Macroscopic Identification Atlas of Endangered Woods Common in Trade

Editors YIN Yafang JIAO Lichao
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Science Press | edp sciences

Science Press: ISBN(print) 978-7-03-070590-7
EDP Sciences: ISBN(ebook) 978-2-7598-3203-3

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Abstract

The *Macroscopic Identification Atlas of Endangered Woods Common in Trade* was edited by the Wildlife Conservation Department of China National Forestry and Grassland Administration (NFGA), the CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) Management Authority of China and the Research Institute of Wood Industry, Chinese Academy of Forestry, with the support of the International Association of Wood Anatomists (IAWA) and the Research Group 5.16.00 of the International Union of Forest Research Organization (IUFRO).

In the atlas, a total of twenty-six tree species listed in the CITES Appendices, were included. The taxonomy, geographic distribution, morphological characteristics of trees, wood description, identification characteristics of wood, type of wood products, and conservation class of each species is reviewed. Moreover, key identification features, in comparison with the similar (easy to be confused or look-alike) species, are indicated with images of solid wood and at low magnification under the stereomicroscope.

The atlas is portable and suitable for on-site inspection and law enforcement training. It will provide an important reference for law enforcement and customs of China, and strengthen management of imports and exports of endangered tree species. Meanwhile, the atlas will assist the popularization of wood science for the public.

Published by Science Press, EDP Sciences

Science Press: ISBN(print) 978-7-03-070590-7
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Preface

China is an important destination and consumer market for timber shipments from all over the world. These timber imports and re-exports involve many of the tree species that are listed in the Appendices in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

At present, CITES is an incomparable international regulatory tool, by means of which enforcement officers can play a key role in combatting illegal logging and its related trade. So far, more than 520 tree species have been listed in the CITES Appendices.

Being a contracting party of CITES, the Chinese government has always placed emphasis on the conservation and sustainable use of timber resources by strictly implementing the convention and by improving the law enforcement for cracking down on illegal trade and trafficking.

The rapid increase in the number of tree species listed in the CITES Appendices for control pose a formidable challenge to the implementation of the convention, since it requires an identification of timber that are subject to international trade.

It is well known that an identification of a timber can be very difficult and far more complex than that of other plants, since trade seldom occurs that involves all the examples of a particular species, complete with the anatomical features that can be used to identify that particular species, e.g.,

leaves, flowers and fruit.

With a keen understanding of this problem, the CITES Management Authority of China has prepared this identification atlas in cooperation with the Research Institute of Wood Industry, Chinese Academy of Forestry, together with the International Association of Wood Anatomists (IAWA) and the Research Group 5.16.00 of the International Union of Forest Research Organizations (IUFRO).

The atlas includes twenty-six endangered tree species that are common in international trade, twenty-four of which are listed in CITES Appendix Ⅱ, with the remaining two species being listed in the Appendix Ⅲ.

Each species is described in concise words, accompanied by sample photos that show the taxonomy, geographic distribution, characteristic morphology of tree and wood, wood products, and conservation class along with key macroscopic anatomical traits.

This atlas is a useful tool for the stakeholders that are involved in implementing the convention, when it comes to law enforcement, customs officers and inspectors. It can serve as material for raising public awareness and knowledge dissemination of this important issue. We hope that this atlas will play an active and important role in promoting the resources protection and sustainable use of tree species. Parts of photographs in the atlas taken in the Forest Products Laboratory (FPL), Forest Service (FS), USDA, the Singapore Botanic Gardens and the Experimental Center of Tropical Forestry, Chinese Academy of Forestry are gratefully acknowledged.

Editors

28 December, 2021

Contents

Overview

1 Objective

With the rapid increase in global forest resource trade, tree species have become the focus of attention in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). As one of the world's major timber importers and wood product processing and consumer countries, China is facing increasing pressure and challenges to implement the convention. Accurate identification of wood is of great practical significance. Fast and accurate wood identification technology is very necessary for the majority of organizations and personnel engaged in wood production and processing, management, customs and wood inspection, scientific research and education in all aspects of the timber trade activities.

We aim to develop law enforcement training on the identification capacity of tree species listed in CITES Appendices, strengthen the supervision of timber trade of endangered tree species, and improve China's capacity to implement CITES and protect endangered tree species by preparing the *Macroscopic Identification Atlas of Endangered Woods Common in Trade*.

2 Introduction of Endangered Wood

Endangered timber listed in the CITES Appendices generally refers to the timber from tree species that could be at risk of extinction if not protected. The Convention protects species by listing them in Appendices at three different levels of management, and by restricting trade through a permission system. As defined by the Convention, the Appendices are as follows: Appendix Ⅰ lists species that are the most endangered among CITES-listed animals and plants. Appendix Ⅱ lists species that are not necessarily now threatened with extinction but that may become so unless trade is closely controlled. Appendix Ⅲ is a list of species included at the request of a Party that already regulates trade in the species and that needs the cooperation of other countries to prevent unsustainable or illegal exploitation.

CITES was concluded in Washington in March 1973 and took effect on July 1, 1975. Now it has 184 Parties (including the EU). China officially joined the CITES in 1981, and established the Management Authority at China National Forestry and Grassland Administration in 1995, on behalf of the Chinese government to perform the CITES Convention, and issue the Import and Export Permission Certificate in accordance with the *Chinese Regulations for Administration of Import and Export of Endangered Wild Animals and Plants*. CITES will protect and control wildlife by formulating a list of endangered species, requiring all parties to implement a permission system to control international trade in these species and their products, promoting national compliance legislation and the fight against illegal trade, and imposing sanctions on violating parties. By combining the protection of wild plants with the control of their trade, it can be achieved the purpose of resources conservation and realizing sustainable development.

Before 2010, the number of tree species listed in the CITES Appendices had been small, and the international community paid less attention to timber. However, since the CoP 15th in 2010, the number of tree species listed in the Appendices has increased multiple times (Table 1). The increased species mainly included tropical species of genera such as *Dalbergia*, *Pterocarpus*, *Diospyros*, *Guibourtia*, and *Cedrela*. According to the development trend of the CITES Conference of the Parties in the past 10 years, CITES is continuously accelerating the extension of its control scope, especially tropical tree species. This indicates that with the intensification of global environment and climate change, as well as the enhancement of environmental protection awareness in human society, the protection and sustainable use of tropical tree species have been paid high attention by the international community. Up to December 2021, over 520 tree species have been listed in the CITES Appendices, including 7 species in 7 genera in Appendix Ⅰ, approx. 506 species in 21 genera in Appendix Ⅱ, and 7 species in 5 genera in Appendix Ⅲ (Table 2).

Table 1 Tree species listed in CITES from CoP 15th to 18th

Year Conference	Total number of tree species listed	CITES Appendices		
		Appendix Ⅰ	Appendix Ⅱ	Appendix Ⅲ
2010 CoP 15th	112	7	95 species. Newly added: *Aniba rosaeodora*. From Appendix Ⅲ to Appendix Ⅱ : *Bulnesia sarmientoi*	10
2013 CoP 16th	248	7	232 species. Newly added: *Dalbergia cochinchinensis*, *Dalbergia granadillo*, *Osyris lanceolata*, and 48 species of *Dalbergia* and 84 species of *Diospyros* in Madagascar. From Appendix Ⅲ to Appendix Ⅱ : *Dalbergia retusa* and *Dalbergia stevensonii*	9
2016 CoP 17th	504	7	Approx. 487 species. Newly added: *Dalbergia* spp. (Approx. 249 species)、*Guibourtia demeusei, Guibourtia pellegriniana, Guibourtia tessmannii, Adansonia grandidieri.* From Appendix Ⅲ to Appendix Ⅱ : *Pterocarpus erinaceus, Dalbergia tucurensis, Dalbergia davidii*	10
2019 CoP 18th	Over 520	7	Approx. 506 species. Newly added: *Pterocarpus tinctorius,* 14 species of *Cedrela, Widdringtonia whytei.* From Appendix Ⅲ to Appendix Ⅱ : *Cedrela fissilis, Cedrela lilloi, Cedrela odorata*	7

Table 2 CITES Appendices Listed Tree Species (Up to December 2021)

Family	Genus/Species	Appendix
Araucariaceae	**1 species**	
	Araucaria araucana	Ⅰ
Cupressaceae	**3 species**	
	Fitzroya cupressoides	Ⅰ
	Pilgerodendron uviferum	Ⅰ
	Widdringtonia whytei	Ⅱ
Pinaceae	**2 species**	
	Abies guatemalensis	Ⅰ
	Pinus koraiensis (Russian Federation)	Ⅲ
Podocarpaceae	**2 species**	
	Podocarpus neriifolius (Nepal)	Ⅲ
	Podocarpus parlatorei	Ⅰ
Taxaceae	**5 species**	
	Taxus chinensis	Ⅱ
	Taxus cuspidata	Ⅱ
	Taxus fuana	Ⅱ
	Taxus sumatrana	Ⅱ
	Taxus wallichiana	Ⅱ
Caryocaraceae	**1 species**	
	Caryocar costaricense	Ⅱ
Ebenaceae	**84 species**	
	Diospyros spp. (Madagascar population)	Ⅱ
Fagaceae	**1 species**	
	Quercus mongolica (Russian Federation)	Ⅲ
Juglandaceae	**1 species**	
	Oreomunnea pterocarpa	Ⅱ
Lauraceae	**1 species**	
	Aniba rosaeodora	Ⅱ

Continued

Family	Genus/Species	Appendix
Leguminosae	**Approx. 314 species**	
	Paubrasilia echinata	Ⅱ
	Dalbergia nigra	Ⅰ
	Dalbergia spp. (Except for the species listed in Appendix Ⅰ)	Ⅱ
	Dipteryx panamensis (Costa Rica, Nicaragua)	Ⅲ
	Guibourtia demeusei	Ⅱ
	Guibourtia pellegriniana	Ⅱ
	Guibourtia tessmannii	Ⅱ
	Pericopsis elata	Ⅱ
	Platymiscium parviflorum	Ⅱ
	Pterocarpus erinaceus	Ⅱ
	Pterocarpus santalinus	Ⅱ
	Pterocarpus tinctorius	Ⅱ
Magnoliaceae	**1 species**	
	Magnolia liliifera var. *obovata* (Nepal)	Ⅲ
Meliaceae	**20 species**	
	Cedrela spp. (Neotropical population)	Ⅱ
	Swietenia humilis	Ⅱ
	Swietenia macrophylla (Neotropical population)	Ⅱ
	S*wietenia mahagoni*	Ⅱ
Oleaceae	**1 species**	
	Fraxinus mandshurica (Russian Federation)	Ⅲ
Rosaceae	**1 species**	
	Prunus africana	Ⅱ
Rubiaceae	**1 species**	
	Balmea stormiae	Ⅰ
Santalaceae	**1 species**	
	Osyris lanceolata (Populations of Burundi, Ethiopia, Kenya, Rwanda, Uganda and the United Republic of Tanzania)	Ⅱ

Continued

Family	Genus/Species	Appendix
Thymelaeaceae	**73 species**	
	Aquilaria spp.	Ⅱ
	Gonystylus spp.	Ⅱ
	Gyrinops spp.	Ⅱ
Trochodendraceae	**1 species**	
	Tetracentron sinense (Nepal)	Ⅲ
Zygophyllaceae	**6 species**	
	Bulnesia sarmientoi	Ⅱ
	Guaiacum spp.	Ⅱ

Instructions

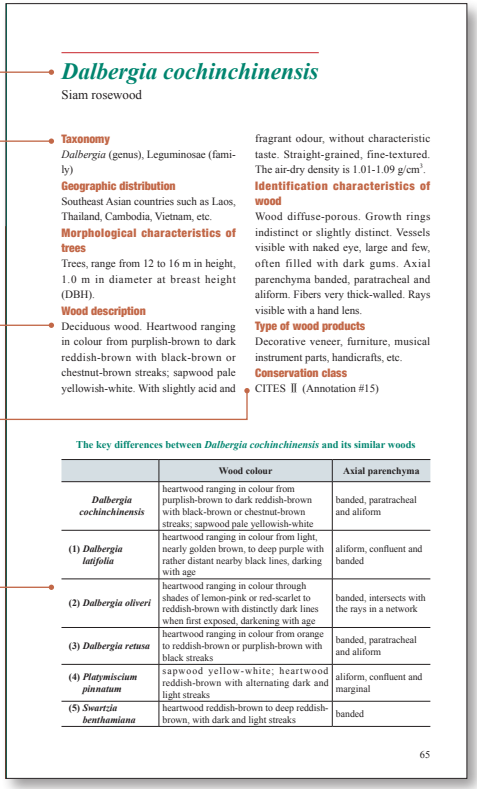
Species name and commercial name

Family name and genus name

Wood characteristics

CITES appendix and annotation

The main wood features of this species different from its similar species



Dalbergia cochinchinensis

Siam rosewood

Taxonomy

Dalbergia (genus), Leguminosae (family)

Geographic distribution

Southeast Asian countries such as Laos, Thailand, Cambodia, Vietnam, etc.

Morphological characteristics of trees

Trees, range from 12 to 16 m in height, 1.0 m in diameter at breast height (DBH).

Wood description

Deciduous wood. Heartwood ranging in colour from purplish-brown to dark reddish-brown with black-brown or chestnut-brown streaks; sapwood pale yellowish-white. With slightly acid and fragrant odour, without characteristic taste. Straight-grained, fine-textured. The air-dry density is 1.01-1.09 g/cm^3.

Identification characteristics of wood

Wood diffuse-porous. Growth rings indistinct or slightly distinct. Vessels visible with naked eye, large and few, often filled with dark gums. Axial parenchyma banded, paratracheal and aliform. Fibers very thick-walled. Rays visible with a hand lens.

Type of wood products

Decorative veneer, furniture, musical instrument parts, handicrafts, etc.

Conservation class

CITES Ⅱ (Annotation #15)

The key differences between *Dalbergia cochinchinensis* and its similar woods

	Wood colour	Axial parenchyma
Dalbergia cochinchinensis	heartwood ranging in colour from purplish-brown to dark reddish-brown with black-brown or chestnut-brown streaks; sapwood pale yellowish-white	banded, paratracheal and aliform
(1) ***Dalbergia latifolia***	heartwood ranging in colour from light, nearly golden brown, to deep purple with rather distant nearby black lines, darking with age	aliform, confluent and banded
(2) ***Dalbergia oliveri***	heartwood ranging in colour through shades of lemon-pink or red-scarlet to reddish-brown with distinctly dark lines when first exposed, darkening with age	banded, intersects with the rays in a network
(3) ***Dalbergia retusa***	heartwood ranging in colour from orange to reddish-brown or purplish-brown with black streaks	banded, paratracheal and aliform
(4) ***Platymiscium pinnatum***	sapwood yellow-white; heartwood reddish-brown with alternating dark and light streaks	aliform, confluent and marginal
(5) ***Swartzia benthamiana***	heartwood reddish-brown to deep reddish-brown, with dark and light streaks	banded

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Photos of tree morphology

Photo of log

Photo of wood products

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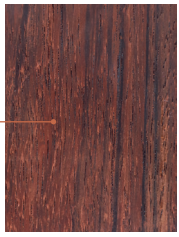
Photo of longitudinal surface of wood

Photo of transverse section of wood

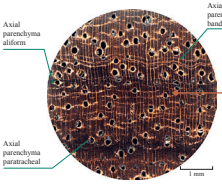
Photo of longitudinal surface of the similar wood

Photo of transverse section of the similar wood

Similar woods



Dalbergia cochinchinensis Longitudinal surface of wood



Dalbergia cochinchinensis Transverse section of wood

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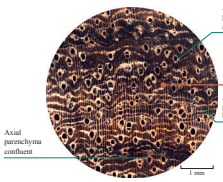
Dalbergia latifolia

Dalbergia latifolia Longitudinal surface of wood



Dalbergia latifolia Transverse section of wood

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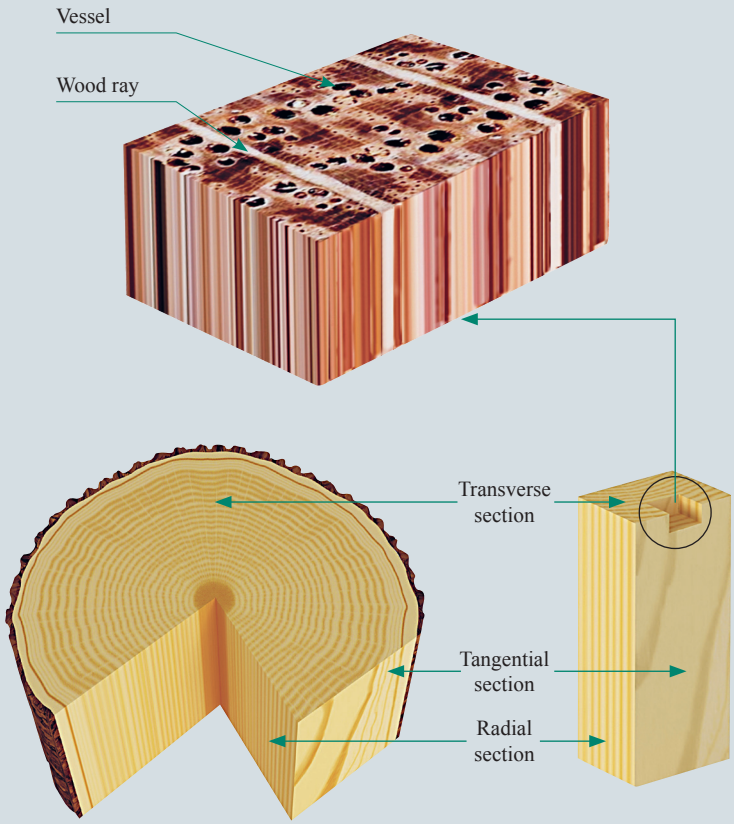
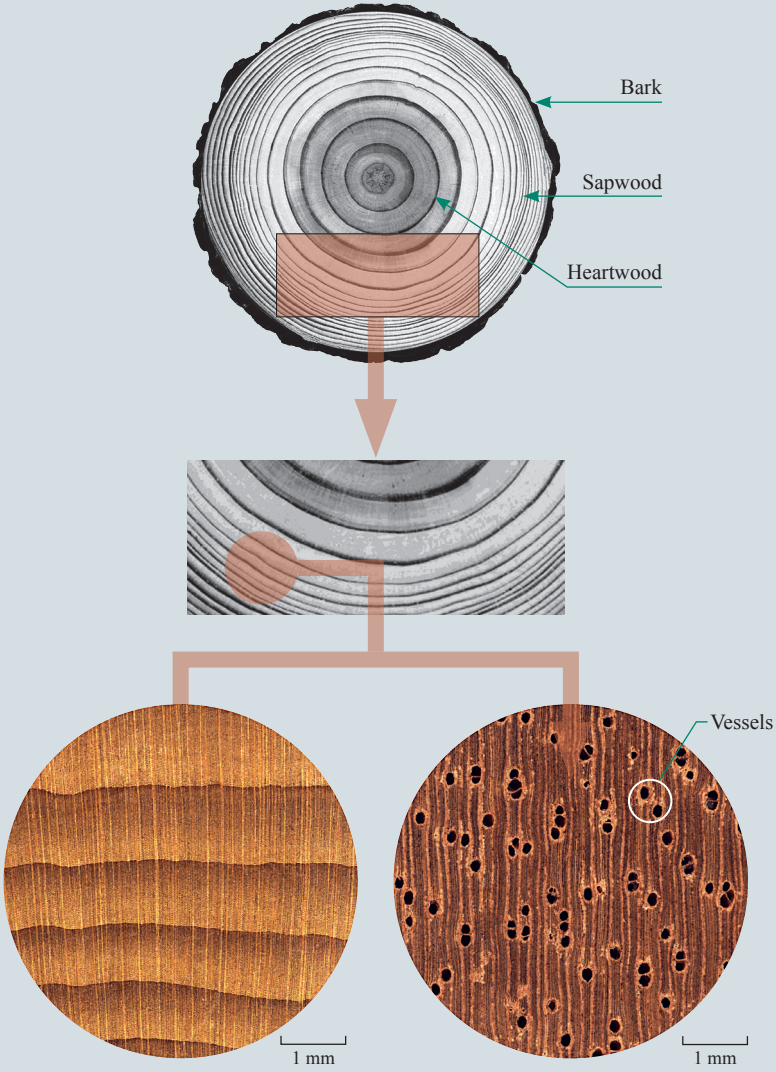
General Knowledge of Wood Identification

1 General knowledge of wood

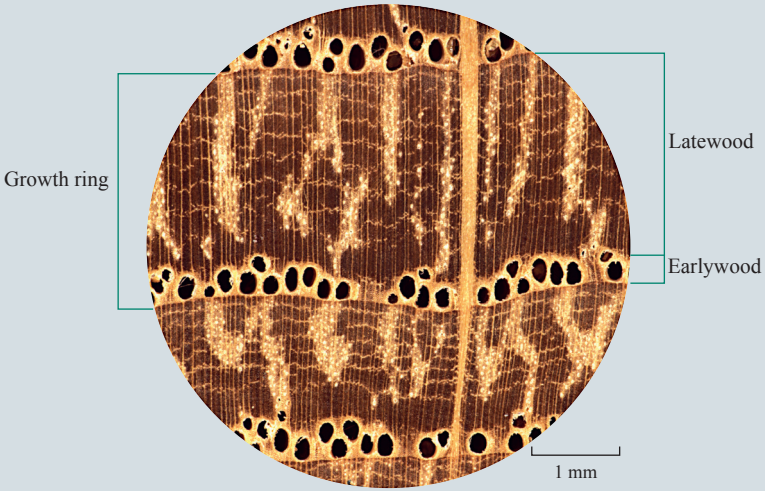


(1) Without / with pores



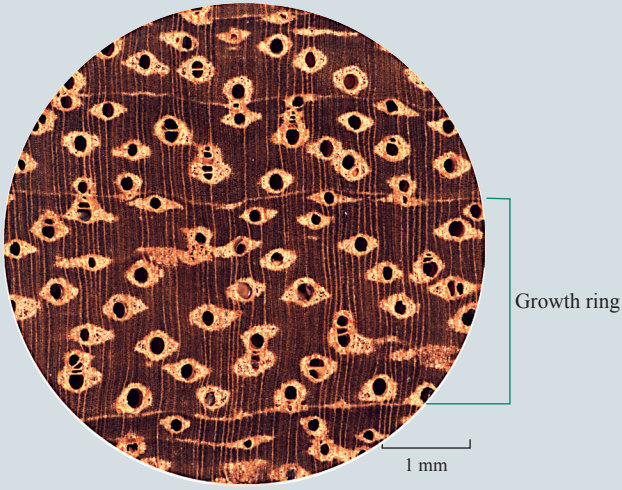
(2) Ring/Diffuse porous wood

1) Ring porous wood



Quercus mongolica
Earlywood vessels are larger than latewood vessels

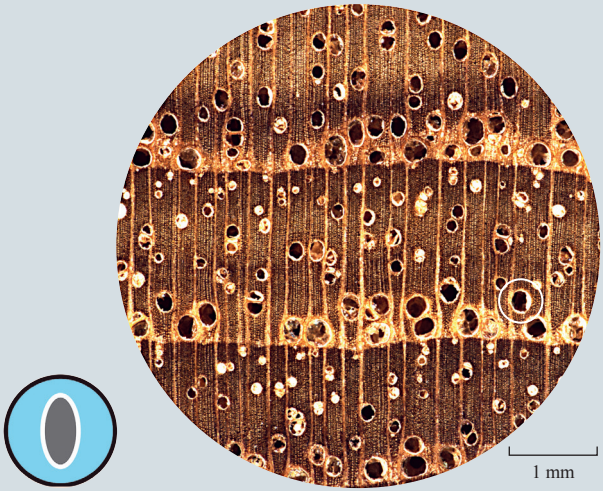
2) Diffuse porous wood



Platymiscium pinnatum
Earlywood and latewood vessels are roughly the same size

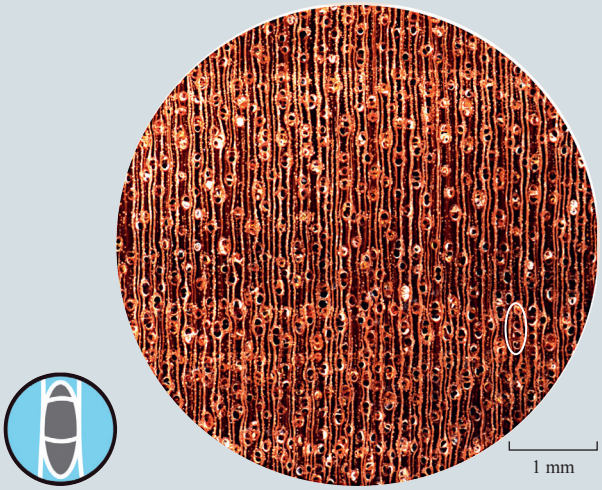
2 Vessels

(1) Solitary vessel



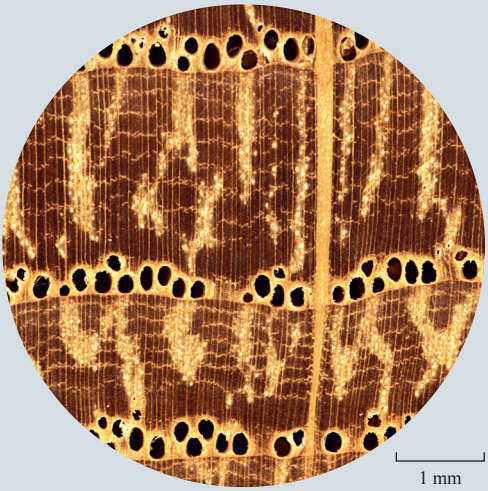
Tectona grandis
Solitary vessel

(2) Radial multiple vessel

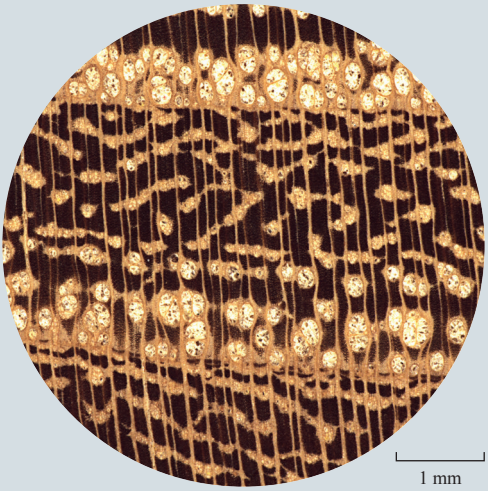


Colophospermum mopane
Vessels in radial multiples

(3) Vessel arrangements



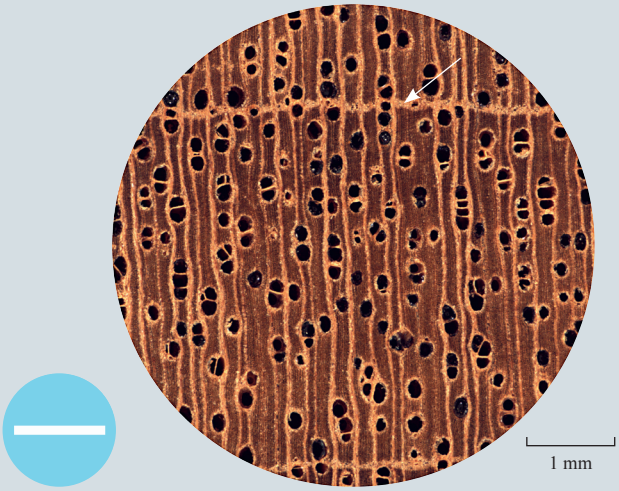
Quercus mongolica
Flamboyancy arrangements in latewood zone



