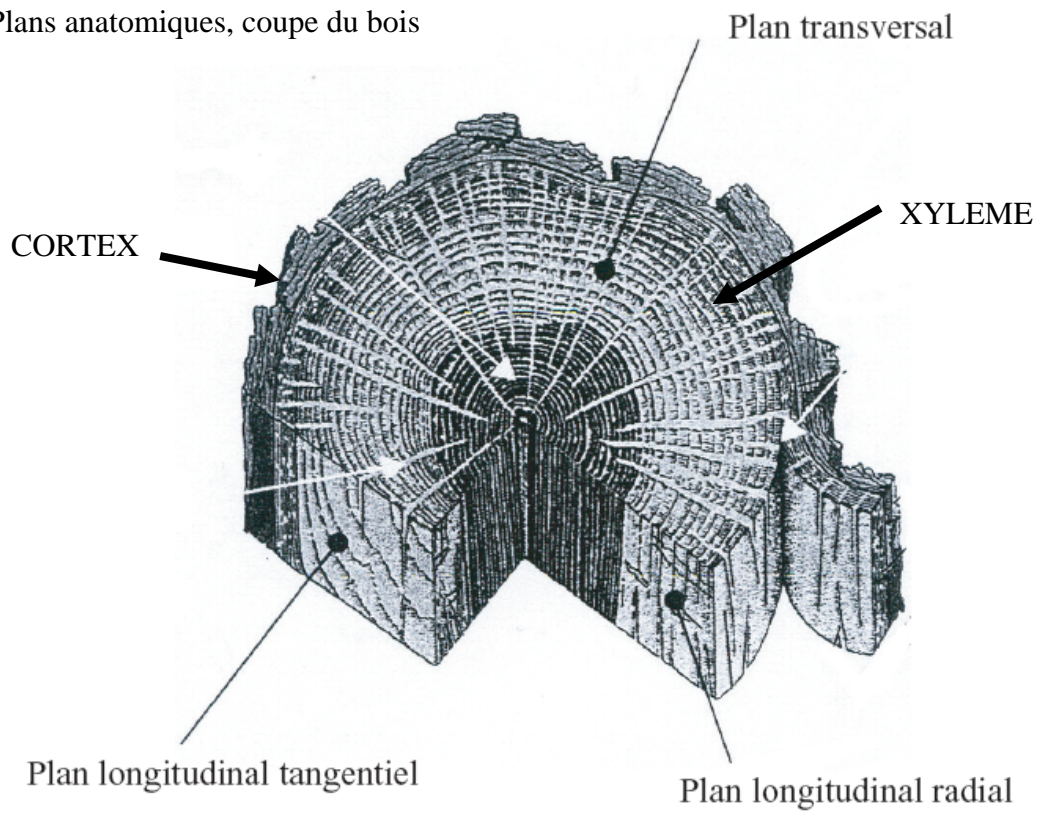
Moutarde 2006). On a pu ainsi lister les différents types de caractères anatomiques et créer des fiches standardisées pour chaque grande classe botanique (familles et espèces de Dicotylédones, espèces de Monocotylédones, espèces de Ptéridophytes), dans le but de former une base de données interactive qui peut être consultée, enrichie, ou interrogée en remplissant les champs correspondant pour chaque échantillon observé.

Les plantes qui nous intéressent ici sont celles dont la croissance du tissu ligneux, ou xylème, entraîne la formation de bois chez les Dicotylédones, ou d'un stipe solide chez quelques Monocotylédones et Ptéridophytes tropicales ou archaïques. Toutes les plantes ont une tige constituée des mêmes éléments fondamentaux, dont l'organisation et les formes peuvent être caractéristiques des essences. Le tissu extérieur, l'épiderme, entoure un tissu de soutien et de protection intermédiaire appelé cortex, constitué de cellules de collenchyme, fibres et parenchyme – qui peuvent être lignifiées et former du sclerenchyme comme dans les stipes de Cyathaceae. L'intérieur, la majeure partie de la tige, est formé de tissus conducteurs qui constituent le cylindre central et entourent la moelle faite de cellules de parenchyme : xylème d'une part, composé par l'association de trachéïdes (Ptéridophytes à stipe ligneux, Gymnospermes) ou d'éléments de vaisseaux (faisceaux vasculaires des Monocotylédones, Angiospermes), phloème d'autre part, formé de différents types de cellules allongées et extrêmement fragiles (la plupart du temps détruit dans les charbons archéologiques de Monocotylédones et de Cyathaceae). C'est le cylindre, et notamment le xylème, qui est conservé et observé sous forme de charbons dans la très grande majorité des cas, excepté pour les fragments de « troncs » des fougères arborescentes (Cyathaceae) dont il ne subsiste souvent que les cellules épaisses de sclerenchyme, rarement associées à quelques faisceaux vasculaires.

Chez la majorité des Dicotylédones, le cylindre est de type « continu » : le phloème entoure le xylème, qui forme un tissu continu constitué des différentes cellules le composant : fibres, vaisseaux et parfois trachéïdes, parenchyme (de rayons et de parenchyme axial) (fig. 2). Les différentes formes d'organisation que peuvent prendre ces éléments au sein du xylème constituent les caractères discriminants d'identification des essences (cf. IAWA 1989). Chez la plupart des Monocotylédones ainsi que chez les Cyathaceae, le cylindre est de type « divisé » : des faisceaux vasculaires qui rassemblent les deux tissus du phloème et du xylème (fibres et éléments vasculaires) sont éparpillés dans un fond de parenchyme. La forme et l'organisation des faisceaux vasculaires peuvent être caractéristiques des essences de Monocotylédones à stipe ligneux et des Cyathaceae. Chez les Monocotylédones, ces faisceaux peuvent être de type collatéral ou bicollatéral en fonction de la position du phloème autour du xylème. Quelques unes, comme notamment les *Cordylines* (Laxmanniaceae), ont des faisceaux de type amphivasal, où le xylème entoure le phloème (Fahn 1990 : 187-195) (se reporter aux figures 3 à 6).

Chez les Cyathaceae, le phloème entoure le xylème selon une organisation dite « dictyostelique » pour la plupart des Cyathaceae, c'est-à-dire où les faisceaux vasculaires sont séparés par des fenêtres foliaires laissées par les cicatrices de développement des feuilles. Ces faisceaux vasculaires sont appelés « méristèles » et sont entourés par les cellules du cortex, principalement de sclerenchyme (Fahn 1990 : 187-195 ; Ogura 1972).

Plans anatomiques, coupe du bois



- 1 : Vaisseaux
- 2 : Rayons
- 3 : Fibres

Plans anatomiques et éléments observables dans le bois

Figure 2 : Les plans anatomiques et éléments à observer pour l'identification anthracologique ; le cas du bois (d'après Moutarde 2006 et Raven 2000)

Les variantes de distribution, forme et nombre de ces éléments, ont donc été listées de manière systématique dans les fiches descriptives anatomiques de la base de données, selon trois grands types : Dicotylédones, Monocotylédones et Cyathaceae ou Ptéridophytes. Pour les Dicotylédones, des fiches rassemblant les grands traits anatomiques des familles ont été réalisées à partir des observations faites sur nos propres échantillons et des descriptions trouvées dans les différentes publications consultées (suscitées). Dans le but de constituer une base de données interactive d'identification des charbons archéologiques, la description des caractères discriminants principaux a été standardisée sous forme de listes à choix unique. Ceci nécessite de faire parfois des choix arbitraires dans la description de certains caractères, mais permet de faire apparaître uniquement les fiches d'essences correspondant à un ou plusieurs critères lors de la recherche d'identification. Un espace de remarque permet de préciser les particularités ou irrégularités observées pour affiner la caractérisation anatomique de chaque essence. Les champs correspondant à des éléments non observés ou difficiles à examiner sont laissés vides. De plus, des photographies de chacun des plans anatomiques, à plusieurs grossissements, ont été réalisées pour chaque taxon décrit. Lorsque cela a été possible, les images au microscope à lumière réfléchie ont été doublées d'images prise au microscope électronique à balayage, permettant d'avoir une meilleure vue d'ensemble, de mieux représenter la structure en 3 dimensions, et de saisir des points nécessitant un fort grossissement (Electronic Microscopy Unit de l'A.N.U. et Centre for Microscopy, Characterisation and Analysis de l'U.W.A.). Les espèces n'ayant jamais été décrites ou ayant une large répartition ont été privilégiées, ainsi que les spécimens présentant des particularités anatomiques. Enfin, les fiches ont été réalisées en anglais, dans le but de faciliter l'utilisation de l'atlas dans la région Pacifique où les recherches, archéologique et paléoenvironnementale, restent majoritairement anglophones.

Enfin, parce que l'identification de ces arbres n'appartient pas qu'au monde scientifique mais aussi au lien tissé avec les hommes du Pays, leur nom local a été noté ainsi que celui en Cémuhî (langue vernaculaire parlée dans la zone de fouilles) à chaque fois que l'on a pu le trouver, et en Païcî (la langue voisine) qui a, le plus souvent, été celui donné pendant les collectes.

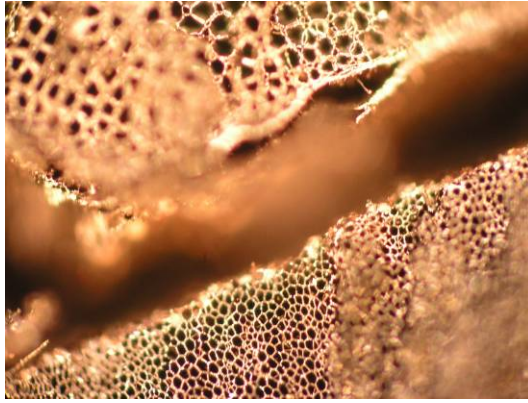


Figure 3 : frontière entre sclerenchyme (à droite) et trachéides (à gauche) dans un stipe de fougère arborescente *Dicksonia* (CTx10)

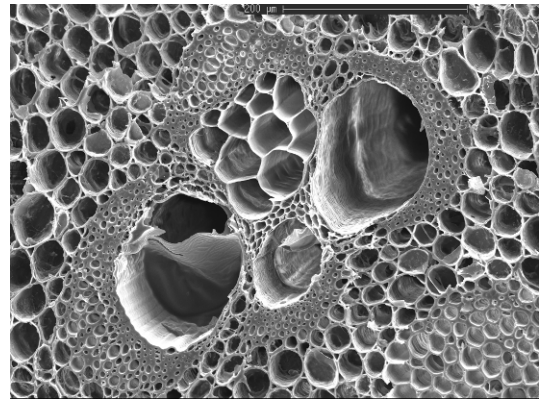
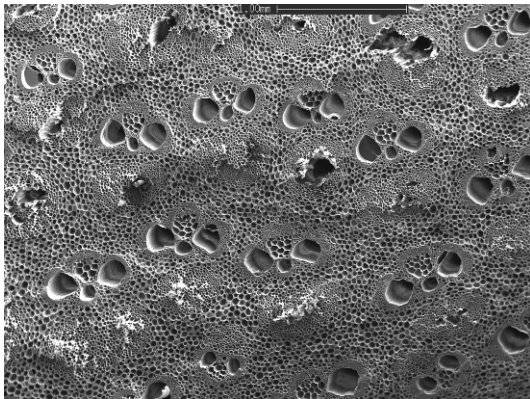


Figure 4 : faisceaux vasculaires de monocotylédones (Bambou, *Dendrocalamus*) constitués de fibres entourant les éléments vasculaires (xylème) et le phloème, dispersés dans du parenchyme (CT)

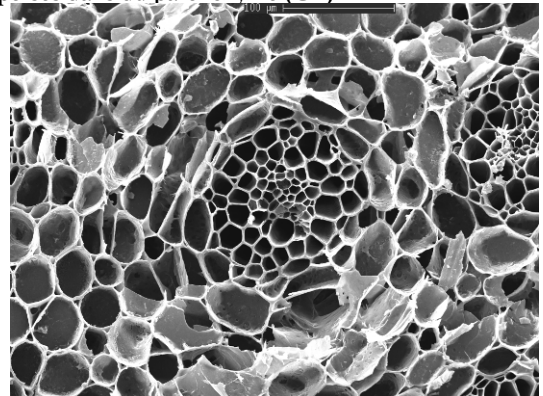
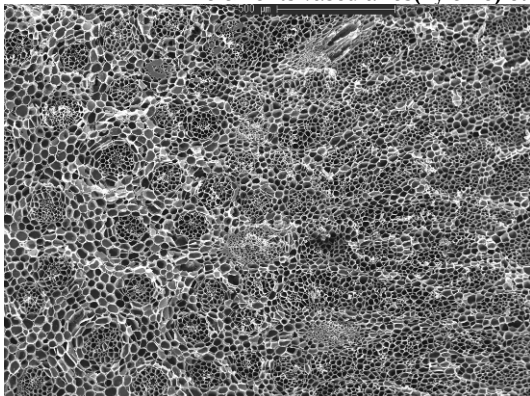


Figure 5 : faisceaux vasculaires de type amphivasal le xylème (fibres et éléments vasculaires) entoure le phloème, dans un fond de parenchyme. CT de *Cordyline* (Laxmaniacée, Monocotylédone)

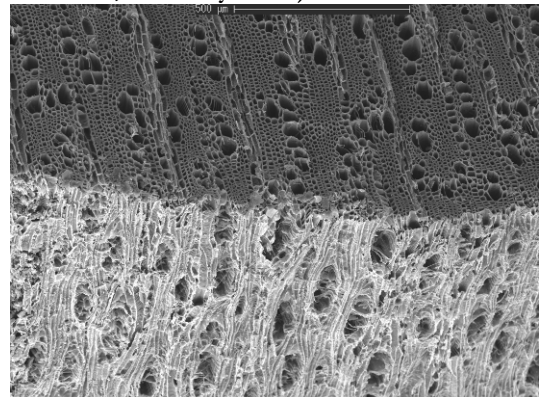
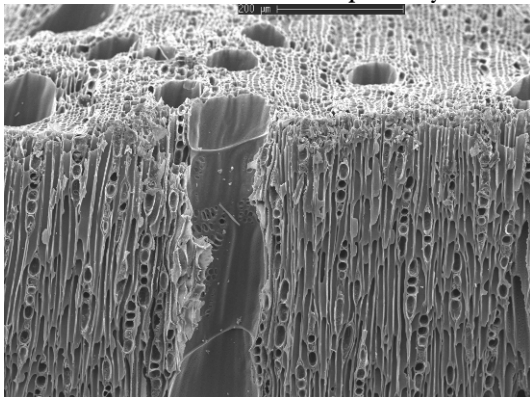


Figure 3 : angle entre la coupe transversale et la coupe longitudinale tangentielle de deux Dicotylédones (tamanou, *Calophyllum inopyllum* à gauche et une Rhizophoracée archéologique à droite). Vaisseaux solitaires ou en chaîne et rayons unisériés ou multisériés sont visibles.

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Index des taxons

FAMILLE	ESPECE	NOM LOCAL	NOM EN LANGUE VERNACULAIRE
CYATHACEAE	<i>Cyathea neocaledonica</i>	fougère arborescente	
CYATHACEAE	<i>Dicksonia baudouinii</i>	fougère arborescente	
ARACEAE	<i>Colocasia esculenta</i>	taro d'eau	âju-wë
DIOSCOREACEAE	<i>Dioscorea alata</i>	igname	nägöri
GRAMINEAE	<i>Dendrocalamus sp</i>	bambou	
LAXMANNIACEAE	<i>Cordyline fruticosa</i>	cordyline	wâjiti
LAXMANNIACEAE	<i>Cordyline spp</i>	cordyline rouge	tî
PALMACEAE	<i>Burretokentia vieillardii</i>	palmier de forêt	cè?
PALMACEAE	<i>Cocos nucifera</i>	cocotier	nù
PANDANACEAE	<i>Pandanus tectorius</i>	pandanus	
PANDANACEAE	<i>Pandanus sp.</i>	pandanus de forêt	
ANACARDIACEAE	<i>Mangifera indica</i>	manguier	
ANACARDIACEAE	<i>Semecarpus atra</i>	acajou	
ANACARDIACEAE	<i>Spondias cytherea</i>	pommier cythère	
ANNONACEAE	<i>Polyalthia nitidissima</i>		
APOCYNACEAE	<i>Alstonia costata</i>		
APOCYNACEAE	<i>Cerbera manghas</i>		
APOCYNACEAE	<i>Cerberiopsis candelabra</i>		
APOCYNACEAE	<i>Ochrosia elliptica</i>		
APOCYNACEAE	<i>Pagiantha serifera</i>		
AQUIFOLIACEAE	<i>cf. Ilex sp.</i>		(bois de feu piquant à palabres)
ARALIACEAE	<i>Schefflera gabriellae</i>		
ARALIACEAE	<i>Schefflera reginae</i>		
ARALIACEAE	<i>Schefflera veitchii</i>		
ARALIACEAE	<i>Thiegemopanax bracteatus</i>		
ARAUCARIACEAE	<i>Agathis corbassonii</i>		
ARAUCARIACEAE	<i>Agathis moorei</i>		
ARAUCARIACEAE	<i>Araucaria columnaris</i>		
ARAUCARIACEAE	<i>Agathis ovata</i>		
ATHEROSPERMATAEAE	<i>Nemuaron vieillardii</i>	bois pernod	
BISCHOFIACEAE	<i>Bischofia javanica</i>		
BORAGINACEAE	<i>Argusia argentea</i>		
BORAGINACEAE	<i>Cordia dichotoma</i>		
CASUARINACEAE	<i>Casuarina collina</i>		
CASUARINACEAE	<i>Casuarina equisetifolia</i>		
CASUARINACEAE	<i>Gymnostoma nodiflora</i>		
CELASTRACEAE	<i>Pleurostylia opposita</i>		
COMBRETACEAE	<i>Terminalia catappa</i>	badamier/sea almond	
CUNONIACEAE	<i>Codia incrassata</i>		
CUNONIACEAE	<i>Cunonia ausrocaledonica</i>	chêne rouge	bwia
CUNONIACEAE	<i>Geissois hirsuta</i>		
CUNONIACEAE	<i>Geissois racemosa</i>	faux tamanou	mô
CUNONIACEAE	<i>Pancheria gatopensis</i>		
CUPRESSACEAE	<i>Neocalliptrosis pancheri</i>		
EBENACEAE	<i>Diospyros fasciculosa</i>		
ELAEOCARPACEAE	<i>Elaeocarpus angustifolius</i>		
ELAEOCARPACEAE	<i>Elaeocarpus rotundifolius</i>		
EUPHORBIACEAE	<i>Acalypha grandis</i>		
EUPHORBIACEAE	<i>Aleurites moluccana</i>		
EUPHORBIACEAE	<i>Cleidion vieillardii</i>		
EUPHORBIACEAE	<i>Cleistanthus stipitatus</i>		
EUPHORBIACEAE	<i>Codiaeum peltatum</i>	croton	aru? (paîci)

EUPHORBIACEAE	<i>Croton insularis</i>	Croton	
EUPHORBIACEAE	<i>Drypetes deplanchei</i>		
EUPHORBIACEAE	<i>Fontainea pancheri</i>		
EUPHORBIACEAE	<i>Macaranga alcharoides</i>		
FLACOURTIACEAE	<i>Caesaria deplanchei</i>		
FLACOURTIACEAE	<i>Homalium deplanchei</i>		
GESNERIACEAE	<i>Depanthus glaber</i>		anyâ : "feu" en Paicî)
GUTTIFERAE	<i>Garcinia puat</i>	faux houp, houp blanc	wii (paicî)
GUTTIFEREAE	<i>Calophyllum caledonicum</i>		
GUTTIFEREAE	<i>Calophyllum inophyllum</i>		
GUTTIFEREAE	<i>Montrouziera cauliflora</i>	houp	u (cemuhi)
HERNANDIACEAE	<i>Gyrocarpus americanus</i>	bois pirogue, bois blanc	
HERNANDIACEAE	<i>Hernandia cordigera</i>		
ICACINACEAE	<i>Apodytes clusifolia</i>	faux ralia	koka (cemuhi)
LABIATEAE	<i>Premna serratifolia</i>		
LAURACEAE	<i>Cryptocaria macrocarpa</i>	bois moustiquaire	
LECYTHIDACEAE	<i>Barringtonia asiatica</i>	bonnet d'évêque	jio (cemuhi)
LECYTHIDACEAE	<i>Barringtonia neocaledonica</i>		
LEGU-CAESALPINIACEAE	<i>Intsia bijuga</i>		
LEGU-CAESALPINIACEAE	<i>Storckiella pancheri</i>	faux frêne/kingué	kâgé (paicî)
LEGU-FABACEAE	<i>Inocarpus fagifer</i>	châtaigner tahitien	mape (huahine)
LEGU-MIMOSACEAE	<i>Acacia spirorbis</i>	gaïac	
LEGU-MIMOSACEAE	<i>Archidendropsis streptocarpa</i>		pwapene (paicî)
LEGU-PAPILIONACEAE	<i>Erythrina variegata</i>	peuplier kanak	nârû waapwii (paicî)
LOGANIACEAE	<i>Fagraea berteriana</i>	bois pétrole, bois tabou	mâdûgô (paicî)
LOGANIACEAE	<i>Neuburgia neocaledonica</i>		Wétia (cemuhi)
MALVACEAE	<i>Hibiscus tiliaceus</i>	bourao	bwao-pwêti (paicî)
MALVACEAE	<i>Thespesia populnea</i>	bois de rose d'océanie	bwao-kûrûnêê : bourao d'Ouvéa (p)
MELIACEAE	<i>Aglaia elaeagnoidea</i>		
MELIACEAE	<i>Dysoxylum cf. roseum</i>		
MELIACEAE	<i>Dysoxylum machrantum</i>		tuburu (paicî)(planté pour les fêtes)
MELIACEAE	<i>Dysoxylum rufescens</i>	bois d'ail	mââpwéa, pibèè kû ? (paicî)
MORACEAE	<i>Artocarpus altilis</i>	arbre à pain	î (paicî)
MORACEAE	<i>Broussonetia papyfera</i>	arbre à tapa	
MORACEAE	<i>Ficus cf. orthophora</i>		wâi (paicî)
MORACEAE	<i>Ficus fraseri</i>	sandpaper	
MORACEAE	<i>Ficus prolixa</i>	banian	bwe (cemuhi)
MORACEAE	<i>Ficus prolixa (root)</i>	banian	bwe (cemuhi)
MYRTACEAE	<i>Arillastrum gummiferum</i>	chêne gomme	èöki (paicî)
MYRTACEAE	<i>Carpolepis laurifolia</i>	faux teck	kiki (paicî)
MYRTACEAE	<i>Eugenia gacognei</i>		
MYRTACEAE	<i>Melaleuca quinquenervia</i>	niaouli	itêu (paicî)
MYRTACEAE	<i>Ptilocalix macrophylla</i>	goya	èpu-iawé (paicî)
MYRTACEAE	<i>Psidium guajava</i>	goyavier	
MYRTACEAE	<i>Syzygium cumini</i>	jamelonier	
MYRTACEAE	<i>Syzygium malaccense</i>	pommier kanak	èpu (paicî)
PROTEACEAE	<i>Kermadecia sinuata</i>	hêtre	pwaii (paicî)
PROTEACEAE	<i>Viotia roussellii</i>		
RHAMNACEAE	<i>Alphytonia neocaledonica</i>	bois savon, pomadis	
RHAMNACEAE	<i>Colubrina asiatica</i>		tutu (huahine)
RHAMNACEAE	<i>Rhamnella vitiensis</i>		
RHIZOPHORACEAE	<i>Bruguiera gymnorhiza</i>	palétuvier rouge	nyîbwe (cemuhi)
RHIZOPHORACEAE	<i>Crossostylis grandiflora</i>	palétuvier de montagne	opwâro (paicî)
RHIZOPHORACEAE	<i>Crossostylis multiflora</i>	hêtre nouveaux/chêne gris	nyââmî (paicî)