Robinia pseudoacacia
Tangential band arrangements in latewood zone

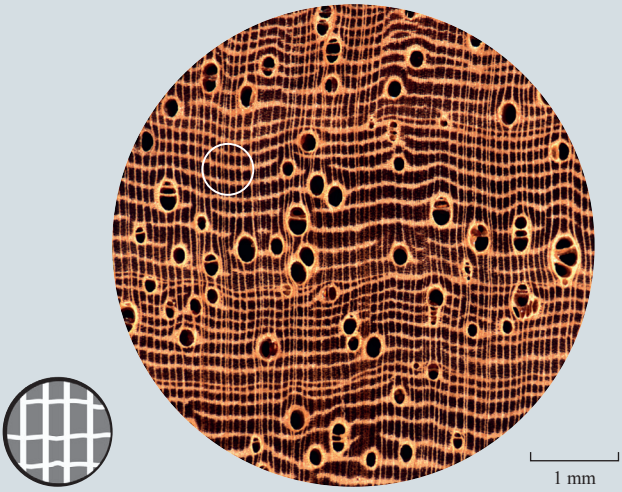
3 Parenchyma

(1) Marginal parenchyma



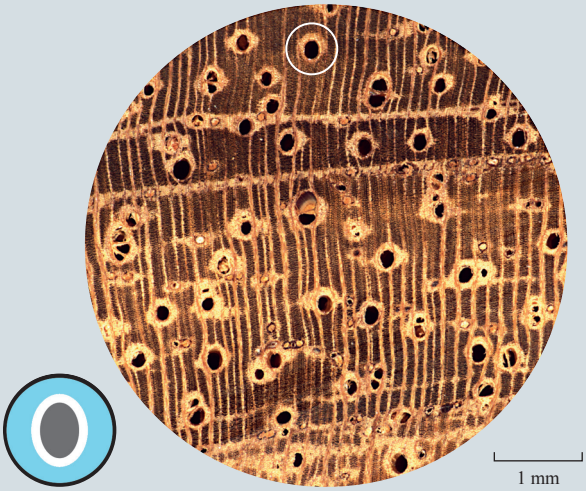
Swietenia macrophylla
At the beginning or at the end of a growth ring

(2) Banded parenchyma



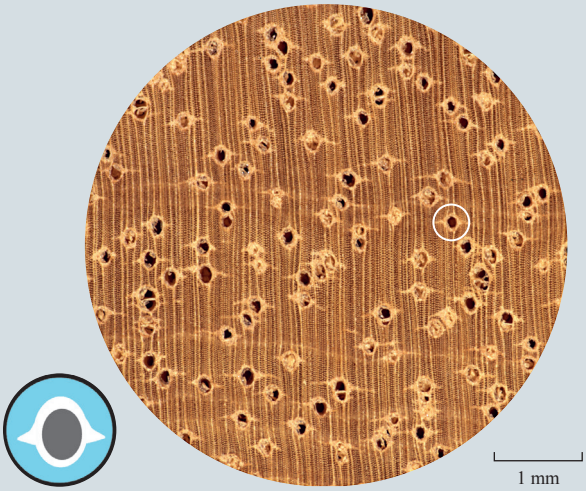
Dalbergia oliveri
Band (in horizontal) within a growth ring

(3) Paratracheal parenchyma



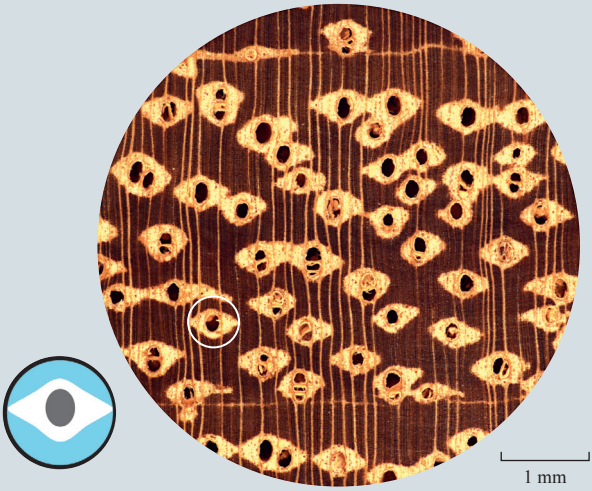
Daniellia oliveri
Associated with the vessels, surrounding them

(4) Aliform parenchyma



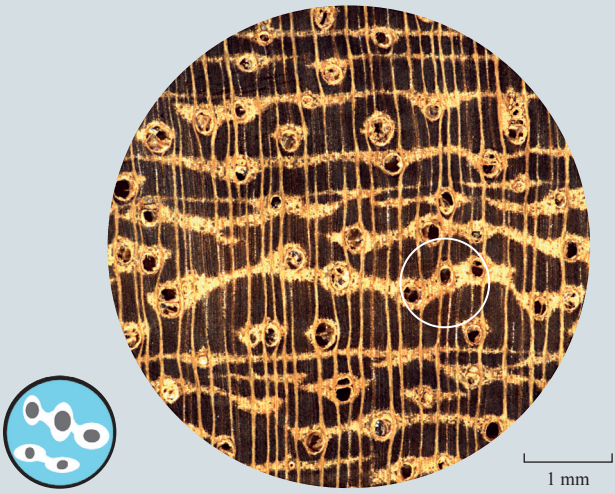
Gonystylus bancanus
Surrounds vessels, forms winglike projections

(5) Lozenge aliform parenchyma



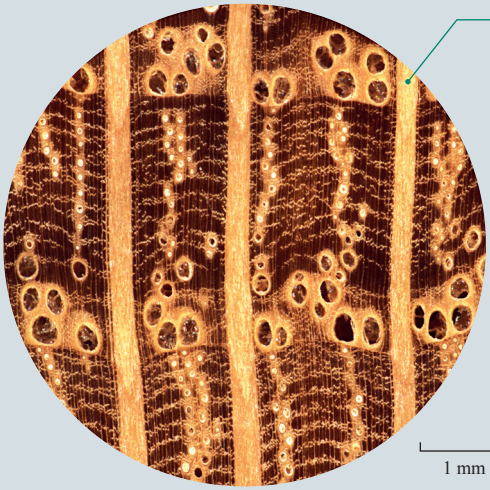
Afzelia africana
Aliform paratrachyma forming a lozenge shape

(6) Confluent parenchyma

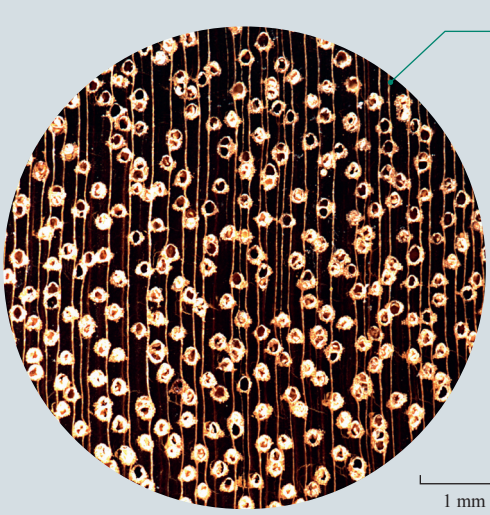


Milicia excelsa
Aliform parenchyma extends to connect many vessels

4 Wood ray



Quercus acutissima
Wide rays

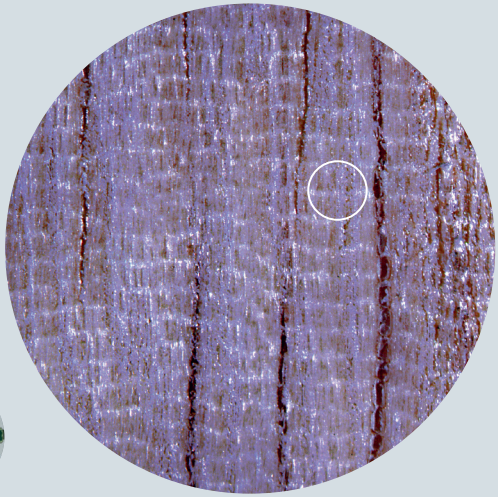


Chlorocardium rodiei
Narrow rays

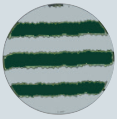
5 Storied rays

Coarse

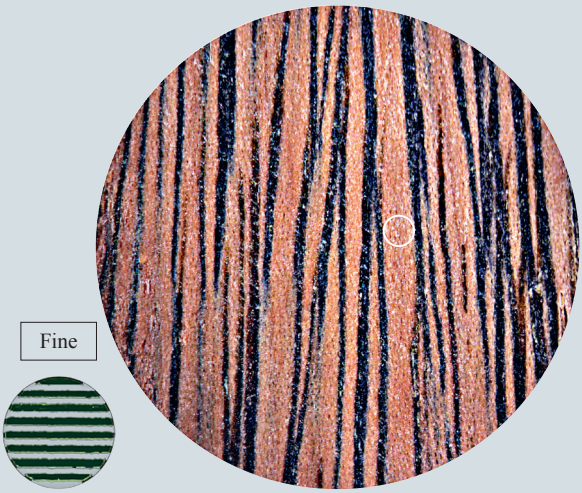
Swietenia macrophylla



Medium



Dialium cochinchinense



Bulnesia sarmientoi

Storied rays:

On the tangential section, ray arrange form even horizontal rows sometimes visible to the naked eye.

Storied rays can be divided into three classifications:

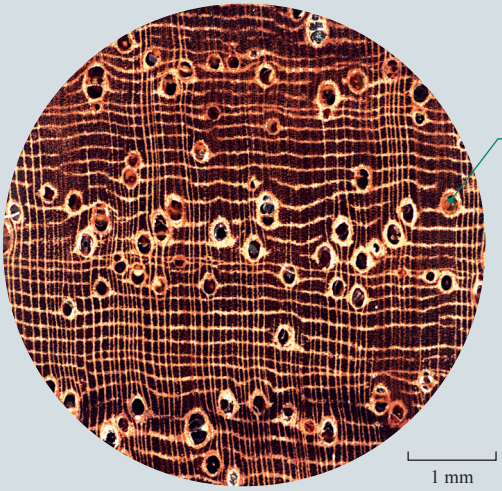
Coarse: 2 rows or less per mm;

Medium: 3-6 rows per mm;

Fine: more than 6 rows per mm.

6 Inclusions

Gums in the vessels



Dalbergia oliveri

7 Odor

Natural odor can be judged by new cutting wood

Cedrela odorata
Cedar odor

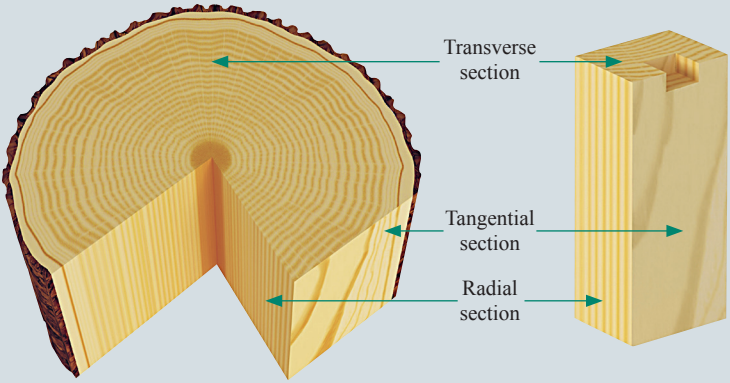
Bulnesia sarmientoi
Fruit odor

8 Hardness

Nail easily marks the wood, soft
Nail does not easily mark the wood, hard

9 Steps of wood identification

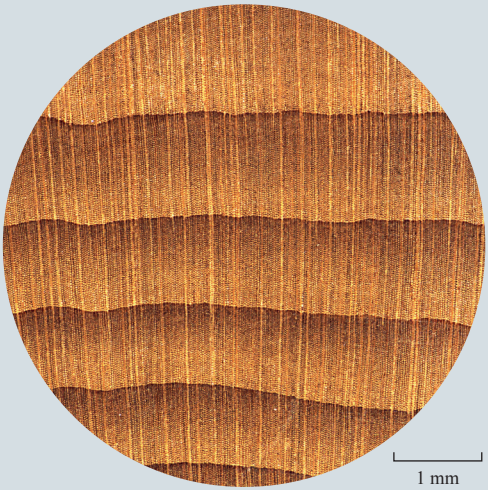
(1) Prepare a wood block.



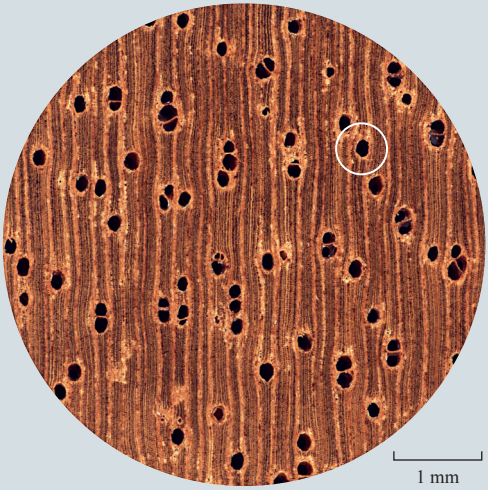
(2) Cut a smooth transverse section using a sharp blade.

(3) Observe the transverse section using a hand-held magnifying lens.

(4) Check whether there are vessels.

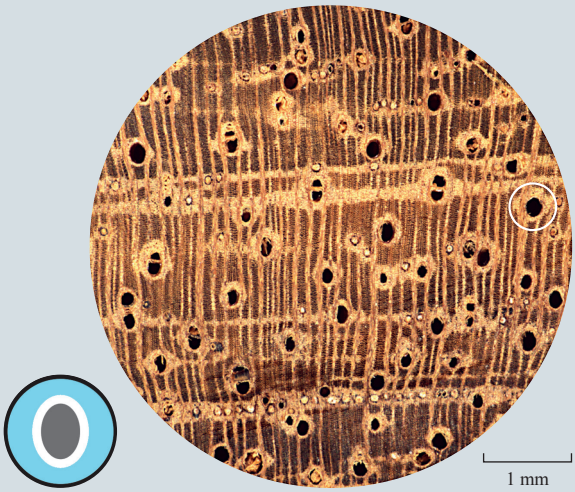


Without vessels—Softwood

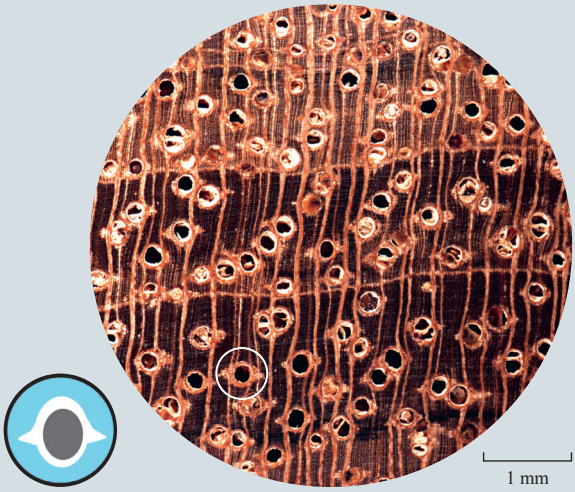


With vessels—Hardwood

(5) Check the parenchyma.

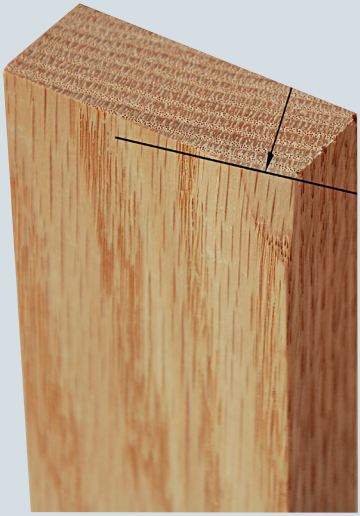


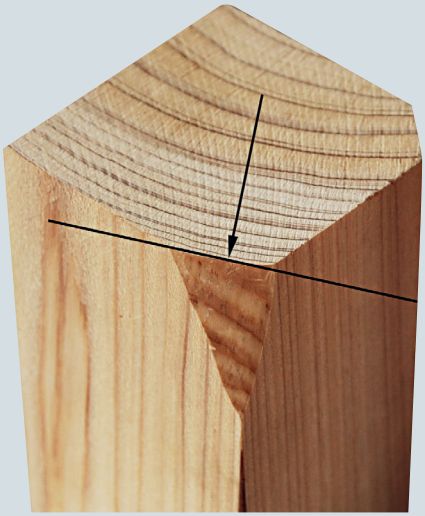
Paratracheal parenchyma



Aliform paratracheal parenchyma

(6) Cut a smooth tangential section using a sharp blade.





(7) Check if there exist storied rays.

(8) Determine the wood species by referring to the description of the main characteristics of the wood samples.


Pinus
koraiensis


Taxus
chinensis


Aquilaria
sinensis


Dalbergia
granadillo


Dalbergia
latifolia


Dalbergia
louvelii


Dalbergia
stevensonii


Fraxinus
mandshurica


Gonystylus
bancanus

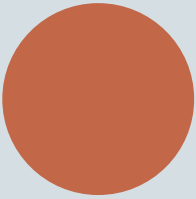

Paubrasilia
echinata


Pericopsis
elata


Pterocarpus
erinaceus


Swietenia
macrophylla


Swietenia
mahagoni




Bulnesia
sarmientoi


Cedrela
odorata


Dalbergia
cochinchinensis


Dalbergia
melanoxylon


Dalbergia
oliveri


Dalbergia
retusa


Guaiacum
sanctum

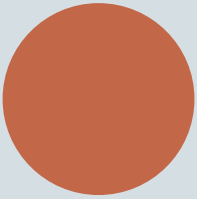

Guibourtia
demeusei

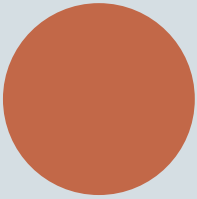

Guibourtia
tessmannii

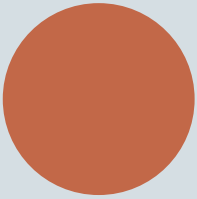

Pterocarpus
santalinus


Pterocarpus
tinctorius


Quercus
mongolica







Pinus koraiensis

Korean pine

Taxonomy

Pinus (genus), Pinaceae (family)

Geographic distribution

Northeast China, Russia, D.P.R. Korea, Japan, etc.

Morphological characteristics of trees

Trees, up to 50 m in height, 1 m in diameter at breast height (DBH). Bark grayish brown when young, almost smooth; large trees gray-brown or gray, longitudinally split into irregular rectangular scales off, inner bark reddish-brown.

Wood description

Coniferous wood. Sapwood light yellowish-brown to yellowish-brown; heartwood ranging in colour from light reddish-brown to reddish-brown, darkening with age. Lustrous, with strongly resinous odour, without characteristic taste. Straight-grained, medium fine- and even-textured. The air-dry density is about 0.44 g/cm^3.

Identification characteristics of wood

Growth rings slightly distinct, delineated by a dark band of latewood, earlywood zone usually wide, transition from earlywood to latewood gradual. Tracheids slightly distinct with a hand lens. Axial parenchyma absent. Rays rare to medium, very fine, distinct on the transverse section with a hand lens. Axial and radial resin canals visible.

Type of wood products

Logs, furniture, veneer, etc.

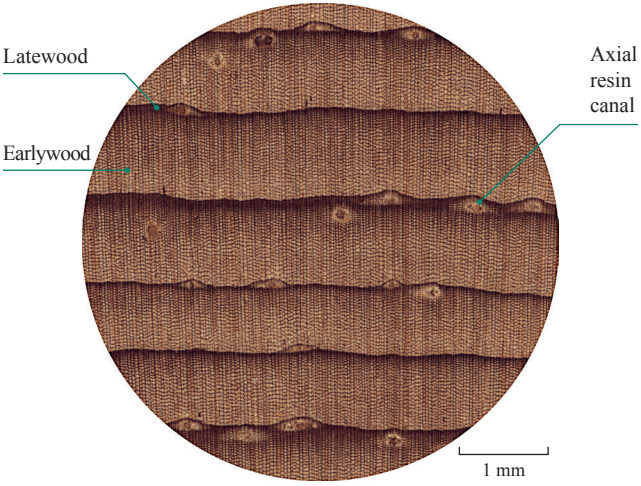
Conservation class

CITES Ⅲ (Populations of Russian Federation, Annotation #5)

The key differences between *Pinus koraiensis* and its similar woods

	Wood colour	Transition from earlywood to latewood
Pinus koraiensis	sapwood light yellowish-brown to yellowish-brown; heartwood ranging in colour from light reddish-brown to reddish-brown, darkening with age	gradual
(1) *Pinus armandii*	sapwood pale yellowish-white or yellowish-brown; heartwood ranging in colour from light reddish-brown to reddish-brown	gradual
(2) *Pinus sylvestris*	sapwood yellow-white or light yellowish-brown; heartwood reddish-brown or reddish-brown with yellow	abrupt
(3) *Pinus sylvestris* var. *mongolica*	sapwood light yellowish-brown; heartwood reddish-brown	slightly abrupt
(4) *Pinus tabuliformis*	sapwood light yellow; heartwood ranging in colour from light reddish-brown to reddish-brown	abrupt or slightly abrupt

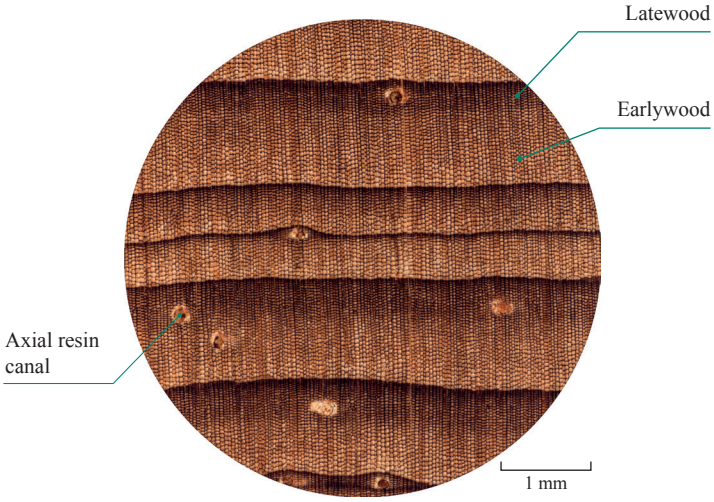
Pinus koraiensis Longitudinal surface of wood



Pinus koraiensis Transverse section of wood

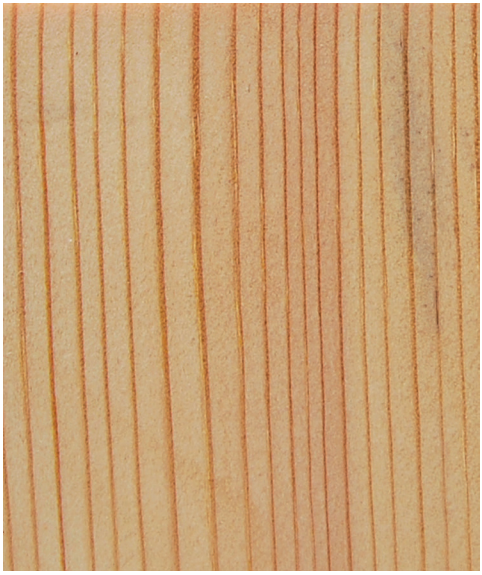
Pinus armandii

Pinus armandii Longitudinal surface of wood

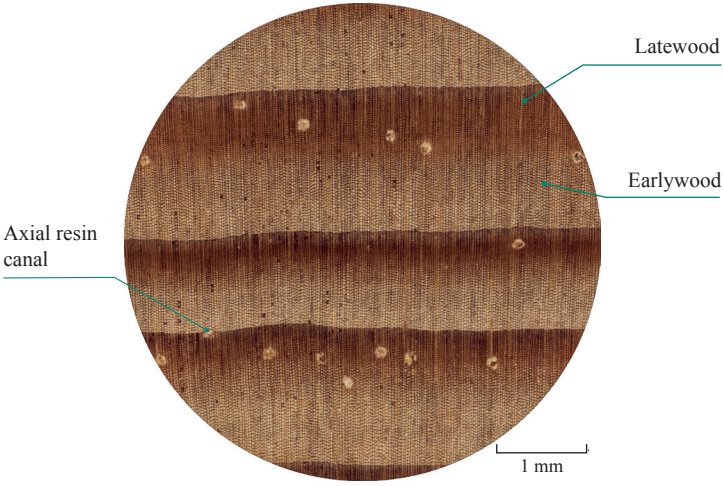


Pinus armandii Transverse section of wood

Pinus sylvestris



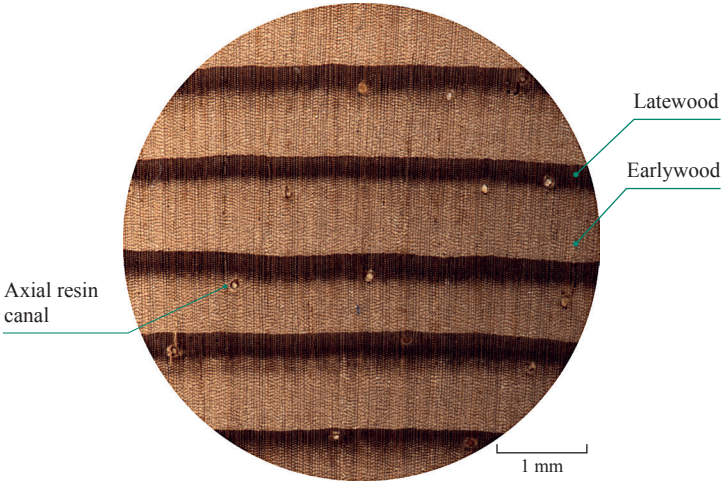
Pinus sylvestris Longitudinal surface of wood



Pinus sylvestris Transverse section of wood

Pinus sylvestris var. *mongolica*

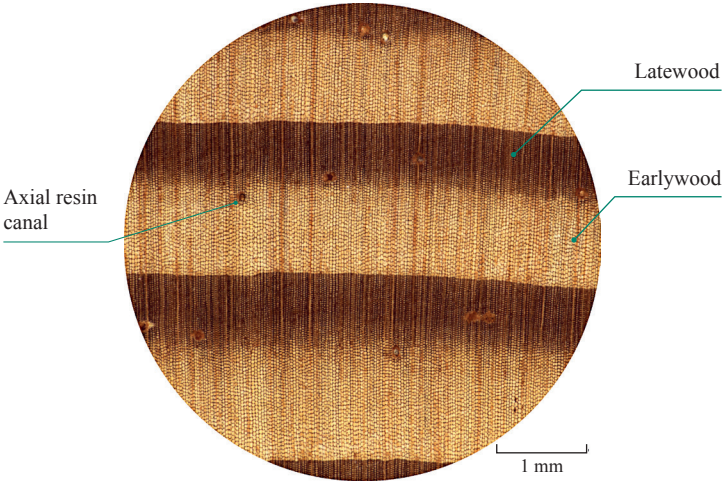
Pinus sylvestris var. *mongolica* Longitudinal surface of wood



Pinus sylvestris var. *mongolica* Transverse section of wood

Pinus tabuliformis

Pinus tabuliformis Longitudinal surface of wood



Pinus tabuliformis Transverse section of wood

Taxus chinensis

Chinese yew

Taxonomy

Taxus (genus), Taxaceae (family)

Geographic distribution

Temperate and subtropical regions of the Northern Hemisphere

Morphological characteristics of trees

Trees, up to 20 m in height, 1 m in diameter at breast height (DBH). Bark gray-brown or reddish-brown, flaky peeling.