RHIZOPHORACEAE	<i>Rhizophora sp.</i>	palétuvier	kéö (paicî)
RUBIACEAE	<i>Gardenia oudiepe</i>	gommier de forêt	oro / tûü « arbre à colle » (paicî)
RUBIACEAE	<i>Gardenia urvillei</i>	tiaré des forêts sèches	
RUBIACEAE	<i>Ixora cauliflora</i>		
RUBIACEAE	<i>Morinda citrifolia</i>	noni	wërê-upwârâ (paicî)
RUBIACEAE	<i>Psychotria cf. collina</i>		
RUTACEAE	<i>Acronychia laevis</i>		
RUTACEAE	<i>Murraya paniculata</i>		
RUTACEAE	<i>Picrella glandulosa</i>		
SANTALACEAE	<i>Santalum austrocaledonicum</i>	bois de santal	
SAPINDACEAE	<i>Cupaniopsis cf. trigonocarpa</i>		
SAPINDACEAE	<i>Cupaniopsis cf. sylvatica</i>		
SAPINDACEAE	<i>Dodonea viscosa</i>		
SAPINDACEAE	<i>Ellatostachys apetala</i>		mi (paicî)
SAPINDACEAE	<i>Guioa villosa</i>		niamötö (paicî)
SAPINDACEAE	<i>Pometia pinnata</i>	pometier	
SAPOTACEAE	<i>Manilkara dissecta</i>	buni	
SAPOTACEAE	<i>Mimusops elengii</i>	raporé	
SAPOTACEAE	<i>Niemeyera balansae</i>	marronnier	mba (paicî)
SAPOTACEAE	<i>Planchonella cinerea</i>		
SONERATIACEAE	<i>Soneratia alba</i>	palétuvier	
SYMPLOCACEAE	<i>Symplocos arborea</i>		omô (paicî)
ULMACEAE	<i>Celtis hypoleuca</i>		
WINTERACEAE	<i>Zygogynum spp.</i>		
AMBORELLACEAE	<i>Amborella trichopoda</i>		

**NEW CALEDONIA WOOD CHARCOAL DATABASE
OF ANATOMY DESCRIPTIONS:**

**PTERIDOPHYTES
Cyathaceae**

CYATHACEAE

Cyathea neocaledonica

sample number

33

PTERIDOPHYTE

DICOTYLEDONS

MONOCOTYLEDONS

Fougère arborescente

morphology of the charcoal

elongated thin wavy structure. pith and cortex of parenchyma and phloeme cells from the vascular bundles are destroyed almost completely by charring. tracheids and sclerenhyma cells bands remain alone

Transverse section**Longitudinal sections**

VASCULAR BUNDLES

main stelar system type

dictyostelic

vascular bundles/meristeles size

large

meristeles general shape

wavy "W" shape layers

Sclerenchyma fibres stelar sheat around meristeles

present

Sclerenchyma fibres sheat disposition

bicollateral

Sclerenchyma band cells shape and pits

fibrous sclerenchymatous type.
small simple pits along the walls.

phloem arrangement

bicollateral

tracheids shape

irregular oval to round

tracheids pits

tracheids size

large

scalariform

Notes

sclerenchyma cells very thick walled, sometimes no protoxylem visible

ARCHAEOLOGICAL CHARCOALS: only sclerenchyma bands remained, still shaping an elongated charcoal with wavy shape, small fragments in v-shaped in TS

CYATHACEAE

Dicksonia baudouinii

sample number

30

PTERIDOPHYTE

DICOTYLEDONS

MONOCOTYLEDONS

Fougère arborescente

morphology of the charcoal

Hard, elongated thin wavy structure. pith and cortex of parenchyma and phloeme cells from the vascular bundles are destroyed almost completely by charring. tracheids and sclerenhyma cells bands remain alone

Transverse section**Longitudinal sections**

VASCULAR BUNDLES

main stelar system type

dictyostelic

vascular bundles/meristeles size

large

meristeles general shape

triangular layers

Sclerenchyma fibres stelar sheat around meristeles

present

Sclerenchyma fibres sheat disposition

bicollateral

Sclerenchyma band cells shape and pits

fibrous sclerenchymatous type.
small simple pits along the walls

phloem arrangement

bicollateral

tracheids shape

angular lozangic

tracheids size

large

tracheids pits

scalarifom

Notes

frequency of protoxylem tracheids higher than cyathea, sclerenchyma cell walls medium to thick slightly thinner than cyathea

ARCHAEOLOGICAL CHARCOALS: only sclerenchyma bands remained, still shaping an elongated charcoal with wavy shape, small fragments in v-shaped in TS

**NEW CALEDONIA WOOD CHARCOAL DATABASE
OF ANATOMY DESCRIPTIONS:**

MONOCOTYLEDONS

AGAVACEAE

Cordyline fruticosa

sample number 52

MONOCOTYLEDON

PTERIDOPHYTES
DICOTYLEDONS

cordyline

wājiti

Morphology of the charcoal
soft and light

Transverse section

Longitudinal sections

VASCULAR BUNDLES

breakdown

disposition

frequency

size

shape

vascular bundles longitudinal disposition

VASCULAR ELEMENTS

number

size

disposition

perforation

pits

FIBRES

proportion wall thickness

Secondary Xylem

GROUND PARENCHYMA CELLS

contents

shape

state

walls thickness

Sclerenchyma**Notes**

strong difference between stem and woody part, with center stem in a usual monocotyledon vb loosely distribution scheme, and tight lines of vb in woody part
main difference with C.spp : tracheid pits simple only, slightly less than parenchyma, with regular shape and arrangement

AGAVACEAE

Cordyline spp

sample number 119

MONOCOTYLEDON

PTERIDOPHYTES

DICOTYLEDONS

Cordyline rouge

tî

Morphology of the charcoal

light but hard, small diameter only

Transverse section

Longitudinal sections

VASCULAR BUNDLES

breakdown

some of the phloeme parts

disposition

radial lines of vb in alternate close rows

frequency

very high (low in central stem parts)

size

medium (larger than fruticosa)

shape

elongated ovals

vascular bundles longitudinal disposition

axial to oblique

VASCULAR ELEMENTS

number

numerous

size

small

disposition

amphivasal bundles in hard part of the stem, xyem surrounding minute phloem centre

perforation

scalariform

pits

large simple opposed pits to scalariform

FIBRES

proportion

wall thickness

Secondary Xylem

GROUND PARENCHYMA CELLS

contents

shape

irregular large oval to lozangic or rectangular shaped

state

good

walls thickness

thin

Sclerenchyma**Notes**

strong difference between stem and woody part, with center stem in a usual monocot vb loosely distribution scheme, and tight lines of amphivasal bundles in woody part
main difference with *C.fruticosa* : tracheid pits simple and scleriform, slightly more parenchyma, with irregular shape and arrangement

ARECACEAE

Burretokia vieillardii

sample number 31

MONOCOTYLEDON

PTERIDOPHYTES

DICOTYLEDONS

palmier de forêt

cè?

Morphology of the charcoal

Transverse section

Longitudinal sections

VASCULAR BUNDLES

breakdown

phloem

disposition

throughout the stem

frequency

very high (low in central stem part)

size

medium to small

shape

lozange to oval shape

vascular bundles longitudinal disposition

regular axial distribution

VASCULAR ELEMENTS

number

one or 2 solitary, few in cluster

size

large (1/3 of the VB)

disposition

almost centered

perforation

scalariform

pits

scalariform

FIBRES

proportion

2/3 in pith to 3/4 in cortex

wall thickness

thin in pith to medium in cortex

Secondary Xylem

irregular number of small vessels around the metaxylem

GROUND PARENCHYMA CELLS

contents

shape

where conserved : rectangular to oval

state

mainly squizzed between vb ,few and melted by charring

walls thickness

thin

Sclerenchyma

center, mostly crumbled

Notes

fibres arranged from rounded in the center to large elongated cells towards the external part of the vb

ARECACEAE

Cocos nucifera

sample number 124

MONOCOTYLEDON

PTERIDOPHYTES

DICOTYLEDONS

cocotier

nù

Morphology of the charcoal

Transverse section

Longitudinal sections

VASCULAR BUNDLES

breakdown

phloem

disposition

numerous throughout the stem

frequency

medium density

size

medium to large

shape

rounded to triangular with smooth angles

vascular bundles longitudinal disposition

some vb in oblique longitudinal disposition + leaf traces in oblique disposition too

VASCULAR ELEMENTS

number

mainly 2-3 or 1 large, sometimes smaller 3-4 in cluster

size

large when solitary or 2

disposition

centered at one ends of the bundle

perforation

simple

pits

scalariform

FIBRES

proportion

3/4

wall thickness

thick to medium sized

Secondary Xylem

2-3 small vessels above metaxylem elements

GROUND PARENCHYMA CELLS

contents

shape

rectangular in longitudinal section, ovals elongated in transverse section

state

good, large areas of ground parenchyma in between vb

walls thickness

thin

Sclerenchyma

mostly breakdown

Notes

breakdown parts in the the center of vb (ploem) can be quite large

GRAMINEAE

Dendrocalamus sp

sample number 95

MONOCOTYLEDON

PTERIDOPHYTES

DICOTYLEDONS

Bambou

Morphology of the charcoal

very hard

Transverse section

Longitudinal sections

VASCULAR BUNDLES

breakdown

phloem parts

disposition

relative regular alternate disposition

frequency

medium to low

size

large

shape

triangular with smooth angle

vascular bundles longitudinal disposition

very regular axial disposition

VASCULAR ELEMENTS

number

two large solitary, sometimes in clusters of 2

size

very large

disposition

V shaped with secondary xylem

perforation

simple

pits

alternate small oval pits

FIBRES

proportion

1/4

wall thickness

very thick

Secondary Xylem

one smaller vessel centered

GROUND PARENCHYMA CELLS

contents

empty

shape

round to oval

state

good

walls thickness

thin

Sclerenchyma

circumvascular anchor type to isolated bundles

Notes

size and shape in "noeud papillon" of vb characteristic
phloeme conserved after charring in fresh sample, in clusters of large cells with thin walls at the center of the vb

PANDANACEAE

Pandanus sp.

sample number 103

MONOCOTYLEDON

PTERIDOPHYTES

DICOTYLEDONS

pandanus de forêt

Morphology of the charcoal

good strenght to hard on cortex and bark

Transverse section

Longitudinal sections

VASCULAR BUNDLES

breakdown

all parenchymous tissue in the inner part of the stem

disposition

irregularly dipsersed

frequency

high density in cortex , low density in pith

size

small to medium

shape

oval to lozange

vascular bundles longitudinal disposition

mainly axial

VASCULAR ELEMENTS

number

two solitary, very rarely in clusters of 2

size

small

disposition

extreme end or corner of the vb

perforation

scalariform more than 10 bars

pits

opposite large to scalariform

FIBRES

proportion

3/4

wall thickness

thin in pith to medium in cortex

Secondary Xylem

clusters of 2/3 vessels centred in top end

GROUND PARENCHYMA CELLS

contents

shape

oval with smooth angle

state

destroyed in inner part

walls thickness

thin

Sclerenchyma

crumbled

Notes

vb and vessels remarkably larger towards the center of the stem

PANDANACEAE

Pandanus tectorius

sample number 123

MONOCOTYLEDON

PTERIDOPHYTES

DICOTYLEDONS

Pandanus

Morphology of the charcoal

extremely fibrous and crumbly

Transverse section

Longitudinal sections

VASCULAR BUNDLES

breakdown

parenchymous and sclerenchymous parts

disposition

irregularly dispersed

frequency

medium

size

small

shape

elongated ovals to 8 shaped

vascular bundles longitudinal disposition

oblique and axial arrangement

VASCULAR ELEMENTS

number

two lonely vessels or two clusters of two or more

size

medium to small

disposition

opposite, at the extreme end of the vb

perforation

scalariform with more than 10 bars?

pits

opposite to scalariform

FIBRES

proportion

2/3 to 3/4

wall thickness

thick

Secondary Xylem

several small vessels above and between metaxylem vessels

GROUND PARENCHYMA CELLS

contents

large raphides clusters

shape

angular

state

crumbled or undifferentiated cells from charring

walls thickness

medium to thin

Sclerenchyma

Notes

radial vb or vessels

**NEW CALEDONIA WOOD CHARCOAL DATABASE
OF ANATOMY DESCRIPTIONS:**

DICOTYLEDONS

AMBORELLACEAE

distinctive features and notes

Vesselless dicotyledons with a single specy : *Amborella trichopoda* Baill., endemic to New Caledonia., thought to be one the most primitive angiosperm known today, placed with Nymphaeales and Illiciales at the basis of angiosperms cladograms (Mathews and Donoghue 1999, Parkinson et al. 1999, Qiu et al. 1999, Soltis et al. 1999; all cited in Carlquist 2001).

Rays are of two types and always long : uni-biseriate rays or 3-5 cells wide multiseriate rays, with mainly square to upright cells. Parenchyma is scarce.

Reference: Carlquist 2001. *Pacific Science* 55 (3) : 305-312

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalfe and Chalk 1950*
 Scheel-Ybert 1998 *Illic/CSIRO 1999*

Families general anatomical features

ANACARDIACEAE

distinctive features and notes

Family divided in 2 groups based on anatomical features (Ilic 1999). Both are present in our "Central Pacific" region (associated with "Malaysia") and in the "Australia and New Zealand" region of Ilic (1999).

Axial canals are reported as frequent in this family by Scheel-Ybert and Ilic, though not observed in *Semecarpus atra* sample from the reference collection.

Ilic reports druses in rays as frequent. Tyloses are frequent.

Scalariform perforation plates are restricted to *Dracontomelon* and *Spondias* (Ilic 1999)

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalfe and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

ANACARDIACEAE

DB

Mangifera indica

collection number

113

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

manguier

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

bordered pits

intervessels pits size

small

perforation plates types

simple

helical thickenings

no

vessels porosity /
tracheids diameter

semi-ring porous

vessels grouping

clusters common (2 or 3)

vessels
arrangement

radial to diagonal pattern

solitary vessels with angular outline

no

vessels tyloses

yes

vessels deposits

FIBERS

fibers wall thickness

very thin walled

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

yes

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

paratracheal lozenge aliform

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

8 to 15 cells

rays width

1 to biseriate

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

large, rounded or elongate

walls

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

present

NOTES

Rays appear more heterogenous to sub-homogenous, contrary to homogenous rays described by Détienne

ANACARDIACEAE

DB

Semecarpus atra

collection number

68

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

acajou

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

intervessels / tracheids pits arrangement

uniseriate to opposed biseriate

vessels porosity /
tracheids diameter

diffuse-porous

intervessels / tracheids pits shapes

simple

vessels grouping

clusters common (3 or more)

vessels
arrangement

radial pattern

intervessels pits size

changeable

solitary vessels with angular outline

no

perforation plates types

simple

vessels tyloses

no

helical thickenings

no

vessels deposits

FIBERS

fiber helical thickenings

no

fibers wall thickness

very thin walled

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

extremely rare

fusiform parenchyma cells

axial parenchyma arrangement

apotracheal diffuse

axial parenchyma bands

RAYS / RADIAL PARENCHYMA

rays height

3 or 4 to 20 cells high

rays width

1 to biseriate

rays

present

rays cellular composition

heterogeneous

aggregate rays

yes

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

simple, larges, restricted to
marginal rows

walls

thin

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

SEM images show different types of aggregate rays: long uni-biseriate, rare triseriate parts, and some rare multiseriate ones, same length as uni-biseriate
vessel pits large to pseudoscalariform

ANACARDIACEAE

DB

Spondias cytherea

collection number

114

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

pommier cythère

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

intervessels / tracheids pits arrangement

vessels porosity /
tracheids diameter

intervessels / tracheids pits shapes

vessels grouping

vessels
arrangement

solitary vessels with angular outline

vessels tyloses

vessels deposits

intervessels pits size

perforation plates types

helical thickenings

FIBERS

fibers wall thickness

fiber helical thickenings

fiber pits

spetate fibers present

vascular-vasicentric tracheids present

parenchyma like fibers present

AXIAL PARENCHYMA

axial parenchyma present

extremely rare

axial parenchyma arrangement

scanty paratracheal

fusiform parenchyma cells

axial parenchyma bands

RAYS / RADIAL PARENCHYMA

rays

aggregate rays

rays height

rays width

rays cellular composition

rays sheat cells

tile cells

storied structure

VESSEL RAYS CROSSING

vessels rays pitting

walls

pits rare, large, rounded or
elongated

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

present

NOTES

Reference: Détienne 1999. No reference sample.
rays 4-6 seriate
fibers sometime septate

ANNONACEAE

distinctive features and notes

Family with homogenous anatomical feature, present in the region throughout our "Central Pacific" area, associated with "Malaysia", and in the "Australia and New Zealand" region defined by Ilic (1999).

Ilic reports spiral thickenings in many genera.
Crystals can be present in parenchyma cells.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalfe and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

ANNONACEAE

DB

Polyalthia nitidissima

collection number

79

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

minute

perforation plates types

simple

helical thickenings

no

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

in radial clusters

vessels
arrangement

radial pattern

solitary vessels with angular outline

no

vessels tyloses

vessels deposits

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

scalariform

fusiform parenchyma cells

no

axial parenchyma bands

more than 3 cells wide

RAYs / RADIAL PARENCHYMA

rays

present

aggregate rays

yes

rays height

20 to 30 cells high

rays width

3 to 10 seriate

rays cellular composition

homogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

minute, marginal

walls

smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

characterising feature: numerous narrow bands of parenchyma cells

Families general anatomical features

APOCYNACEAE

distinctive features and notes

Family divided in 2 groups based on anatomical features (Ilic 1999). Both are present in our "Central Pacific" region (associated with "Malaysia").

Divided in three types by Scheel-Ybert (1998).

Genera of this family present a wide diversity of anatomical features.

Parenchyma can be absent or present in various apotracheal forms.

Spiral thickenings in fibres reported by Ilic.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
- clusters common
- radial clusters common

intervessels pits

- simple
- bordered
- vested
- scalariform
- minute
- large

perforation plates

- simple
- scalariform or reticulate

axial parenchyma

- absent or rare
- scanty paratracheal
- paratracheal in various forms
- confluent
- apotracheal in bands
- apotracheal diffuse
- scalariform
- reticulate

fiber pits

- mainly simple
- mainly distinctly bordered

spetate fibers

- frequent
- absent or rare

rays width

- exclusively uniseriate
- no uniseriate
- uni- to multiseriate 3 or less cells
- multiseriate 10 or less cells
- multiseriate more than 10 cells
- uniseriate and multiseriate parts same width
- rays of two different width

storied structure

- rays
- fibres
- axial parenchyma

rays cellular composition

- mainly heterogenous
- mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992*
- Détienne 1999*
- Metcalf and Chalk 1950*
- Scheel-Ybert 1998*
- Ilic/CSIRO 1999*

APOCYNACEAE

DB

Alstonia costata

collection number 111

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

huahine

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

intervessels / tracheids pits arrangement

alternate

vessels porosity /
tracheids diameter diffuse-porous

intervessels / tracheids pits shapes

vestured pits

vessels grouping in radial clusters

vessels
arrangement radial pattern

intervessels pits size small

solitary vessels with angular outline no

perforation plates types simple

vessels tyloses no

helical thickenings

no

vessels deposits

FIBERS

fiber helical thickenings no

fibers wall thickness

thick walled

fiber pits simple to minutely bordered

spetate fibers present no

vascular-vasicentric tracheids present no

parenchyma like fibers present no

AXIAL PARENCHYMA

axial parenchyma present present

fusiform parenchyma cells no

axial parenchyma arrangement

apotracheal diffuse

axial parenchyma bands

no

RAY / RADIAL PARENCHYMA

rays height 7 to 15 cells high

rays present

rays width 1 to 3 seriate

aggregate rays

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting same as intervascular but larger

walls thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

small and numerous pores, in radial clusters of 2 or 4-7 cells
rays are mainly uni- to biseriate in body parts, same width, with tails of elongated large cell,
rare septate fibers noted by D tienne (*reference*)

APOCYNACEAE

DB

Cerbera manghas

collection number

38

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

in radial clusters

vessels
arrangement

radial pattern

solitary vessels with angular outline

yes

vessels tyloses

no

vessels deposits

Longitudinal sections

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

vestured pits

intervessels pits size

minute

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

yes

vascular-vasicentric tracheids present

parenchyma like fibers present

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

in large bands (more than 3 cells wide)

fusiform parenchyma cells

no

axial parenchyma bands

RAY / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

5 to 20, rare 1 or 2, cells high

rays width

1 to biseriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

storied structure

VESSEL RAYS CROSSING

vessels rays pitting

bordered, 4 to 8 per square

walls

smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

parenchyma bands are irregularly distributed, 3-4 cells wide
possible gum deposits in rays
rays are numerous and their majority is uniseriate

APOCYNACEAE

DB

Cerberiopsis candelabra

collection number

66

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

vestured pits

intervessels pits size

small

perforation plates types

simple

helical thickenings

no

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

in radial clusters

vessels
arrangement

radial to diagonal pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

tend to

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

marginal bands

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

rays height

6 to 20, rarely 1 to 2, cells high

rays width

exclusively uniseriate

rays cellular composition

homogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

bordered, medium to large, 15 to more all over the square

walls

thick

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

APOCYNACEAE

DB

Ochrosia elliptica

collection number

122

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

vestured pits

intervessels pits size

minute

perforation plates types

simple

helical thickenings

no

vessels porosity /
tracheids diameter

ring-porous

vessels grouping

solitary

vessels
arrangement

tangential bands

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

dictinctly bordered

spetate fibers present

vascular-vasicentric tracheids present

parenchyma like fibers present

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

apotracheal diffuse

axial parenchyma bands

no

RAYs / RADIAL PARENCHYMA

rays height

14-16 cells high

rays width

1 to 3 seriate

rays

present

aggregate rays

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

6-8 medium cells, tends to be bordered, regularly spread

walls

thin and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

ring changes in cells diameters is gradual

rays are 3-4 seriate in body part with rounded cells, and have uniseriate tails with upright cells

APOCYNACEAE

DB

Pagiantha serifera

collection number

96

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

vestured pits

vessels
arrangement

intervessels pits size

small

solitary vessels with angular outline

no

perforation plates types

simple

vessels tyloses

no

helical thickenings

no

vessels deposits

FIBERS

fiber helical thickenings

no

fiber pits

simple to minutely bordered

fibers wall thickness

very thin walled

spetate fibers present

tend to

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

apotracheal diffuse

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays height

15 to 20 cells high

rays width

uniseriate and multiseriate portions same width

rays

present

rays cellular composition

heterogeneous

aggregate rays

all upright/square

rays sheat cells

tile cells

storied structure

VESSEL RAYS CROSSING

vessels rays pitting

small to minute, marginal

walls

smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

very sensitive to charring fragmentation : large holes
pores can also be in short radial clusters of 2-3 cells but sometimes hard to differentiate from fibers
rays are bi to triseriate in their central part with large lonely cells in their tails

Families general anatomical features

AQUIFOLIACEAE

distinctive features and notes

Family divided in 2 groups based on anatomical features (Ilic 1999). Both are present in our "Central Pacific" region (associated with "Malaysia") and in the "Australia and New Zealand" region.

Scalariform perforations have more than 25 bars.

Parenchyma is diffused mainly in aggregate.

Spiral thickenings are present mainly in *Ilex*

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalfe and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

AQUIFOLIACEAE

DB

cf. Ilex sp.

collection number

105

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

bois de feu piquant pour les

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

in radial clusters

vessels
arrangement

radial pattern

solitary vessels with angular outline

no

intervessels pits size

perforation plates types

scalariform 20 to 40 bars

vessels tyloses

no

helical thickenings

scarce

vessels deposits

FIBERS

fiber helical thickenings

tend to

fiber pits

simple to minutely bordered

fibers wall thickness

thick walled

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

apotracheal diffuse

axial parenchyma bands

no

RAYs / RADIAL PARENCHYMA

rays height

10 to 25 cells high

rays width

3 to 10 seriate

rays

present

rays cellular composition

homogeneous

aggregate rays

no

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

small, simple, 5-6 pits per square,
marginal

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

cambial variants

druses

silica

prismatic crystal

radial secretory canals

included phloem

NOTES

also some vessels with paratracheal axial parenchyma
majority of the rays are 4 cells wide
helical thickening present in vessels are very thin
prismatic crystals present in ray cells

Families general anatomical features

ARALIACEAE

distinctive features and notes

Family with homogenous anatomical features, present in the region throughout our "Central Pacific" area, associated with "Malaysia", and in the "Australia and New Zealand" region defined by Ilic (1999).

Scalariform bars are usually less than 10 bars. Simple perforations in Thiegemopanax (reference sample). Some genera exhibit spiral thickenings in vessels and fibers (Ilic). Tyloses reported in some genera (Détienne).

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalf and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

ARALIACEAE

DB

Schefflera gabriellae

collection number

29

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

in radial clusters

vessels
arrangement

radial pattern

solitary vessels with angular outline

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

bordered to scalariform

intervessels pits size

changeable

perforation plates types

scalariform 3 to 10 bars

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

extremely rare

axial parenchyma arrangement

scanty paratracheal

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

rays height

5 to 20 cells high

rays width

two different types

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

minute, simple to minutely
bordered, marginal

walls

thin

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

cambial variants

druses

silica

prismatic crystal

radial secretory canals

included phloem

NOTES

large vessels and rays in transverse section
few uniseriate rays of 1 to 2 cells high + large multiseriate 3-10 cells aggregate rays of more than 40 cells high are presents in some parts of the wood

ARALIACEAE

DB

Schefflera reginae

collection number

129

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

intervessels / tracheids pits arrangement

uniseriate

vessels porosity /
tracheids diameter

diffuse-porous

intervessels / tracheids pits shapes

bordered to scalariform

vessels grouping

in radial clusters

vessels
arrangement

radial pattern

intervessels pits size

changeable

solitary vessels with angular outline

no

perforation plates types

scalariform 3 to 10 bars

vessels tyloses

no

helical thickenings

no

vessels deposits

FIBERS

fiber helical thickenings

no

fibers wall thickness

thick walled

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

paratracheal unilateral

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays height

mainly 30 cells high, some 8-10 cells high

rays width

two different types

rays

present

rays cellular composition

heterogeneous

aggregate rays

yes

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

minute, 6-8 pits, marginals

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

absent

lactifers tanniferous tubes

absent

radial secretory canals

absent

cambial variants

included phloem

druses

absent

silica

absent

prismatic crystal

absent

NOTES

no solitary vessels

paratracheal unilateral axial parenchyma forms long uniseriate radial bands

rays are mainly bi to triseriate, and tend to be storied / some large multiseriate rays are scattered

scalariform perforation plates tend to be reticulate

ARALIACEAE

DB

Schefflera veitchii

collection number

74

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (3 or more)

vessels
arrangement

radial pattern

solitary vessels with angular outline

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

uniseriate to opposed biseriate

intervessels / tracheids pits shapes

bordered to scalariform

intervessels pits size

large

perforation plates types

scalariform 3 to 10 bars

helical thickenings

no

FIBERS

fibers wall thickness

very thin walled

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

tend to

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

extremely rare

axial parenchyma arrangement

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

rays height

10 to 20 cells high

rays width

3 to 10 seriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

upright

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

simple, small, 3 to 6 per square

walls

thin

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

present

NOTES

quite sensitive to charring fragmentation
crystal deposits in rays cells

ARALIACEAE

DB

Thiegemopanax bracteatus

collection number 109

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

in radial clusters

vessels
arrangement

radial to diagonal pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

simple to scalariform

intervessels pits size

changeable

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

dictinctly bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

scanty paratracheal

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYs / RADIAL PARENCHYMA

rays

present

aggregate rays

yes

rays height

10 to 40 cells high

rays width

3 to 10 seriate

rays cellular composition

homogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

small, simple, 2 to 3 scattered

walls

smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

some uniseriate and 1 to 2 cells high rays scattered through the wood
rays are mainly 4 cells wide

Families general anatomical features

ARAUCARIACEAE

distinctive features and notes

Family with homogenous anatomical features, with species of the same genus being very similar, present in the Pacific region in: Australia, New Zealand, Malaysia and islands of the Western Pacific.

Small and narrow rays (lobger in *Araucaria*), tracheids with large vestured, polygonal or bordered pits, uniseriate to alternate biseriate, rays/tracheids pits araucarioïdes for *Agathis*, tending to cupresoïdes for *Araucaria* in samples of the reference collection.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalfe and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

ARAUCARIACEAE

DB

Agathis corbassonii

collection number

35

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**soft wood :
tracheids only

intervessels / tracheids pits arrangement

uniseriate to alernate biseriate

intervessels / tracheids pits shapes

bordered pits

intervessels pits size

perforation plates types

helical thickenings

scarse

vessels porosity /
tracheids diameter

abrupt change in tracheid diam

vessels grouping

vessels
arrangement

solitary vessels with angular outline

vessels tyloses

vessels deposits

FIBERS

fiber helical thickenings

fiber pits simple to minutely bordered

spetate fibers present

vascular-vasicentric tracheids present

parenchyma like fibers present

fibers wall thickness

thick walled

AXIAL PARENCHYMA

axial parenchyma present

absent

axial parenchyma arrangement

fusiform parenchyma cells

axial parenchyma bands

RAYs / RADIAL PARENCHYMA

rays height 1 to 3 cells high

rays width exclusively uniseriate

rays cellular composition

homogeneous

all upright/square

rays sheat cells

tile cells

storied structure

rays

present

aggregate rays

no

VESSEL RAYS CROSSING

vessels rays pitting

araucarioïdes, 3 to 4 per square

walls

thick and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

the changes in tracheids diameter, though obviously visible, is not thought to be related with regular annual rings. (CIRAD 1992), could be related to irregular drought periods.

some tracheids with polygonal alternate pits.

tendency to helical thickenings?

ARAUCARIACEAE

DB

Agathis moorei

collection number

28

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**soft wood :
tracheids only

intervessels / tracheids pits arrangement

uniseriate to alternate biseriate

intervessels / tracheids pits shapes

polygonal alternate pits

intervessels pits size

perforation plates types

helical thickenings

scarse

vessels porosity /
tracheids diameter

abrupt change in tracheid diam

vessels grouping

vessels
arrangement

solitary vessels with angular outline

vessels tyloses

vessels deposits

FIBERS

fiber helical thickenings

fiber pits

spetate fibers present

vascular-vasicentric tracheids present

parenchyma like fibers present

fibers wall thickness

AXIAL PARENCHYMA

axial parenchyma present

absent

fusiform parenchyma cells

axial parenchyma bands

axial parenchyma arrangement

RAYs / RADIAL PARENCHYMA

rays height

rays width

rays cellular composition

rays sheat cells

tile cells

storied structure

rays

aggregate rays

VESSEL RAYS CROSSING

vessels rays pitting

walls

araucarioïdes, 2 to 6 pits per
square

thick

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

possible gum deposits in rays
tracheid walls thicker than *Agathis corbassonii* in transverse section
some of the uniseriate tracheids pits are only bordered, not with polygonal shape

ARAUCARIACEAE

DB

Araucaria columnaris

collection number

49

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**VESSELS/TRACHEIDS**soft wood :
tracheids onlyvessels porosity /
tracheids diameter

homogeneous

vessels grouping

vessels
arrangement

solitary vessels with angular outline

vessels tyloses

vessels deposits

FIBERS

fibers wall thickness

AXIAL PARENCHYMA

axial parenchyma present

absent

axial parenchyma arrangement

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

VESSEL RAYS CROSSING**Longitudinal sections**

intervessels / tracheids pits arrangement

uniseriate to alernate biseriate

intervessels / tracheids pits shapes

bordered pits

intervessels pits size

perforation plates types

helical thickenings

no

fiber helical thickenings

fiber pits

spetate fibers present

vascular-vasicentric tracheids present

parenchyma like fibers present

fusiform parenchyma cells

axial parenchyma bands

rays height

1 to 8 cells high

rays width

exclusively uniseriate

rays cellular composition

homogeneous

mixed cellular composition

rays sheat cells

tile cells

storied structure

vessels rays pitting

araucarioïdes/cupressoïdes
3 to 8 pits per square

walls

thick

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

possible gum deposits

rays density high, with some rays very close to each other, even though no aggregate structure

ARAUCARIACEAE

DB

Agathis ovata

collection number

55

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**soft wood :
tracheids only

intervessels / tracheids pits arrangement

uniseriate to alernate biseriate

intervessels / tracheids pits shapes

polygonal alternate pits

intervessels pits size

perforation plates types

helical thickenings

no

vessels porosity /
tracheids diameter abrupt change in tracheid diam

vessels grouping

vessels
arrangement

solitary vessels with angular outline

vessels tyloses

vessels deposits

FIBERS

fiber helical thickenings

fiber pits

spetate fibers present

vascular-vasicentric tracheids present

parenchyma like fibers present

fibers wall thickness

AXIAL PARENCHYMA

axial parenchyma present absent

axial parenchyma arrangement

fusiform parenchyma cells

axial parenchyma bands

RAY / RADIAL PARENCHYMA

rays height 1 to 2-sometimes 3-cells high

rays width exclusively uniseriate

rays cellular composition

homogeneous

all upright/square

rays sheat cells

tile cells

storied structure

rays present

aggregate rays no

VESSEL RAYS CROSSINGvessels rays pitting araucarioïdes to cupressoïdes
4 to 12 pits per square

walls

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

absent

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

parts of the wood with homogeneous tracheids cells, other parts with lines of abrupt changes in diameter, for each of the three Agathis of the database : ecological significance more than identification criteria?
demonstrates alternate biseriate tracheids pits more often than the two other Agathis species of the database.

ATHEROSPERMATACEA

distinctive features and notes

Only one specy of this family has been collected and described in our database and none in the main references used. It is present in the region in Australia and New Zealand.

Described in the general atlas of Metcalfe and Chalk : within the Monimiaceae.
Rays predominantly 3-4 seriate.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalfe and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

ATHEROSPERMATACEA

DB

Nemuaron vieillardii

collection number 37

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

bois pernod

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

intervessels / tracheids pits arrangement

uniseriate

vessels porosity /
tracheids diameter diffuse-porous

intervessels / tracheids pits shapes

simple to scalariform

vessels grouping solitary

vessels
arrangement radial to diagonal pattern

intervessels pits size

solitary vessels with angular outline no

perforation plates types scalariform 40 bars or more

vessels tyloses no

helical thickenings

no

vessels deposits

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings no

fiber pits distinctly bordered

spetate fibers present yes

vascular-vasicentric tracheids present

no

parenchyma like fibers present

AXIAL PARENCHYMA

axial parenchyma present present

fusiform parenchyma cells no

axial parenchyma arrangement

apotracheal diffuse

axial parenchyma bands

no

RAY / RADIAL PARENCHYMA

rays present

aggregate rays

rays height 6 to 9 cells high

rays width 1 to biseriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting bordered, large,
numerous

walls smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

a few clusters of 2 pores can be seen

rays either biseriate with uniseriate tails as large as body part, or uniseriate with large elongated cells

vessels are numerous and widely dispersed in transverse section

BISCHOFIACEAE

distinctive features and notes

Only one specy of this family has been collected and described in our database and none in the references used. It is present in the region in other Pacific islands.

Described in the general atlas of Metcalfe and Chalk: within the Euphorbiaceae, "group B glochidion type". perforations are predominantly simple but some scalariform ones are reported for *Bischoffia*, *Antidesma*, *Hymenocardia*, *Bridelia*. Rays are mainly 4-11 cells wide. Crystals and silica can be present.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
- clusters common
- radial clusters common

intervessels pits

- simple
- bordered
- vestured
- scalariform
- minute
- large

perforation plates

- simple
- scalariform or reticulate

axial parenchyma

- absent or rare
- scanty paratracheal
- paratracheal in various forms
- confluent
- apotracheal in bands
- apotracheal diffuse
- scalariform
- reticulate

fiber pits

- mainly simple
- mainly distinctly bordered

spetate fibers

- frequent
- absent or rare

rays width

- exclusively uniseriate
- no uniseriate
- uni- to multiseriate 3 or less cells
- multiseriate 10 or less cells
- multiseriate more than 10 cells
- uniseriate and multiseriate parts same width
- rays of two different width

storied structure

- rays
- fibres
- axial parenchyma

rays cellular composition

- mainly heterogenous
- mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992*
- Détienne 1999*
- Metcalfe and Chalk 1950*
- Scheel-Ybert 1998*
- Ilic/CSIRO 1999*

BISCHOFIACEAE

DB

Bischofia javanica

collection number

111

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

in radial clusters

vessels
arrangement

radial pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

uniseriate

intervessels / tracheids pits shapes

simple

intervessels pits size

small

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

very thin walled

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

yes

vascular-vasicentric tracheids present

no

parenchyma like fibers present

yes

AXIAL PARENCHYMA

axial parenchyma present

extremely rare

axial parenchyma arrangement

fusiform parenchyma cells

no

axial parenchyma bands

no

RAY / RADIAL PARENCHYMA

rays

present

aggregate rays

rays height

6 to 20 cells high

rays width

1 to 3 seriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

simple, elongated and large

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

characterizing feature: vessels have a lozenge-like shape in transverse section
wood appears very sensitive to charring fragmentation along vessels clusters.

Families general anatomical features

BORAGINACEAE

distinctive features and notes

Family with homogenous anatomical features, present in the region throughout our "Central Pacific" area, associated with "Malaysia", and in the "Australia and New Zealand" region defined by Ilic (1999).

Spiral thickenings reported by Ilic in vessels of some genera.
Crystals and sheat cells in rays can be present.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalf and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

BORAGINACEAE

DB

Argusia argentea

collection number

120

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (2 or 3)

vessels
arrangement

diagonal patterns

solitary vessels with angular outline

no

vessels tyloses

yes

vessels deposits

Longitudinal sections

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

simple

intervessels pits size

minute

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

tend to

axial parenchyma arrangement

in narrow bands (up to 3 cells wide)

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

5 to 10 cells high

rays width

bi to triseriate

rays cellular composition

homogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

minute pist, scaterred, 5-10

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

some scarce solitary unicellular rays

BORAGINACEAE

DB

Cordia dichotoma

collection number

121

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

ring-porous

vessels grouping

clusters common (2 or 3)

vessels
arrangement

tangential bands

solitary vessels with angular outline

no

vessels tyloses

yes

vessels deposits

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

simple

intervessels pits size

minute

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

tend to

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

scanty paratracheal

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

rays height

5-10 or 15-25 cells high

rays width

bi to triseriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

low rays storied/high rays non storied

VESSEL RAYS CROSSING

vessels rays pitting

minute, scaterred pits, 6-10 per square

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

cambial variants

druses

silica

prismatic crystal

radial secretory canals

included phloem

NOTES

ring changes in cells diameter is abrupt
rays shapes are highly diverse, a few rays are storied, mainly 3-4seriate, some biseriate and scarce uniseriate short rays
deposits in ray cells-crystal
vessels elements are very short
fibers pits are numerous and minute (as opposed to *Argusia argentea*)

CASUARINACEA

distinctive features and notes

Family with homogenous anatomical features, present in the region throughout our "Central Pacific" area, associated with "Malaysia", and in the "Australia and New Zealand" region defined by Ilic (1999).