Wood description

Coniferous wood. Sapwood yellow-white or light yellow; heartwood ranging in colour from orange red to rose red, turning to dark reddish-brown with age. Lustrous, without characteristic odour or taste. Straight or slightly diagonal-grained, fine-and even-textured. The air-dry density is 0.62-0.76 g/cm^3.

Identification characteristics of wood

Growth rings distinct, delineated by a dark band of latewood, earlywood zone wide, latewood zone extremely narrow, transition from earlywood to latewood gradual. Axial parenchyma absent. Rays medium, fine, distinct on the transverse section with a hand lens.

Type of wood products

Handicraft articles, etc.

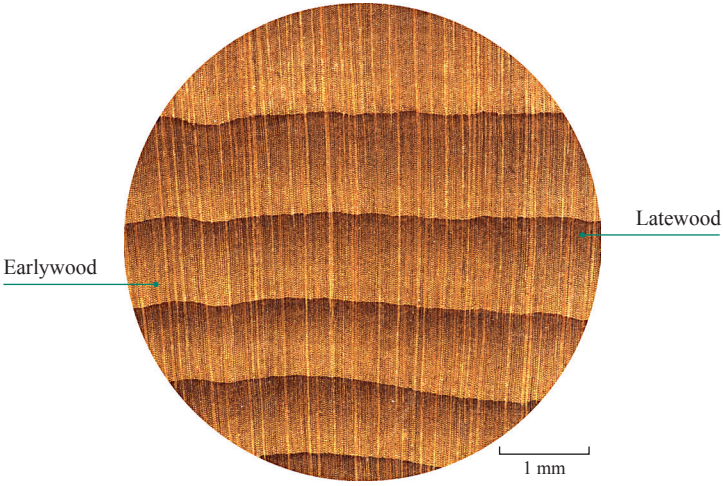
Conservation class

CITES Ⅱ (Annotation #2)

The key differences between *Taxus chinensis* and its similar woods

	Wood colour	Wood odour
Taxus chinensis	sapwood yellow-white or light yellow; heartwood ranging in colour from orange red to rose red	none
(1) *Cephalotaxus fortunei*	light yellowish-brown	none
(2) *Cupressus funebris*	sapwood yellowish-white or light yellowish-brown; heartwood ranging in colour from yellowish-brown to reddish-brown	cypress odour
(3) *Pseudotaxus chienii*	sapwood yellow-white or light yellow; heartwood ranging in colour from light yellowish-brown to yellowish-brown	none
(4) *Torreya grandis*	sapwood yellow-white; heartwood light yellow or yellow-brown	slightly unpleasant smell, like medicine

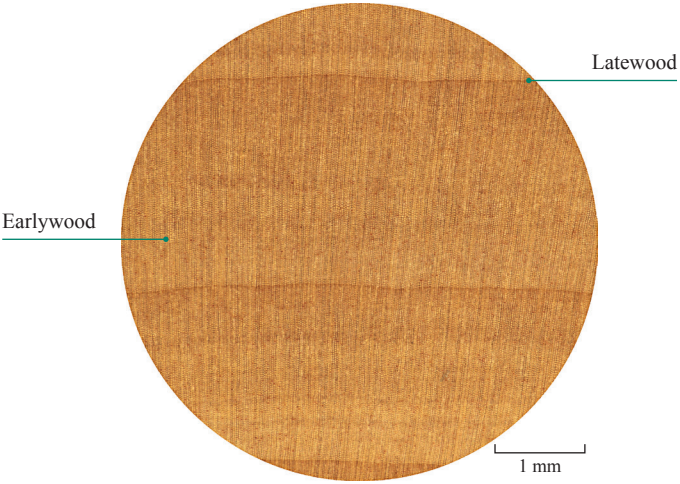
Taxus chinensis Longitudinal surface of wood



Taxus chinensis Transverse section of wood

Cephalotaxus fortunei

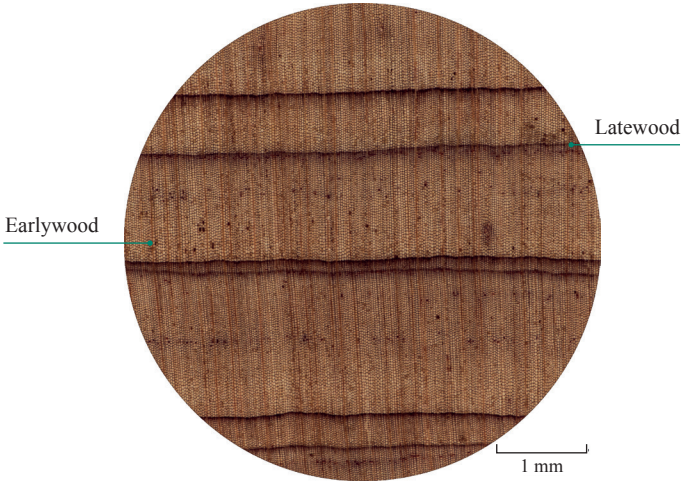
Cephalotaxus fortunei Longitudinal surface of wood



Cephalotaxus fortunei Transverse section of wood

Cupressus funebris

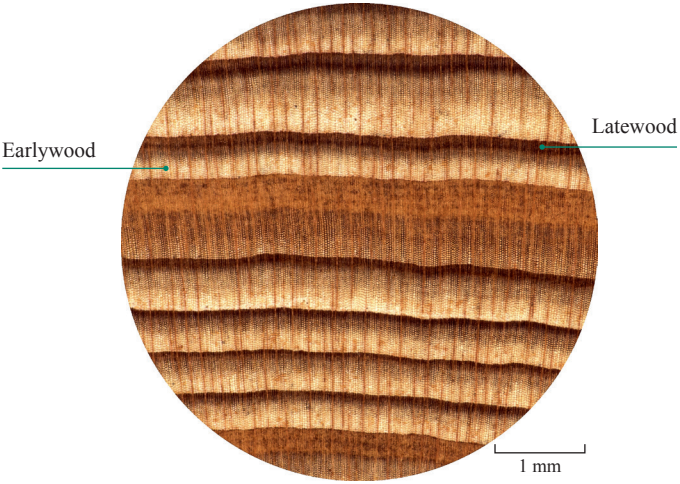
Cupressus funebris Longitudinal surface of wood



Cupressus funebris Transverse section of wood

Pseudotaxus chienii

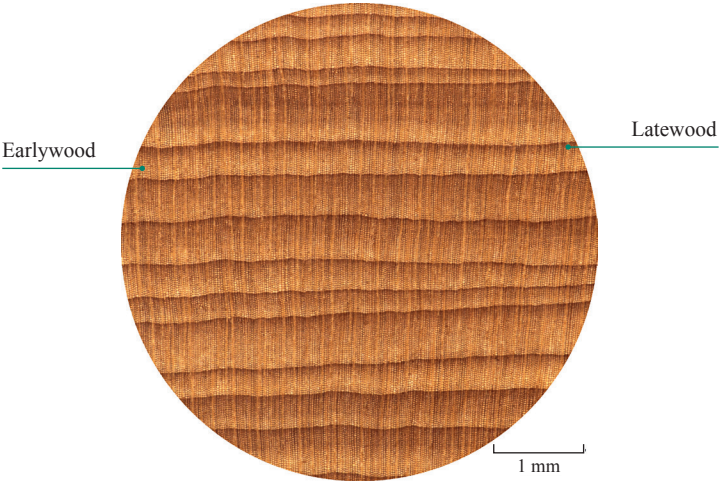
Pseudotaxus chienii Longitudinal surface of wood



Pseudotaxus chienii Transverse section of wood

Torreya grandis

Torreya grandis Longitudinal surface of wood



Torreya grandis Transverse section of wood

Aquilaria sinensis

Agarwood

Taxonomy

Aquilaria (genus), Thymelaeaceae (family)

Geographic distribution

Guangdong, Hainan, Guangxi, Yunnan and Fujian of China

Morphological characteristics of trees

Trees, up to 25 m in height, 0.6 m in diameter at breast height (DBH). Bark gray, coarse or finely lobed.

Wood description

Deciduous wood. Yellowish white without distinct heartwood; when the xylem starts to produce agarwood, black line or porphyritic will occur at the corresponding position; after producing more agarwood, the whole piece of wood will become black or dark brown. Lustrous, with slightly fragrant and sweet odour. The air-dry density is 0.40-0.43 g/cm^3.

Identification characteristics of wood

Wood diffuse-porous. Growth rings indistinct. Vessel distinct with a hand lens, in radial multiples of 2-3, size consistent, evenly distributed. Axial parenchyma usually invisible. Rays medium, fine, visible with a hand lens. Island-type included phloem abundance, diffuse, visible with the naked eye.

Type of wood products

Crafts, spices, medicine, etc.

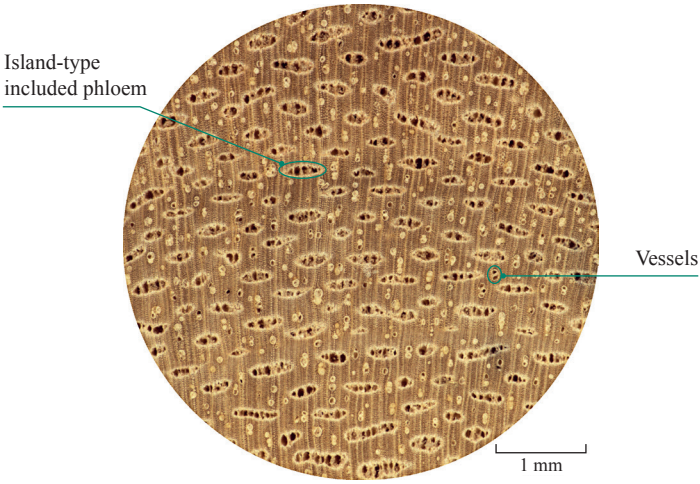
Conservation class

CITES Ⅱ (Annotation #14)

The key differences between *Aquilaria sinensis* and its similar woods

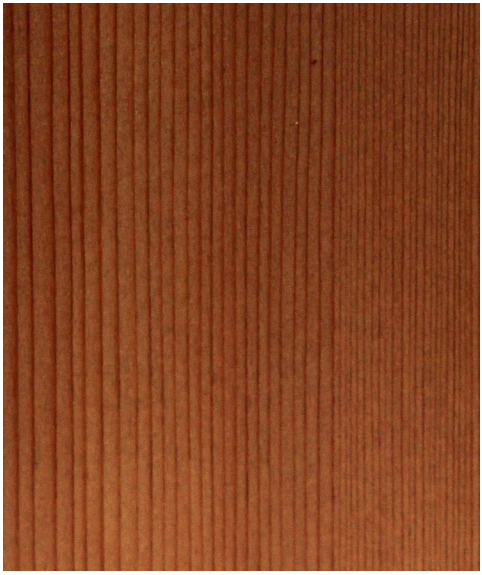
	Included phloem	Vessels
Aquilaria sinensis	island-type, numerous	in radial multiples of 2-3, very large
(1) *Chamaecyparis formosensis*	none	none
(2) *Cocos nucifera*	none	contained in vascular bundle, 2-3 in number
(3) *Gonystylus bancanus*	none	slightly small and few
(4) *Memecylon ligustrifolium*	foraminate, few, very small	solitary, very small
(5) *Strychnos ovata*	foraminate, medium, very large	in radial multiples of 3-5, very large

Aquilaria sinensis Longitudinal surface of wood

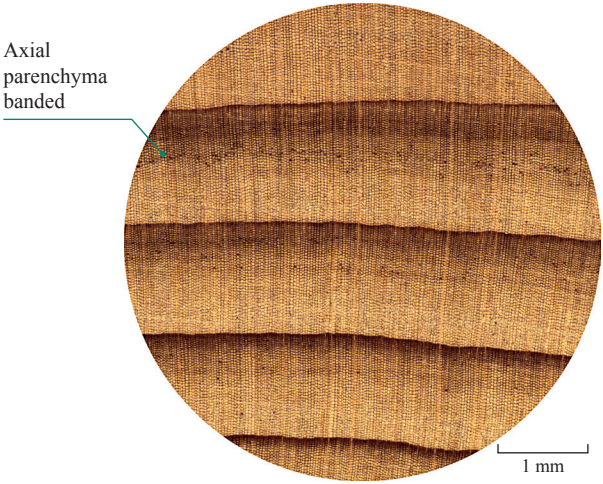


Aquilaria sinensis Transverse section of wood

Chamaecyparis formosensis



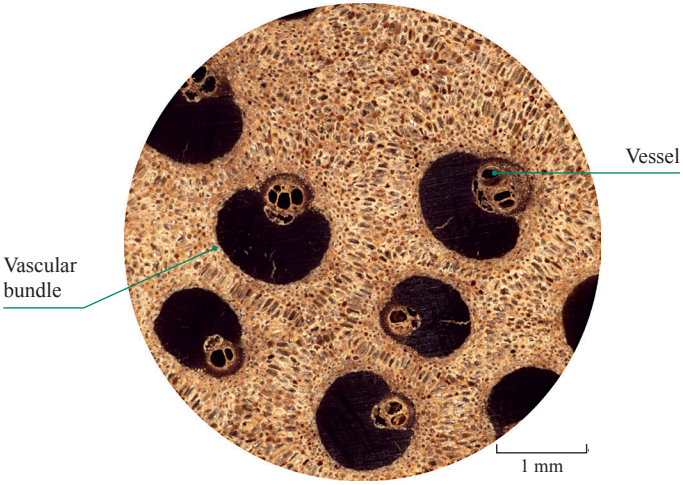
Chamaecyparis formosensis Longitudinal surface of wood



Chamaecyparis formosensis Transverse section of wood

Cocos nucifera

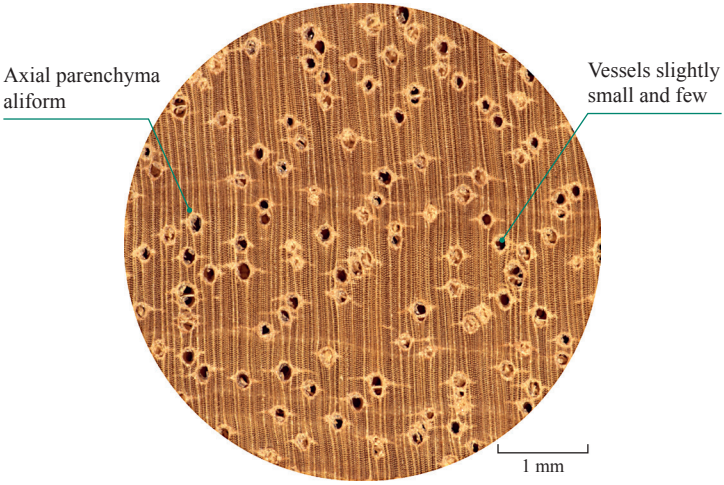
Cocos nucifera Longitudinal surface of wood



Cocos nucifera Transverse section of wood

Gonystylus bancanus

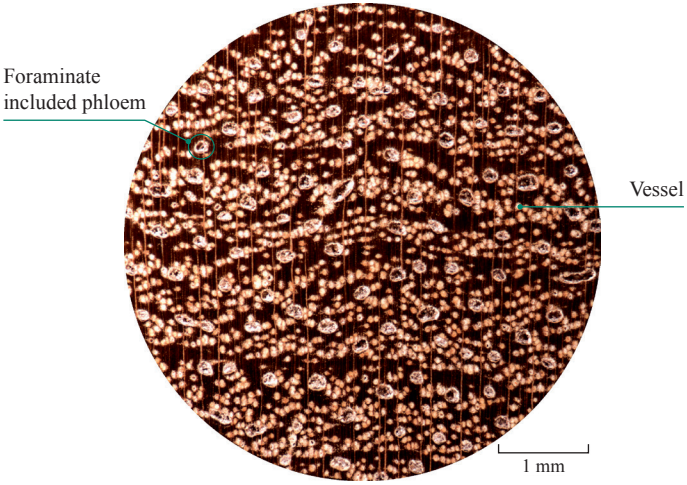
Gonystylus bancanus Longitudinal surface of wood



Gonystylus bancanus Transverse section of wood

Memecylon ligustrifolium

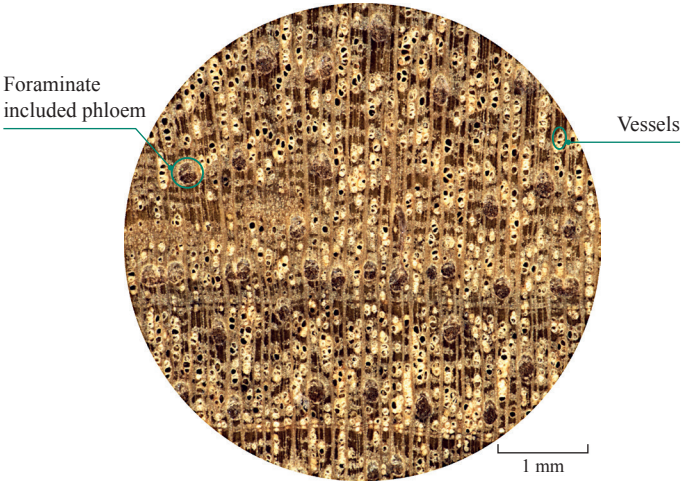
Memecylon ligustrifolium Longitudinal surface of wood



Memecylon ligustrifolium Transverse section of wood

Strychnos ovata

Strychnos ovata Longitudinal surface of wood



Strychnos ovata Transverse section of wood

Bulnesia sarmientoi

Palo santo

Taxonomy

Bulnesia (genus), Zygophyllaceae (family)

Geographic distribution

South American countries such as Argentina, Peru, Bolivia, Brazil, Paraguay, etc.

Morphological characteristics of trees

Trees, range from 12 to 15 m in height, 0.3 to 0.6 m in diameter at breast height (DBH).

Wood description

Deciduous wood. Heartwood ranging in colour from dark olive-green to dark brown with gray-black streaks, distinctly differs from sapwood. Lustrous, with distinctive fruit odour, heavy, hard, straight- or slightly diagonal-grained, feather-like arrangement, fine-textured. The air-dry density is about 1.19 g/cm^3.

Identification characteristics of wood

Wood diffuse-porous. Vessels mostly solitary, few in short radial or tangential multiples, very small, numerous, barely visible with the naked eye, yellow, yellowish-green, or black deposits abundant. Axial parenchyma invisible. Rays storied, fine.

Type of wood products

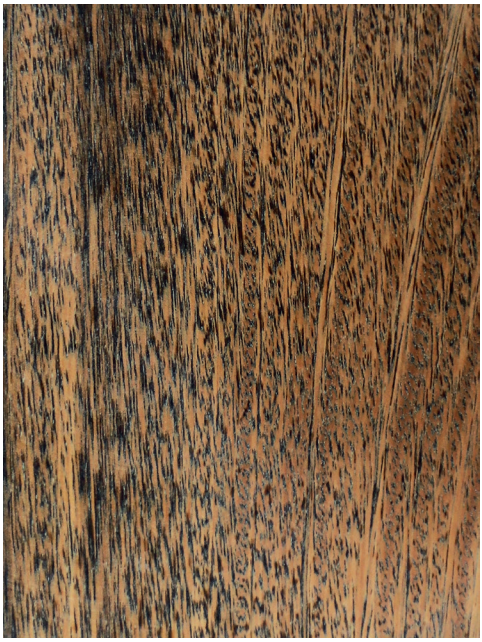
Crafts, furniture, tool handles, etc.

Conservation class

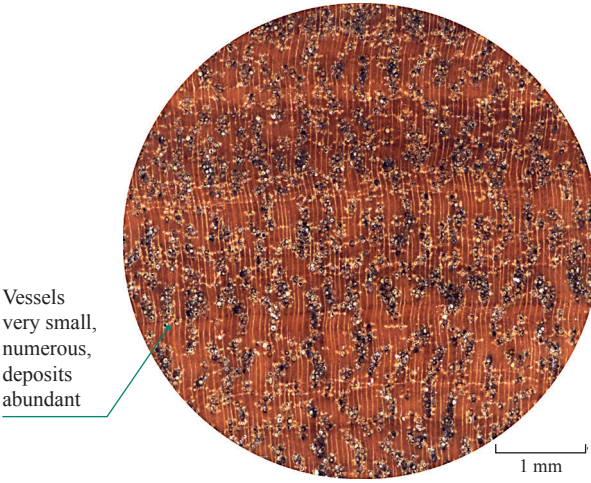
CITES Ⅱ (Annotation #11)

The key differences between *Bulnesia sarmientoi* and its similar woods

	Wood colour	Odour	Vessels
Bulnesia sarmientoi	heartwood ranging in colour from dark olive-green to dark brown with gray-black streaks	distinctive fruit odour	very small, numerous, deposits abundant
(1) *Chlorocardium rodiei*	heartwood yellow or yellowish-brown slightly with green	none	very large
(2) *Guaiacum officinale*	heartwood ranging in colour from dark brown to black-brown with black streaks	slightly fragrant odour	diffuse, very small, few, deposits abundant
(3) *Guaiacum sanctum*	heartwood ranging in colour from yellowish-brown to dark green-brown with black streaks	slightly fragrant odour	diffuse, very small, slightly less, deposits abundant
(4) *Handroanthus serratifolius*	heartwood ranging in colour from light to dark olive-brown, alternating with dark or light streaks	none	very large, deposits abundant



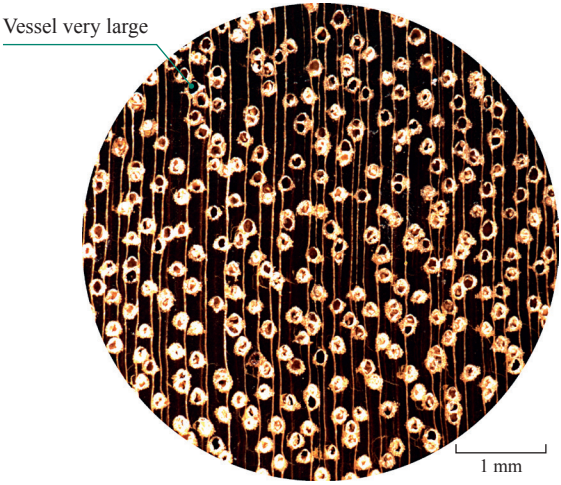
Bulnesia sarmientoi Longitudinal surface of wood



Bulnesia sarmientoi Transverse section of wood

Chlorocardium rodiei

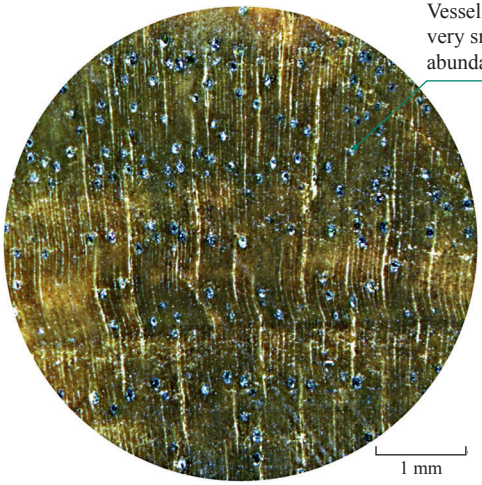
Chlorocardium rodiei Longitudinal surface of wood



Chlorocardium rodiei Transverse section of wood

Guaiacum officinale

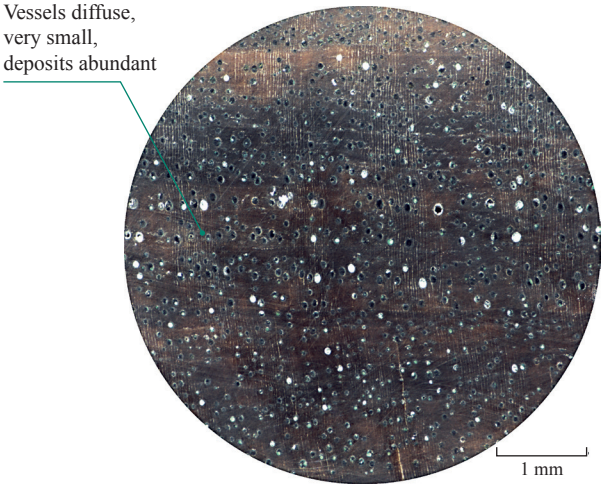
Guaiacum officinale Longitudinal surface of wood



Guaiacum officinale Transverse section of wood

Guaiacum sanctum

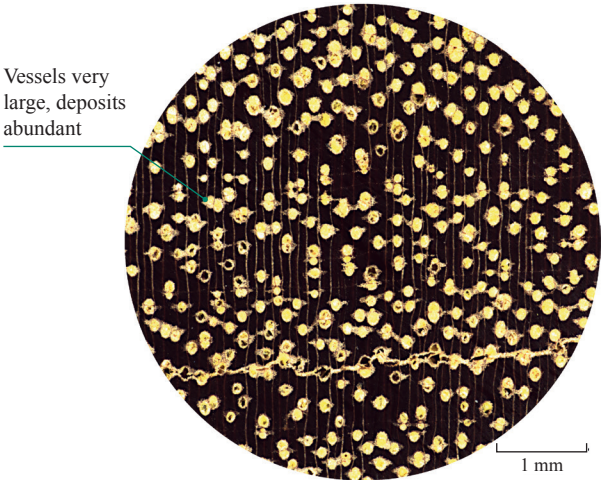
Guaiacum sanctum Longitudinal surface of wood



Guaiacum sanctum Transverse section of wood

Handroanthus serratifolius

Handroanthus serratifolius Longitudinal surface of wood



Handroanthus serratifolius Transverse section of wood

Cedrela odorata

Central American cedar

Taxonomy

Cedrela (genus), Meliaceae (family)

Geographic distribution

Latin American countries such as Mexico, Columbia, Peru, Guatemala, Bolivia, etc.

Morphological characteristics of trees

Trees, range from 25 to 30 m in height, up to 1 m in diameter at breast height (DBH).

Wood description

Deciduous wood. Heartwood brown or light brown, differs from sapwood. Slightly lustrous, with distinctive cedar odour (spicy). Light to medium, soft, straight-grained, even- and slightly coarse-textured. The air-dry density is about 0.45 g/cm^3.

Identification characteristics of wood

Wood diffuse-porous. Growth rings distinct. Vessels mostly solitary, few in radial multiples, slightly large, few, visible with the naked eye. Axial parenchyma marginal and paratracheal distinct with the naked eye. Rays slightly visible with the naked eye, slightly close, fine, non-storied.

Type of wood products

Furniture, vehicle materials, veneer, musical instruments, instrument boxes, carvings, etc.

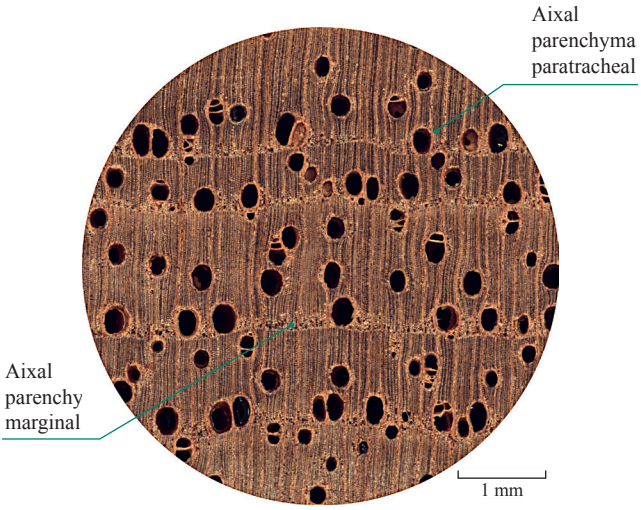
Conservation class

CITES Ⅱ (Populations of the Neotropics, Annotation #6)

The key differences between *Cedrela odorata* and its similar woods

	Wood colour	Axial parenchyma
Cedrela odorata	heartwood brown or light brown, sapwood slightly light	paratracheal, marginal
(1) *Carapa guianensis*	heartwood light reddish-brown, sapwood yellowish-white	banded, paratracheal
(2) *Guarea laurentii*	heartwood reddish-brown, sapwood light pink-brown	banded, paratracheal
(3) *Khaya anthotheca*	heartwood light reddish-brown, sapwood yellowish-white	paratracheal
(4) *Swietenia macrophylla*	heartwood brown to reddish-brown, sapwood slightly light	marginal, paratracheal

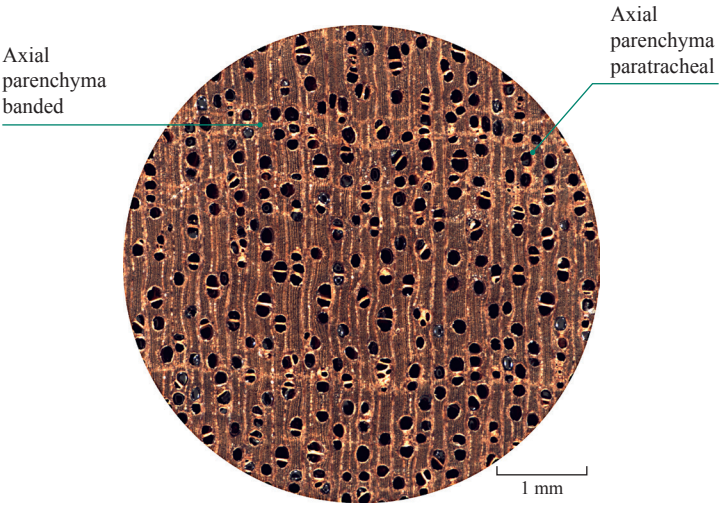
Cedrela odorata Longitudinal surface of wood



Cedrela odorata Transverse section of wood

Carapa guianensis

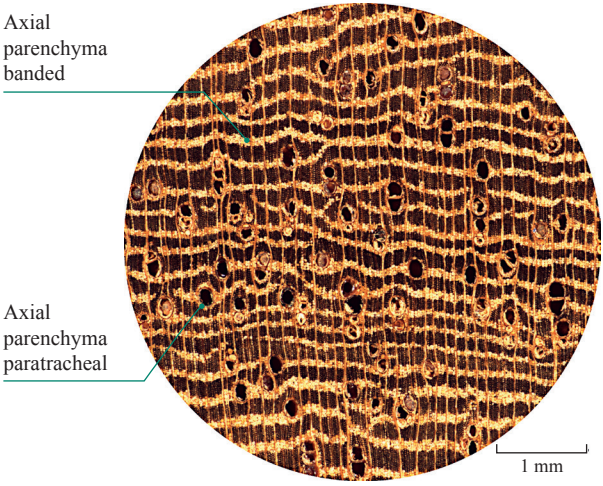
Carapa guianensis Longitudinal surface of wood



Carapa guianensis Transverse section of wood

Guarea laurentii

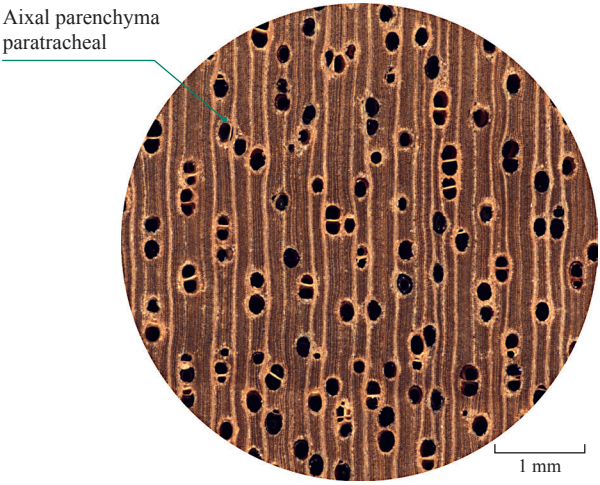
Guarea laurentii Longitudinal surface of wood



Guarea laurentii Transverse section of wood

Khaya anthotheca

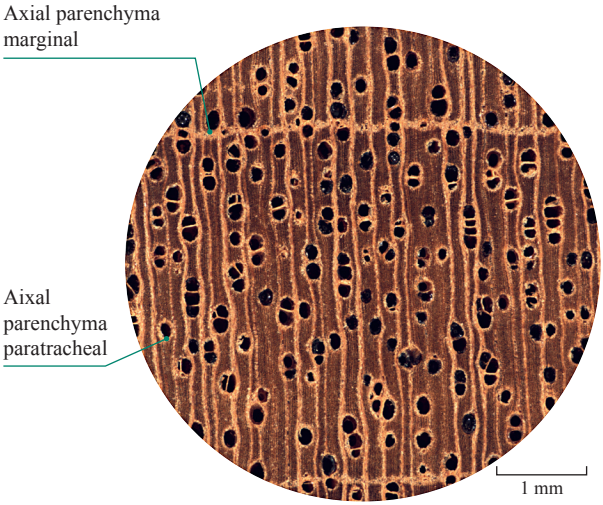
Khaya anthotheca Longitudinal surface of wood



Khaya anthotheca Transverse section of wood

Swietenia macrophylla

Swietenia macrophylla Longitudinal surface of wood



Swietenia macrophylla Transverse section of wood

Dalbergia cochinchinensis

Siam rosewood

Taxonomy

Dalbergia (genus), Leguminosae (family)

Geographic distribution

Southeast Asian countries such as Laos, Thailand, Cambodia, Vietnam, etc.

Morphological characteristics of trees

Trees, range from 12 to 16 m in height, 1.0 m in diameter at breast height (DBH).

Wood description

Deciduous wood. Heartwood ranging in colour from purplish-brown to dark reddish-brown with black-brown or chestnut-brown streaks; sapwood pale yellowish-white. With slightly acid and fragrant odour, without characteristic taste. Straight-grained, fine-textured. The air-dry density is 1.01-1.09 g/cm^3.

Identification characteristics of wood

Wood diffuse-porous. Growth rings indistinct or slightly distinct. Vessels visible with naked eye, large and few, often filled with dark gums. Axial parenchyma banded, paratracheal and aliform. Fibers very thick-walled. Rays visible with a hand lens.

Type of wood products

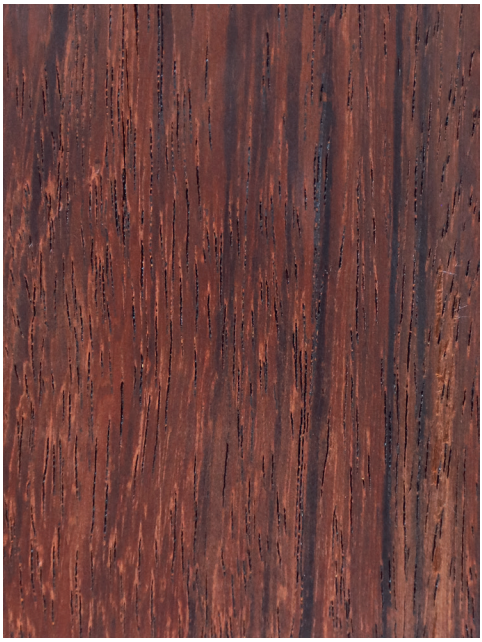
Decorative veneer, furniture, musical instrument parts, handicrafts, etc.

Conservation class

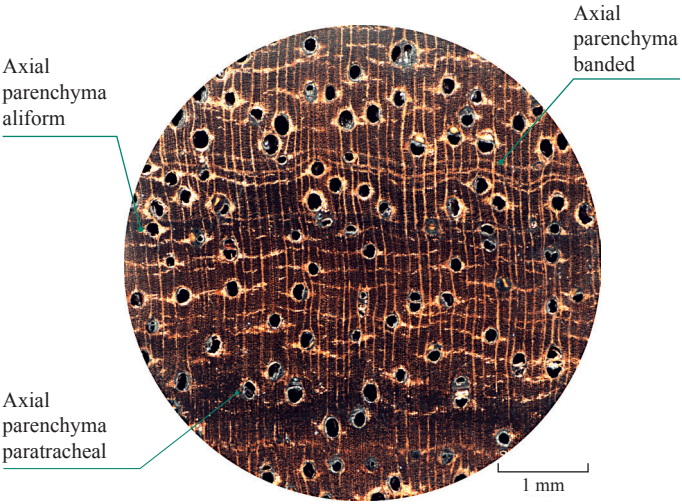
CITES Ⅱ (Annotation #15)

The key differences between *Dalbergia cochinchinensis* and its similar woods

	Wood colour	Axial parenchyma
Dalbergia cochinchinensis	heartwood ranging in colour from purplish-brown to dark reddish-brown with black-brown or chestnut-brown streaks; sapwood pale yellowish-white	banded, paratracheal and aliform
(1) ***Dalbergia latifolia***	heartwood ranging in colour from light, nearly golden brown, to deep purple with rather distant nearby black lines, darking with age	aliform, confluent and banded
(2) ***Dalbergia oliveri***	heartwood ranging in colour through shades of lemon-pink or red-scarlet to reddish-brown with distinctly dark lines when first exposed, darkening with age	banded, intersects with the rays in a network
(3) ***Dalbergia retusa***	heartwood ranging in colour from orange to reddish-brown or purplish-brown with black streaks	banded, paratracheal and aliform
(4) ***Platymiscium pinnatum***	sapwood yellow-white; heartwood reddish-brown with alternating dark and light streaks	aliform, confluent and marginal
(5) ***Swartzia benthamiana***	heartwood reddish-brown to deep reddish-brown, with dark and light streaks	banded



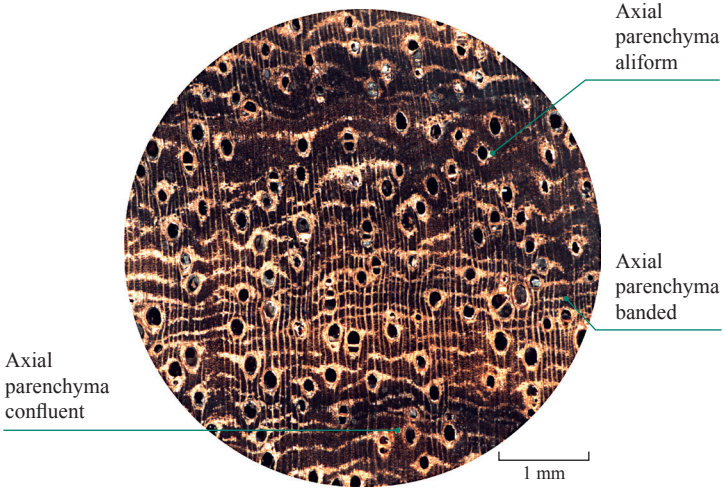
Dalbergia cochinchinensis Longitudinal surface of wood



Dalbergia cochinchinensis Transverse section of wood

Dalbergia latifolia

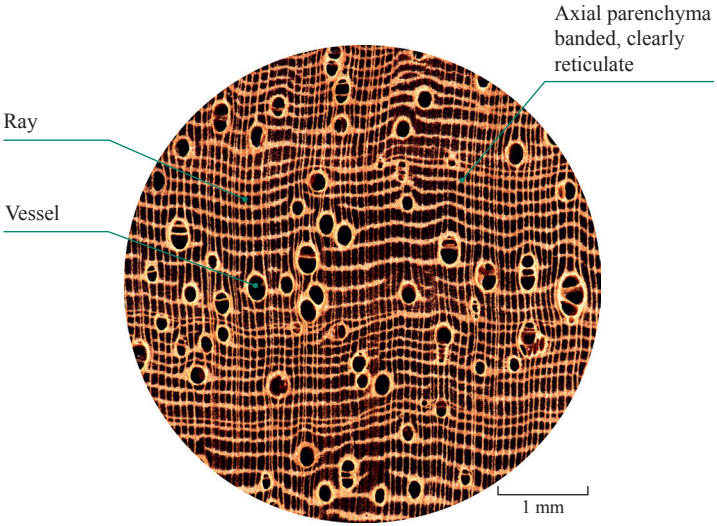
Dalbergia latifolia Longitudinal surface of wood



Dalbergia latifolia Transverse section of wood

Dalbergia oliveri

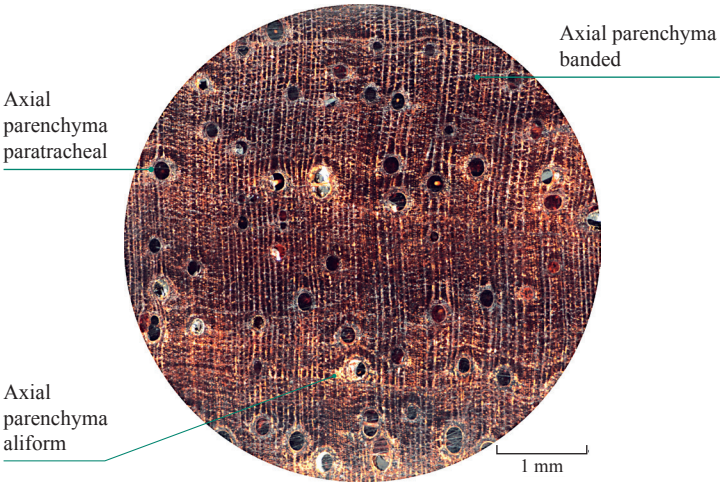
Dalbergia oliveri Longitudinal surface of wood



Dalbergia oliveri Transverse section of wood

Dalbergia retusa

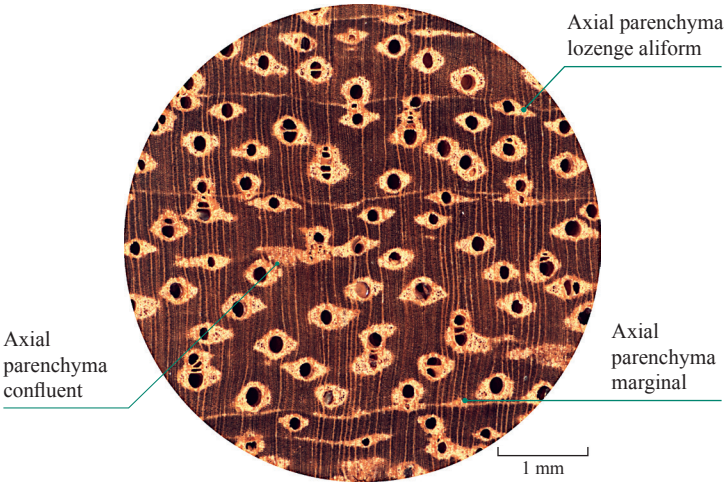
Dalbergia retusa Longitudinal surface of wood



Dalbergia retusa Transverse section of wood

Platymiscium pinnatum

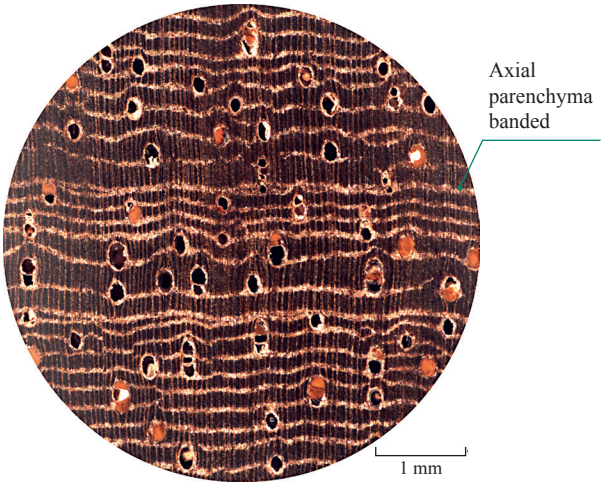
Platymiscium pinnatum Longitudinal surface of wood



Platymiscium pinnatum Transverse section of wood

Swartzia benthamiana

Swartzia benthamiana Longitudinal surface of wood



Swartzia benthamiana Transverse section of wood

Dalbergia granadillo

Cocobolo

Taxonomy

Dalbergia (genus), Leguminosae (family)

Geographic distribution

South America sunch as Mexico

Morphological characteristics of trees

Trees, up to 20 m in height.

Wood description

Deciduous wood. Sapwood pale yellowish-white; heartwood ranging in colour from orange-brown to dark reddish-brown with black streaks when first exposed. With spicy odour, without characteristic taste, straight- or slightly interlocked-grained, fine-textured. The air-dry density is 0.98-1.22 g/cm^3.

Identification characteristics of wood

Wood diffuse-porous. Growth rings distinct. Vessels visible to distinct with the naked eye, very few to few. Axial parenchyma distinct with a hand lens, aliform, and banded. Rays distinct with a hand lens. Storied rays indistinct.

Type of wood products

Logs, sawn wood, furniture, musical instruments parts, handicrafts, etc.

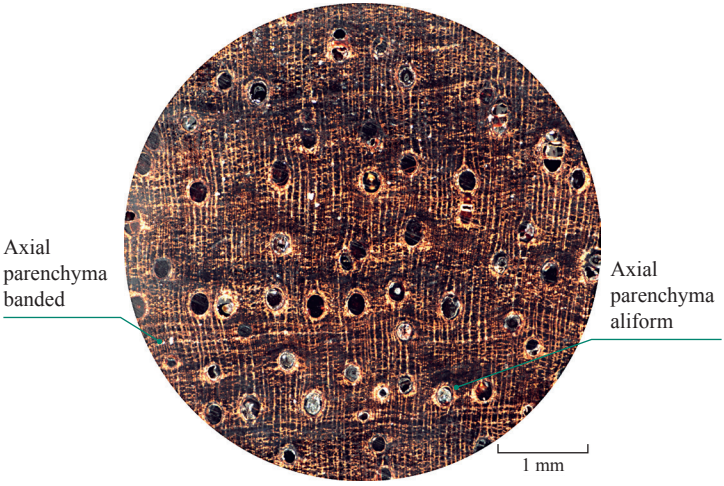
Conservation class

CITES Ⅱ (Annotation #15)

The key differences between *Dalbergia granadillo* and its similar woods

	Wood colour	Axial parenchyma
Dalbergia granadillo	sapwood pale yellowish-white; heartwood ranging in colour from orange-brown to dark reddish-brown with black streaks when first exposed	aliform, banded
(1) ***Dalbergia congestiflora***	sapwood yellow-white, heartwood light reddish-brown	banded, marginal and paratracheal
(2) ***Dalbergia stevensonii***	sapwood pale yellow-white; heartwood light reddish-brown with alternating dark and light streaks	paratracheal, aliform, banded and marginal
(3) ***Machaerium scleroxylon***	sapwood near white or light yellow; heartwood purplish-brown, with dark and light streaks	aliform, banded and marginal
(4) ***Platymiscium pinnatum***	sapwood yellow-white; heartwood reddish-brown with alternating dark and light streaks	aliform, confluent and marginal

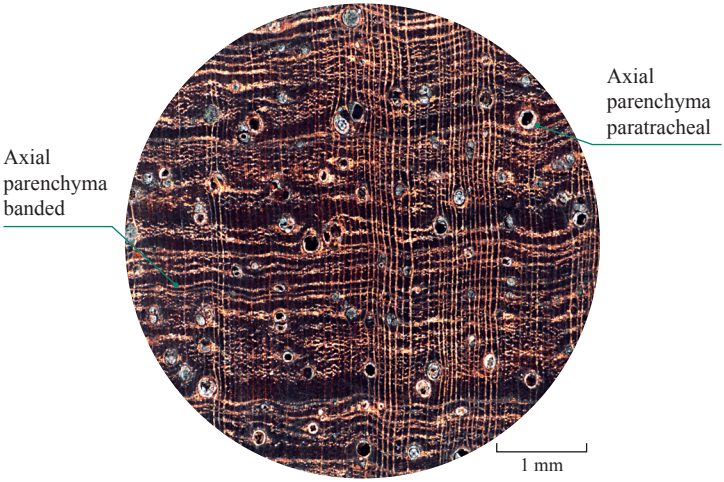
Dalbergia granadillo Longitudinal surface of wood



Dalbergia granadillo Transverse section of wood

Dalbergia congestiflora

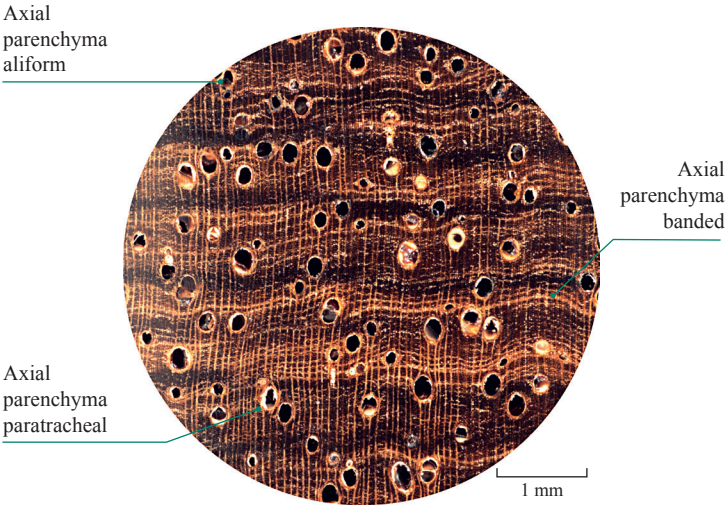
Dalbergia congestiflora Longitudinal surface of wood



Dalbergia congestiflora Transverse section of wood

Dalbergia stevensonii

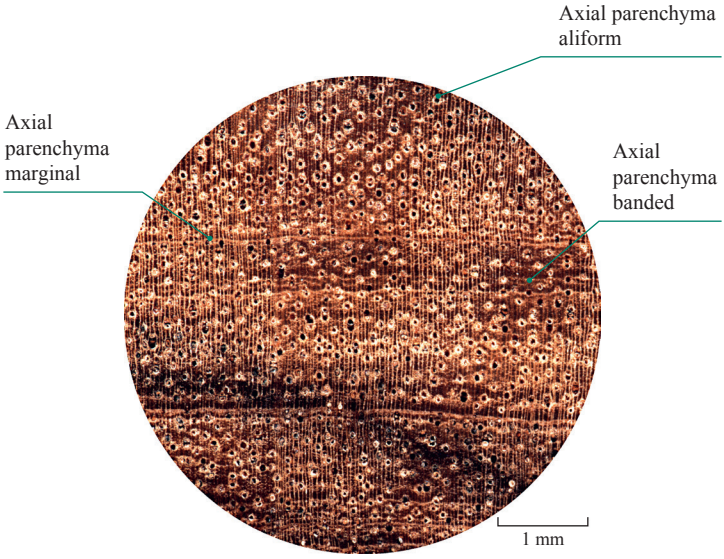
Dalbergia stevensonii Longitudinal surface of wood



Dalbergia stevensonii Transverse section of wood

Machaerium scleroxylon

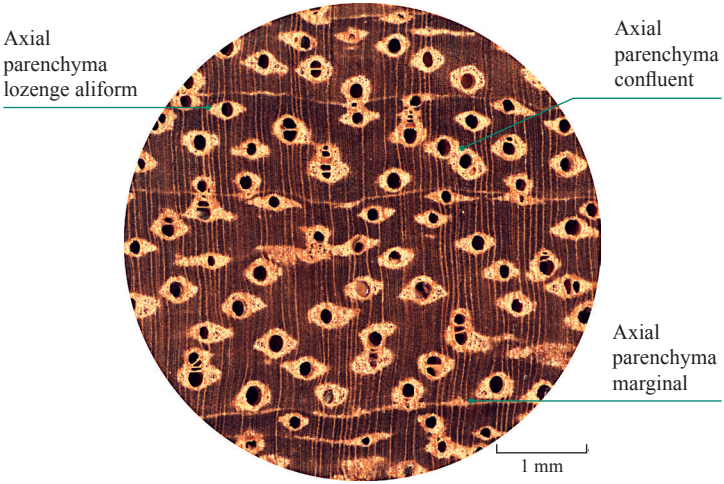
Machaerium scleroxylon Longitudinal surface of wood



Machaerium scleroxylon Transverse section of wood

Platymiscium pinnatum

Platymiscium pinnatum Longitudinal surface of wood



Platymiscium pinnatum Transverse section of wood

Dalbergia latifolia

Indian rosewood

Taxonomy

Dalbergia (genus), Leguminosae (family)

Geographic distribution

India, Indonesia

Morphological characteristics of trees

Trees, usually not straight, up to 43 m in height, 1.5 m in diameter at breast height (DBH). Bark pale white, flaky peeling in small pieces.

Wood description

Deciduous wood. Sapwood pale yellowish-white; heartwood ranging in colour from light, nearly golden brown, to deep purple with rather distant nearby black lines, darking with age. With acid and fragrant odour, without characteristic taste, narrowly interlocked-grained, fine-textured. The air-dry density is 0.75-1.04 g/cm^3.

Identification characteristics of wood

Wood diffuse-porous. Growth rings indistinct or slightly distinct. Vessels visible with the naked eye, few to slightly few. Axial parenchyma extremely distinct with the naked eye, aliform, confluent, and banded. Rays distinct with a hand lens. Storied rays visible with a hand lens.

Type of wood products

Furniture, decorative veneer, plywood, musical instrument parts, floor, etc.