Typically with simple as well as scalariform perforations, less than 10 bars, and parenchyma in narrow bands. Some spiral thickenings in vessels can be present, as well as vasicentric tracheids and crystals in parenchyma cells (Ilic). Aggregate rays are frequent in every genera.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vested
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalf and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

CASUARINACEAE

DB

Casuarina collina

collection number 65

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

exclusively solitary/90% or more

vessels
arrangement

radial to diagonal pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

simple

intervessels pits size

minute

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

in narrow bands (up to 3 cells wide)

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

yes

rays height

uni-biseriate 5-10 cells, multiseriate 40 or +

rays width

two different types

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

small, bordered

walls

thick

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

cambial variants

druses

silica

prismatic crystal

radial secretory canals

included phloem

NOTES

2 types of rays : uni to biseriate short rays, or multiseriate long rays in radial aggregates. large rays can also result from aggregate rays (cf. Carlquist 1988: 200)

2 sizes of pores

possible scalariform perforations with broken bars

CASUARINACEAE

DB

Casuarina equisetifolia

collection number

118

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

solitary

vessels
arrangement

dendritic pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

FIBERS

fibers wall thickness

thick walled

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

in narrow bands (up to 3 cells wide)

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

VESSEL RAYS CROSSINGintervessels / tracheids pits arrangement
alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

minute

perforation plates types

simple and scalariform

helical thickenings

no

fiber helical thickenings

no

fiber pits

distinctly bordered

spetate fibers present

vascular-vasicentric tracheids present

parenchyma like fibers present

fusiform parenchyma cells

axial parenchyma bands

rays height

5 to 10 or more cells high

rays width

3 to 10 seriate

rays cellular composition

homogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

vessels rays pitting

minute, more than 5 per square
scattered all over

walls

smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

some clusters of two vessels in the transverse sections
 vessels have "twisted" and "waved" walls
 majority of the perforation plates are simple
 when perforations are scalariform, the bars tend to be broken
 fiber pits are almost vestured
 some parts of the wood with uni-biseriate short rays
 3 specimens observed : no intraspecy variability

CASUARINACEAE

DB

Gymnostoma nodiflora

collection number

03

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

exclusively solitary/90% or more

vessels
arrangement

dendritic pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

bordered pits

intervessels pits size

small

perforation plates types

simple and scalariform

helical thickenings

no

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

in narrow bands (up to 3 cells wide)

fusiform parenchyma cells

no

axial parenchyma bands

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

yes

rays height

uni-biseriate 5-10 cells, multiseriate 40 or +

rays width

two different types

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

small, lonely

walls

thick

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

majority of the rays are uni to biseriate and short, a few groups of multiseriate long rays
large rays can also result from aggregate rays (cf. Carlquist 1988: 200)
majority of the perforation plates are scalariform, a few are simple
2 sizes of pores

CELASTRACEAE

distinctive features and notes

Family divided in 5 groups based on anatomical features (Ilic 1999). Anatomical features of the 3 groups present in our "Central Pacific" region (associated with "Malaysia") and in the "Australia and New Zealand" region are summarized here.

This family presents a wide variety of anatomical features: perforations simple or scalariform with few or numerous bars, pits exhibit diverse shapes, parenchyma and rays are equally various. Crystals in rays are frequent (Ilic).

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalfe and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

CELASTRACEAE

DB

Pleurostylia opposita

collection number

92

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

exclusively solitary/90% or more

vessels
arrangement

tangential bands

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

changeable

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

tend to

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

in large bands (more than 3 cells wide)

fusiform parenchyma cells

no

axial parenchyma bands

more than 3 cells wide

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

4 to 20 cells high

rays width

1 to biseriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

simple, large, numerous

walls

thick and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

vessels elements are very small, short and thin
some fibers - or narrow vessels have either scalariform pits or thick spiral thickenings
a few fibers with thin septate walls

COMBRETACEAE

distinctive features and notes

Family with homogenous anatomical features, present in the region throughout our "Central Pacific" area, associated with "Malaysia", and in the "Australia and New Zealand" region defined by Ilic (1999).

Parenchyma is absent or paratrache tending to aliform confluent and bands. Pores of two sizes frequent (ilic). Vasicentric tracheids and spiral thickenings in fibres reported by Ilic. Rays are mainly uniseriate and sometimes uniseriate to biseriate (Scheel-Ybert). Druses in parenchyma cells can be present as well as included phloeme (Ilic).

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vested
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalf and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

COMBRETACEAE

DB

Terminalia catappa

collection number

49

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

badamier/sea almond

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

semi-ring porous

vessels grouping

clusters common (2 or 3)

vessels
arrangement

dendritic pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

vestured pits

intervessels pits size

large

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

paratracheal lozenge aliform

fusiform parenchyma cells

no

axial parenchyma bands

in narrow lines up to 3 cells wide

RAYs / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

3 to 10 cells high

rays width

exclusively uniseriate

rays cellular composition

homogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

small to medium, 5-6 pits per
suquare, regularly distributed

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

clusters of pores can be radial or not
axial parenchyma can sometime form narrow marginal bands
some rays have tails of elongated parenchyma cells
fibers are very long

CUNONIACEAE

distinctive features and notes

Family divided in 2 groups based on anatomical features (Ilic 1999). Both are present in our "Central Pacific" region (associated with "Malaysia") and in the "Australia and New Zealand" region.

Perforations can be simple or scalariform with few or numerous bars. Vasicentric tracheids reported by Ilic. Crystals in parenchyma cells can be present. Ray types are diverse from one genus to the other.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalf and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

CUNONIACEAE

DB

Codia incrassata

collection number

42

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

exclusively solitary/90% or more

vessels
arrangement

radial to dendritic pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

uniseriate

intervessels / tracheids pits shapes

bordered pits

intervessels pits size

small

perforation plates types

scalariform 3 to 10 bars

helical thickenings

no

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

in narrow bands (up to 3 cells wide)

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

7 to 10 cells high

rays width

exclusively uniseriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

medium to large, 3 per square

walls

thick and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

rays are mainly uniseriate but some have biseriate body parts as wide as uniseriate parts

CUNONIACEAE

DB

Cunonia ausrocaledonica

collection number

36

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

chêne rouge

bwia

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

ring-porous

vessels grouping

solitary

vessels
arrangement

radial pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

bordered pits

intervessels pits size

changeable

perforation plates types

scalariform 10 to 20 bars

helical thickenings

no

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

no

fiber pits

dictinctly bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

apotracheal in aggregates

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

rays height

10 to 20

rays width

two different types

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

8 to 10 pits per square, scaterred,
size changeable

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

absent

lactifers tanniferous tubes

absent

radial secretory canals

absent

cambial variants

included phloem

druses

absent

silica

absent

prismatic crystal

present

NOTES

some clusters of 2 pores are present
vessels are numerous, parenchyma too, and it can also form some rare large bands
rays are either uniseriate with rounded/elongated cells or 2 -rarely 3-seriate with small cells
possible prismatic crystal in axial parenchyma

CUNONIACEAE

DB

Geissois hirsuta

collection number

108

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

bordered pits

intervessels pits size

changeable

perforation plates types

simple

helical thickenings

no

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

in radial clusters

vessels
arrangement

radial pattern

solitary vessels with angular outline

yes

vessels tyloses

yes

vessels deposits

FIBERS

fibers wall thickness

very thin walled

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

yes

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

apotracheal in aggregates

fusiform parenchyma cells

no

axial parenchyma bands

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

5 to 15 cells high

rays width

1 to biseriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

simple pits, medium size, 9 per square, regularly scaterred

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

axial parenchyma and fibers are hard to differentiate,
some deposits in axial parenchyma cells-crystals
a few scalariform perforation are present

CUNONIACEAE

DB

Geissois racemosa

collection number

02

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

faux tamanou

mô

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

bordered pits

intervessels pits size

changeable

perforation plates types

simple and scalariform

helical thickenings

no

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

in radial clusters

vessels
arrangement

radial pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

FIBERS

fibers wall thickness

very thin walled

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

apotracheal diffuse

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

uniseriate: 8-10 cells high, triseriate: 14-16

rays width

1 to 3 seriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

large, bordered, 6 per square

walls

thick and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

fibers and axial parenchyma are hard to differentiate in transverse section
some deposits in axial parenchyma cells - crystals
a few scalariform perforation

CUNONIACEAE

DB

Pancheria gatopensis

collection number

107

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

solitary

vessels
arrangement

radial to diagonal pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

Longitudinal sections

intervessels / tracheids pits arrangement

uniseriate

intervessels / tracheids pits shapes

bordered pits

intervessels pits size

perforation plates types

scalariform 10 bars or more

helical thickenings

no

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

no

fiber pits

dictinctly bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

apotracheal in aggregates

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYs / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

20-30 cells high

rays width

uniseriate and multiseriate portions same width

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

marginal small pits

walls

thick and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

cambial variants

druses

silica

prismatic crystal

radial secretory canals

included phloem

NOTES

show high fragmentation in transverse section
 some clusters of 2 pores, smaller than other Cunoniaceae
 vessels arrangement is regularly diffuse
 uniseriate and biseriate rays, one multiseriate ray was present in sample observed
 some deposits in rays cells - crystals
 prismatic crystals in axial parenchyma cells
 large pits have a tendency to pseudoscalariform shape in some vessels elements

CUPRESSACEAE

distinctive features and notes

Only one specy of this family has been collected and described in our database

see schweingruber...

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalf and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

CUPRESSACEAE

DB

Neocalliptrosis pancheri

collection number

34

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

soft wood :
tracheids onlyvessels porosity /
tracheids diameter

homogeneous

vessels grouping

vessels
arrangement

solitary vessels with angular outline

vessels tyloses

vessels deposits

intervessels / tracheids pits arrangement

uniseriate

intervessels / tracheids pits shapes

bordered pits

intervessels pits size

perforation plates types

helical thickenings

no

FIBERS

fibers wall thickness

fiber helical thickenings

fiber pits

spetate fibers present

vascular-vasicentric tracheids present

parenchyma like fibers present

AXIAL PARENCHYMA

axial parenchyma present

absent

axial parenchyma arrangement

fusiform parenchyma cells

axial parenchyma bands

RAYs / RADIAL PARENCHYMA

rays

aggregate rays

rays height

1 to 5 cells high

rays width

exclusively uniseriate

rays cellular composition

homogeneous

all upright/square

rays sheat cells

tile cells

storied structure

VESSEL RAYS CROSSING

vessels rays pitting

walls

smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

tracheids cells are thick-walled and quite small

Families general anatomical features

EBENACEAE

distinctive features and notes

Family with homogenous anatomical features, present in the region throughout our "Central Pacific" area, associated with "Malaysia", and in the "Australia and New Zealand" region defined by Ilic (1999).

Crystals and silica can be present in rays (Ilic).

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalfe and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

EBENACEAE

DB

Diospyros fasciculosa

collection number

77

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

in radial clusters

vessels
arrangement

radial to diagonal pattern

solitary vessels with angular outline

yes

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

small

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

very thin walled

fiber helical thickenings

no

fiber pits

distinctly bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

extremely rare

axial parenchyma arrangement

apotracheal diffuse

fusiform parenchyma cells

no

axial parenchyma bands

in narrow lines up to 3 cells wide

RAY / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

3 to 15 cells high

rays width

exclusively uniseriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

small, few, marginals, minute

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

parenchyma widely distributed
druses present in rays
some rays with biseriate parts

ELAEOCARPACEAE

distinctive features and notes

Family divided in 2 groups based on anatomical features (Ilic 1999). Both are present in our "Central Pacific" region (associated with "Malaysia") and in the "Australia and New Zealand" region.

Perforations can be simple or scalariform depending on the genus. Silica deposits are possible in *Elaeocarpus*. Some spiral thickenings in vessels are reported by Ilic in some genera.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalfe and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

ELAEocarPACEAE

DB

Elaeocarpus angustifolius

collection number

27

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

in radial clusters

vessels
arrangement

radial to dendritic pattern

solitary vessels with angular outline

no

vessels tyloses

yes

vessels deposits

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

simple

intervessels pits size

changeable

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

very thin walled

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

yes

vascular-vasicentric tracheids present

no

parenchyma like fibers present

yes

AXIAL PARENCHYMA

axial parenchyma present

extremely rare

fusiform parenchyma cells

no

axial parenchyma arrangement

scanty paratracheal

axial parenchyma bands

no

RAYs / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

2 to 20 cells high

rays width

1 to biseriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

small to minute, diffuse and
numerous

walls

thin and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

some rays with triseriate body parts

main difference with *Elaeocarpus rotundifolius* : no difference between fibers and axial parenchyma in transverse section because of fibers walls thin thickness

ELAEOCARPACEAE

DB

Elaeocarpus rotundifolius

collection number

102

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

semi-ring porous

vessels grouping

in radial clusters

vessels
arrangement

radial pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

simple

intervessels pits size

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

dictinctly bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

paratracheal unilateral

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYs / RADIAL PARENCHYMA

rays

present

aggregate rays

rays height

25-30 cells high

rays width

bi to triseriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

large pits, 3 to 5, simple, throughout
the whole square

walls

thick and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

high charring fragmentation in vessels clusters (transverse section)
paratracheal unilateral axial parenchyma can form uniseriate narrow bands, difference between fibers and parenchyma in transverse section is more obvious than in *Elaeocarpus angustifolius*
uniseriate long tails of rays with elongated cells are similar to long chains of axial parenchyma

EUPHORBIACEAE

distinctive features and notes

Family highly diverse, divided in 10 groups based on anatomical features (Ilic 1999). Anatomical features of the 8 groups present in our "Central Pacific" region (associated with "Malaysia") and in the "Australia and New Zealand" region are summarized here.

Perforations can be simple or scalariform with few or numerous bars depending on genera. Pores often in radial clusters (reference collection samples). Parenchyma varies but is scarce, often absent or diffuse (Détienne and reference samples). Tyloses, druses and silica present in parenchyma cells (Ilic, CIRAD).

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalfe and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

EUPHORBIACEAE

DB

Acalypha grandis

collection number

112

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

in radial clusters

vessels
arrangement

radial to dendritic pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

small

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

very thin walled

fiber helical thickenings

yes

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

apotracheal diffuse

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYs / RADIAL PARENCHYMA

rays

aggregate rays

yes

rays height

uni-biseriate 5-10 cells, multiseriate 25 +

rays width

two different types

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

small to medium sized, bordered,
throughout the whole square, 10+

walls

thin and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

high charring fragmentation
vessels diameter small
rays: either uni-biseriate and short, or 4-5 seriate and long
a few aggregate rays

EUPHORBIACEAE

DB

Aleurites moluccana

collection number

01

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (3 or more)

vessels
arrangement

radial to diagonal pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

large

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

distinctly bordered

spetate fibers present

tend to

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

scanty paratracheal

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYs / RADIAL PARENCHYMA

rays

aggregate rays

rays height

3 to 10 cells high

rays width

1 to biseriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

bordered, medium to large,
numerous

walls

dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

large majority of the rays are uniseriate, a few have uniseriate tails and biseriate body
some rays' body cells are square
3 specimens observed, intraspecific variability appears low

some samples or parts of the wood have septate fibers

EUPHORBIACEAE

DB

Cleidion vieillardii

collection number

72

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

bordered to scalariform

intervessels pits size

changeable

perforation plates types

simple

helical thickenings

no

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

in radial clusters

vessels
arrangement

radial to diagonal pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

FIBERS

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

tend to

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

fibers wall thickness

thick walled

AXIAL PARENCHYMA

axial parenchyma present

extremely rare

fusiform parenchyma cells

axial parenchyma bands

axial parenchyma arrangement

RAYS / RADIAL PARENCHYMA

rays height

4 to 20 or more cells high

rays width

1 to 3 seriate

rays cellular composition

heterogeneous

all upright/square

rays

present

aggregate rays

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

simple, large, marginal

walls

thick and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

intervessels pits vested to pseudo-scalariform

rays could also be described of 2 types, bi-triseriate ones with uniseriate tails as large as multiseriate body, and short uniseriate rays with elongated cells similar to axial parenchyma

axial parenchyma absent?

EUPHORBIACEAE

DB

Cleistanthus stipitatus

collection number 08

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

in radial clusters

vessels
arrangement

radial pattern

solitary vessels with angular outline

yes

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

vestured pits

intervessels pits size

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

very thin walled

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

yes

vascular-vasicentric tracheids present

no

parenchyma like fibers present

yes

AXIAL PARENCHYMA

axial parenchyma present

extremely rare

axial parenchyma arrangement

scanty paratracheal

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYs / RADIAL PARENCHYMA

rays

present

aggregate rays

rays height

20 +/- cells high

rays width

uniseriate and multiseriate portions same width

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

bordered, large, marginal

walls

dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

ray cells are elongated and squared in tails, but small and rounded in body parts
uniseriate parts as large as biseriate parts of the rays

EUPHORBIACEAE

DB

Codiaeum peltatum

collection number

75

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

croton

aru? (paici)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

semi-ring porous

vessels grouping

in radial clusters

vessels
arrangement

tangential bands

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

small

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

distinctly bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

extremely rare

fusiform parenchyma cells

yes

axial parenchyma arrangement

apotracheal diffuse

axial parenchyma bands

no

RAYs / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

4 cells to 10-15 cells high

rays width

1 to biseriate

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

slightly larger than vessels pits,
simple, numerous and widely

walls

thick and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

vessels are small and in radial clusters of 2 or 8-10 cells long,

high density of rays

rays are mainly long and uniseriate with body parts biseriate

presence of crystal deposits in rays cells

fibers and axial parenchyma walls have a similar width so hard to differentiate in transverse section,
very long fibers

EUPHORBIACEAE

DB

Croton insularis

collection number

85

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Croton

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

intervessels / tracheids pits arrangement

opposite

vessels porosity /
tracheids diameter

semi-ring porous

intervessels / tracheids pits shapes

simple

vessels grouping

in radial clusters

vessels
arrangement

radial to dendritic pattern

intervessels pits size

solitary vessels with angular outline

no

perforation plates types

simple

vessels tyloses

no

helical thickenings

no

vessels deposits

FIBERS

fiber helical thickenings

no

fibers wall thickness

very thin walled

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

apotracheal diffuse

axial parenchyma bands

no

RAYs / RADIAL PARENCHYMA

rays height

1-3 cells high, or 10 cells high

rays width

1 to biseriate

rays

present

rays cellular composition

heterogeneous

aggregate rays

no

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

medium, simple to bordered, 4-5
pits irregularly dispersed

walls

thin and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

pores are numerous, widely and regularly dispersed in tangential section
some rays have procumbent cells in body part, and a few are biseriate
some vessels pits tend to be bordered

EUPHORBIACEAE

DB

Drypetes deplanchei

collection number

87

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter diffuse-porous

vessels grouping in radial clusters

vessels
arrangement radial to diagonal pattern

solitary vessels with angular outline no

vessels tyloses no

vessels deposits

FIBERS

fibers wall thickness

thick walled

AXIAL PARENCHYMA

axial parenchyma present absent

axial parenchyma arrangement

RAYS / RADIAL PARENCHYMA

rays present

aggregate rays no

Longitudinal sections

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

bordered pits

intervessels pits size minute

perforation plates types simple and scalariform

helical thickenings

no

fiber helical thickenings no

fiber pits simple to minutely bordered

spetate fibers present no

vascular-vasicentric tracheids present no

parenchyma like fibers present yes

fusiform parenchyma cells

axial parenchyma bands

rays height 5 to 10 cells high

rays width uniseriate and multiseriate portions same width

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting small to minute pits, numerous and widely dispersed

walls thick and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

pores are small and scattered throughout transverse section, tend to a diagonal distribution, form short radial clusters of 2 or 3 vessels
rays with large rounded cells or square cells in tails and small cells in biseriate body parts.

EUPHORBIACEAE

DB

Fontainea pancheri

collection number

59

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

changeable

perforation plates types

simple

helical thickenings

no

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

in radial clusters

vessels
arrangement

radial pattern

solitary vessels with angular outline

yes

vessels tyloses

no

vessels deposits

druses

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

in narrow bands (up to 3 cells wide)

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

2 to 15 cells high

rays width

uniseriate and multiseriate portions same width

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

small to minute, marginal

walls

thin and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

some druses present in rays parenchyma cells, and also possibly in vessels
vessels elements are small
rays have biseriate body parts as large as uniseriate parts

EUPHORBIACEAE

DB

Macaranga alcharoides

collection number

106

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (3 or more)

vessels
arrangement

radial to diagonal pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

small

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

very thin walled

fiber helical thickenings

no

fiber pits

dictinctly bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

yes

AXIAL PARENCHYMA

axial parenchyma present

extremely rare

axial parenchyma arrangement

apotracheal diffuse

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYs / RADIAL PARENCHYMA

rays

present

aggregate rays

rays height

2 to 3 or 10 to 20 cells high

rays width

uniseriate and multiseriate portions same width

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

yes

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

simple, large, marginal

walls

dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

long rays with large long upright cells in tails and small rounded cells in biseriate body parts.
vessel rays pitting not visible

FLACOURTIACEAE

distinctive features and notes

Family divided in 3 groups based on anatomical features (Ilic 1999). The 3 are present in our "Central Pacific" region (associated with "Malaysia") and in the "Australia and New Zealand" region.