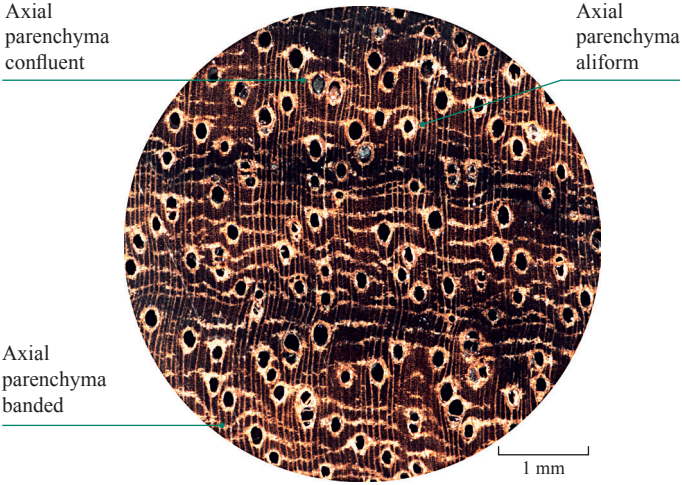
Conservation class

CITES Ⅱ (Annotation #15)

The key difference between *Dalbergia latifolia* and its similar woods

	Wood colour	Axial parenchyma
Dalbergia latifolia	heartwood ranging in colour from light, nearly golden brown, to deep purple with rather distant nearby black lines, darking with age	aliform, confluent and banded
(1) *Dalbergia cochinchinensis*	heartwood ranging in colour from purplish-brown to dark reddish-brown with black-brown or chestnut-brown streaks; sapwood pale yellowish-white	banded, paratracheal and aliform
(2) *Dalbergia granadillo*	sapwood pale yellowish-white; heartwood ranging in colour from orange-brown to dark reddish-brown with black streaks when first exposed	aliform, banded
(3) *Dalbergia retusa*	heartwood orange-yellow is obvious, long dew atmosphere is reddish-brown, purplish red-brown, often with black streaks	banded, paratracheal and aliform
(4) *Dalbergia stevensonii*	sapwood pale yellow-white; heartwood light reddish-brown, with alternating dark and light streaks	paratracheal, aliform, banded and marginal
(5) *Swartzia leiocalycina*	sapwood nearly white or light yellow; heartwood dark brown to purplish brown, with deep olive or purplish brown streaks	aliform, banded and marginal
(6) *Terminalia tomentosa*	sapwood pale yellow; heartwood ranges from light brown with dark streaks to chocolate brown	aliform, confluent and marginal

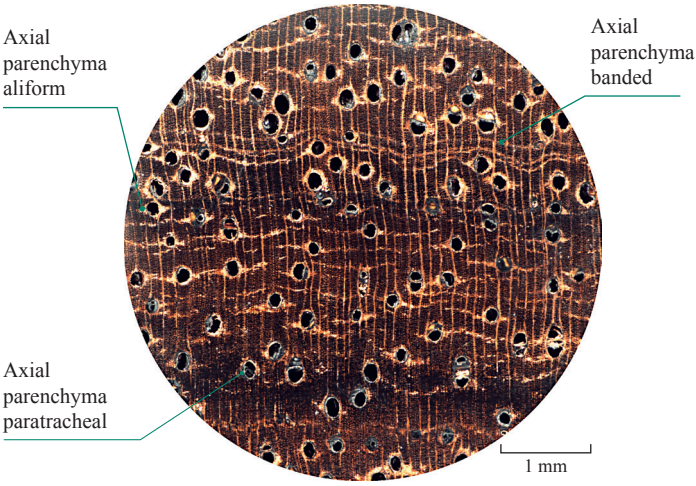
Dalbergia latifolia Longitudinal surface of wood



Dalbergia latifolia Transverse section of wood

Dalbergia cochinchinensis

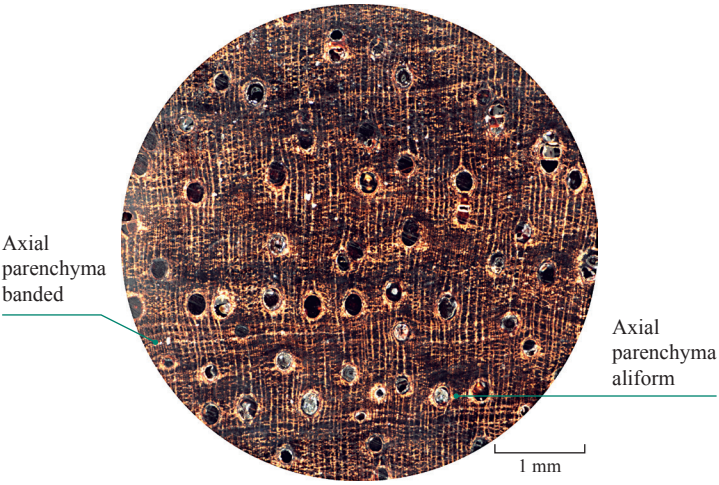
Dalbergia cochinchinensis Longitudinal surface of wood



Dalbergia cochinchinensis Transverse section of wood

Dalbergia granadillo

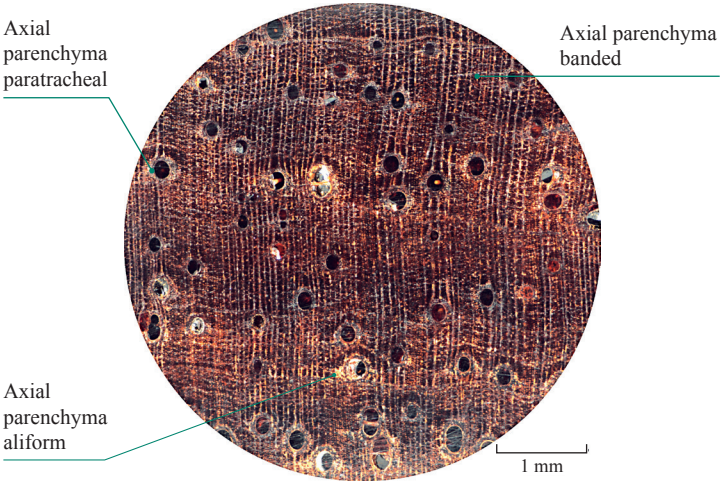
Dalbergia granadillo Longitudinal surface of wood



Dalbergia granadillo Transverse section of wood

Dalbergia retusa

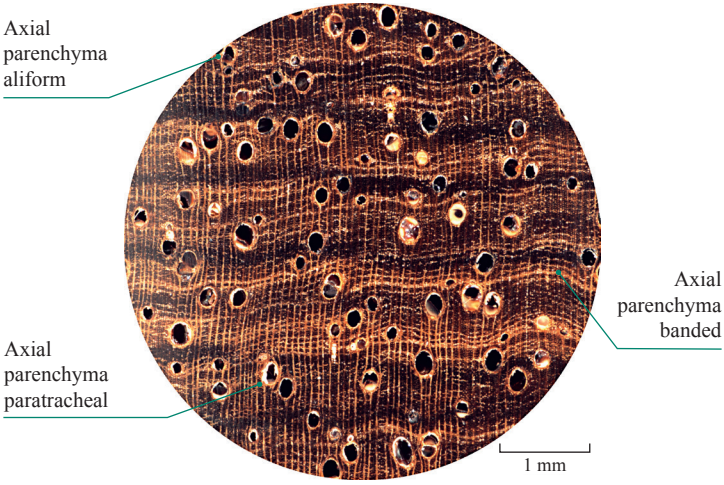
Dalbergia retusa Longitudinal surface of wood



Dalbergia retusa Transverse section of wood

Dalbergia stevensonii

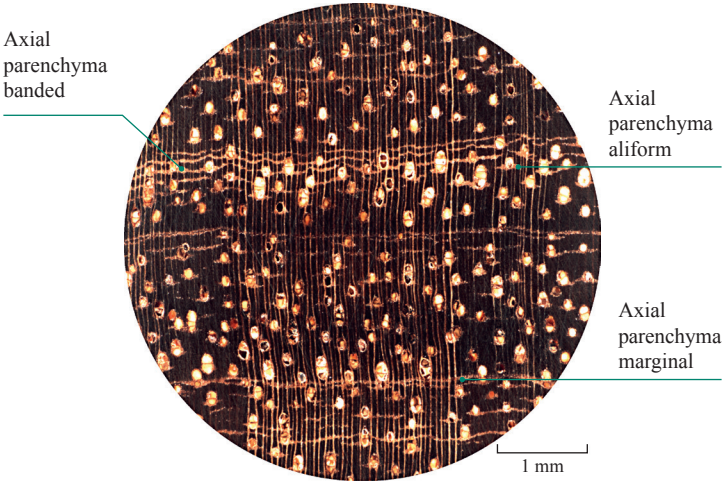
Dalbergia stevensonii Longitudinal surface of wood



Dalbergia stevensonii Transverse section of wood

Swartzia leiocalycina

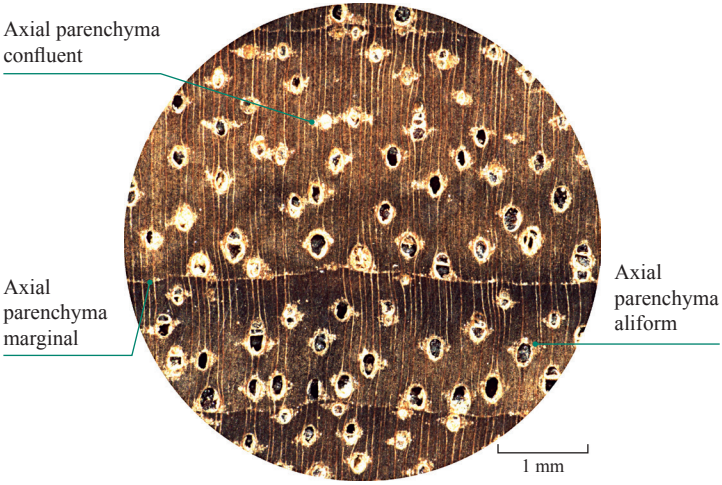
Swartzia leiocalycina Longitudinal surface of wood



Swartzia leiocalycina Transverse section of wood

Terminalia tomentosa

Terminalia tomentosa Longitudinal surface of wood



Terminalia tomentosa Transverse section of wood

Dalbergia louvelii

Bois de rose

Taxonomy

Dalbergia (genus), Leguminosae (family)

Geographic distribution

Madagascar, etc.

Morphological characteristics of trees

Trees, up to 15 m in height, 0.4 m in diameter at breast height (DBH).

Wood description

Deciduous wood. Sapwood pale yellowish-white; heartwood ranging in colour from purplish-red to black purple when first exposed, darkening with age. With slighting acid and fragrant odour, without characteristic taste, interlocked-grained, extremely fine- or fine- textured. The air-dry density is about 0.95 g/cm^3.

Identification characteristics of wood

Wood diffuse-porous. Growth rings indistinct. Vessels in heartwood invisible with the naked eye, very few to slightly few. Axial parenchyma banded, distinct with a hand lens. Rays distinct with a hand lens. Storied rays indistinct.

Type of wood products

Furniture, etc.

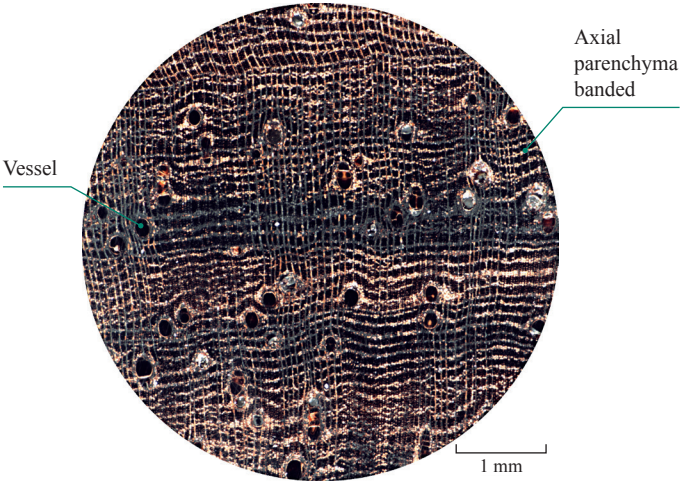
Conservation class

CITES Ⅱ (Annotation #15)

The key differences between *Dalbergia louvelii* and its similar woods

	Wood colour	Axial parenchyma	Fluorescence
Dalbergia louvelii	heartwood ranging in colour from purplish-red to black purple	banded	none
(1) *Dalbergia granadillo*	heartwood ranging in colour from orange-brown to dark reddish-brown with black streaks when first exposed	aliform, banded	none
(2) *Dalbergia melanoxylon*	heartwood black-brown to yellow-purplish-brown, often with black streaks, sapwood yellow-white	few	none
(3) *Gluta renghas*	heartwood reddish-brown with black streaks occasionally	marginal, banded and paratracheal	none
(4) *Pterocarpus santalinus*	heartwood orange-red when first exposed, turning light and dark streaks, purplish-black, or almost black	in discontinuous tangential bands, aliform and paratracheal	in water, heartwood fluorescent in yellowish-green to light blue

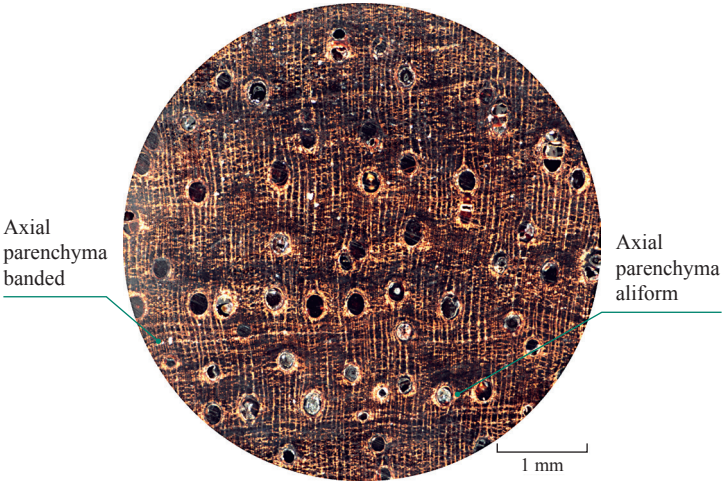
Dalbergia louvelii Longitudinal surface of wood



Dalbergia louvelii Transverse section of wood

Dalbergia granadillo

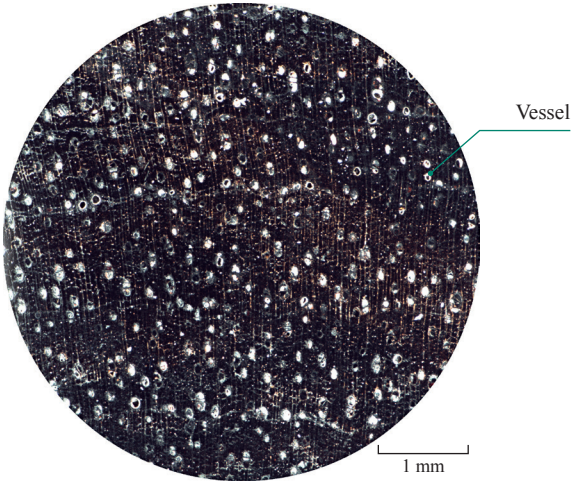
Dalbergia granadillo Longitudinal surface of wood



Dalbergia granadillo Transverse section of wood

Dalbergia melanoxylon

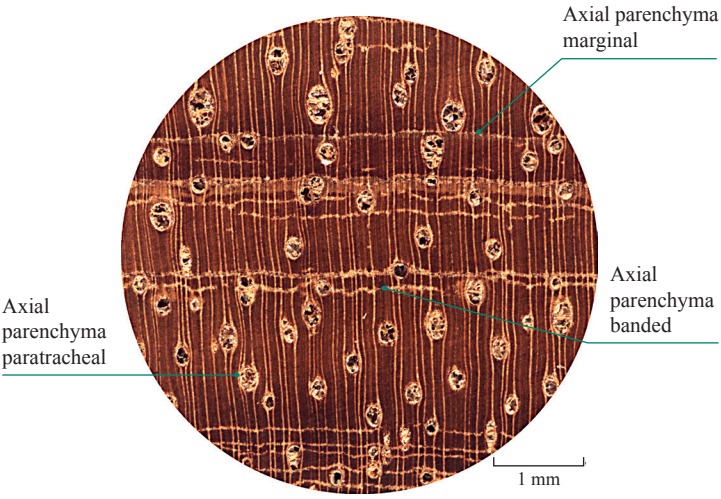
Dalbergia melanoxylon Longitudinal surface of wood



Dalbergia melanoxylon Transverse section of wood

Gluta renghas

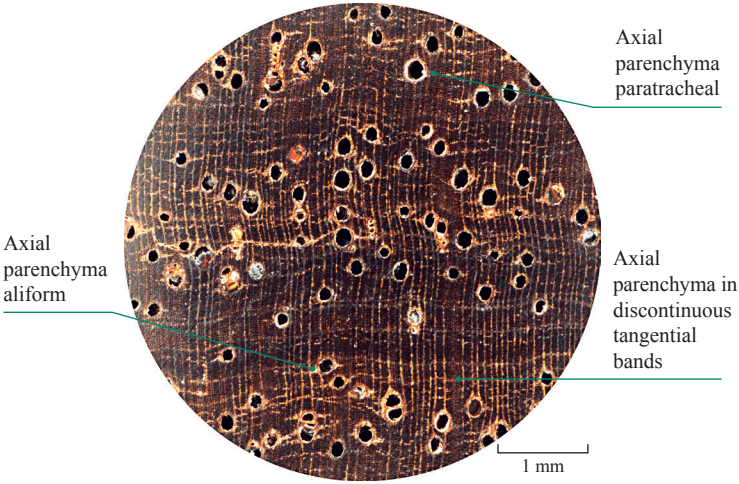
Gluta renghas Longitudinal surface of wood



Gluta renghas Transverse section of wood

Pterocarpus santalinus

Pterocarpus santalinus Longitudinal surface of wood



Pterocarpus santalinus Transverse section of wood

Dalbergia melanoxylon

African Blackwood

Taxonomy

Dalbergia (genus), Leguminosae (family)

Geographic distribution

Cameroon, Gabon, Equatorial Guinea

Morphological characteristics of trees

Trees, range from 5 to 9 m in height, 0.5 to 0.6 m in diameter at breast height (DBH).

Wood description

Deciduous wood. Heartwood black-brown to yellow purplish-brown, often with black streaks, sapwood yellow-white. Without or very faint acid and fragrant odour, fine-textured, straight-grained. The air-dry density is 1.00-1.33 g/cm^3.

Identification characteristics of wood

Wood diffuse-porous. Growth rings indistinct. With a hand lens, vessels and rays visible, axial parenchyma slightly visible.

Type of wood products

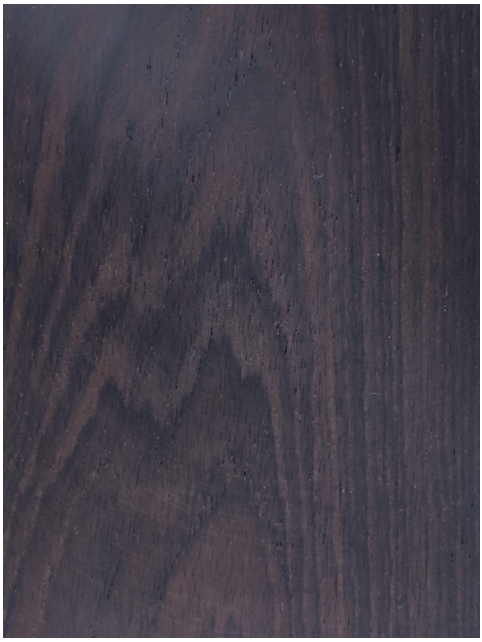
Furniture, handicrafts, buddha statues, beads, strings, musical instruments, etc.

Conservation class

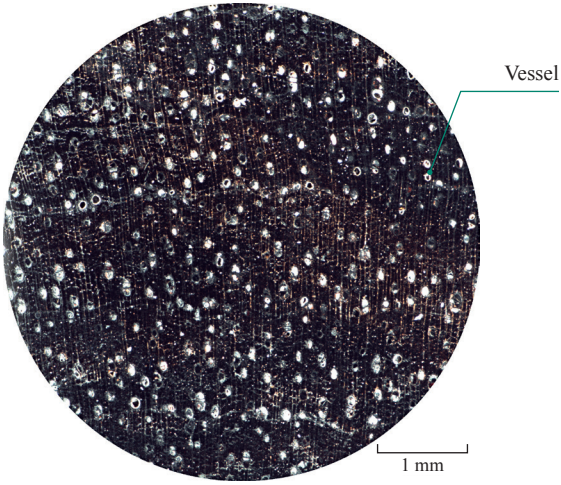
CITES Ⅱ (Annotation #15)

The key differences between *Dalbergia melanoxylon* and its similar woods

	Wood colour	Axial parenchyma
Dalbergia melanoxylon	heartwood black-brown to yellow purplish-brown, often with black streaks; sapwood yellow-white	few
(1) *Combretum imberbe*	heartwood dark brown to black purple, with dark and light streaks; sapwood yellow-white	paratracheal
(2) *Dalbergia louvelii*	heartwood ranging in colour from purplish-red to black purple; sapwood pale yellowish-white	banded
(3) *Diospyros ebenum*	heartwood jet black, very rarely with a few light streaks; sapwood light yellowish-grey to grey	abundant, extremely close, difficult or invisible with a hand lens, banded and paratracheal
(4) *Guibourtia conjugata*	heartwood reddish-brown; sapwood light pink-brown	banded, aliform, confluent, paratracheal and marginal
(5) *Swartzia bannia*	heartwood dark purple-brown to nearly black; sapwood light yellow to yellow	banded
(6) *Xanthostemon melanoxylon*	heartwood dark black-brown, containing black gum; sapwood light color	few, paratracheal



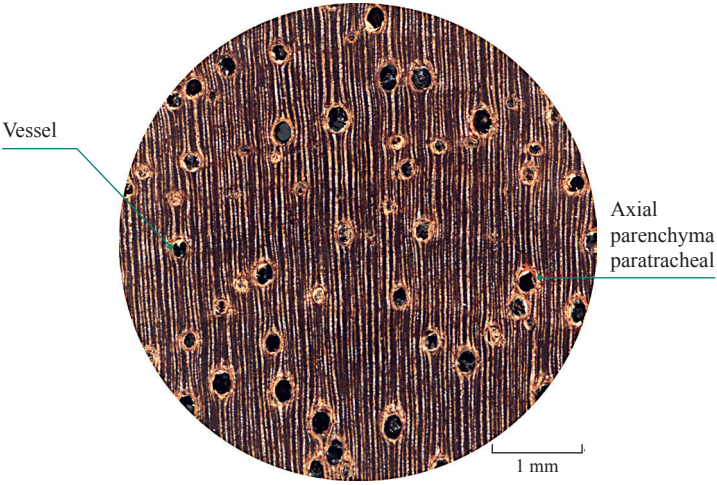
Dalbergia melanoxylon Longitudinal surface of wood



Dalbergia melanoxylon Transverse section of wood

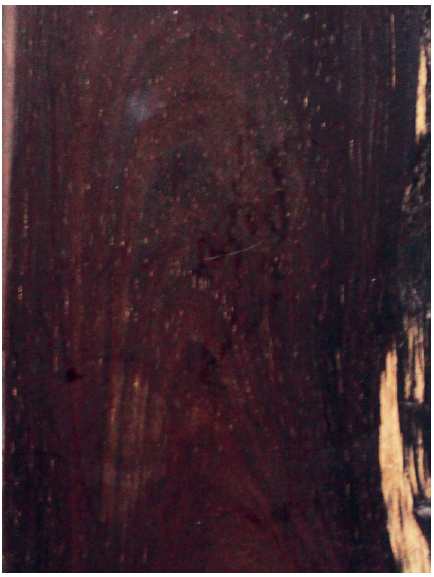
Combretum imberbe

Combretum imberbe Longitudinal surface of wood

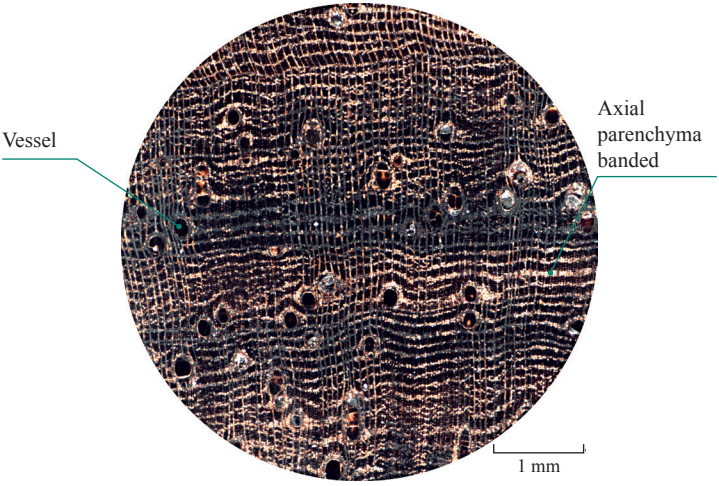


Combretum imberbe Transverse section of wood

Dalbergia louvelii



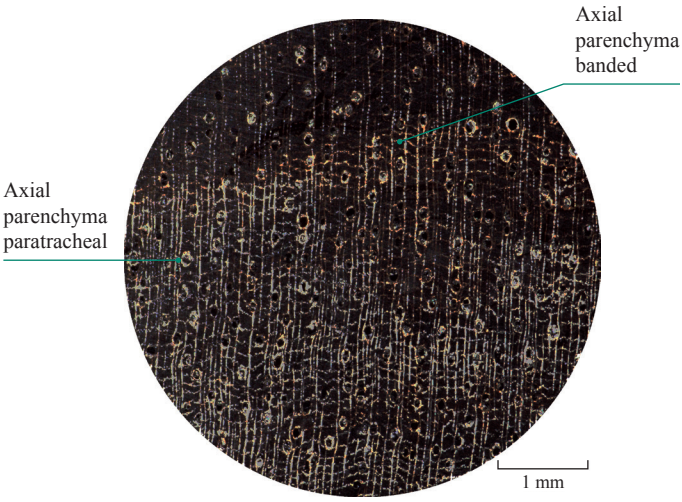
Dalbergia louvelii Longitudinal surface of wood



Dalbergia louvelii Transverse section of wood

Diospyros ebenum

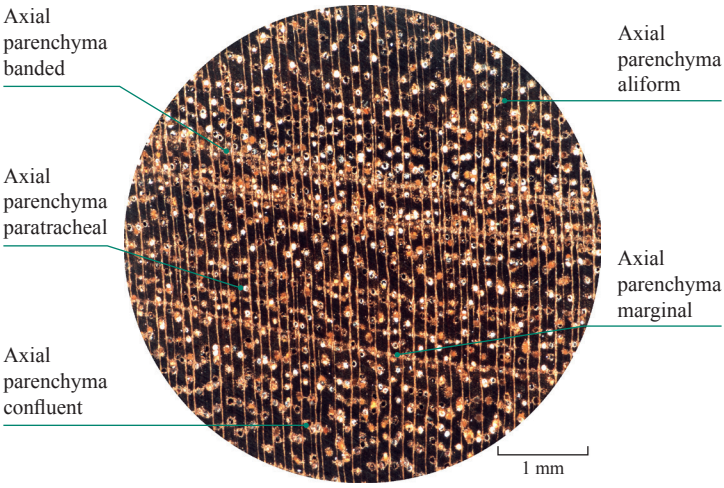
Diospyros ebenum Longitudinal surface of wood



Diospyros ebenum Transverse section of wood

Guibourtia conjugata

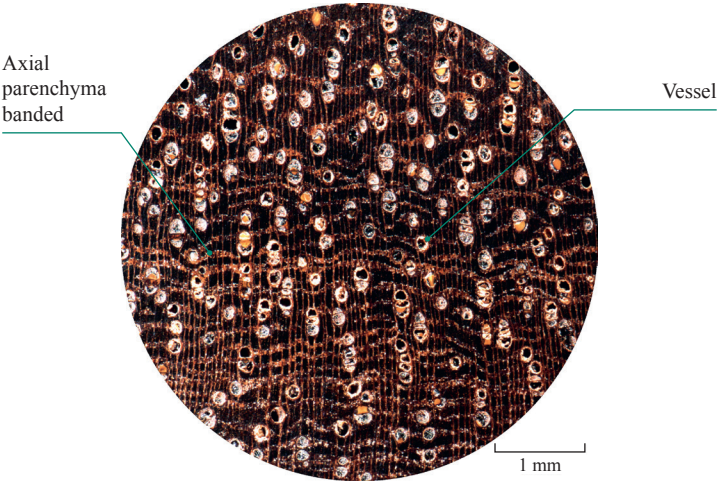
Guibourtia conjugata Longitudinal surface of wood



Guibourtia conjugata Transverse section of wood

Swartzia bannia

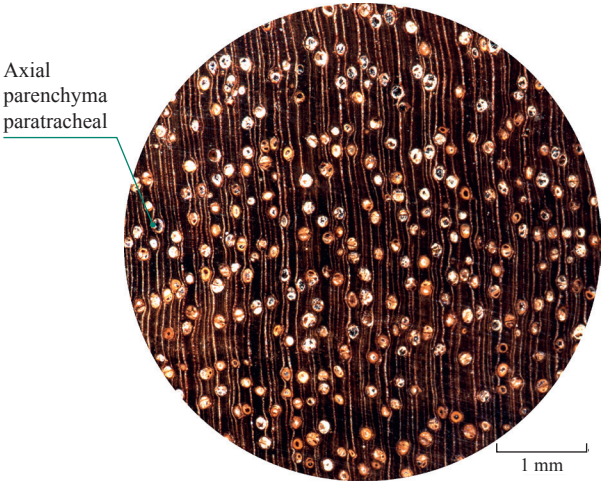
Swartzia bannia Longitudinal surface of wood



Swartzia bannia Transverse section of wood

Xanthostemon melanoxylon

Xanthostemon melanoxylon Longitudinal surface of wood



Xanthostemon melanoxylon Transverse section of wood

Dalbergia oliveri

Burma tulipwood

Taxonomy

Dalbergia (genus), Leguminosae (family)

Geographic distribution

Thailand, Myanmar and Laos

Morphological characteristics of trees

Trees, up to 25 m in height, 0.5 to 2 m in diameter at breast height (DBH).