Typically with septate fibers and multiseriate rays less than 10 cells wide. Anatomical features are very diverse depending on genera. Perforations can be simple or scalariform with few or numerous bars. Spiral thickenings can be observed in vessels of some genera (Ilic). Parenchyma appears in various form, from absent to abundant. Druses and silica can be present in parenchyma cells and fibers.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
- clusters common
- radial clusters common

intervessels pits

- simple
- bordered
- vestured
- scalariform
- minute
- large

perforation plates

- simple
- scalariform or reticulate

axial parenchyma

- absent or rare
- scanty paratracheal
- paratracheal in various forms
- confluent
- apotracheal in bands
- apotracheal diffuse
- scalariform
- reticulate

fiber pits

- mainly simple
- mainly distinctly bordered

septate fibers

- frequent
- absent or rare

rays width

- exclusively uniseriate
- no uniseriate
- uni- to multiseriate 3 or less cells
- multiseriate 10 or less cells
- multiseriate more than 10 cells
- uniseriate and multiseriate parts same width
- rays of two different width

storied structure

- rays
- fibres
- axial parenchyma

rays cellular composition

- mainly heterogenous
- mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992*
- Détienne 1999*
- Metcalfe and Chalk 1950*
- Scheel-Ybert 1998*
- Ilic/CSIRO 1999*

FLACOURTIACEAE

DB

Caesaria deplanchei

collection number

86

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

in radial clusters

vessels
arrangement

tangential bands

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

minute

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

dictinctly bordered

spetate fibers present

yes

vascular-vasicentric tracheids present

no

parenchyma like fibers present

yes

AXIAL PARENCHYMA

axial parenchyma present

extremely rare

axial parenchyma arrangement

apotracheal diffuse

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

yes

rays height

7-12 or 17 to more than than 30 cells high

rays width

two different types

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

sall to medium size pits, numerous
and widely dispersed

walls

thick and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

high charring fragmentation

a few aggregate rays

rays are either uni-biseriate, or triseriate and long, with mixed procumbent (mainly in body part) and upright cells (mainly in tails)

perforation plates tend to have one or two thin scalariform bars

FLACOURTIACEAE

DB

Homalium deplanchei

collection number

78

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

minute

perforation plates types

simple

helical thickenings

no

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

in radial clusters

vessels
arrangement

radial pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

yes

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

absent

axial parenchyma arrangement

fusiform parenchyma cells

axial parenchyma bands

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

yes

rays height

10-15 to 20 or more cells high

rays width

1 to 3 seriate

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

rays and/or axial elements irregularly storied

VESSEL RAYS CROSSING

vessels rays pitting

similar to intervessel pits but slightly larger, numerous

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

small pores, in short (2-4 cells) or long (8-10 cells) radial clusters, sometime forming a tangential line, highly fragmented from charring
long and narrow vessel elements, with perforations storied
high rays density, some rays with uniseriate tails, made up of large upright cells having the same width as multiseriate body parts
very long and narrow fibers
prismatic crystals can be present in rays cells

Families general anatomical features

GESNERIACEAE

distinctive features and notes

Only one specy of this family has been collected and described in our database, and one in Détienne (1999). It is present in the region in Malaysia and in other Pacific Islands.

Metcalf and Chalk: vessels typically small to extremely small. Vascular tracheids often present

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalf and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

GESNERIACEAE

DB

Depanthus glaber

collection number

23

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

ânyâ ("feu" en Paicî)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

semi-ring porous

vessels grouping

in radial clusters

vessels
arrangement

tangential bands

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

minute

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

yes

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

scanty paratracheal

fusiform parenchyma cells

axial parenchyma bands

RAY / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

10 to more than 20 cells high

rays width

3 to 10 seriate

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

medium sized, simple to bordered,
numerous but marginal

walls

thin and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

pores in short radial clusters

rays are 3-4 seriate, with small procumbent cells in body parts, and upright/rounded cells throughout

fibers pits are large

Families general anatomical features

GUTTIFEREAE

distinctive features and notes

or CLUSIACEAE

Family divided in 4 groups based on anatomical features (Ilic 1999). Anatomical features of the 3 groups present in our "Central Pacific" region (associated with "Malaysia") and in the "Australia and New Zealand" region are summarized here.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
- clusters common
- radial clusters common

intervessels pits

- simple minute
- bordered large
- vestured
- scalariform

perforation plates

- simple
- scalariform or reticulate

axial parenchyma

- absent or rare
- scanty paratracheal
- paratracheal in various forms
- confluent
- apotracheal in bands
- apotracheal diffuse
- scalariform
- reticulate

fiber pits

- mainly simple
- mainly distinctly bordered

spetate fibers

- frequent
- absent or rare

rays width

- exclusively uniseriate
- no uniseriate
- uni- to multiseriate 3 or less cells
- multiseriate 10 or less cells
- multiseriate more than 10 cells
- uniseriate and multiseriate parts same width
- rays of two different width

storied structure

- rays
- fibres
- axial parenchyma

rays cellular composition

- mainly heterogenous
- mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992*
- Détienne 1999*
- Metcalfe and Chalk 1950*
- Scheel-Ybert 1998*
- Ilic/CSIRO 1999*

GUTTIFERAE

DB

Garcinia puat

collection number

25

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

faux houp, houp blanc

wii (paicî)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

in radial clusters

vessels
arrangement

radial pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

bordered pits

intervessels pits size

medium

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

fiber pits simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

in narrow bands (up to 3 cells wide)

fusiform parenchyma cells

no

axial parenchyma bands

in narrow lines up to 3 cells wide

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

yes

rays height 10 to 30 or more cells high

rays width bi to triseriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

medium size pits, 5-6 widely
scattered

walls

thick and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

radial clusters of 2-3 or more pores
druses deposits are possible in ray cells
fibers pits tend to be pseudoscalariform

GUTTIFERAE

DB

Calophyllum caledonicum

collection number

12

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

exclusively solitary/90% or more

vessels
arrangement

dendritic pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

simple

intervessels pits size

minute

perforation plates types

simple and scalariform

helical thickenings

no

FIBERS

fibers wall thickness

very thin walled

fiber helical thickenings

no

fiber pits

distinctly bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

in narrow bands (up to 3 cells wide)

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYs / RADIAL PARENCHYMA

rays

present

aggregate rays

rays height

2 to 15 cells high

rays width

exclusively uniseriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

bordered, large, numerous,
marginal

walls

thick and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

"waved" and twisted effects on vessels walls
large majority of the perforation plates are simple

GUTTIFEREAE

DB

Calophyllum inophyllum

collection number

44

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

intervessels / tracheids pits arrangement

opposite

vessels porosity /
tracheids diameter

diffuse-porous

intervessels / tracheids pits shapes

simple

vessels grouping

exclusively solitary/90% or more

vessels
arrangement

radial to dendritic pattern

intervessels pits size

minute

solitary vessels with angular outline

perforation plates types

simple

vessels tyloses

yes

helical thickenings

no

vessels deposits

FIBERS

fiber helical thickenings

no

fibers wall thickness

very thin walled

fiber pits

dictinctly bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

in narrow bands (up to 3 cells wide)

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays height

2 to 10 cells high

rays width

1 to biseriate

rays

present

rays cellular composition

heterogeneous

aggregate rays

all upright/square

rays sheat cells

tile cells

storied structure

VESSEL RAYS CROSSING

vessels rays pitting

large and simples

walls

thin

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

majority of the rays are uniseriate

rays tails upright cells are not as large and long as in *Calpophyllum caledonicum*

GUTTIFEREAE

DB

Montrouziera cauliflora

collection number

14

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

houp

u

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

intervessels / tracheids pits arrangement

opposite

vessels porosity /
tracheids diameter

diffuse-porous

intervessels / tracheids pits shapes

bordered pits

vessels grouping

clusters common (2 or 3)

vessels
arrangement

tangential bands

intervessels pits size

changeable

solitary vessels with angular outline

no

perforation plates types

simple

vessels tyloses

yes

helical thickenings

no

vessels deposits

FIBERS

fiber helical thickenings

fibers wall thickness

thick walled

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

in large bands (more than 3 cells wide)

axial parenchyma bands

more than 3 cells wide

RAYs / RADIAL PARENCHYMA

rays height

6 to 15 cells high

rays width

1 to biseriate

rays

present

rays cellular composition

heterogeneous

aggregate rays

no

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

small to medium size, 3-4 pits
scattered

walls

thick and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

pores are large, and dispersed, vessel arrangement is unclear,
axial parenchyma in large bands can tend to paratracheal aliform confluent
rare triseriate rays
vessel elements demonstrate irregular sizes and can be very short,
crystals, possibly chambered, in axial parenchyma

Families general anatomical features

HERNANDIACEAE

distinctive features and notes

Family with homogenous anatomical feature, present in the region throughout our "Central Pacific" area, associated with "Malaysia", and in the "Australia and New Zealand" region defined by Ilic (1999).

Pores are typically in tangential arrangement. Parenchyma is mainly aliform confluent to in bands. Crystals are present in rays and oil or mucilage cells are possible (Ilic, Détienne).

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalfe and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

HERNANDIACEAE

DB

Gyrocarpus americanus

collection number

128

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

bois pirogue, bois blanc

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

intervessels / tracheids pits arrangement

opposite

vessels porosity /
tracheids diameter

diffuse-porous

intervessels / tracheids pits shapes

simple

vessels grouping

clusters common (2 or 3)

vessels
arrangement

diagonal patterns

intervessels pits size

large

solitary vessels with angular outline

no

perforation plates types

simple

vessels tyloses

yes

helical thickenings

no

vessels deposits

FIBERS

fiber helical thickenings

no

fibers wall thickness

very thin walled

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

yes

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

paratracheal vasicentric

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays height

6 to 15 cells high

rays width

exclusively uniseriate

rays

present

rays cellular composition

homogeneous

aggregate rays

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

few large pits

walls

thin and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

SAMPLE OBSERVED VERY SMALL, description based on comparison with CIRAD anatomical features (cf. list references)

large number of solitary pores,

pores are large and rare, in tangential to diagonal pattern.

axial parenchyma hard to differentiate from fibers

fibers elements are short and similar to parenchyma cells, with minute pits

vessel elements are short and large

some narrow vertical elements (fibers?) have scalariform pits

a few rays have biseriate body parts

HERNANDIACEAE

DB

Hernandia cordigera

collection number

09

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

intervessels / tracheids pits arrangement

alternate

vessels porosity /
tracheids diameter

semi-ring porous

intervessels / tracheids pits shapes

simple

vessels grouping

clusters common (3 or more)

vessels
arrangement

radial pattern

intervessels pits size

changeable

solitary vessels with angular outline

no

perforation plates types

simple

vessels tyloses

yes

helical thickenings

no

vessels deposits

FIBERS

fiber helical thickenings

no

fibers wall thickness

very thin walled

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

paratracheal vasicentric

axial parenchyma bands

in narrow lines up to 3 cells wide

RAYS / RADIAL PARENCHYMA

rays height

uniseriate 2 cells, biseriate 10 cells high

rays width

1 to biseriate

rays

present

rays cellular composition

heterogeneous

aggregate rays

yes

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

medium to large, simple, marginal

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

big aggregate rays of 5 to 10 cells wide
presence of crystals in rays
large and short vessels elements

Families general anatomical features

ICACINACEAE

distinctive features and notes

Family divided in 2 groups based on anatomical features (Ilic 1999). All 3 are present in our "Central Pacific" region (associated with "Malaysia") and in the "Australia and New Zealand" region.

Perforations are simple and scalariform with few or numerous bands. Aggregate rays are frequent. Crystals can be present in rays.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
- clusters common
- radial clusters common

intervessels pits

- simple
- bordered
- vestured
- scalariform
- minute
- large

perforation plates

- simple
- scalariform or reticulate

axial parenchyma

- absent or rare
- scanty paratracheal
- paratracheal in various forms
- confluent
- apotracheal in bands
- apotracheal diffuse
- scalariform
- reticulate

fiber pits

- mainly simple
- mainly distinctly bordered

spetate fibers

- frequent
- absent or rare

rays width

- exclusively uniseriate
- no uniseriate
- uni- to multiseriate 3 or less cells
- multiseriate 10 or less cells
- multiseriate more than 10 cells
- uniseriate and multiseriate parts same width
- rays of two different width

storied structure

- rays
- fibres
- axial parenchyma

rays cellular composition

- mainly heterogenous
- mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992*
- Détienne 1999*
- Metcalfe and Chalk 1950*
- Scheel-Ybert 1998*
- Ilic/CSIRO 1999*

ICACINACEAE

DB

Apodytes clusifolia

collection number

11

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

faux ralia

koka

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (2)

vessels
arrangement

radial pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

simple to scalariform

intervessels pits size

changeable

perforation plates types

scalariform 20 to 40 bars

helical thickenings

no

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

apotracheal in aggregates

fusiform parenchyma cells

no

axial parenchyma bands

more than 3 cells wide

RAYs / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

15 to 20 cells high

rays width

two different types

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

medium size, scattered

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

pores are small and clusters are highly fragmented

parenchyma is widespread, axial parenchyma cells are present in chains throughout transverse section and

parenchyma cells bands in radial section are numerous, making fibers hardly visible in radial section

rays are mainly bi-triseriate, a few are uniseriate

vessel elements are narrow

LABIATEAE

distinctive features and notes

Only one specy of this family has been collected and described in our database and none in the references used. It is present in the region in other Pacific islands.

metcalfe and chalk: vessels small to minute usually in tangential bands and often with spiral thickenings, septate fibres reported in some genera.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

septate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalfe and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

LABIATEAE

DB

Premna serratifolia

collection number

76

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

semi-ring porous

vessels grouping

clusters common (2 or 3)

vessels
arrangement

radial to diagonal pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

small

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

yes

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

extremely rare

fusiform parenchyma cells

no

axial parenchyma arrangement

scanty paratracheal

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

yes

rays height

6 to 10 or more than 25 cells high

rays width

two different types

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

large and numerous simple pits

walls

thick and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

numerous solitary pores, spiral thickenings scarce not obvious

rare tylose deposits

rays are mainly multiseriate 3-4 cells wide, some rays have biseriate body parts with rounded and procumbent cells and uniseriate tails with cells always upright,

long vessel elements

Families general anatomical features

LAURACEAE

distinctive features and notes

Family divided in 2 groups based on anatomical features (Ilic 1999). All 3 are present in our "Central Pacific" region (associated with "Malaysia") and in the "Australia and New Zealand" region.

Perforations can be simple or scalariform with less than 10 bars. Silica and crystals in rays reported by Ilic, oil or mucilage cells by Ilic and Scheel-Ybert and CIRAD.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalf and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

LAURACEAE

DB

Cryptocaria macrocarpa

collection number

15

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

bois moustiquaire

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (2 or 3)

vessels
arrangement

dendritic pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

bordered pits

intervessels pits size

small

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

dictinctly bordered

spetate fibers present

tend to

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

in narrow bands (up to 3 cells wide)

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

aggregate rays

no

rays height

15 to 25 or more cells high

rays width

1 to 3 seriate

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

large and numerous (5-6), simple

walls

thick and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

numerous solitary pores
axial parenchyma can form thin paratracheal circle and be aliform
some 3-4 seriate rays can be present according to CIRAD
fibers elements are long and thin
cells with oil (CIRAD)

LECYTHIDACEAE

distinctive features and notes

Family with homogenous anatomical feature, present in the region throughout our "Central Pacific" area, associated with "Malaysia", and in the "Australia and New Zealand" region defined by Ilic (1999).

Crystals and silica reported in some genera parenchyma cells by Ilic.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalfe and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

LECYTHIDACEAE

DB

Barringtonia asiatica

collection number

125

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

bonnet d'évêque

jio

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

semi-ring porous

vessels grouping

clusters common (2 or 3)

vessels
arrangement

radial to diagonal pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

minute

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

dictinctly bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

in narrow bands (up to 3 cells wide)

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

uniseriate 6-10 cells high, triseriate 20-30

rays width

two different types

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

upright

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

large simple pits throughtout entire square

walls

thin and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

few short radial clusters of pores

large pores

rays are numerous and mainly long and triseriate or more, a few are uniseriate and short

crystals are present in ray parenchyma cells

axial parenchyma can be aliform confluent

long fiber elements.

LECYTHIDACEAE

DB

Barringtonia neocaledonica

collection number 97

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter diffuse-porous

vessels grouping clusters common (2)

vessels
arrangement tangential bands

solitary vessels with angular outline no

vessels tyloses yes

vessels deposits

Longitudinal sections

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

simple

intervessels pits size changeable

perforation plates types simple

helical thickenings

no

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings no

fiber pits simple to minutely bordered

spetate fibers present no

vascular-vasicentric tracheids present no

parenchyma like fibers present no

AXIAL PARENCHYMA

axial parenchyma present present

axial parenchyma arrangement

paratracheal confluent

fusiform parenchyma cells no

axial parenchyma bands

in narrow lines up to 3 cells wide

RAY / RADIAL PARENCHYMA

rays present

aggregate rays tend to

rays height 20 to 30 or more cells high

rays width 1 to 3 seriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

walls

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

silica and crystals in rays' cells

some rays are bi or triseriate body with one tail being a uniseriate line of square cells

Families general anatomical features

LEGUMINOSAE

distinctive features and notes

CAESALPINIACEAE, FABACEAE, MIMOSACEAE, PAPILIONACEAE.

The four different families of Leguminosae form a wide homogenous anatomical group which main features are summarized here. They are present in the region throughout our "Central Pacific" area, associated with "Malaysia", and in the "Australia and New Zealand" region defined by Ilic (1999).

Pores are predominantly solitary only in *Erythrina* (Papilionaceae). Parenchyma vary but is always abundant. Crystals and silica present, as well as spiral thickenings in vessels and vasicentric tracheids.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
- clusters common
- radial clusters common

intervessels pits

- simple minute
- bordered large
- vestured
- scalariform

perforation plates

- simple
- scalariform or reticulate

axial parenchyma

- absent or rare
- scanty paratracheal
- paratracheal in various forms
- confluent
- apotracheal in bands
- apotracheal diffuse
- scalariform
- reticulate

fiber pits

- mainly simple
- mainly distinctly bordered

spetate fibers

- frequent
- absent or rare

rays width

- exclusively uniseriate
- no uniseriate
- uni- to multiseriate 3 or less cells
- multiseriate 10 or less cells
- multiseriate more than 10 cells
- uniseriate and multiseriate parts same width
- rays of two different width

storied structure

- rays
- fibres
- axial parenchyma

rays cellular composition

- mainly heterogenous
- mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992*
- Détienne 1999*
- Metcalfe and Chalk 1950*
- Scheel-Ybert 1998*
- Ilic/CSIRO 1999*

LEGU-

DB

Intsia bijuga

collection number

73

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (2)

vessels
arrangement

radial to diagonal pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

vestured pits

intervessels pits size

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

yes

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

paratracheal lozenge aliform

fusiform parenchyma cells

no

axial parenchyma bands

more than 3 cells wide

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

5 to 20 cells high

rays width

1 to biseriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

rays and/or axial elements irregularly storied

VESSEL RAYS CROSSING

vessels rays pitting

simple, small to medium size, 6 to 10 per square

walls

thin and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

some areas with parenchyma in narrow bands visible in transverse section
some clusters of 3 pores
deposits in rays-crystals

LEGU-

DB

Storckiella pancheri

collection number

71

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

faux frêne/kingué

kâgé (paici)

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (2 or 3)

vessels
arrangement

diagonal patterns

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

simple

intervessels pits size

minute

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

tend to

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

in large bands (more than 3 cells wide)

axial parenchyma bands

in narrow lines up to 3 cells wide

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

5 to 10 cells high

rays width

1 to biseriate

rays cellular composition

homogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

VESSEL RAYS CROSSING

vessels rays pitting

marginal, small

walls

thick and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

vessels arrangement is unclear
axial parenchyma bands are mainly 3-4 cells wide
large majority of the rays are uniseriate
no storied structure observed in CIRAD

LEGU-FABACEAE

DB

Inocarpus fagifer

collection number

110

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

châtaigner tahitien

mape (huahine)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

solitary

vessels
arrangement

radial pattern

solitary vessels with angular outline

yes

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

vestured pits

intervessels pits size

medium

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

in large bands (more than 3 cells wide)

fusiform parenchyma cells

no

axial parenchyma bands

in narrow lines up to 3 cells wide

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

4 to 9 cells high

rays width

exclusively uniseriate

rays cellular composition

homogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

VESSEL RAYS CROSSING

vessels rays pitting

medium, wide spread, 5-6 per square

walls

thick and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

some short radial clusters of pores (2-4 cells), pores tend to form tangential bands
axial parenchyma in large bands of 3-4 cells, tend to be paratracheal confluent
storied structures for rays and axial parenchyma noted by Detienne (*reference*), occurring only irregularly in
observed sample

LEGU-MIMOSACEAE

DB

Acacia spirorbis

collection number

62

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

gaïac

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (2 or 3)

vessels
arrangement

radial to diagonal pattern

solitary vessels with angular outline

no

vessels tyloses

yes

vessels deposits

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

vestured pits

intervessels pits size

medium

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

tend to

fiber pits

dictinctly bordered

spetate fibers present

tend to

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

paratracheal lozenge aliform

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

4 to 8-10 cells high

rays width

exclusively uniseriate

rays cellular composition

homogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

simple, small, marginal

walls

thick and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

in tangential section, rays appear very small compared to vessels width.
few biseriate parts in rays

LEGU-MIMOSACEAE

DB

Archidendropsis streptocarpa

collection number 24

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

pwapene (paici)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter diffuse-porous

vessels grouping clusters common (2)

vessels
arrangement tangential bands

solitary vessels with angular outline no

vessels tyloses no

vessels deposits

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

simple

intervessels pits size minute

perforation plates types simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings tend to

fiber pits simple to minutely bordered

spetate fibers present yes

vascular-vasicentric tracheids present no

parenchyma like fibers present no

AXIAL PARENCHYMA

axial parenchyma present present

axial parenchyma arrangement

paratracheal confluent

fusiform parenchyma cells no

axial parenchyma bands

in narrow lines up to 3 cells wide

RAYS / RADIAL PARENCHYMA

rays present

aggregate rays no

rays height 10-20 cells high

rays width 1 to biseriate

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting small dispersed pits similar to
intervessel pits

walls thin and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

large rounded and widely scattered pores

axial parenchyma can be lozenge aliform extending to confluent

small rays are mainly uniseriate with alternate rows of biseriate procumbent cells and uniseriate rounded cell

prismatic crystals is present in parenchyma cells

LEGU-PAPILIONACEAE

DB

Erythrina variegata

collection number

113

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

peuplier kanak

närû waapwii (paici)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

solitary

vessels
arrangement

radial pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

vestured pits

intervessels pits size

small

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

yes

axial parenchyma arrangement

in large bands (more than 3 cells wide)

axial parenchyma bands

more than 3 cells wide

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

uniseriate 3-10 cells, multiseriate 40 +

rays width

two different types

rays cellular composition

homogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

rays and/or axial elements irregularly storied

VESSEL RAYS CROSSING

vessels rays pitting

similar to intervessel pits or scanty
larger, numerous

walls

thin and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

rare and large pores, a few can be in clusters of 2 or 3 (Détienne)
parenchyma is widespread in the wood : axial parenchyma bands are around 10 cells wide, more parenchyma than fibres
presence of deposits in axial parenchyma cells-crystals
rays are mainly 3-5-seriate and very long, a few are short and uniseriate.
axial parenchyma cells are storied, and vessel elements are storied and short

LOGANIACEAE

distinctive features and notes

Family with homogenous anatomical feature, present in the region throughout our "Central Pacific" area, associated with "Malaysia", and in the "Australia and New Zealand" region defined by Ilic (1999).