Wood description

Deciduous wood. Sapwood white or yellowish-white; heartwood ranging in colour through shades of lemon-pink or red-scarlet to reddish-brown with distinctly dark lines when first exposed, darkening with age. With slightly acid and fragrant odour, without characteristic taste, straight- or but slightly interlocked-grained, fine-textured. The air-dry density is about 1.04 g/cm^3.

Identification characteristics of wood

Wood diffuse-porous or semi-ring-porous. Growth rings distinct or slightly distinct. Vessels extremely visible with the naked eye, very few to slightly few. Axial parenchyma distinct with the naked eye, banded, clearly reticulate. Ray distinct with a hand lens. Storied rays visible with a hand lens.

Type of wood products

Furniture, crafts, etc.

Conservation class

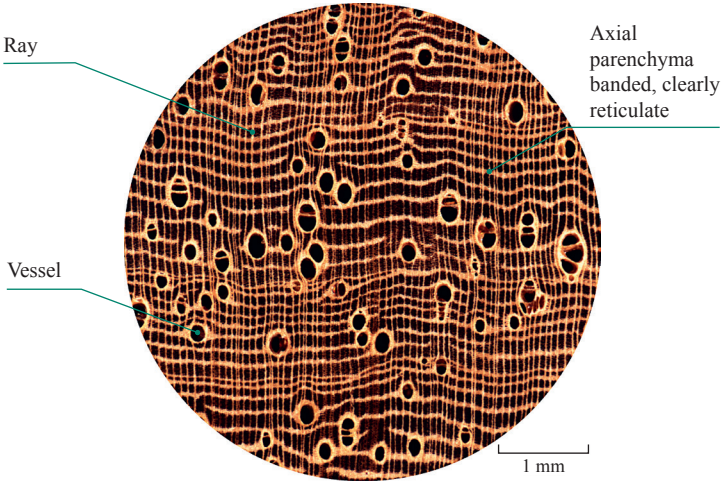
CITES Ⅱ (Annotation #15)

The key differences between *Dalbergia oliveri* and its similar woods

	Wood colour	Axial parenchyma
Dalbergia oliveri	heartwood ranging in colour through shades of lemon-pink or red-scarlet to reddish-brown with distinctly dark lines	banded, clearly reticulate
(1) *Bobgunnia madagascariensis*	heartwood reddish-brown, often with alternating streaks	banded
(2) *Burkea africana*	heartwood purplish-reddish-brown, often with light and dark streaks	abundant, paratracheal, aliform, confluent and marginal
(3) *Dalbergia odorifera*	heartwood reddish-brown to dark reddish-brown or purplish-red-brown with uneven depth and often mixed with dark-brown streaks	abundant, banded, paratracheal and aliform
(4) *Dalbergia retusa*	heartwood ranging in colour from orange to reddish-brown or purplish-brown with black streaks	banded, aliform, and paratracheal
(5) *Dalbergia sissoo*	heartwood purplish-brown with black streaks	aliform, confluent, banded and marginal


Dalbergia stirtoni
Tamalan Tree; Black Rosewood
FABACEAE
India to Pen. Malaysia

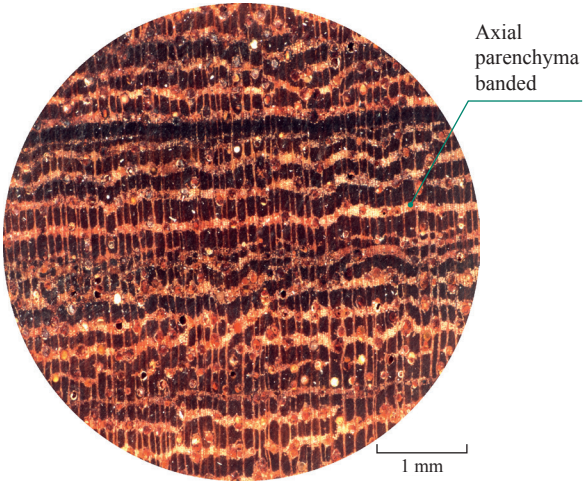
Dalbergia oliveri Longitudinal surface of wood



Dalbergia oliveri Transverse section of wood

Bobgunnia madagascariensis

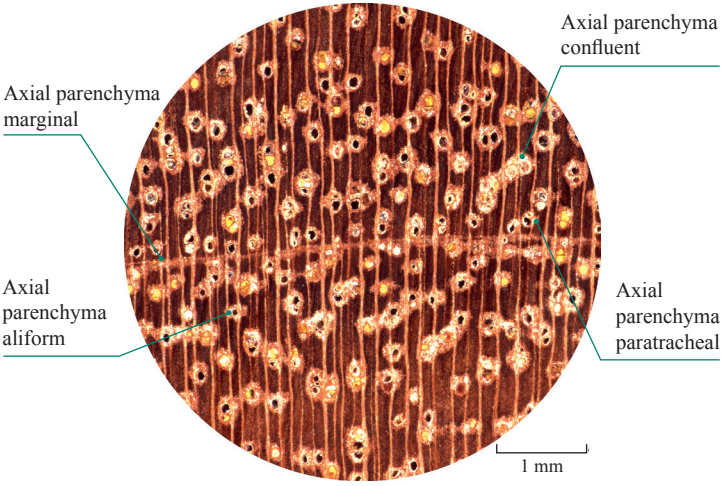
Bobgunnia madagascariensis Longitudinal surface of wood



Bobgunnia madagascariensis Transverse section of wood

Burkea africana

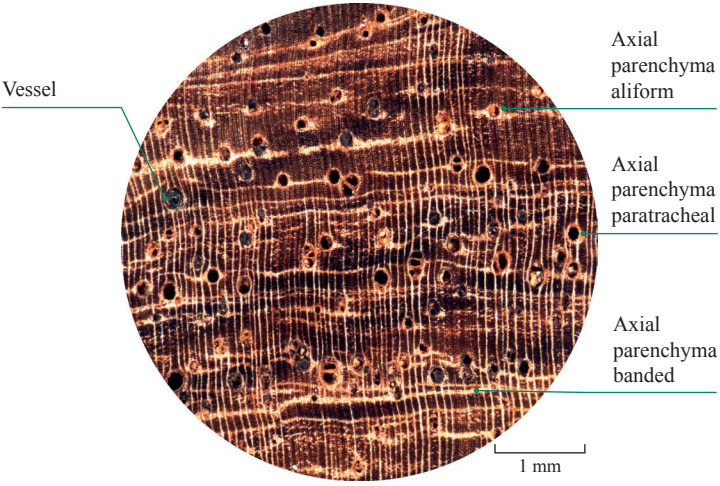
Burkea africana Longitudinal surface of wood



Burkea africana Transverse section of wood

Dalbergia odorifera

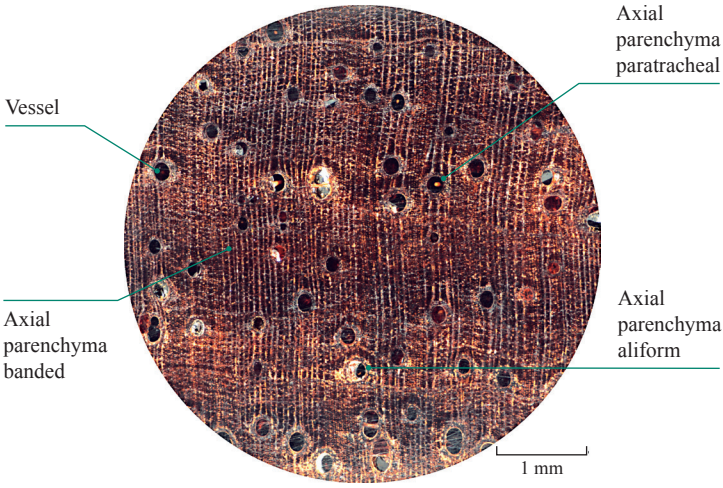
Dalbergia odorifera Longitudinal surface of wood



Dalbergia odorifera Transverse section of wood

Dalbergia retusa

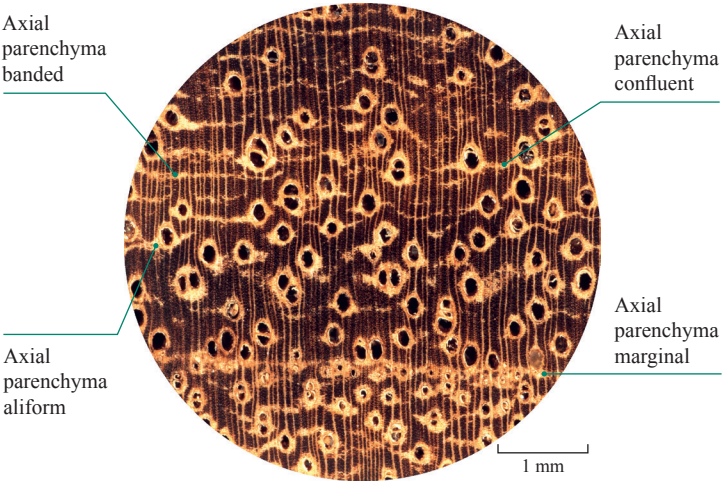
Dalbergia retusa Longitudinal surface of wood



Dalbergia retusa Transverse section of wood

Dalbergia sissoo

Dalbergia sissoo Longitudinal surface of wood



Dalbergia sissoo Transverse section of wood

Dalbergia retusa

Cocobolo

Taxonomy

Dalbergia (genus), Leguminosae (family)

Geographic distribution

Mexico to Panama.

Morphological characteristics of trees

Trees, range from 13 to 18 m in height, up to 0.5 m in diameter at breast height (DBH).

Wood description

Deciduous wood. Sapwood pale yellowish-white; heartwood ranging in colour from orange to reddish-brown or purplish-brown with black streaks when first exposed, darkening with age. With spicy odour, straight- or interlocked-grained, fine- or even-textured. The air-dry density is greater than 1.0 g/cm^3.

Identification characteristics of wood

Wood diffuse-porous. Vessels distinct with a hand lens, very few. Axial parenchyma visible, paratracheal aliform and banded. Rays slightly distinct with a hand lens, close, very fine. Storied rays invisible.

Type of wood products

Logs, sawn wood, furniture, musical instrument parts, handicrafts, etc.

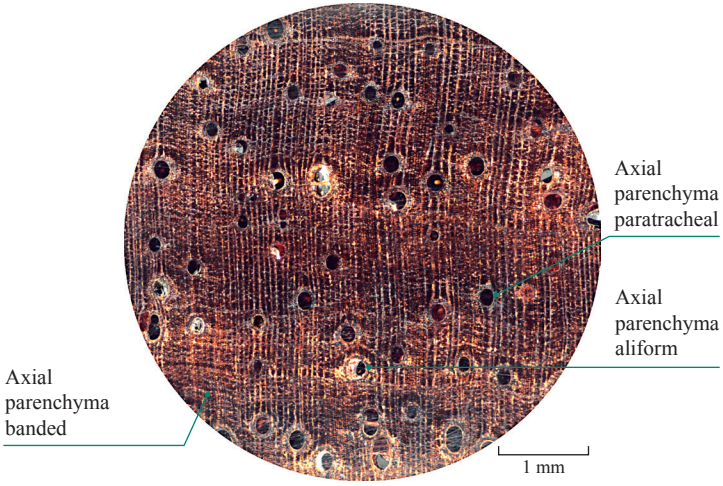
Conservation class

CITES Ⅱ (Annotation #15)

The key differences between *Dalbergia retusa* and its similar woods

	Wood colour	Porosity	Axial parenchyma
Dalbergia retusa	heartwood ranging in colour from orange to reddish-brown or purplish-brown with black streaks	wood diffuse-porous	banded, aliform and paratracheal
(1) ***Dalbergia cochinchinensis***	heartwood ranging in colour from purplish-brown to dark reddish-brown with black-brown or chestnut-brown streaks	wood diffuse-porous	banded, paratracheal and aliform
(2) ***Dalbergia stevensonii***	heartwood light reddish-brown with alternating dark and light streaks	wood semi-ring-porous	paratracheal, aliform, banded and marginal
(3) ***Dalbergia tucurensis***	heartwood dark or deep reddish-brown with black streaks	wood diffuse-porous	banded, paratracheal and aliform

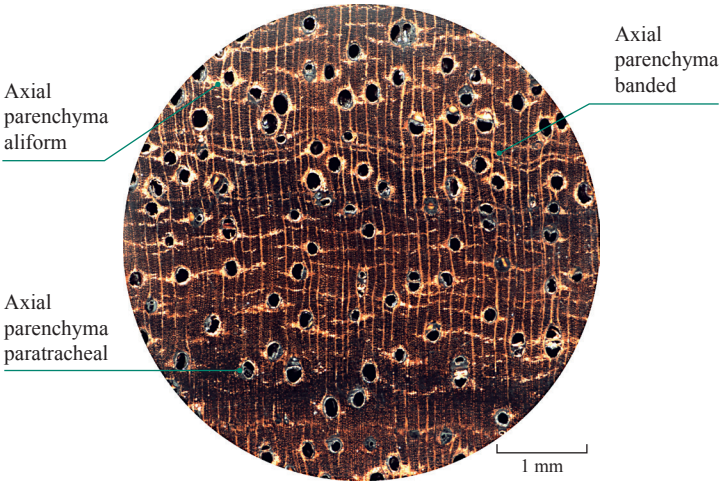
Dalbergia retusa Longitudinal surface of wood



Dalbergia retusa Transverse section of wood

Dalbergia cochinchinensis

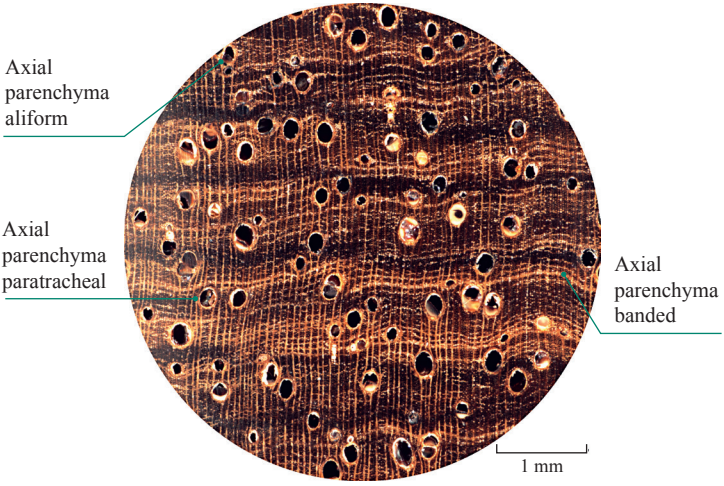
Dalbergia cochinchinensis Longitudinal surface of wood



Dalbergia cochinchinensis Transverse section of wood

Dalbergia stevensonii

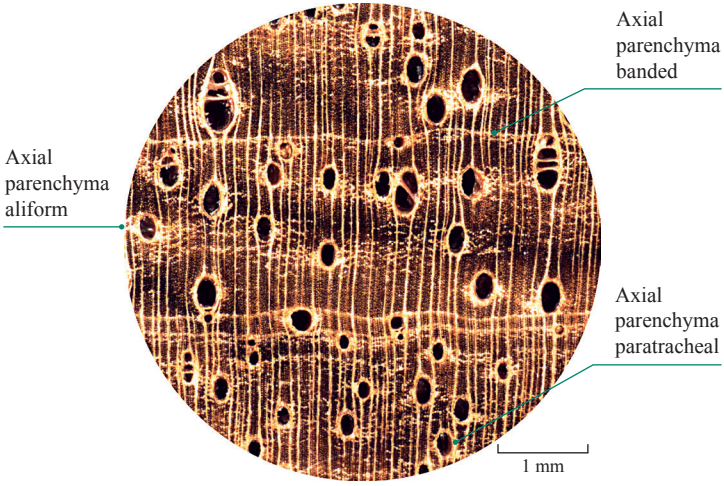
Dalbergia stevensonii Longitudinal surface of wood



Dalbergia stevensonii Transverse section of wood

Dalbergia tucurensis

Dalbergia tucurensis Longitudinal surface of wood



Dalbergia tucurensis Transverse section of wood

Dalbergia stevensonii

Honduras rosewood

Taxonomy

Dalbergia (genus), Leguminosae (family)

Geographic distribution

Belize and other Central America countries

Morphological characteristics of trees

Trees, range from 15 to 30 m in height, up 0.9 m in diameter at breast height (DBH).

Wood description

Deciduous wood. Sapwood pale yellowish-white; heartwood light reddish-brown with alternating dark and light streaks. With slightly fragrant odour, straight- or interlocked-grained, fine- or even-textured. The air-dry density is 0.93-1.19 g/cm^3.

Identification characteristics of wood

Wood semi-ring-porous. Growth rings distinct. Vessels distinct with a hand lens, slightly few. Axial parenchyma abundant, paratracheal, aliform, banded, and marginal. Rays distinct with a hand lens, slightly close, very fine. Ripple marks slightly distinct.

Type of wood products

Logs, sawn wood, furniture, musical instrument parts, handicrafts, etc.

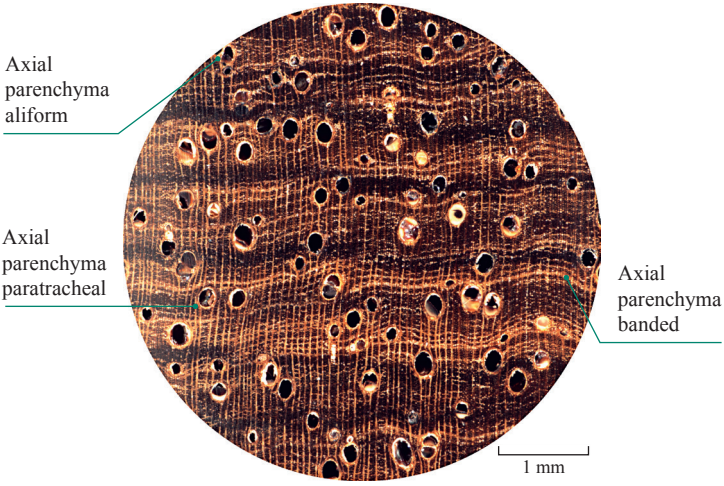
Conservation class

CITES Ⅱ (Annotation #15)

The key differences between *Dalbergia stevensonii* and its similar woods

	Wood colour	Porosity	Axial parenchyma
Dalbergia stevensonii	heartwood light reddish-brown with alternating dark and light streaks	wood semi-ring-porous	paratracheal, aliform, banded and marginal
(1) ***Anadenanthera macrocarpa***	heartwood pale reddish-brown with dark and light streaks	wood diffuse-porous	paratracheal, aliform marginal and confluent
(2) ***Dalbergia granadillo***	heartwood ranging in colour from orange-brown to dark reddish-brown with black streaks when first exposed	wood diffuse-porous	aliform, banded
(3) ***Dalbergia latifolia***	heartwood ranging in colour from light, nearly golden-brown, to deep purple with rather distant nearly black lines	wood diffuse-porous	aliform, confluent and banded
(4) ***Dalbergia tucurensis***	heartwood dark or deep reddish-brown with black streaks	wood diffuse-porous	banded, paratracheal and aliform
(5) ***Machaerium scleroxylon***	heartwood purplish-brown, with dark and light streaks	wood diffuse-porous	aliform, banded and marginal

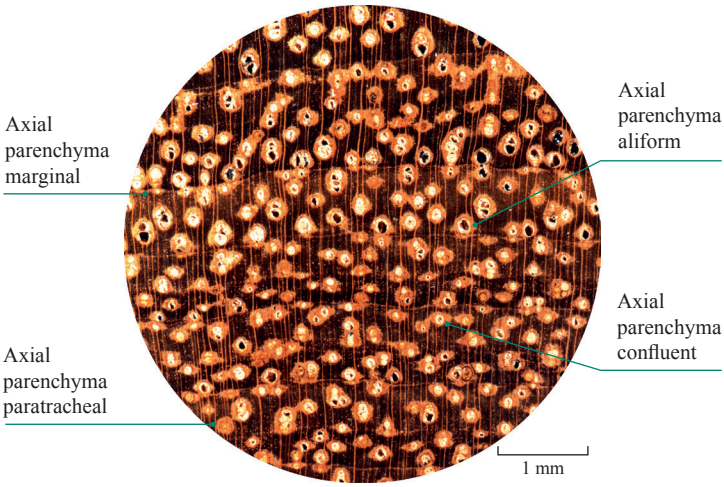
Dalbergia stevensonii Longitudinal surface of wood



Dalbergia stevensonii Transverse section of wood

Anadenanthera macrocarpa

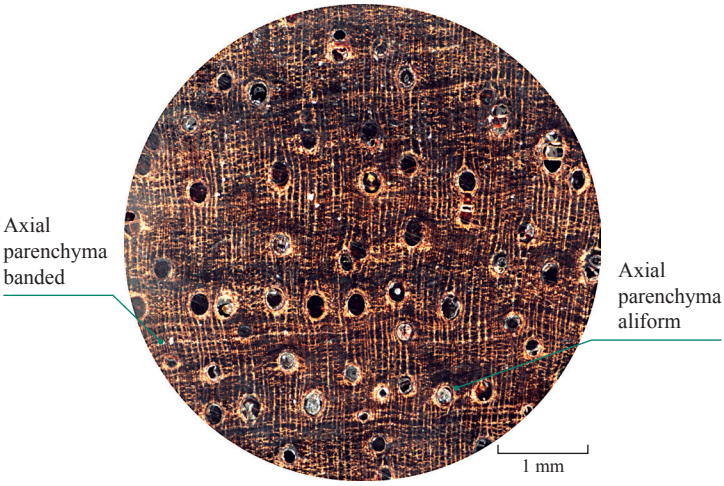
Anadenanthera macrocarpa Longitudinal surface of wood



Anadenanthera macrocarpa Transverse section of wood

Dalbergia granadillo

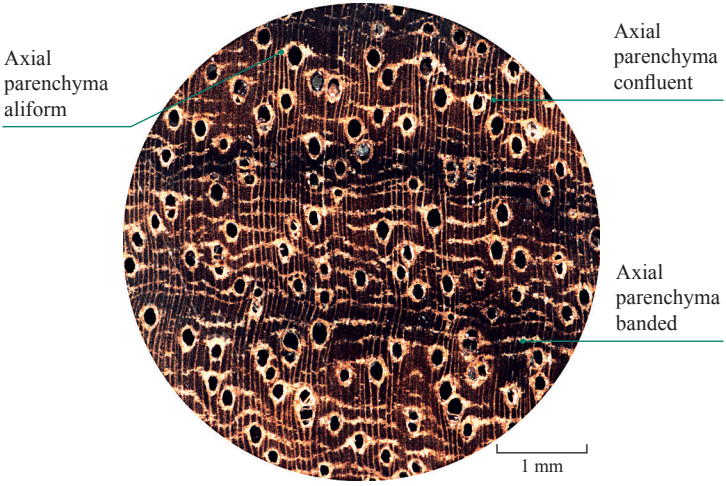
Dalbergia granadillo Longitudinal surface of wood



Dalbergia granadillo Transverse section of wood

Dalbergia latifolia

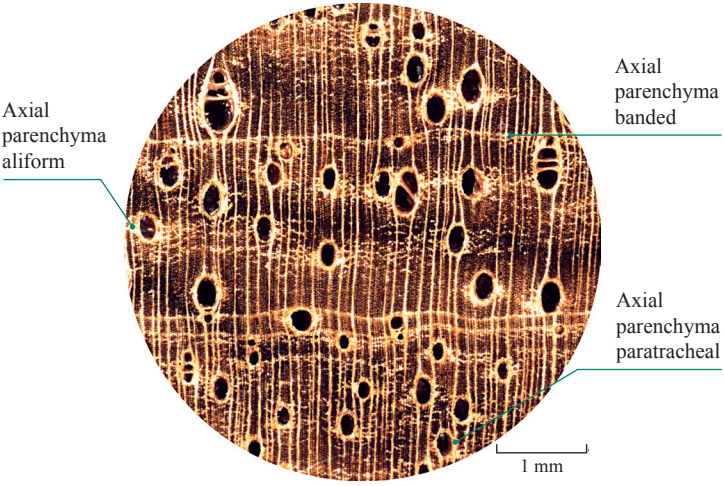
Dalbergia latifolia Longitudinal surface of wood



Dalbergia latifolia Transverse section of wood

Dalbergia tucurensis

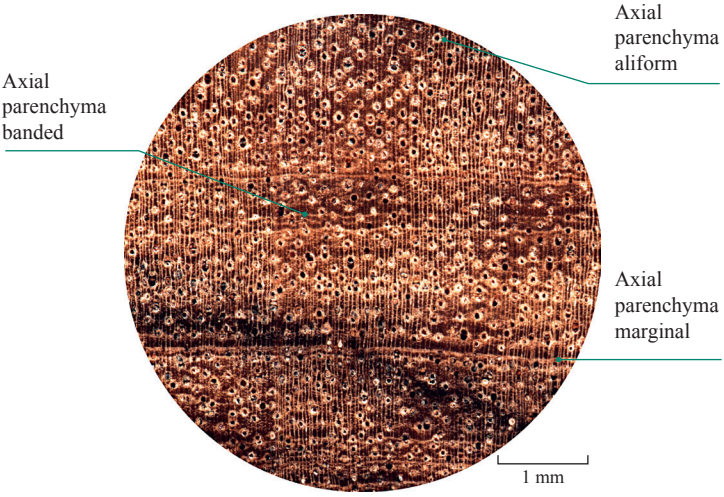
Dalbergia tucurensis Longitudinal surface of wood



Dalbergia tucurensis Transverse section of wood

Machaerium scleroxylon

Machaerium scleroxylon Longitudinal surface of wood



Machaerium scleroxylon Transverse section of wood

Fraxinus mandshurica

Manchurian ash

Taxonomy

Fraxinus (genus), Oleaceae (family)

Geographic distribution

Northeast and North China, Russia, D.P.R. Korea, Japan, etc.

Morphological characteristics of trees

Trees, up to 35 m in height, 1.0 m in diameter at breast height (DBH). Bark grayish-white, vertical and horizontal crack.

Wood description

Deciduous wood. Sapwood yellow-white or light yellowish-brown; heartwood greyish-brown or light chestnut brown. Lustrous, without characteristic odour or taste, straight-grained, medium fine- and uneven- textured. The air-dry density is 0.64-0.69 g/cm^3.