Spiral thickenings in vessels reported in some genera by Ilic. Parenchyma and rays width diverse depending on genera. Rays often uni to biseriate (CIRAD). Crystals can be present in parenchyma cells, as well as included phloem (Ilic).

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalfe and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

LOGANIACEAE

DB

Fagraea berteriana

collection number

20

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

bois pétrole, bois tabou

mâdugö (paici)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (2 or 3)

vessels
arrangement

radial pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

changeable

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

tend to

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

in narrow bands (up to 3 cells wide)

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

5-8 cells high

rays width

exclusively uniseriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

rays and/or axial elements irregularly storied

VESSEL RAYS CROSSING

vessels rays pitting

large simple pits, 6-8

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

pores can form a few short radial clusters

axial parenchyma can be reticulate

High fragmentation along the axial parenchyma bands

rays are numerous and a few are only one or two cells high, all cells are upright.

in Détienne said to be heterogenous with procumbent cells in body and tend to storied structure but not in sample.

vessel elements have irregular length,

perforations tend to be storied

long fiber elements

LOGANIACEAE

DB

Neuburgia neocaledonica

collection number

16

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

wétia

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (2 or 3)

vessels
arrangement

radial pattern

solitary vessels with angular outline

yes

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

vestured pits

intervessels pits size

small

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

very thin walled

fiber helical thickenings

no

fiber pits

dictinctly bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

yes

AXIAL PARENCHYMA

axial parenchyma present

extremely rare

axial parenchyma arrangement

apotracheal diffuse

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYs / RADIAL PARENCHYMA

rays

present

aggregate rays

rays height

3-5 to 10 to 20 or more cells high

rays width

exclusively uniseriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

rays and/or axial elements irregularly storied

VESSEL RAYS CROSSING

vessels rays pitting

medium to small simple pits,
numerous and regularly scattered

walls

thin and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

pores are scattered and medium to small, can form a few short radial clusters (4-5 cells)
a few very long rays, but the majority is 10-20 cells high.
vessel elements are short,
perforations and fibers are storied
perforations might appear simple but be scalariform with broken bars?
deposits in parenchyma cells-crystals

Families general anatomical features

MALVACEAE

distinctive features and notes

Family with homogenous anatomical feature, present in the region throughout our "Central Pacific" area, associated with "Malaysia", and in the "Australia and New Zealand" region defined by Ilic (1999).

Typically with longitudinal elements storied. Rays can be uni-triseriate with same width or of two types. and often have sheat cells. Druses are present in parenchyma cells of some genera (Ilic). Vascular tracheids reported by Ilic.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalfe and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

MALVACEAE

DB

Hibiscus tiliaceus

collection number

6

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

bourao

bwao-pwëti (paicî)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (2 or 3)

vessels
arrangement

radial pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

minute

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

paratracheal confluent

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYs / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

10 cells high, or 15 to 20

rays width

bi to triseriate

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

procumbent

tile cells

no

storied structure

rays and/or axial elements irregularly storied

VESSEL RAYS CROSSING

vessels rays pitting

numersou small pits similar to
intervessel pits

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

large pores, can form some thin tangential bands of pores
 axial parenchyma is sometime in short chains or similar to large bands when confluent (in D tienne described as thin aliform paratracheal)
 axial elements are short and storied, except long rays.
 some rays have uniseriate tails of upright cells
 only a few rays have sheat cellls on one or two sides of body part.

MALVACEAE

DB

Thespesia populnea

collection number

61

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

bois de rose d'océanie

bwao-kûrûnêê : «bourao

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (2 or 3)

vessels
arrangement

radial pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

minute

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

apotracheal in aggregates

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

aggregate rays

rays height

15 to 25 cells high

rays width

1 to 3 seriate

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

rays and/or axial elements irregularly storied

VESSEL RAYS CROSSING

vessels rays pitting

numerous small pits scattered all
over the square

walls

thin and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

pores are large and sometime form short radial clusters (3-4 cells)

axial parenchyma form short chains

rays are mainly 3seriate and long, tails of uniseriate upright cells, can appear similar to axial parenchyma chains.

prismatic crystals is present in axial parenchyma cells

vessel elements are short

distinctive feature in longitudinal views : storied structures, axial parenchyma cells are storied, fibers and vessel elements tend to

Families general anatomical features

MELIACEAE

distinctive features and notes

Family divided in 2 groups based on anatomical features (Ilic 1999). Both are present in our "Central Pacific" region (associated with "Malaysia") and in the "Australia and New Zealand" region.

Spiral thickenings in vessel possible (Détienne). Parenchyma often in narrow bands (reference samples).

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalf and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

MELIACEAE

DB

Aglaia elaeagnoidea

collection number

64

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

semi-ring porous

vessels grouping

in radial clusters

vessels
arrangement

radial pattern

solitary vessels with angular outline

yes

vessels tyloses

yes

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

small

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

yes

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

in narrow bands (up to 3 cells wide)

fusiform parenchyma cells

no

axial parenchyma bands

in narrow lines up to 3 cells wide

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

10 +/- cells high

rays width

exclusively uniseriate

rays cellular composition

homogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

small to medium, marginal,
bordered

walls

thin and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

absent

lactifers tanniferous tubes

absent

radial secretory canals

absent

cambial variants

included phloem

druses

absent

silica

absent

prismatic crystal

absent

NOTES

large majority of the rays are exclusively uniseriate, but a few have biseriate middle body parts on one or two cells rows

fibers' pits are large and irregularly scattered throughout body

MELIACEAE

DB

Dysoxylum cf. roseum

collection number

115

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (2 or 3)

vessels
arrangement

radial to diagonal pattern

solitary vessels with angular outline

no

vessels tyloses

yes

vessels deposits

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

simple

intervessels pits size

small

perforation plates types

simple

helical thickenings

scarce

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

yes

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

in narrow bands (up to 3 cells wide)

fusiform parenchyma cells

no

axial parenchyma bands

in narrow lines up to 3 cells wide

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

5-10 or 10-15 cells high

rays width

1 to biseriate

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

large simple to minutely bordered,
numerous pits

walls

thin and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

large rounded pores
rays are numerous and small
vessel elements and fibers are short
prismatic crystals can be present in parenchyma cells

MELIACEAE

DB

Dysoxylum machrantum

collection number

26

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

tuburu (paicî)(planté pendant les

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

semi-ring porous

vessels grouping

in radial clusters

vessels
arrangement

radial to dendritic pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

bordered pits

intervessels pits size

small

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

no

fiber pits

dictinctly bordered

spetate fibers present

yes

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

in narrow bands (up to 3 cells wide)

axial parenchyma bands

in narrow lines up to 3 cells wide

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

10 cells high or 15 to 25 cells high

rays width

1 to biseriate

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

similar to intervessel pits, small and simple, numerous

walls

thick and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

large rounded pores in short radial clusters, mainly of 2-3 cells
axial parenchyma bands are 3 cells wide
body rays cells : rounded and procumbent cells alternate
crystals in parenchyma cells

MELIACEAE

DB

Dysoxylum rufescens

collection number

70

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

bois d'ail

mââpwéa, pibèè kù ? (paici)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

minute

perforation plates types

simple

helical thickenings

no

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

in radial clusters

vessels
arrangement

tangential bands

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

tend to

fiber pits

simple to minutely bordered

spetate fibers present

yes

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

in narrow bands (up to 3 cells wide)

axial parenchyma bands

in narrow lines up to 3 cells wide

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

10 to 25 cells high

rays width

1 to biseriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

small 5-10 simple pits

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

large pores, in short radial clusters 2 to 4 cells high

axial parenchyma bands either very large (rare) or 2 cells high (mainly) (tend to be scalariform in some cases)

rays are mainly uniseriate

fibers are very thick walled

prismatic crystals is present in parenchyma cells, numerous in rays/vessels crossing

Families general anatomical features

MORACEAE

distinctive features and notes

Family with homogenous anatomical feature, present in the region throughout our "Central Pacific" area, associated with "Malaysia", and in the "Australia and New Zealand" region defined by Ilic (1999).

Sheat cells are present in rays. Crystals and silica have been observed by ilic in parenchyma cells and fibres. Latex tubes can be present in some genera (Ilic).

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalfe and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

MORACEAE

DB

Artocarpus altilis

collection number

127

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

arbre à pain

î (paici)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (2 or 3)

vessels
arrangement

radial pattern

solitary vessels with angular outline

no

vessels tyloses

yes

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

large

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

very thin walled

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

paratracheal vasicentric

fusiform parenchyma cells

no

axial parenchyma bands

more than 3 cells wide

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

10-15 or more than 25 cells high

rays width

bi to triseriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

upright

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

large numerous pits similar to
intervessel pits

walls

thick and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

pores are very large and there are numerous solitary ones
paratracheal axial parenchyma can be lozenge aliform as described in Détiéne (1999)
some rays are 3-5-seriate, and can have procumbent cells in body part as described in Détiéne (1999), no sheat cells on our sample
long fibers
vessel elements with very irregular lenght

MORACEAE

DB

Broussonetia papyfera

collection number

118

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

arbre à tapa

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

in radial clusters

vessels
arrangement

solitary vessels with angular outline

vessels tyloses

vessels deposits

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

simple

intervessels pits size

medium

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

very thin walled

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

extremely rare

axial parenchyma arrangement

scanty paratracheal

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

10 to 30 cells

rays width

3 to 10 seriate

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

upright

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

similar to intervessels, numerous
and opposite

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

There are also several solitary pores

prismatic crystals in rays cells

large rays are often broken, visible ones are bi- to triseriate

détienne: short radial cluster and some solitary pores, 2 sizes of pores

MORACEAE

DB

Ficus cf. orthophora

collection number

18

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

wâi (paici)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (2 or 3)

vessels
arrangement

radial to diagonal pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

simple

intervessels pits size

medium

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

in large bands (more than 3 cells wide)

axial parenchyma bands

more than 3 cells wide

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

6-10 or 20-25 cells high

rays width

1 to biseriate

rays cellular composition

heterogeneous

body ray cell procumbent with row of
upright/square marginal cells

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

large simple pits, similar to
intervessel pits

walls

thin and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

numerous solitary pores

axial parenchyma in short tangential bands are numerous and mainly 3-4 cells wide

rays are either short exclusively uniseriate, or long uniseriate with body part biseriate.

rays body parts cells are procumbent and tails cells upright and rounded

MORACEAE

DB

Ficus fraseri

collection number 98

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

sandpaper

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

semi-ring porous

vessels grouping

clusters common (2 or 3)

vessels
arrangement

radial to diagonal pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

simple

intervessels pits size

changeable

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

very thin walled

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

in large bands (more than 3 cells wide)

axial parenchyma bands

more than 3 cells wide

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

8 to 20 or more cells high

rays width

bi to triseriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

simple, few scatterred, small

walls

thick and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

vessels elements walls are "waved-like"
some rays have uniseriate long and large cells similar to axial parenchyma

MORACEAE

DB

Ficus prolixa

collection number

40a

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

banian

bwe

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (2 or 3)

vessels
arrangement

radial to diagonal pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

simple

intervessels pits size

large

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

yes

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

in large bands (more than 3 cells wide)

axial parenchyma bands

in narrow lines up to 3 cells wide

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

uniseriate 3 cells high,multiseriate 20-30

rays width

two different types

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

oval large simple pits, 2 or 3 by square

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

large rounded pores, sometime in short radial clusters of 4
 a few uniseriate short rays (3 cells high), but the majority is made of long bi-triseriate or 4-5-seriate rays 20 or more cells high. Some upright sheat cells possible (Détienne 1999) but not clear in our sample
 body parts are made of procumbent and rounded cells, tails of upright cells
 intervessel pits are shaped as large ovals
 prismatic crystals is present in rays cells
 only a few septate fibers

axial parenchyma can be be in storied structure as described in Détienne (*référence*)

MORACEAE

DB

Ficus prolixa (root)

collection number

40b

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

banian

bwe

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (2 or 3)

vessels
arrangement

radial to diagonal pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

simple

intervessels pits size

large

perforation plates types

simple

helical thickenings

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

yes

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

in large bands (more than 3 cells wide)

axial parenchyma bands

more than 3 cells wide

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

uni-biseriate 10 cells, multiseriate 20-25

rays width

two different types

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

oval similar to intervessel pits

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

main difference with the branch wood of *Ficus prolixa* : axial parenchyma bands are wider, more regular and frequent
rays are either uni-biseriate short, or 3 to 5-seriate long,
rays are heterogenous but without procumbent cells
numerous septate fibers and sometimes storied

MYRTACEAE

distinctive features and notes

Family quite diverse, divided in 7 groups based on anatomical features (Ilic 1999). Anatomical features of the 6 groups present in our "Central Pacific" region (associated with "Malaysia") and in the "Australia and New Zealand" region are summarized here.

Intraspecific heterogeneity is high, particularly in *Eugenia*.

Typically with distinctly bordered pits in fibers and in vessels (vestured). Mainly with solitary pores. Crystals in parenchyma cells and silica in rays are frequent. Vascentric tracheids reported by Ilic.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalfe and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

MYRTACEAE

DB

Arillastrum gummiferum

collection number 56

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

chêne gomme

èöki (paicî)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels porosity /
tracheids diameter diffuse-porous

vessels grouping exclusively solitary/90% or more

vessels
arrangement dendritic pattern

solitary vessels with angular outline no

vessels tyloses no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size medium

perforation plates types simple

helical thickenings

no

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings no

fiber pits simple to minutely bordered

spetate fibers present no

vascular-vasicentric tracheids present no

parenchyma like fibers present no

AXIAL PARENCHYMA

axial parenchyma present present

axial parenchyma arrangement

scanty paratracheal

fusiform parenchyma cells no

axial parenchyma bands

no

RAY / RADIAL PARENCHYMA

rays present

aggregate rays no

rays height 3-12 cells high

rays width exclusively uniseriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting large, 1-2 per square, rounded or square

walls thick and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

large rounded pores
axial parenchyma paratracheal sometime extend to short aliform chains
intervessel pits tend to lozenge-like shape

scalariform perforation in some small axial elements, to be defined

MYRTACEAE

DB

Carpolepis laurifolia

collection number

22

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

faux teck

kiki (paici)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

vestured pits

intervessels pits size

small

perforation plates types

simple

helical thickenings

no

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

exclusively solitary/90% or more

vessels
arrangement

dendritic pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

fiber pits

dictinctly bordered

spetate fibers present

tend to

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

apotracheal diffuse

fusiform parenchyma cells

no

axial parenchyma bands

no

RAY / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

3-5 to 10-15 cells high

rays width

1 to biseriate

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

medium sized bordered pits, oval, 3-4 per square

walls

thick and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

large rounded pores,
axial parenchyma scattered in isolated cells or in short chains
1-2 seriate rays with rare triseriate parts, made of procumbent and upright cells in body part
fibers pits are visible in both longitudinal sections

MYRTACEAE

DB

Eugenia gacognei

collection number

80

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

solitary

vessels
arrangement

radial pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

bordered pits

intervessels pits size

small

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

dictinctly bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

extremely rare

axial parenchyma arrangement

apotracheal diffuse

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

10-15 cells high (12 mainly)

rays width

uniseriate and multiseriate portions same width

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

15-20 bordered pits, medium sized, larger than intervessel pits

walls

thick and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

small and numerous pores

rays are mainly biseriate -sometimes 3-seriate- in body parts and have uniseriate tails of large upright cells

MYRTACEAE

DB

Melaleuca quinquenervia

collection number 43

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Niaouli

itëu (paici)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

semi-ring porous

vessels grouping

solitary

vessels
arrangement

radial to diagonal pattern

solitary vessels with angular outline

no

vessels tyloses

yes

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

small

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

dictinctly bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

apotracheal in aggregates

fusiform parenchyma cells

no

axial parenchyma bands

no

RAY / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

8-9 cells high mainly, some 2-3 or 12 cells

rays width

1 to biseriate

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

medium, 3 to 6 per square,
scattered

walls

thin and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

vessels are numerous and widespread in transverse section, some few clusters 2-3 pores are present
paratracheal axial parenchyma can be aliform or extending in bands 2-3 cells large
a few rays are biseriate, but the majority is uniseriate

vessel elements are short and irregular
possible broken scalariform bars in perforation
wood structure is variable : some parts of the sample demonstrate very regular rays length and cells shape
and other parts show irregular rays.

MYRTACEAE

DB

Piliocalix macrophylla

collection number

17

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

goya

èpu-iawé (paicì)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (2)

vessels
arrangement

radial pattern

solitary vessels with angular outline

no

vessels tyloses

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

vestured pits

intervessels pits size

changeable

perforation plates types

simple

helical thickenings

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

in large bands (more than 3 cells wide)

fusiform parenchyma cells

no

axial parenchyma bands

more than 3 cells wide

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

15-17 cells high

rays width

1 to 3 seriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

large, irregular, 8-9 per square,
centred

walls

thick and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

axial parenchyma bands are 3 to 4 cells wide
rays are either uniseriate with large cells, or bi-triseriate with smaller cells; some have uniseriate tails and bi-triseriate body, but the majority is biseriate in body parts with subhomogenous cells

MYRTACEAE

DB

Psidium guajava

collection number

116

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

goyavier

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels porosity /
tracheids diameter ring-porous

vessels grouping clusters common (2 or 3)

vessels
arrangement tangential bands

solitary vessels with angular outline no

vessels tyloses no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

vestured pits

intervessels pits size small

perforation plates types simple

helical thickenings

no

FIBERS

fibers wall thickness

very thin walled

fiber helical thickenings no

fiber pits distinctly bordered

spetate fibers present no

vascular-vasicentric tracheids present no

parenchyma like fibers present no

AXIAL PARENCHYMA

axial parenchyma present present

axial parenchyma arrangement

apotracheal in aggregates

fusiform parenchyma cells no

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays present

aggregate rays no

rays height 5 to 10 cells

rays width 1 to biseriate

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells yes

storied structure

rays and/or axial elements irregularly storied

VESSEL RAYS CROSSING

vessels rays pitting similar to intervessels pits

walls

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

Axialparenchyma tends to form thin bands
Upright cells in rays tails
Détienne: majority of the pores are solitary

MYRTACEAE

DB

Syzygium cumini

collection number

115

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

jamelonier

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (2 or 3)

vessels
arrangement

tangential bands

solitary vessels with angular outline

no

vessels tyloses

yes

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

vestured pits

intervessels pits size

small

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

no

fiber pits

dictinctly bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

paratracheal aliform

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

7 to 20 cells

rays width

1 to 3 seriate

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

large and elongated, simple, few

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

détienne: axial parenchyma paratracheal with aliform shape, can appear as large bands of more than 3 elements

MYRTACEAE

DB

Syzygium malaccense

collection number 04

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

pommier kanak

èpu (paicì)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

intervessels / tracheids pits arrangement

opposite

vessels porosity /
tracheids diameter

semi-ring porous

intervessels / tracheids pits shapes

simple

vessels grouping

clusters common (2 or 3)

vessels
arrangement

diagonal patterns

intervessels pits size

minute

solitary vessels with angular outline

no

perforation plates types

simple

vessels tyloses

no

helical thickenings

no

vessels deposits

FIBERS

fiber helical thickenings

no

fibers wall thickness

medium thickness

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

apotracheal in aggregates

axial parenchyma bands

more than 3 cells wide

RAYS / RADIAL PARENCHYMA

rays height

8 to 20 or more cells high

rays width

3 to 10 seriate

rays

present

rays cellular composition

heterogeneous

aggregate rays

yes

mixed cellular composition

rays sheat cells

upright

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

simple, small, few gathered in the
centre of the square

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

axial parenchyma is very irregularly distributed, from rare to widespread in different parts of the wood, and can be either diffuse or in bands of 3 cells
 some radial clusters of 3-4 pores. some rays have upright sheat cells.
 rays are mainly 3-5 seriate, but some uni to biseriate short rays can be present
 fibers have medium thickness walls but are large in width
 several samples observed and comparison with other description in atlases (cf. references list) show probable strong intra-specific variability

Families general anatomical features

PROTEACEAE

distinctive features and notes

Family with homogenous anatomical feature, present in the region throughout our "Central Pacific" area, associated with "Malaysia", and in the "Australia and New Zealand" region defined by Ilic (1999).