Identification characteristics of wood

Wood ring-porous. Growth rings distinct. Earlywood vessels medium-sized to sightly large, distinct with the naked eye, continuous arrangement forming a distinct earlywood zone, mostly 2-4 vessels wide. Tyloses visible in the heartwood. Transition from earlywood to latewood abrupt. Latewood vessels slightly few, very small to sightly small, slightly distinct with a hand lens, diffuse or in short diagonal pattern. Axial parenchyma distinct with a hand lens, paratracheal and marginal, and banded at the end of the ring. Rays rare to medium, very fine to slightly fine, visible with a hand lens.

Type of wood products

Furniture, sports appliances, interior decoration, musical instruments, farm tools, handicrafts, etc.

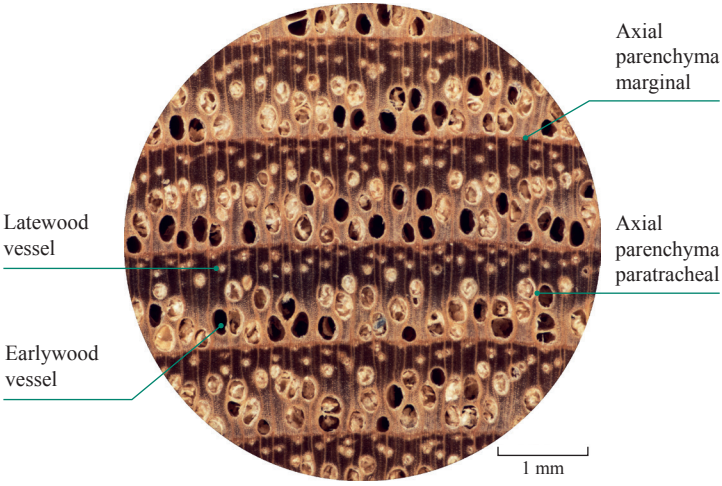
Conservation class

CITES Ⅲ (Populations of Russian Federation, Annotation #5)

The key differences between *Fraxinus mandshurica* and its similar woods

	Wood colour	Vessels arrangement	Axial parenchyma	Wide rays commonly> 10-seriate	Air-dried density (g/cm^3)
Fraxinus mandshurica	sapwood yellow-white or light yellowish-brown; heartwood greyish-brown or light chestnut brown	earlywood vessels continuous arrangement forming a distinct earlywood zone, latewood vessels diffuse or in short diagonal pattern	paratracheal, marginal	none	0.64-0.69
(1) *Fraxinus americana*	heartwood basically brown or shades of brown or white to grey	earlywood vessels continuous arrangement forming a distinct earlywood zone, latewood vessels diffuse	paratracheal, aliform, confluent and marginal	none	0.50-0.85
(2) *Fraxinus chinensis*	heartwood yellowish-brown or light brown	earlywood vessels continuous arrangement forming a distinct earlywood zone, latewood vessels diffuse or in diagonal pattern	marginal, banded and aliform	none	approx. 0.66
(3) *Quercus acutissima*	sapwood dark yellowish-brown or grayish-yellowish-brown; heartwood light reddish-brown	earlywood vessels continuous arrangement forming a distinct earlywood zone, latewood vessels in radial pattern	banded	exist	0.92-0.93
(4) *Quercus mongolica*	sapwood light yellowish-brown; heartwood yellowish-brown or light chestnut brown	earlywood vessels continuous arrangement forming a distinct earlywood zone, latewood vessels in dendritic radial pattern	banded	exist	0.77-0.83

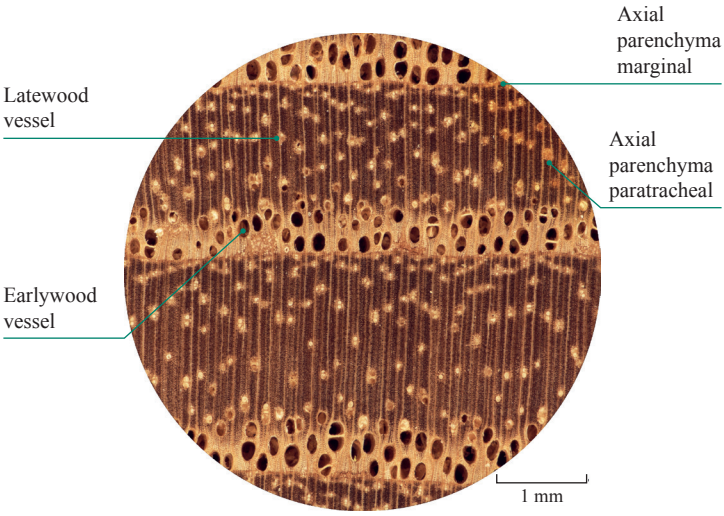
Fraxinus mandshurica Longitudinal surface of wood



Fraxinus mandshurica Transverse section of wood

Fraxinus americana

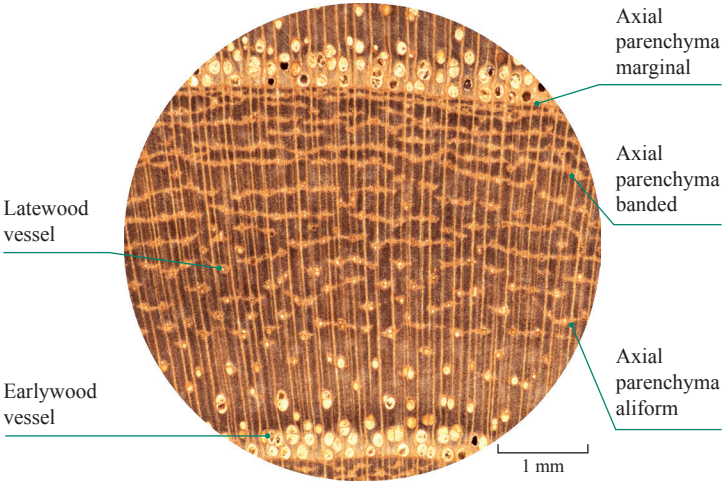
Fraxinus americana Longitudinal surface of wood



Fraxinus americana Transverse section of wood

Fraxinus chinensis

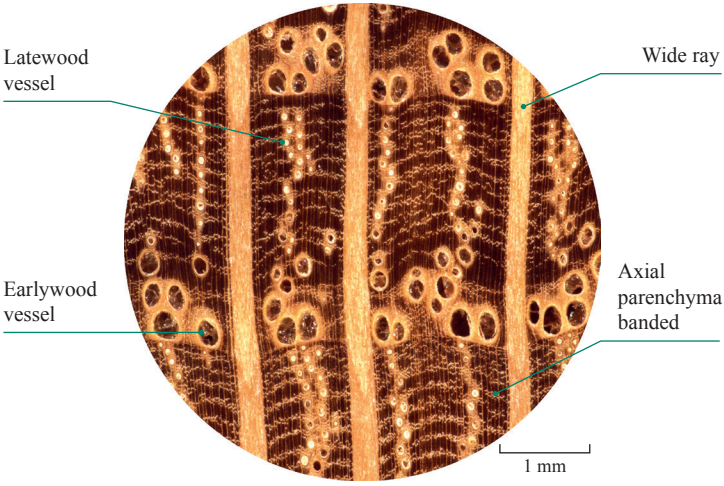
Fraxinus chinensis Longitudinal surface of wood



Fraxinus chinensis Transverse section of wood

Quercus acutissima

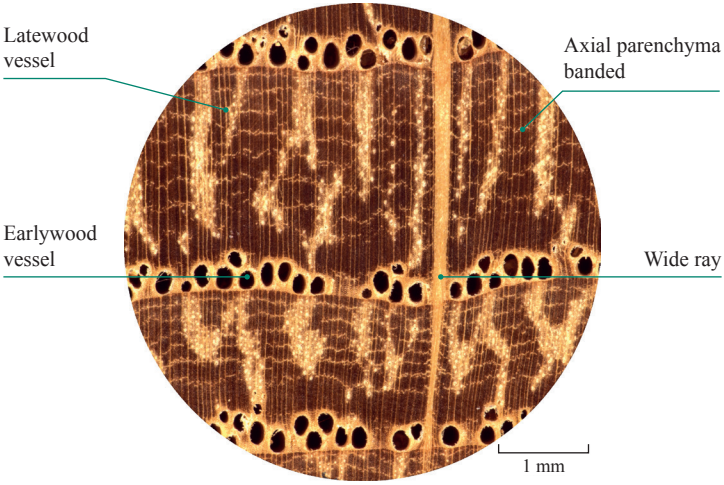
Quercus acutissima Longitudinal surface of wood



Quercus acutissima Transverse section of wood

Quercus mongolica

Quercus mongolica Longitudinal surface of wood



Quercus mongolica Transverse section of wood

Gonystylus bancanus

Ramin melawis

Taxonomy

Gonystylus (genus), Thymelaeaceae (family)

Geographic distribution

Southeast Asian countries such as Malaysia, Indonesia, Brunei, etc.

Morphological characteristics of trees

Trees, range from 20 to 30 m in height, 0.6 to 1.0 m in diameter at breast height (DBH).

Wood description

Deciduous wood. White or straw yellow sapwood without distinct heartwood. Lustrous, moderately heavy; slightly interlocked-grained, even- and fine- textured. The air-dry density is about 0.66 g/cm^3.

Identification characteristics of wood

Wood diffuse-porous. Vessels mostly solitary, very few in radial multiples, slightly small and few, slightly visible with the naked eye, distinct with a hand lens. Axial parenchyma distinct with a hand lens, aliform, few confluent and in irregular bands.

Type of wood products

Interior decoration, furniture, panels, handicrafts, etc.

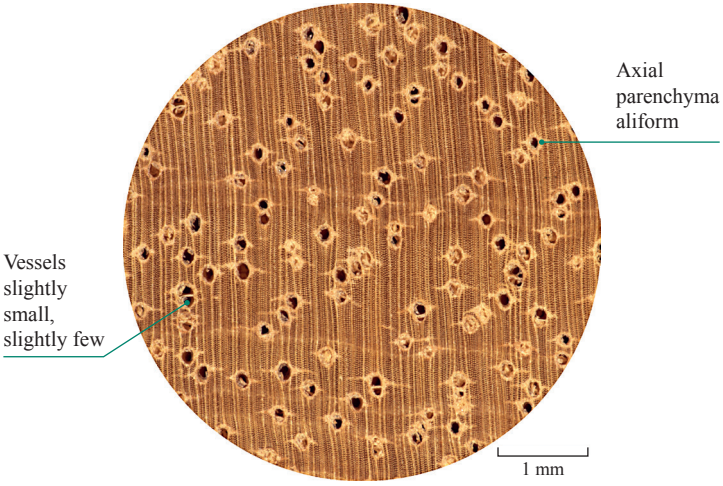
Conservation class

CITES Ⅱ (Annotation #4)

The key differences between *Gonystylus bancanus* and its similar woods

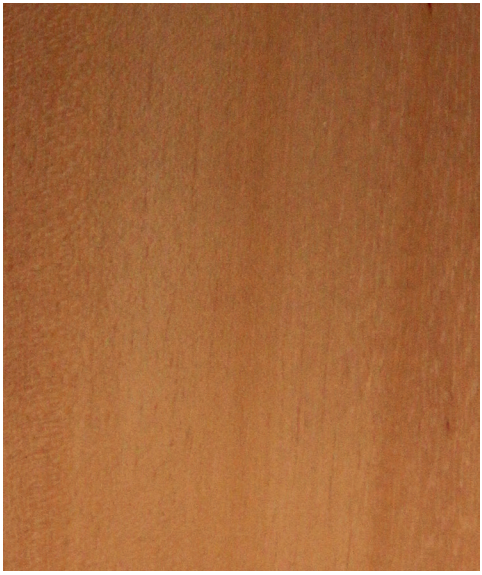
	Wood colour	Vessels
Gonystylus bancanus	white or straw yellow	slightly small and few
(1) *Brosimum alicastrum*	yellowish-brown	very small but numerous
(2) *Brosimum utile*	yellowish-brown	very large and few
(3) *Falcataria moluccana*	light brown with pink	very large and few
(4) *Jacaranda copaia*	yellowish-brown	very large and few

Gonystylus bancanus Longitudinal surface of wood

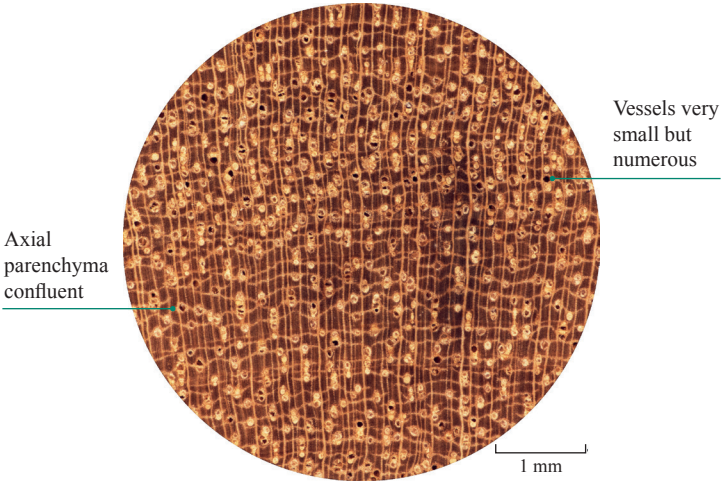


Gonystylus bancanus Transverse section of wood

Brosimum alicastrum



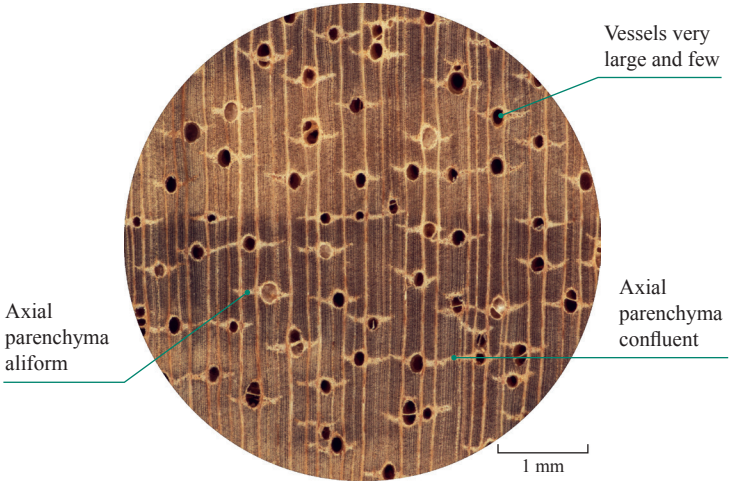
Brosimum alicastrum Longitudinal surface of wood



Brosimum alicastrum Transverse section of wood

Brosimum utile

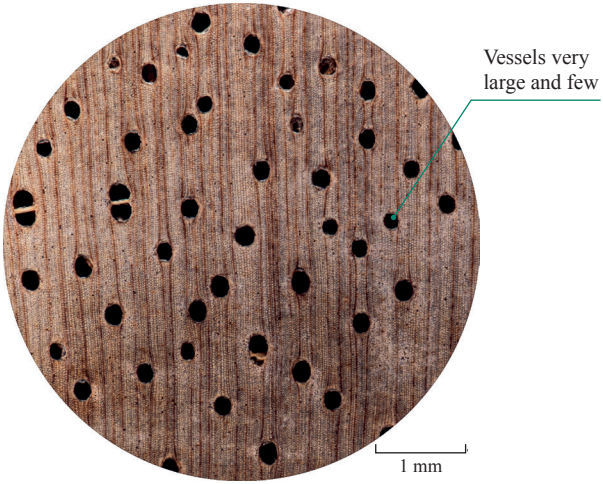
Brosimum utile Longitudinal surface of wood



Brosimum utile Transverse section of wood

Falcataria moluccana

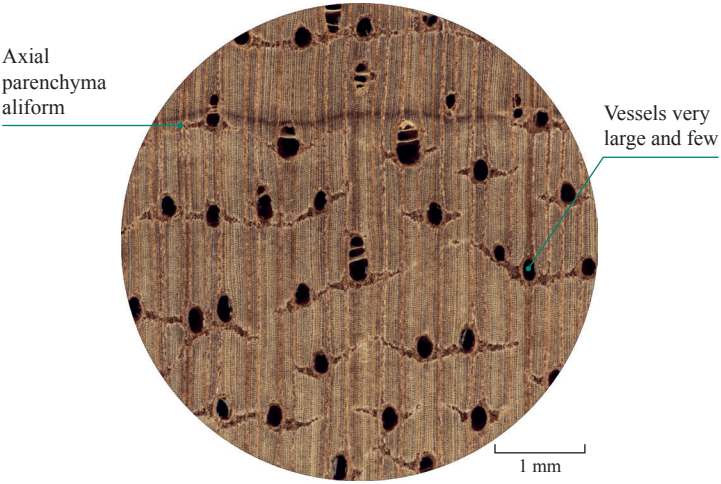
Falcataria moluccana Longitudinal surface of wood



Falcataria moluccana Transverse section of wood

Jacaranda copaia

Jacaranda copaia Longitudinal surface of wood



Jacaranda copaia Transverse section of wood

Guaiacum sanctum

Lignum vitae

Taxonomy

Guaiacum (genus), Zygophyllaceae (family)

Geographic distribution

West Indies, Mexico and tropical regions of South America

Morphological characteristics of trees

Trees, 2 to 3 m in height, 0.3 m in diameter at breast height (DBH).

Wood description

Deciduous wood. Heartwood ranging in colour from yellowish-brown to dark green-brown with black streaks. With slightly fragrant odour. The air-dry density is 1.10-1.13 g/cm^3.

Identification characteristics of wood

Wood diffuse-porous. Vessels solitary, diffuse and very small, barely visible with the naked eye, deposits abundants. Axial parenchyma invisible with a hand lens. Ray storied, fine.

Type of wood products

Logs, sawn wood, handicrafts, floor, etc.

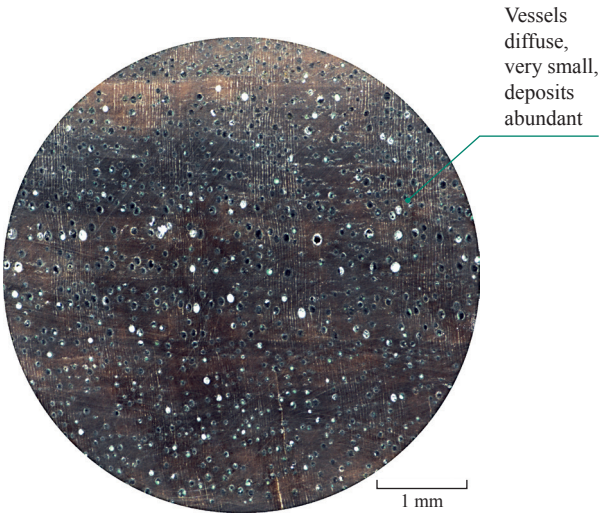
Conservation class

CITES Ⅱ (Annotation #2)

The key differences between *Guaiacum sanctum* and its similar woods

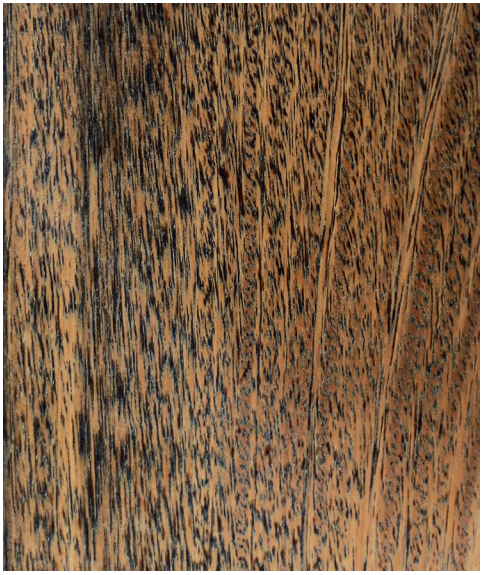
	Wood colour	Odour	Vessels
Guaiacum sanctum	heartwood ranging in colour from yellowish-brown to dark green-brown with black streaks	slightly fragrant odour	diffuse, very small, slightly less, deposits abundant
(1) *Bulnesia sarmientoi*	heartwood ranging in colour from dark olive-green to dark brown with gray black streaks	distinctive fruit odour	very small, numerous, deposits abundant
(2) *Guaiacum officinale*	heartwood ranging in colour from dark brown to black-brown with black streaks	slightly fragrant odour	diffuse, very small, few, deposits abundant
(3) *Handroanthus serratifolius*	heartwood ranging in colour from light to dark olive brown, alternating with dark or light streaks	none	very large, deposits abundant

Guaiacum sanctum Longitudinal surface of wood

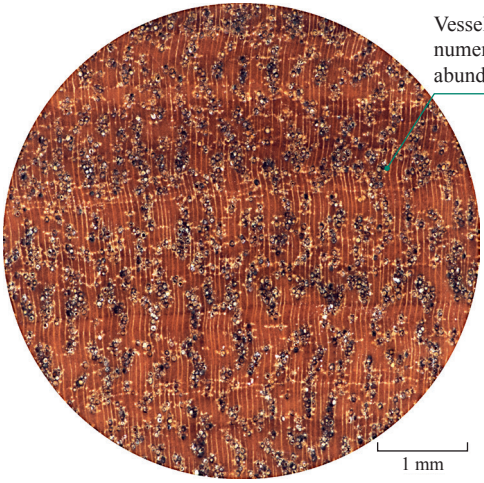


Guaiacum sanctum Transverse section of wood

Bulnesia sarmientoi



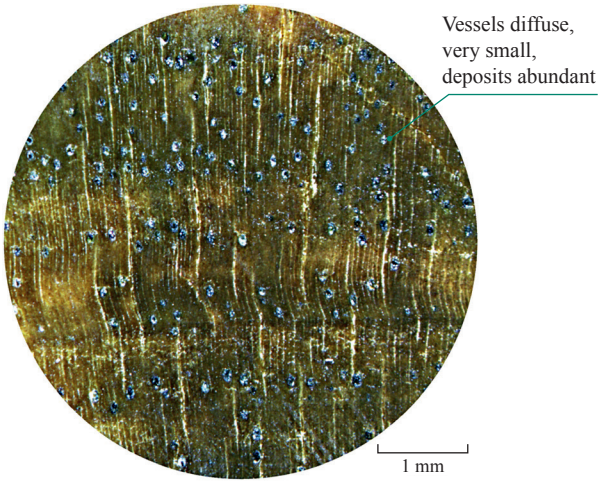
Bulnesia sarmientoi Longitudinal surface of wood



Bulnesia sarmientoi Transverse section of wood

Guaiacum officinale

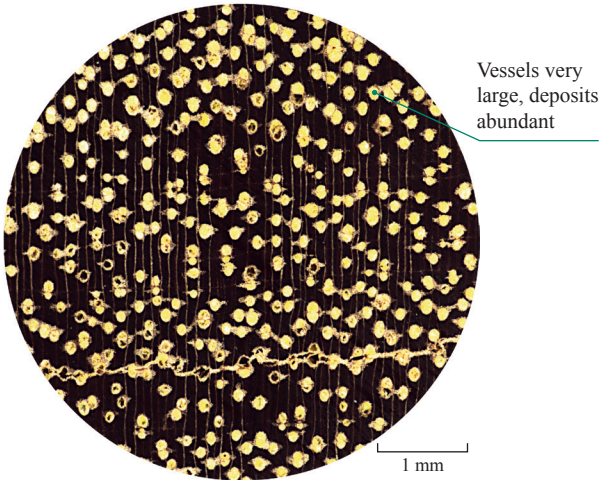
Guaiacum officinale Longitudinal surface of wood



Guaiacum officinale Transverse section of wood

Handroanthus serratifolius

Handroanthus serratifolius Longitudinal surface of wood



Handroanthus serratifolius Transverse section of wood

Guibourtia demeusei

Cameroons copal, Congo copal, Ebana, Paka

Taxonomy

Guibourtia (genus), Leguminosae (family)

Geographic distribution

African countries such as Cameroon, Central Africa, D. R. Congo, Gabon, etc.

Morphological characteristics of trees

Trees, up to 39 m in height, up to 1.2 m in diameter at breast height (DBH).

Wood description

Deciduous wood. Heartwood brown or reddish-brown, distinctly differs from sapwood. Lustrous, straight or slightly sloping grained, fine- and even-textured. The air-dry density is 0.78-1.14 g/cm^3.

Identification characteristics of wood

Wood diffuse-porous. Vessels mostly solitary, few in short radial multiples. Axial parenchyma aliform, confluent and marginal. Rays distinct with a hand lens.

Type of wood products

Logs, sawn wood, furniture, wood floor, decorative veneered plywood, instrument, living utensils, etc.