Rays with sheat cells frequent. Vascentric tracheids reported by Ilic. Crystals and silica can be present in parenchyma cells. Aggregate rays frequent (reference samples)

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalfe and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

PROTEACEAE

DB

Kermadecia sinuata

collection number

19

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

hêtre

pwaii (paici)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (3 or more)

vessels
arrangement

tangential bands

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

minute

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

distinctly bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

apotracheal diffuse

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

yes

rays height

more than 50 cells high

rays width

3 to 10 seriate

rays cellular composition

heterogeneous

body ray cell procumbent with several rows of upright/square marginal cells

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

large bordered pits, numerous

walls

thin and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

absent

lactifers tanniferous tubes

absent

radial secretory canals

cambial variants

included phloem

druses

absent

silica

absent

prismatic crystal

NOTES

presence of several clusters of 2 pores
rays are mainly 5-12 cells wide
short vessel elements
fibers pits are minute but appear bordered
fibers are widespread in longitudinal sections

PROTEACEAE

DB

Vrotia rousellii

collection number

21

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (2)

vessels
arrangement

radial pattern

solitary vessels with angular outline

yes

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

bordered pits

intervessels pits size

medium

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

scalariform

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

yes

rays height

20 or more than 50 cells high

rays width

3 to 10 seriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

numerous pits similar to intervessel
pits but slightly larger

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

small pores and numerous solitary pores
irregular sizes of rays, but all multiseriate and long
fibers are large with minute pits
short vessel elements

Families general anatomical features

RHAMNACEAE

distinctive features and notes

Family with homogenous anatomical feature, present in the region throughout our "Central Pacific" area, associated with "Malaysia", and in the "Australia and New Zealand" region defined by Ilic (1999).

Scalariform perforations have less than 10 bars only.

Spiral thickenings in vessels and vascular tracheids reported by Ilic in some genera.

Parenchyma vary widely.

Crystals can be present in parenchyma cells.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalfe and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

RHAMNACEAE

DB

Alphytonia neocaledonica

collection number

101

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

bois savon, pomadis

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (3 or more)

vessels
arrangement

radial pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits yes

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

small

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

in large bands (more than 3 cells wide)

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

2-3 cells high or 10-13 cells high

rays width

1 to biseriate

rays cellular composition

homogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

larger but similar in shape to
intervessel pits, numerous

walls

thick and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

numerous and large rounded pores, solitary or in short radial clusters (2-5 cells)
axial parenchyma bands are few, either 2-3 cells wide or some more than 3 cells wide
long rays tend to be biseriate in body part
perforations appear simple, but a few could have broken scalariform bars to be confirmed

RHAMNACEAE

DB

Colubrina asiatica

collection number

112

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

tutu (huahine)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

intervessels / tracheids pits arrangement

opposite

vessels porosity /
tracheids diameter

diffuse-porous

intervessels / tracheids pits shapes

simple

vessels grouping

clusters common (2)

vessels
arrangement

wide spread

intervessels pits size

medium

solitary vessels with angular outline

no

perforation plates types

simple

vessels tyloses

no

helical thickenings

no

vessels deposits

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

yes

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

scanty paratracheal

axial parenchyma bands

no

RAY / RADIAL PARENCHYMA

rays

present

rays height

15 to 20 cells high

aggregate rays

no

rays width

1 to biseriate

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

bordered, elongated and wide spread

walls

thick and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

very large pores, in clusters of 2 but solitary pores are frequent and there are rare clusters of 3
 pores are numerous and widespread but could tend to tangential lines
 very heterogenous rays, prismatic crystals in rays cells
 few septate fibers
 small and elongated intervessels pits, tend to pseudoscalariform shape

RHAMNACEAE

DB

Rhamnella vitiensis

collection number

89

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

in radial clusters

vessels
arrangement

radial pattern

solitary vessels with angular outline

no

vessels tyloses

yes

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

minute:4µm or less

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

dictinctly bordered

spetate fibers present

yes

vascular-vasicentric tracheids present

no

parenchyma like fibers present

yes

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

apotracheal in aggregates

fusiform parenchyma cells

no

axial parenchyma bands

more than 3 cells wide

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

6-12 cells high or more than 30 cells high

rays width

exclusively uniseriate

rays cellular composition

homogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

lozangic small pits, numerous

walls

thick and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

small pores, solitary or arranged in two different sizes of radial clusters : short of 2-3 pores or long of 6-12 pores

axial parenchyma in aggregate forms rare large bands or can be diffuse

a few rays have biseriate rows in their body part

septate fibers with wide walls can appear parenchyma-like

Families general anatomical features

RHIZOPHORACEAE

distinctive features and notes

Family divided in 5 groups based on anatomical features (Ilic 1999). Anatomical features of the 3 groups present in our "Central Pacific" region (associated with "Malaysia") and in the "Australia and New Zealand" region are summarized here.

Typically with scalariform pits and multiseriate rays, sometimes with sheat cells.

"Parenchyma vary from absent to abundant in numerous forms.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
- clusters common
- radial clusters common

intervessels pits

- simple
- bordered
- vestured
- scalariform
- minute
- large

perforation plates

- simple
- scalariform or reticulate

axial parenchyma

- absent or rare
- scanty paratracheal
- paratracheal in various forms
- confluent
- apotracheal in bands
- apotracheal diffuse
- scalariform
- reticulate

fiber pits

- mainly simple
- mainly distinctly bordered

spetate fibers

- frequent
- absent or rare

rays width

- exclusively uniseriate
- no uniseriate
- uni- to multiseriate 3 or less cells
- multiseriate 10 or less cells
- multiseriate more than 10 cells
- uniseriate and multiseriate parts same width
- rays of two different width

storied structure

- rays
- fibres
- axial parenchyma

rays cellular composition

- mainly heterogenous
- mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992*
- Détienne 1999*
- Metcalfe and Chalk 1950*
- Scheel-Ybert 1998*
- Ilic/CSIRO 1999*

RHIZOPHORACEAE

DB

Bruguiera gymnorhiza

collection number

58

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

palétuvier rouge

nyibwe

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

intervessels / tracheids pits arrangement

uniseriate

intervessels / tracheids pits shapes

scalariform

intervessels pits size

large

perforation plates types

scalariform 3 to 10 bars

helical thickenings

no

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

in radial clusters

vessels
arrangement

radial pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

apotracheal diffuse

fusiform parenchyma cells

no

axial parenchyma bands

in narrow lines up to 3 cells wide

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

10 to 20 cells high

rays width

3 to 10 seriate

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

large uniseriate pits

walls

thick and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

very small pores in short radial clusters, and very large rays visible in transverse section
rays are mainly triseriate but can be 4-seriate
scalariform perforation plates have 8-12 bars

RHIZOPHORACEAE

DB

Crossostylis grandiflora

collection number 07

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

palétuvier de montagne

opwäro (paicî)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

changeable

perforation plates types

reticulate

helical thickenings

no

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (2)

vessels
arrangement

radial pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

yes

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

paratracheal aliform

fusiform parenchyma cells

no

axial parenchyma bands

more than 3 cells wide

RAYs / RADIAL PARENCHYMA

rays

present

aggregate rays

tend to

rays height

20 to 40 or more cells high

rays width

3 to 10 seriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

rays and/or axial elements irregularly storied

VESSEL RAYS CROSSING

vessels rays pitting

large oval uniseriate simple pits

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

highly fragmented

axial parenchyma partracheal aliform can extend to large or narrow bands, or form short radial chains.

presence of prismatic crystals in rays cells

reticulate perforation plates have very thin bars that are often broken and appear simple

small and few fibers, hard to differentiate from axial parenchyma and rays cells

vessels are not storied with others axial elements

main difference with *Crossostylis multiflora*: less porous, clusters of 3 and 4 pores are rare, some aggregate rays can be present

RHIZOPHORACEAE

DB

Crossostylis multiflora

collection number

13

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

hêtre noueux/chêne gris

nyââmî (paicî)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (3 or more)

vessels
arrangement

radial pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

changeable

perforation plates types

reticulate

helical thickenings

no

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

yes

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

paratracheal aliform

fusiform parenchyma cells

no

axial parenchyma bands

more than 3 cells wide

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

20 to 40 or more cells high

rays width

3 to 10 seriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

rays and/or axial elements irregularly storied

VESSEL RAYS CROSSING

vessels rays pitting

large oval simple pits, uniseriate

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

highly fragmented

pores are in radial or tangential clusters of 2-4, wood is more porous than *Crossostylis grandiflora*

axial parenchyma paratracheal aliform extends in large (4 cells wide) or thin bands, and sometime forms short uniseriate radial chains.

rays are 3-8-seriate (mainly 6-8), with crystal deposits

perforation plates are scalariform to reticulate with thin bars that are often broken and appear simple

small and few fibers, hard to differentiate from axial parenchyma and rays cells

vessels are not storied with others axial elements

RHIZOPHORACEAE

DB

Rhizophora sp.

collection number

60

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

palétuvier

kéö (paicî)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

intervessels / tracheids pits arrangement

uniseriate

intervessels / tracheids pits shapes

simple to scalariform

vessels arrangement

radial pattern

intervessels pits size

large

solitary vessels with angular outline

no

perforation plates types

scalariform 3 to 10 bars

vessels tyloses

no

helical thickenings

no

vessels deposits

FIBERS

fiber helical thickenings

fibers wall thickness

medium thickness

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

extremely rare

fusiform parenchyma cells

no

axial parenchyma arrangement

apotracheal in aggregates

axial parenchyma bands

more than 3 cells wide

RAYS / RADIAL PARENCHYMA

rays height

15 to more than 30 cells high

rays width

bi to triseriate

rays

present

rays cellular composition

heterogeneous

aggregate rays

no

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

large uniseriate pits

walls

thick and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

small pores, solitary or in clusters of 2
 large rays
 presence of prismatic crystals in rays cells,
 presence of some rare short (2-3 cells) uniseriate rays
 perforation scalariform have 5-6 bars
 intervessel pits can be large and uniseriate to pseudoscalariform

RUBIACEAE

distinctive features and notes

Family divided in 3 groups based on anatomical features (Ilic 1999). All 3 are present in our "Central Pacific" region (associated with "Malaysia") and in the "Australia and New Zealand" region.

Septate fibers present in some genera. Parenchyma absent or always apotracheal.
Raphides and silica observed in parenchyma cells.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

septate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalfe and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

RUBIACEAE

DB

Gardenia oudiepe

collection number

32

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

gommier de forêt

oro / tüü « arbre à colle » (paici)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

intervessels / tracheids pits arrangement

alternate

vessels porosity /
tracheids diameter

diffuse-porous

intervessels / tracheids pits shapes

simple

vessels grouping

solitary

vessels
arrangement

radial to diagonal pattern

intervessels pits size

minute

solitary vessels with angular outline

no

perforation plates types

simple

vessels tyloses

no

helical thickenings

no

vessels deposits

FIBERS

fiber helical thickenings

fibers wall thickness

thick walled

fiber pits

dictinctly bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

apotracheal in aggregates

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays height

15 to 20 or more cells high

rays width

1 to biseriate

rays

present

rays cellular composition

heterogeneous

aggregate rays

no

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

similar to intervessel pits

walls

thick and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

small pores, can be in short tangential bands and are mainly solitary with a few clusters of 2-3 pores
axial parenchyma diffuse is in small aggregate or forming few narrow bands
some rays have uniseriate (rounded cells) and bi-triseriate (procumbent cells) parts of the same width
fibers pits are on radial and tangential walls

RUBIACEAE

DB

Gardenia urvillei

collection number

83

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

tiaré des forêts sèches

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

intervessels / tracheids pits arrangement

opposite

vessels porosity /
tracheids diameter

semi-ring porous

intervessels / tracheids pits shapes

simple

vessels grouping

solitary

vessels
arrangement

radial pattern

intervessels pits size

minute

solitary vessels with angular outline

no

perforation plates types

simple

vessels tyloses

no

helical thickenings

no

vessels deposits

FIBERS

fiber helical thickenings

yes

fibers wall thickness

thick walled

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

apotracheal in aggregates

axial parenchyma bands

no

RAY / RADIAL PARENCHYMA

rays height

8-10 or 18-20 cells high

rays width

uniseriate and multiseriate portions same width

rays

present

rays cellular composition

heterogeneous

aggregate rays

no

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

similar to intervessel pits

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

small and numerous pores, with a few clusters of 2,
axial parenchyma apotracheal in aggregate is mainly in short radial chains
rays have procumbent cells in body parts and uniseriate upright cells in tails

RUBIACEAE

DB

Ixora cauliflora

collection number

82

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

minute

perforation plates types

simple

helical thickenings

no

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (2 or 3)

vessels
arrangement

tangential bands

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits elongated crystals (styloids)

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

no

fiber pits

distinctly bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

apotracheal in aggregates

axial parenchyma bands

more than 3 cells wide

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

8-10 to 15-20 cells high

rays width

1 to biseriate

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

similar to intervessel pits, but
slightly larger

walls

thick and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

High fragmentation

small pores, clusters common but numerous solitary pores, forming tangential bands or a slightly tangential pattern

axial parenchyma is in aggregate of 2-3 cells wide, and sometime forms narrow tangential bands

numerous and very heterogeneous rays, with procumbent and rounded/square cell sin body part and upright cells in tails.

rare 3-seriate rays

small fibers, with pits mainly on tangential section

RUBIACEAE

DB

Morinda citrifolia

collection number

46

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

noni

wërê-upwârâ (paici)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

vestured pits

vessels arrangement

radial pattern

intervessels pits size

minute

solitary vessels with angular outline

yes

perforation plates types

simple

vessels tyloses

no

helical thickenings

no

vessels deposits

FIBERS

fiber helical thickenings

fibers wall thickness

medium thickness

fiber pits

simple to minutely bordered

spetate fibers present

tend to

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

apotracheal in aggregates

axial parenchyma bands

in narrow lines up to 3 cells wide

RAY / RADIAL PARENCHYMA

rays height

6-10 to 20-30 cells high

rays width

3 to 10 seriate

rays

present

rays cellular composition

heterogeneous

aggregate rays

no

mixed cellular composition

rays sheat cells

upright

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

similar to intervessel pits, numerous

walls

thin and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

a few radial clusters of 4 pores, others are shorter
 short vessel elements with perforation storied
 axial parenchyma is in short chains of 1-2 cells wide or form a few large bands of more than 3 cells
 rays are mainly 3-seriate, sometime 2 or 4-seriate, some have a row of upright sheat cells on one side
 axial parenchyma is widely distributed,
 few and small fibers
 a few raphides are present in axial parenchyma cells

RUBIACEAE

DB

Psychotria cf. collina

collection number

84

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

intervessels / tracheids pits arrangement

alternate

vessels porosity /
tracheids diameter

diffuse-porous

intervessels / tracheids pits shapes

simple

vessels grouping

in radial clusters

vessels
arrangement

radial pattern

intervessels pits size

minute

solitary vessels with angular outline

yes

perforation plates types

simple

vessels tyloses

yes

helical thickenings

no

vessels deposits

FIBERS

fiber helical thickenings

fibers wall thickness

very thin walled

fiber pits

distinctly bordered

spetate fibers present

yes

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

absent

fusiform parenchyma cells

axial parenchyma arrangement

axial parenchyma bands

RAY / RADIAL PARENCHYMA

rays height

5 to 15 cells high

rays width

1 to biseriate

rays

aggregate rays

no

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

rays and/or axial elements irregularly storied

VESSEL RAYS CROSSING

vessels rays pitting

small, bordered to vestured pits,
numerous

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

absent

lactifers tanniferous tubes

absent

radial secretory canals

absent

cambial variants

included phloem

diffuse

druses

absent

silica

absent

prismatic crystal

present

NOTES

pores in short radial clusters of 2-4 cells, a few longer clusters are around 8 cells
rays are mainly uniseriate with upright cells, a few have biseriate body part with procumbent and upright cells
fibers and vessel elements are storied
presence of prismatic crystals in rays cells

RUTACEAE

distinctive features and notes

Family with homogenous anatomical feature, present in the region throughout our "Central Pacific" area, associated with "Malaysia", and in the "Australia and New Zealand" region defined by Ilic (1999).

Spiral thickenings reported by Ilic in some genera vessels. Rays often uni to triseriate. Crystals can be present in parenchyma cells and silica in rays.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalf and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

RUTACEAE

DB

Acronychia laevis

collection number

92

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

semi-ring porous

vessels grouping

in radial clusters

vessels
arrangement

radial pattern

solitary vessels with angular outline

no

vessels tyloses

yes

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

minute

perforation plates types

reticulate

helical thickenings

scarce

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

no

fiber pits

dictinctly bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

apotracheal in aggregates

axial parenchyma bands

no

RAYs / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

5-10 cells high, or 50 or more cells

rays width

1 to biseriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

similar to intervessel pits

walls

thick and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

axial parenchyma in aggregate sometime form short large bands (4 cells high)
numerous rays, uniseriate with some body parts biseriate
reticulate perforation bars are often broken and can appear simple

RUTACEAE

DB

Murraya paniculata

collection number

88

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

minute

perforation plates types

simple

helical thickenings

no

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

in radial clusters

vessels
arrangement

tangential bands

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

fiber pits

dictinctly bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

in narrow bands (up to 3 cells wide)

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

5-10 cells high

rays width

exclusively uniseriate

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

small, numerous and widespread

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

absent

lactifers tanniferous tubes

absent

radial secretory canals

absent

cambial variants

included phloem

druses

absent

silica

absent

prismatic crystal

absent

NOTES

pores of two sizes, in short radial clusters of 2-4 pores and solitary pores in tangential bands
rays mainly made of square/rounded and upright cells, a few having procumbent cells in body part

RUTACEAE

DB

Picrella glandulosa

collection number

104

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

semi-ring porous

vessels grouping

clusters common (2 or 3)

vessels
arrangement

tangential bands

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

small

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

fiber helical thickenings

fiber pits

dictinctly bordered

spetate fibers present

tend to

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

in large bands (more than 3 cells wide)

axial parenchyma bands

in narrow lines up to 3 cells wide

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

uniseriate 5-10 cells, multiseriate 15-30

rays width

two different types

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

rays and/or axial elements irregularly storied

VESSEL RAYS CROSSING

vessels rays pitting

large oval bordered pits, numerous

walls

thin and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

absent

lactifers tanniferous tubes

absent

radial secretory canals

absent

cambial variants

included phloem

diffuse

druses

absent

silica

absent

prismatic crystal

absent

NOTES

clusters of pores are scattered or can be in tangential bands, presence of a few radial clusters of 4 pores.
presence of included phloeme in isolated aggregates
rays are either exclusively uniseriate and short, or 1 to 3 seriate and long, with uniseriate part same width as 2-3seriate part
storied perforation plates, possible broken scalariform bars
rare septate fibers

Families general anatomical features

SANTALACEAE

distinctive features and notes

Family divided in 2 groups based on anatomical features (Ilic 1999). Both are present in our "Central Pacific" region (associated with "Malaysia") and in the "Australia and New Zealand" region of Ilic (1999).

Rays are mainly 2-4seriate.

Vascular tracheids can be present (Ilic).

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalfe and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

SANTALACEAE

DB

Santalum austrocaledonicum

collection number 53

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

bois de santal

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

exclusively solitary/90% or more

vessels
arrangement

wide spread

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

bordered pits

intervessels pits size

small

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

fiber pits simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

apotracheal in aggregates

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

5 to 15 cells high

rays width

1 to biseriate

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

similar or slightly larger than
intervessel pits

walls

thin and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

apotracheal axial parenchyma can form aggregate of 2-4 cells, or short chains of cells
rays are exclusively biseriate, mainly with procumbent cells
short vessel elements,
fibers have large simple pits, located mainly on tangential walls

Families general anatomical features

SAPINDACEAE

distinctive features and notes

Family divided in 2 groups based on anatomical features (Ilic 1999). Both are present in our "Central Pacific" region (associated with "Malaysia") and in the "Australia and New Zealand" region of Ilic (1999).

Typically with pores in clusters often in radial arrangement, septate fibers, rays uni to biseriate and axial parenchyma sparse.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

septate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalfe and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

SAPINDACEAE

DB

Cupaniopsis cf. trigonocarpa

collection number 90

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

semi-ring porous

vessels grouping

clusters common (2 or 3)

vessels
arrangement

radial pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

bordered pits

intervessels pits size

small

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

very thin walled

fiber helical thickenings

fiber pits distinctly bordered

spetate fibers present

yes

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

apotracheal diffuse

fusiform parenchyma cells

axial parenchyma bands

RAY / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

6-12 cells high

rays width

1 to biseriate

rays cellular composition

homogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

large bordered pits, numerous

walls

thin and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

absent

lactifers tanniferous tubes

absent

radial secretory canals

absent

cambial variants

included phloem

druses

absent

silica

absent

prismatic crystal

absent

NOTES

pores of different sizes, in short radial clusters (2-4 cells)
axial parenhchyma hard to differentiate from fibers large and with thin walls
rays mainly uniseriate, with some 1 or 2 rows of biseriate cells in body part

SAPINDACEAE

DB

Cupaniopsis cf. sylvatica

collection number

117

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

intervessels / tracheids pits arrangement

alternate

vessels porosity /
tracheids diameter

diffuse-porous

intervessels / tracheids pits shapes

simple

vessels grouping

clusters common (2 or 3)

vessels
arrangement

radial to diagonal pattern

intervessels pits size

small

solitary vessels with angular outline

no

perforation plates types

simple

vessels tyloses

no

helical thickenings

no

vessels deposits

FIBERS

fiber helical thickenings

fibers wall thickness

very thin walled

fiber pits simple to minutely bordered

spetate fibers present

yes

vascular-vasicentric tracheids present

no

parenchyma like fibers present

yes

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

axial parenchyma arrangement

apotracheal diffuse

axial parenchyma bands

RAY / RADIAL PARENCHYMA

rays height 2-5 cells high, or 10-20 cells high

rays width exclusively uniseriate

rays

present

rays cellular composition

homogeneous

aggregate rays

no

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

large bordered pits, numerous

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

solitary pores are as numerous as short radial clusters, 2 or 3 pores mainly, but presence of some clusters of 4

axial parenchyma is hard to differentiate from fibers which are large and with thin walls

rays are mainly uniseriate with homogenous rounded cells, but a few long rays have 1 or 2 alternate rows of smaller procumbent cells in body part

vessel elements are short and irregular, with simple and bordered pits

perforation plates storied

SAPINDACEAE

DB

Dodonea viscosa

collection number

67

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

intervessels / tracheids pits arrangement

alternate

vessels porosity /
tracheids diameter

diffuse-porous

intervessels / tracheids pits shapes

simple

vessels grouping

in radial clusters

vessels
arrangement

radial pattern

intervessels pits size

small

solitary vessels with angular outline

no

perforation plates types

simple

vessels tyloses

no

helical thickenings

no

vessels deposits

FIBERS

fiber helical thickenings

yes

fibers wall thickness

thick walled

fiber pits

dictinctly bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

axial parenchyma arrangement

scanty paratracheal

axial parenchyma bands

RAYS / RADIAL PARENCHYMA

rays height

10-15 cells high

rays width

two different types

rays

present

rays cellular composition

heterogeneous

aggregate rays

no

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

large simple pits

walls

thin and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

absent

lactifers tanniferous tubes

absent

radial secretory canals

absent

cambial variants

included phloem

druses

absent

silica

absent

prismatic crystal

absent

NOTES

small pores in long radial clusters of 3-10 cells long, some solitary

axial parenchyma presence and distribution is very irregular depending on individuals : paratracheal scanty to banded and diffuse in aggregate rare to abundant (DETIENNE, Patel 1974 NZ)

rays are widespread

rays are of two types but same length : uniseriate ones have large upright cells, while bi-triseriate ones have small rounded and procumbent cells, but according to Détienne and Patel can also be homogenous

small and thin vessel elements

the sample observed have some strong differences with anatomical features described for the same species by Détienne and Patel (reference) : intraspecific variability appears high

SAPINDACEAE

DB

Ellatostachys apetala

collection number

47

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

mi (paicî)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

semi-ring porous

vessels grouping

clusters common (2 or 3)

vessels
arrangement

radial to diagonal pattern

solitary vessels with angular outline

no

vessels tyloses

yes

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

medium

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

very thin walled

fiber helical thickenings

fiber pits

dictinctly bordered

spetate fibers present

yes

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

paratracheal vasicentric

fusiform parenchyma cells

no

axial parenchyma bands

in narrow lines up to 3 cells wide

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

rays height

2-4 cells high, or 10-20 cells high

rays width

exclusively uniseriate

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

similar or slightly larger then
intervessel pits

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

absent

lactifers tanniferous tubes

absent

radial secretory canals

absent

cambial variants

included phloem

druses

absent

silica

absent

prismatic crystal

present

NOTES

paratracheal axial parenchyma sometime extend to form short aliform tails or can be scanty, a few rays have biseriate rows, either with upright or procumbent cells
presence prismatic crystals in some rays cells

very similar to *Guioa villosa*, but have fibers with simple pits and very thin septate walls as a difference, and rays are more heterogenous

SAPINDACEAE

DB

Guioa villosa

collection number

39

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

niamötö (paici)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (2 or 3)

vessels
arrangement

radial pattern

solitary vessels with angular outline

no

vessels tyloses

yes

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

minute

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

fiber pits

distinctly bordered

spetate fibers present

yes

vascular-vasicentric tracheids present

no

parenchyma like fibers present

yes

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

paratracheal vasicentric

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

4-5 or 15-20 cells high

rays width

exclusively uniseriate

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

large elongated simple pits,
uniseriate

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

pores of two sizes, large pores can be solitary or in clusters of 2 to 4, and are sometime in short radial clusters with smaller pores

parenchyma can form large bands in some parts of the wood

presence of tyloses in some vessels

rays are mainly uniseriate subhomogene with rounded or procumbent cells, but sometime have 1 or 2 rows of biseriate cells with heterogenous composition

very similar to *Ellatostachys apetala*, but with fibers having bordered pits and some wide septate walls as a difference, or rays being less heterogenous

SAPINDACEAE

DB

Pometia pinnata

collection number

117

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

pometier

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**vessels porosity /
tracheids diameter

vessels grouping

vessels
arrangement

solitary vessels with angular outline

vessels tyloses

vessels deposits

intervessels / tracheids pits arrangement

intervessels / tracheids pits shapes

intervessels pits size

perforation plates types

helical thickenings

FIBERS

fibers wall thickness

fiber helical thickenings

fiber pits

spetate fibers present

vascular-vasicentric tracheids present

parenchyma like fibers present

AXIAL PARENCHYMA

axial parenchyma present

axial parenchyma arrangement

fusiform parenchyma cells

axial parenchyma bands

RAYs / RADIAL PARENCHYMA

rays

aggregate rays

rays height

rays width

rays cellular composition

rays sheat cells

tile cells

storied structure

VESSEL RAYS CROSSING

vessels rays pitting

walls

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

détienne: majority of the rays are uniseriate, majority of the pores are solitary

SAPOTACEAE

distinctive features and notes

Family divided in 2 groups based on anatomical features (Ilic 1999). Both are present in our "Central Pacific" region (associated with "Malaysia") and in the "Australia and New Zealand" region of Ilic (1999).

Perforations are mainly simple. Parenchyma always apotracheal, bands are narrow. Rays are 4-10 cells wide only (Ilic, Scheel-Ybert), or uni to biseriate (CIRAD).

Crystals and silica in parenchyma cells. Frequent Tyloses (CIRAD).

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalf and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

SAPOTACEAE

DB

Manilkara dissecta

collection number

101

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

buni

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

in radial clusters

vessels
arrangement

radial pattern

solitary vessels with angular outline

no

vessels tyloses

yes

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

minute

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

tend to

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

apotracheal in aggregates

axial parenchyma bands

more than 3 cells wide

RAYs / RADIAL PARENCHYMA

rays

aggregate rays

no

rays height

5 to 20 or more

rays width

1 to biseriate

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

rays and/or axial elements irregularly storied

VESSEL RAYS CROSSING

vessels rays pitting

large elongated pits, 3-4 per square

walls

thick and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

small pores, in radial clusters 2-3 to 5 or more
axial parenchyma in aggregate of short narrow bands (CIRAD)
rays are extremely heterogenous, hard to distinguish from axial parenchyma
narrow fibers with very large walls, hard to see among widespread parenchyma cells
axial parenchyma cells storied in radial section

SAPOTACEAE

DB

Mimusops elengii

collection number

91

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

raporé

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

minute

perforation plates types

simple

helical thickenings

no

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (3 or more)

vessels
arrangement

radial to dendritic pattern

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

Fils

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

in narrow bands (up to 3 cells wide)

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYs / RADIAL PARENCHYMA

rays

present

aggregate rays

yes

rays height

5 to 10-15 cells high

rays width

two different types

rays cellular composition

heterogeneous

body ray cell procumbent with several rows of
upright/square marginal cells

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

large elongated simpl epits, 4-6 per
square

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

rays are uniseriate with upright cells, or biseriate body parts with upright cells and uniseriate with mixed cellular composition in tails, uniseriate and biseriate parts same width
fibers have thick walls and large rounded simple pits

SAPOTACEAE

DB

Niemeyera balansae

collection number

34

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

marronnier

mba (paicî)

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

in radial clusters

vessels
arrangement

tangential bands

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

small

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

yes

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

in narrow bands (up to 3 cells wide)

fusiform parenchyma cells

no

axial parenchyma bands

in narrow lines up to 3 cells wide

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

8-13 cells high

rays width

1 to biseriate

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

medium to large pits, oval, 4-6 per square

walls

thin and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

small pores in radial clusters of 3-5, sometime tending to form tangential bands
 axial parenchyma is manly in narrow bands of 1-2 cells wide, but can also be in aggregate
 rays are mainly uniseriate with upright cells, some have biseriate rows of procumbent and rounded cells in
 body parts
 some very narrow vessel elements
 fibers have large round simple pits and thick helical thickenings

SAPOTACEAE

DB

Planchonella cinerea

collection number

93

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (3 or more)

vessels
arrangement

wide spread

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

simple

intervessels pits size

minute

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

thick walled

fiber helical thickenings

tend to

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

fusiform parenchyma cells

no

axial parenchyma arrangement

scalariform

axial parenchyma bands

more than 3 cells wide

RAYs / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

6 to 10 cells high

rays width

1 to biseriate

rays cellular composition

heterogeneous

body ray cell procumbent with several rows of upright/square marginal cells

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

large elongated simple pits, 2-5 per square

walls

thick and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

cambial variants

druses

silica

prismatic crystal

radial secretory canals

included phloem

NOTES

numerous bands of axial parenchyma, 1 to 4 cells wide,
very small rays

rays have biseriate body parts with procumbent or rounded cells, and uniseriate tails with upright cells,
biseriate and uniseriate parts are the same width

fibers have wide walls, and are sometime septate, their pits are hard to distinguish

Families general anatomical features

SONERATIACEAE

distinctive features and notes

Family divided in 2 groups based on anatomical features (Ilic 1999). Both are present in our "Central Pacific" region (associated with "Malaysia") and in the "Australia and New Zealand" region of Ilic (1999).

Crystals in rays are possible.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalf and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

SONERATIACEAE

DB

Soneratia alba

collection number

63

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

palétuvier

Transverse section

Longitudinal sections

VESSELS/TRACHEIDS

vessels present

intervessels / tracheids pits arrangement

alternate

intervessels / tracheids pits shapes

simple

intervessels pits size

small

perforation plates types

simple

helical thickenings

no

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

solitary

vessels
arrangement

wide spread

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

FIBERS

fiber helical thickenings

tend to

fiber pits

simple to minutely bordered

fibers wall thickness

very thin walled

spetate fibers present

yes

vascular-vasicentric tracheids present

no

parenchyma like fibers present

yes

AXIAL PARENCHYMA

axial parenchyma present

extremely rare

fusiform parenchyma cells

no

axial parenchyma arrangement

apotracheal diffuse

axial parenchyma bands

no

RAY / RADIAL PARENCHYMA

rays height

3-4 to 10-11 cells high

rays width

exclusively uniseriate

rays

present

rays cellular composition

heterogeneous

aggregate rays

yes

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

large simple pits, 2-4 per square

walls

thick and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

absent

lactifers tanniferous tubes

absent

radial secretory canals

absent

cambial variants

included phloem

druses

absent

silica

absent

prismatic crystal

present

NOTES

small pores, mainly solitary but a few are in clusters by 2, few and scattered
rays are drawing specific dendrititic patterns in transverse section
rays are small and numerous, with prismatic crystals in cells
fibers variable in width and shape: not all demonstrate clear helical thickenings, all have simple round pits
and are septate, some are parenchyma-like

Families general anatomical features

SYMPLOCACEAE

distinctive features and notes

Family with homogenous anatomical feature, present in the region throughout our "Central Pacific" area, associated with "Malaysia", and in the "Australia and New Zealand" region defined by Ilic (1999).

Spiral thickenings in vessels and fibers tips reported by Ilic as consistently present in every genera. Perforations are simple and scalariform with more than 25 bars.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalf and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

SYMPLOCACEAE

DB

Symplocos arborea

collection number

110

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

omô (paicî)

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

diffuse-porous

vessels grouping

clusters common (2)

vessels
arrangement

wide spread

solitary vessels with angular outline

yes

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

uniseriate to alternate biseriate

intervessels / tracheids pits shapes

bordered to scalariform

intervessels pits size

small

perforation plates types

scalariform 40 bars or more

helical thickenings

scarce

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

distinctly bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

paratracheal vasicentric

fusiform parenchyma cells

no

axial parenchyma bands

no

RAYS / RADIAL PARENCHYMA

rays

present

aggregate rays

yes

rays height

10 to 16 cells high

rays width

two different types

rays cellular composition

heterogeneous

all upright/square

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

medium bordered pits, 10-13 per square

walls

thick and smooth

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

small and numerous pores, sometime tending to form large tangential bands
scalariform perforation plates are visible in transverse section
diffuse and paratracheal axial parenchyma
some rays are uniseriate with only upright /square cells, others are 2-4seriate, with rounded or square cells
in body parts and upright cells in uniseriate tails
fibers pits are bordered but small

Families general anatomical features

ULMACEAE

distinctive features and notes

Family with homogenous anatomical feature, present in the region throughout our "Central Pacific" area, associated with "Malaysia", and in the "Australia and New Zealand" region defined by Ilic (1999).

Spiral thickenings in vessels reported by Ilic. Sheat cells in rays.

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalfe and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

ULMACEAE

DB

Celtis hypoleuca

collection number

69

DICOTYLEDON

PTERIDOPHYTES

MONOCOTYLEDONS

Transverse section**Longitudinal sections****VESSELS/TRACHEIDS**

vessels present

vessels porosity /
tracheids diameter

semi-ring porous

vessels grouping

solitary

vessels
arrangement

tangential bands

solitary vessels with angular outline

no

vessels tyloses

no

vessels deposits

intervessels / tracheids pits arrangement

opposite

intervessels / tracheids pits shapes

simple

intervessels pits size

minute

perforation plates types

simple

helical thickenings

no

FIBERS

fibers wall thickness

medium thickness

fiber helical thickenings

no

fiber pits

simple to minutely bordered

spetate fibers present

no

vascular-vasicentric tracheids present

no

parenchyma like fibers present

no

AXIAL PARENCHYMA

axial parenchyma present

present

axial parenchyma arrangement

paratracheal winged aliform

fusiform parenchyma cells

no

axial parenchyma bands

in narrow lines up to 3 cells wide

RAY / RADIAL PARENCHYMA

rays

present

aggregate rays

no

rays height

2-4 to 10-15 cells high

rays width

two different types

rays cellular composition

heterogeneous

mixed cellular composition

rays sheat cells

tile cells

no

storied structure

no

VESSEL RAYS CROSSING

vessels rays pitting

medium simple pits, 10 per square

walls

thin and dentate

RADIAL TRACHEIDS

radial tracheids for gymnosperms

SECRETORY ELEMENTS AND CAMBIAL VARIANTS

axial canals

lactifers tanniferous tubes

radial secretory canals

cambial variants

included phloem

druses

silica

prismatic crystal

NOTES

large and scattered pores, sometime in clusters of 2
 tailed aliform axial parenchyma is confluent
 rays are either uniseriate with only upright cells or biseriate in body parts with square or procumbent cells,
 and uniseriate in tails with upright/rounded sell,
 multiseriate and uniseriate parts have the same width

WINTERACEAE

distinctive features and notes

Vesselless dicotyledons.

Tracheids have pits more abundant on radial walls than tangential walls, they can be scalariform in some species of *Bubbia* and *Zyggynum* (endemic to New Caledonia).

Rays are always of two types : uniseriate with erected cells and multiseriate (4 to 8 cells wide in *Zyggynum*) long with procumbent cells, erected sheat and tails cells.

Reference: Carlquist 1981. *Adansonia* 3 : 281-292, 1989. *Aliso*, 12 (2) : 257-275

GENERAL ANATOMICAL FEATURES

vessels

- predominantly solitary
 clusters common
 radial clusters common

intervessels pits

- simple minute
 bordered large
 vestured
 scalariform

perforation plates

- simple
 scalariform or reticulate

axial parenchyma

- absent or rare
 scanty paratracheal
 paratracheal in various forms
 confluent
 apotracheal in bands
 apotracheal diffuse
 scalariform
 reticulate

fiber pits

- mainly simple
 mainly distinctly bordered

spetate fibers

- frequent
 absent or rare

rays width

- exclusively uniseriate
 no uniseriate
 uni- to multiseriate 3 or less cells
 multiseriate 10 or less cells
 multiseriate more than 10 cells
 uniseriate and multiseriate parts same width
 rays of two different width

storied structure

- rays
 fibres
 axial parenchyma

rays cellular composition

- mainly heterogenous
 mainly homogenous or sub-homogenous

References used

- collectif/CIRAD 1992* *Détienne 1999* *Metcalfe and Chalk 1950*
 Scheel-Ybert 1998 *Ilic/CSIRO 1999*

RESUME

Mots clés : anthracologie, charbons de bois, atlas de bois, Océanie, Nouvelle-Calédonie, période précoloniale, sociétés kanak, Cèmuhi, vallée de la Tiwaka, forêt, arbre, horticulture et arboriculture, archéobotanique

Au cours des 20 dernières années, d'importants progrès ont été réalisés dans notre connaissance du passé archéologique calédonien. Cependant, les données paléoenvironnementales et archéobotaniques demeurent dispersées et peu nombreuses, notamment sur la période kanak dite « précoloniale » (des 10^{ème}/11^{ème} siècles à la seconde moitié du 19^{ème} siècle). Le but de cette recherche doctorale était de développer une approche interdisciplinaire : *i.e.* combinant des données archéologiques, archéobotaniques et ethnologiques/ethnohistoriques, dans le but de comprendre les dynamiques de construction des paysages kanak. La problématique principale concerne l'étude des changements des formations végétales en relation avec le système d'occupation spatiale kanak, les pratiques de gestion des forêts et des espèces ligneuses. Nous avons utilisé l'approche anthracologique – basée sur l'identification des restes de charbons de bois –, à travers une étude de cas menée sur la vallée de la Tiwaka, dans le nord-est de la Grande Terre.

Cette étude représentant la première application de l'anthracologie au contexte calédonien, la première phase du travail a consisté en la création d'une collection de référence des bois et d'une base de données anatomiques pour l'identification des charbons de bois archéologiques. 130 taxons (principalement des Dicotylédones mais aussi quelques Monocotylédones et Ptéridophytes) ont été collectés et leur anatomie décrite. Des prospections archéologiques et botaniques ont été conduites en association dans la vallée, suivies de sondages archéologiques et à la tarière menées sur trois sites, représentant trois zones écologiques différentes de la Tiwaka. Les prélèvements anthracologiques ont été réalisés sur les différents niveaux stratigraphiques repérés, de manière à illustrer les phases pré-occupation et d'occupation. Les questions méthodologiques pour l'anthracologie tropicale sont discutées, relativement aux phases de terrain et de laboratoire.

L'analyse croisée de nos résultats archéologiques et anthracologiques avec les autres données déjà disponibles montre que le système d'occupation spatiale kanak a émergé, dans la vallée, pendant la première moitié du deuxième millénaire de notre ère, au sein d'un paysage végétal montrant peu ou pas d'impact anthropique, avec une forte présence de la forêt humide. La végétation entourant les sites et exploitée par les habitants a ensuite évolué vers une composition plus ouverte mais aussi plus complexe, avec l'existence de taxons utilitaires ou cultivés. La présence de taxons secondaires et de la savane se renforce autour des 17^{ème}-18^{ème} siècles, probablement en association avec l'intensification de l'activité humaine ainsi que la multiplication des sites d'habitat et horticoles dans la vallée. La discussion de nos résultats au regard de l'archéologie calédonienne met en évidence la nécessité de prendre en considération le rôle des changements climatiques sur les évolutions des paysages, et les pratiques de domestication des forêts, à travers la manipulation des plantes et des espaces forestiers, en association avec l'histoire des systèmes d'horticulture/arboriculture dans le Pacifique.

ABSTRACT

Key words : anthracology, wood charcoals, wood atlas, Oceania, New Caledonia, precolonial period, kanak societies, Cèmuhi, Tiwaka valley, forest, tree, horticulture and arboriculture, archaeobotany

Some important progresses have been made in the last 20 years in our knowledge of New Caledonia archaeological past. However, palaeoenvironmental and archaeobotanical data remain sparse, most especially on the recent so-called “precolonial” kanak period (10th/11th to late 19th centuries AD). The aim of this PhD research was to develop an interdisciplinary palaeoenvironmental and anthropological approach: *i.e.* combining archaeological, ethnological/ethnohistorical and archaeobotanical data, in order to understand the dynamics of kanak landscape construction. The main emphasis is on the study of forest types changes in relation to the kanak settlement system, human management of forestlands and woody species. We used the anthracological approach - identification of charred woody remains –, through a case study focused on the Tiwaka valley, northeastern Grande Terre.

As this study represents the first application of anthracology in New Caledonia, a wood reference collection and an anatomical database for the identification of archaeological charcoals had first to be created. 130 taxa (mainly Dicotyledons but also a few Monocotyledons and Pteridophyteae) have been collected, and their anatomy described. Coupled archaeological and botanical surveys have been conducted in the valley, followed by archaeological test pits and coring, on three sites representing different ecological locus of the Tiwaka. Anthracological sampling was done for the different stratigraphic levels observed, so as to encompass pre-occupation and occupation phases. Methodological issues for tropical anthracology are discussed, in regards to the field and laboratory work sessions.

The cross-analysis of our archaeological and anthracological results with other data available shows that the kanak settlement system emerged, in the valley, during the first half of the second millenium, within forestlands demonstrating few or no signs of human impact, with a strong presence of the tropical evergreen forest. The vegetation surrounding the sites and exploited by their occupants then evolved towards a more open but also more complex composition, with the presence of utilitarian or cultivated taxa. The presence of secondary and savanna taxa increased around the 17th and 18th centuries, possibly in association with an intensification of human activity and a multiplication of settlement as well as horticultural sites in the valley. The discussion of our results for the archaeology of New Caledonia highlights the need to consider the role of past climate changes on the evolution of the landscape, and practices of forest domestication, through manipulation of plants and forestlands, linked with the history of horticultural/arboricultural systems in the Pacific.