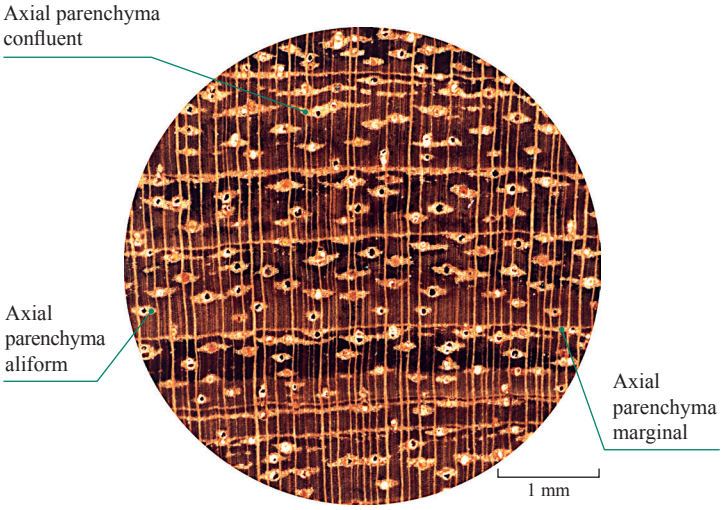
Conservation class

CITES Ⅱ (Annotation #15)

The key differences between *Guibourtia demeusei* and its similar woods

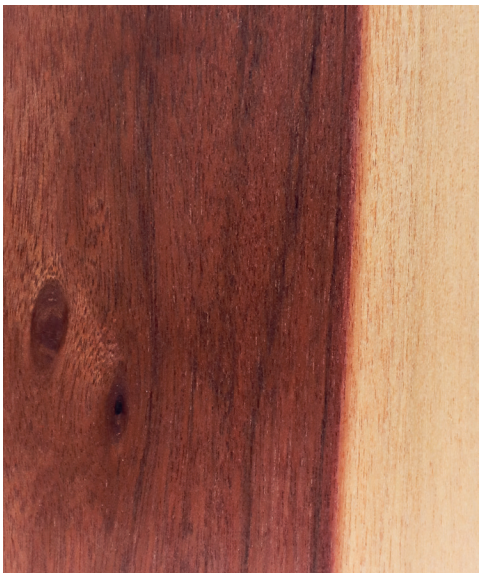
	Wood colour	Axial parenchyma
Guibourtia demeusei	heartwood brown or reddish-brown, distinctly differs from sapwood	aliform, confluent and marginal
(1) ***Colophospermum mopane***	heartwood reddish-brown, distinctly differs from sapwood	paratracheal
(2) ***Guibourtia ehie***	heartwood yellowish-brown to chocolate brown, with dark streaks; sapwood yellowish-white	aliform, marginal
(3) ***Guibourtia pellegriniana***	heartwood reddish-brown, with purple streaks; sapwood nearly white	aliform, marginal
(4) ***Hymenaea courbaril***	heartwood reddish-brown with dark and light streaks; sapwood gray-white	paratracheal, aliform and marginal

Guibourtia demeusei Longitudinal surface of wood

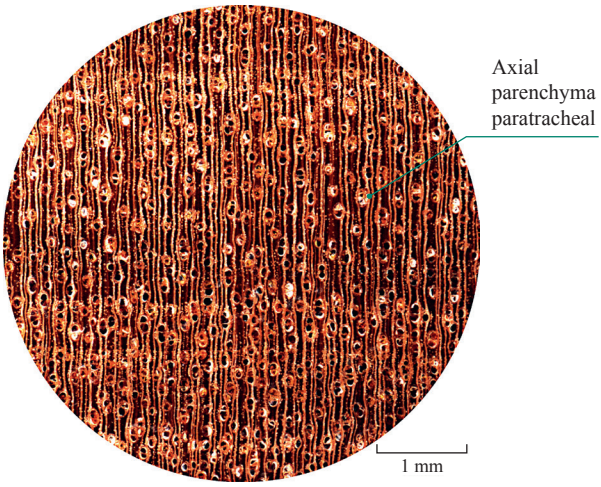


Guibourtia demeusei Transverse section of wood

Colophospermum mopane



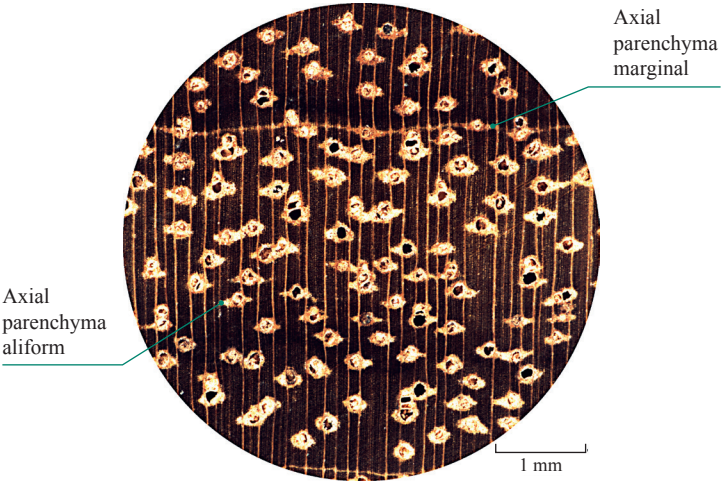
Colophospermum mopane Longitudinal surface of wood



Colophospermum mopane Transverse section of wood

Guibourtia ehie

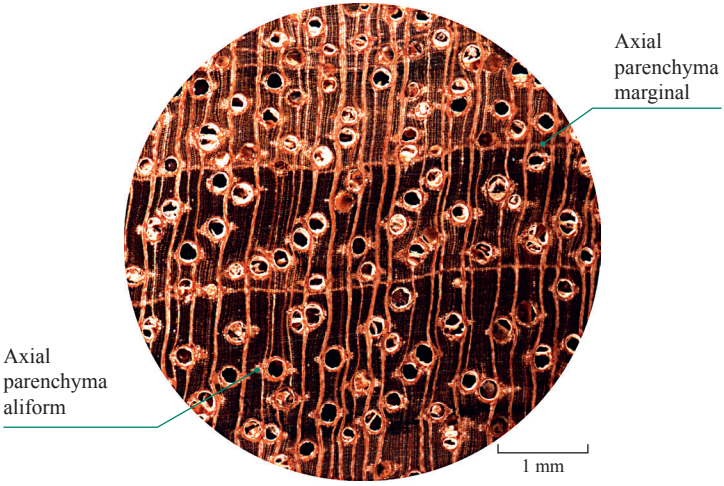
Guibourtia ehie Longitudinal surface of wood



Guibourtia ehie Transverse section of wood

Guibourtia pellegriniana

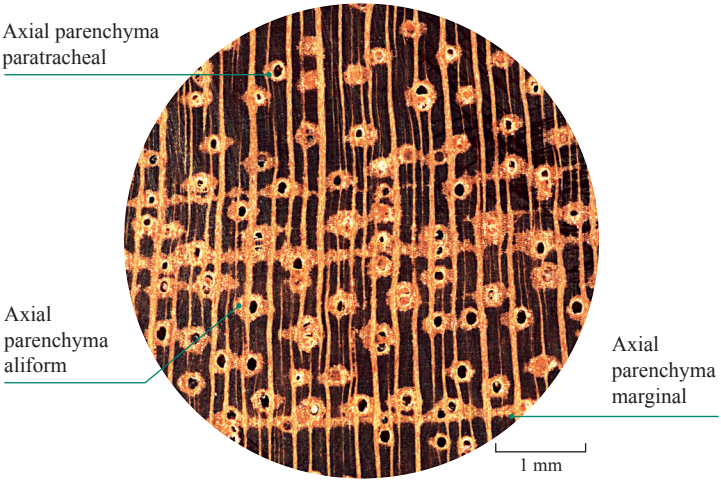
Guibourtia pellegriniana Longitudinal surface of wood



Guibourtia pellegriniana Transverse section of wood

Hymenaea courbaril

Hymenaea courbaril Longitudinal surface of wood



Hymenaea courbaril Transverse section of wood

Guibourtia tessmannii

Bubinga

Taxonomy

Guibourtia (genus), Leguminosae (family)

Geographic distribution

Cameroon, Equatorial Guinea, Gabon, D. R. Congo, etc.

Morphological characteristics of trees

Trees, trunk straight, range from 16 to 20 m in height, 0.8 to 1.5 m in diameter at breast height (DBH). Generally larger roots, up to 3 m high.

Wood description

Deciduous wood. Heartwood reddish-brown, distinctly differs from sapwood, sapwood cream-colored. Lustrous, straight or slightly staggered grained, fine- and even-textured. The air-dry density is 0.87-0.91 g/cm^3.

Identification characteristics of wood

Wood diffuse-porous. Vessels visible with a hand lens, diffuse, few, slightly large. Axial parenchyma paratracheal, aliform and marginal. Rays distinct with a hand lens.

Type of wood products

Logs, sawn wood, furniture, decorative veneered plywood, instrument, living utensils, handicrafts, etc.

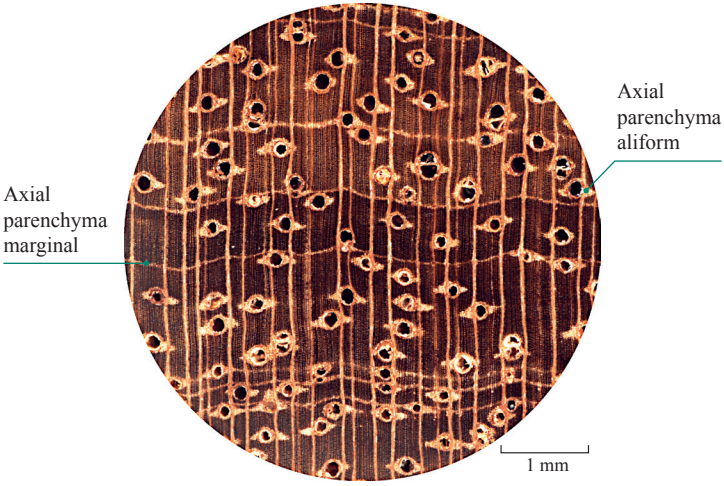
Conservation class

CITES Ⅱ (Annotation #15)

The key differences between *Guibourtia tessmannii* and its similar woods

	Wood colour	Axial parenchyma
Guibourtia tessmannii	heartwood reddish-brown; sapwood cream-colored	aliform, marginal
(1) ***Daniellia oliveri***	heartwood reddish-brown; sapwood light brown	paratracheal, banded
(2) ***Guibourtia arnoldiana***	heartwood light yellowish-brown to reddish-brown; sapwood yellowish-white	aliform, confluent and marginal
(3) ***Guibourtia coleosperma***	heartwood reddish-brown; sapwood slightly light	paratracheal, marginal and aliform
(4) ***Guibourtia conjugata***	heartwood reddish-brown; sapwood light pink-brown	banded, aliform, confluent, paratracheal and marginal
(5) ***Hymenaea courbaril***	heartwood reddish-brown; sapwood gray-white	paratracheal, marginal and aliform
(6) ***Pachyelasma tessmannii***	heartwood dark reddish-brown; sapwood slightly light	banded

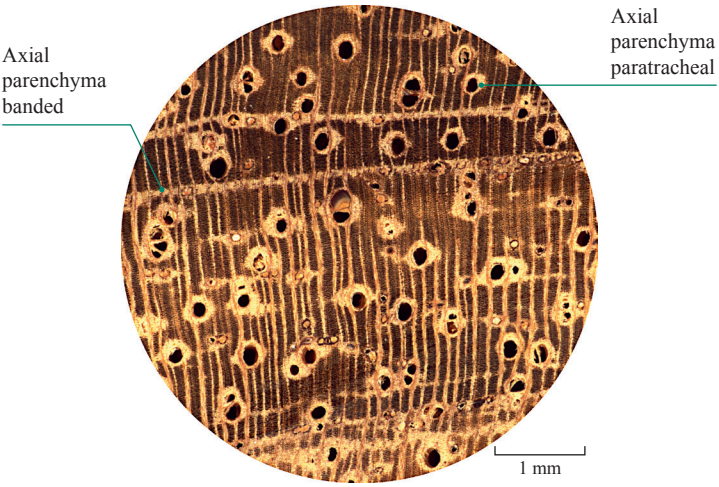
Guibourtia tessmannii Longitudinal surface of wood



Guibourtia tessmannii Transverse section of wood

Daniellia oliveri

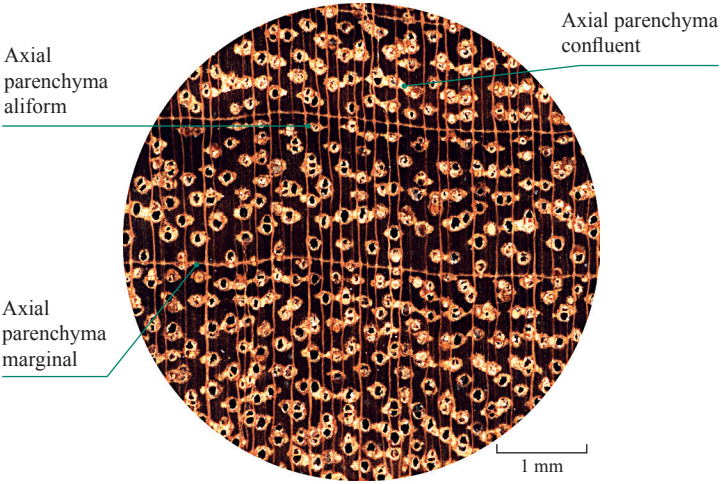
Daniellia oliveri Longitudinal surface of wood



Daniellia oliveri Transverse section of wood

Guibourtia arnoldiana

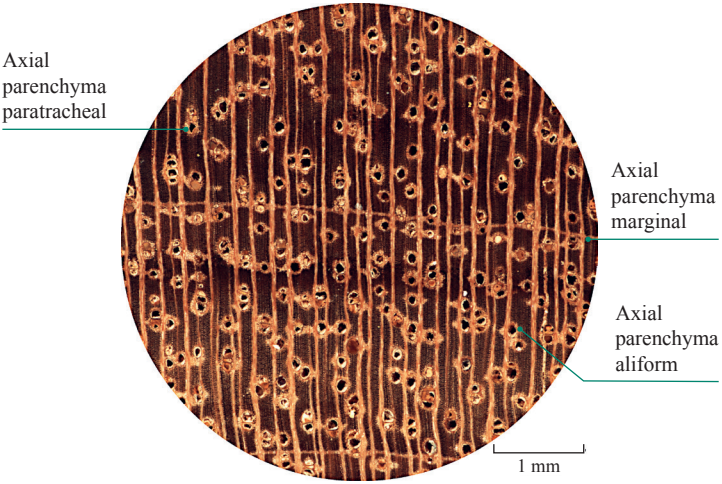
Guibourtia arnoldiana Longitudinal surface of wood



Guibourtia arnoldiana Transverse section of wood

Guibourtia coleosperma

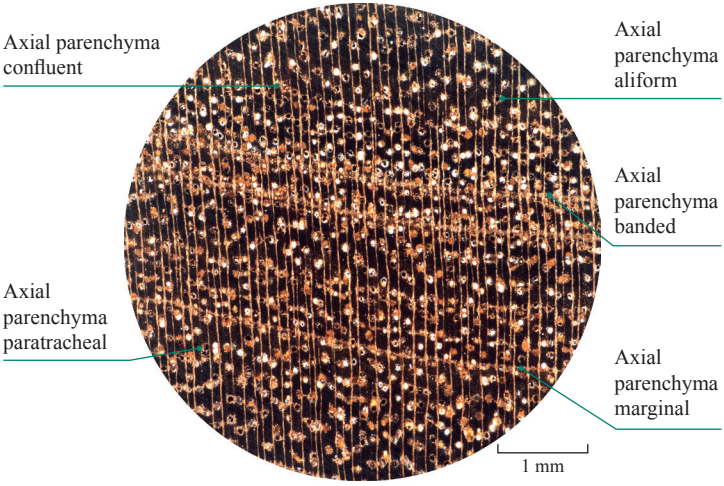
Guibourtia coleosperma Longitudinal surface of wood



Guibourtia coleosperma Transverse section of wood

Guibourtia conjugata

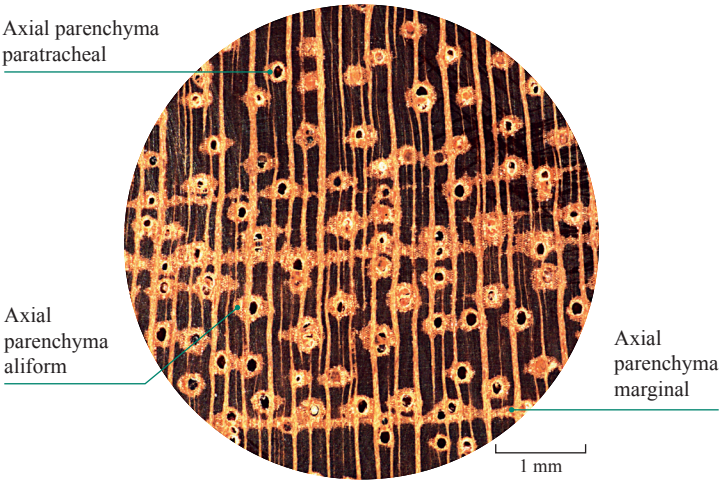
Guibourtia conjugata Longitudinal surface of wood



Guibourtia conjugata Transverse section of wood

Hymenaea courbaril

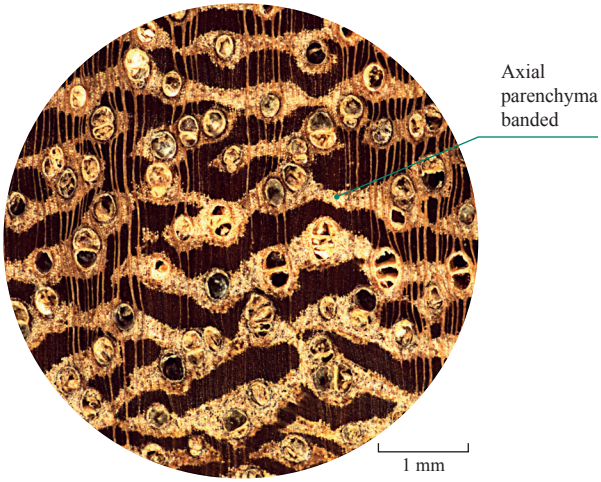
Hymenaea courbaril Longitudinal surface of wood



Hymenaea courbaril Transverse section of wood

Pachyelasma tessmannii

Pachyelasma tessmannii Longitudinal surface of wood



Pachyelasma tessmannii Transverse section of wood

Paubrasilia echinata

Brazilwood

Taxonomy

Paubrasilia (genus), Leguminosae (family)

Geographic distribution

Brazil

Morphological characteristics of trees

Trees, up to 30 m in height, 0.5 to 0.8 m in diameter at breast height (DBH).

Wood description

Deciduous wood. Sapwood light yellow or nearly white; heartwood ranging in colour from orange to reddish-brown when first exposed, darkening with age; lustrous, straight- or interlocked-grained, extremely fine- and even-textured. The air-dry density is greater than 1.0 g/cm^3.

Identification characteristics of wood

Wood diffuse-porous. Growth rings slightly distinct. Vessels slightly distinct with a hand lens, diffuse, slightly few, and very small. Axial parenchyma marginal and paratracheal, distinct with a hand lens. Rays distinct with a hand lens, slightly few, very fine. Storied rays slightly visible. Intercellular canals invisible.

Type of wood products

Musical instrument parts, furniture, etc.

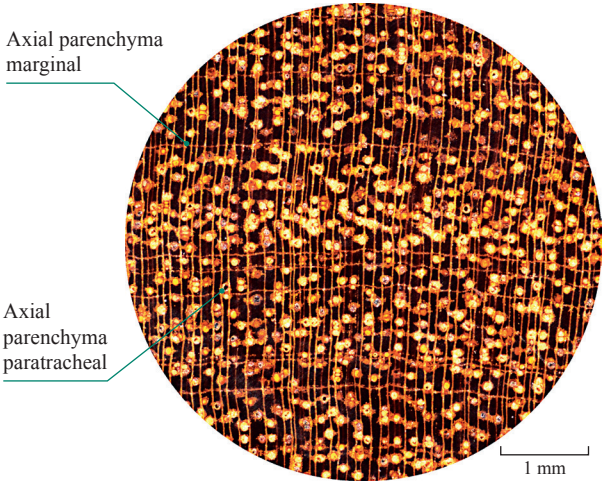
Conservation class

CITES Ⅱ (Annotation #10)

The key differences between *Paubrasilia echinata* and its similar woods

	Wood colour	Vessels	Axial parenchyma
Paubrasilia echinata	heartwood ranging in colour from orange to reddish-brown	very small	marginal, paratracheal
(1) *Baikiaea plurijuga*	heartwood dark red	very small	paratracheal, confluent and banded
(2) *Cynometra malaccensis*	heartwood brown	very large	aliform, confluent and banded
(3) *Libidibia punctata*	heartwood chocolate brown or nearly black	slightly small	banded, aliform and confluent

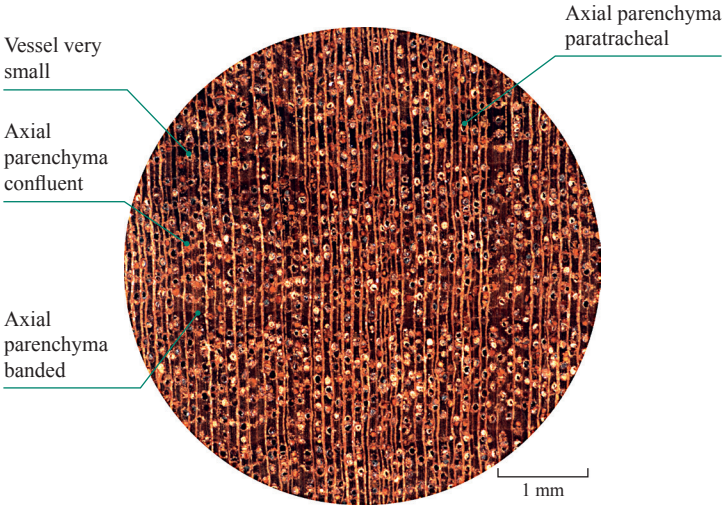
Paubrasilia echinata Longitudinal surface of wood



Paubrasilia echinata Transverse section of wood

Baikiaea plurijuga

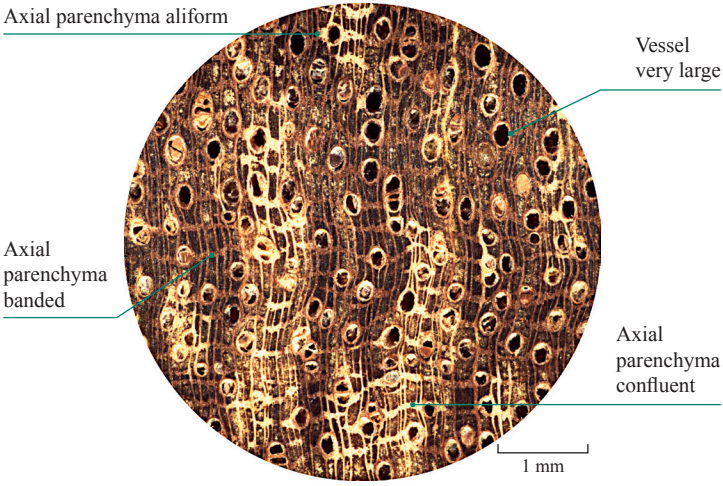
Baikiaea plurijuga Longitudinal surface of wood



Baikiaea plurijuga Transverse section of wood

Cynometra malaccensis

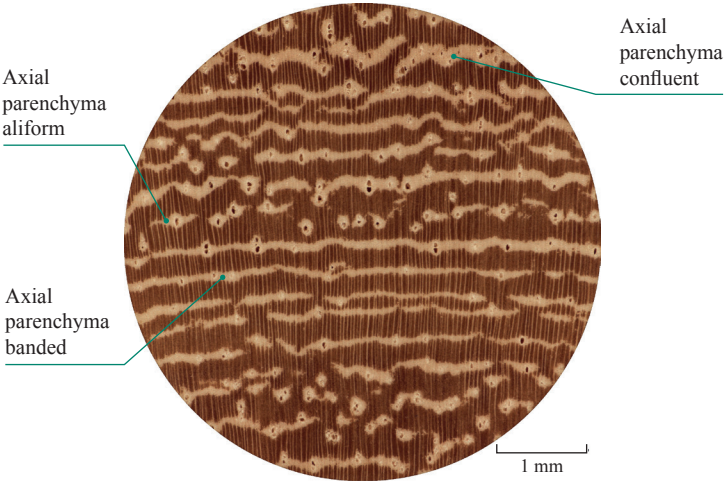
Cynometra malaccensis Longitudinal surface of wood



Cynometra malaccensis Transverse section of wood

Libidibia punctata

Libidibia punctata Longitudinal surface of wood



Libidibia punctata Transverse section of wood

Pericopsis elata

African teak

Taxonomy

Pericopsis (genus), Leguminosae (family)

Geographic distribution

Cameroon, Congo, D.R. Congo, Cote d'Ivoire, Ghana and Nigeria

Morphological characteristics of trees

Trees, up to 45 m in height, 1.5 m in diameter at breast height (DBH).

Wood description

Deciduous wood. Heartwood ranging in colour from yellowish-brown to dark brown with black-brown streaks, distinctly differs from sapwood. Lustrous, moderately heavy to heavy, moderately hard, slightly diagonal- or interlocked-grained, extremely fine- and even-textured. The air-dry density is about 0.69 g/cm^3.

Identification characteristics of wood

Wood diffuse-porous. Vessels solitary and in radial multiples, slightly large, numerous, visible with the naked eye, distinct with a hand lens. Axial parenchyma paratracheal, aliform, confluent and marginal. Rays slightly storied, medium-sized.

Type of wood products

Logs, sawn wood, furniture, floor, decorative veneer, etc.

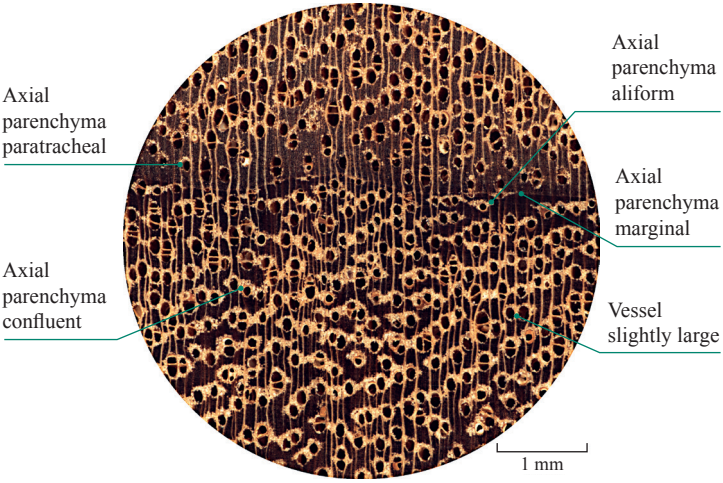
Conservation class

CITES Ⅱ (Annotation #17)

The key differences between *Pericopsis elata* and its similar woods

	Wood colour	Porosity	Axial parenchyma
Pericopsis elata	heartwood ranging in colour from yellowish-brown to dark-brown	wood diffuse-porous, vessels slightly large	paratracheal, aliform, confluent and marginal
(1) *Baikiaea plurijuga*	heartwood dark-red	wood diffuse-porous, vessels very small	paratracheal, confluent and banded
(2) *Milicia excelsa*	heartwood dark-brown	wood diffuse-porous, vessels large	aliform, confluent and banded
(3) *Pericopsis angolensis*	heartwood light dark-brown, with dark streaks	wood diffuse-porous, vessels slightly large	aliform, confluent and banded
(4) *Tectona grandis*	heartwood dark yellowish-brown, with dark streaks	wood ring porous, earlywood vessels large	paratracheal, marginal

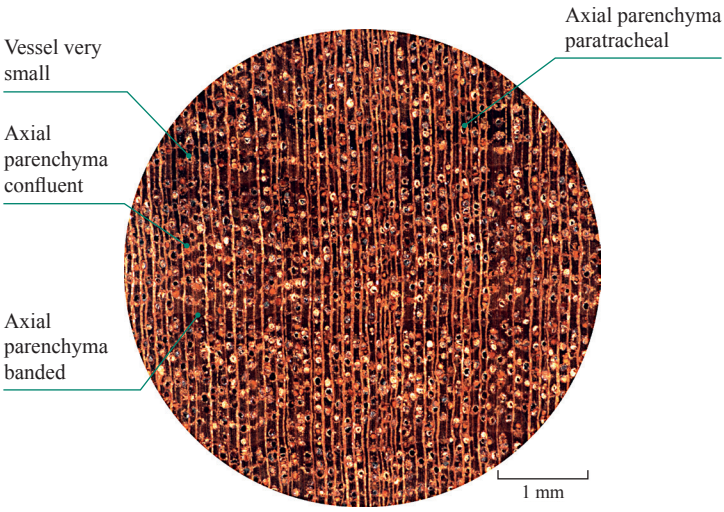
Pericopsis elata Longitudinal surface of wood



Pericopsis elata Transverse section of wood

Baikiaea plurijuga

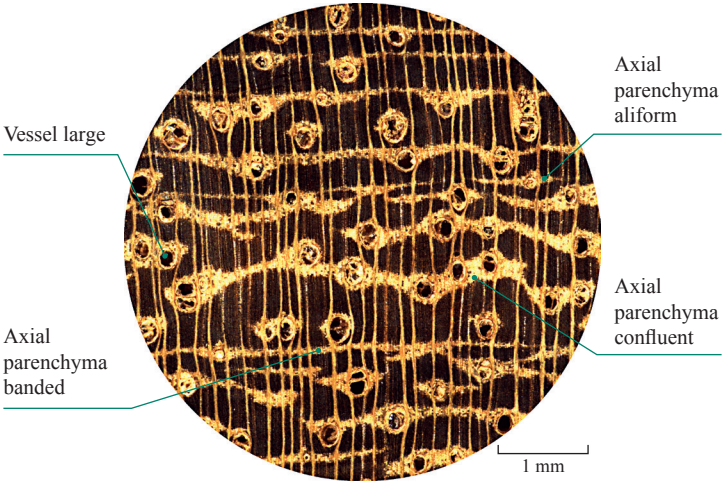
Baikiaea plurijuga Longitudinal surface of wood



Baikiaea plurijuga Transverse section of wood

Milicia excelsa

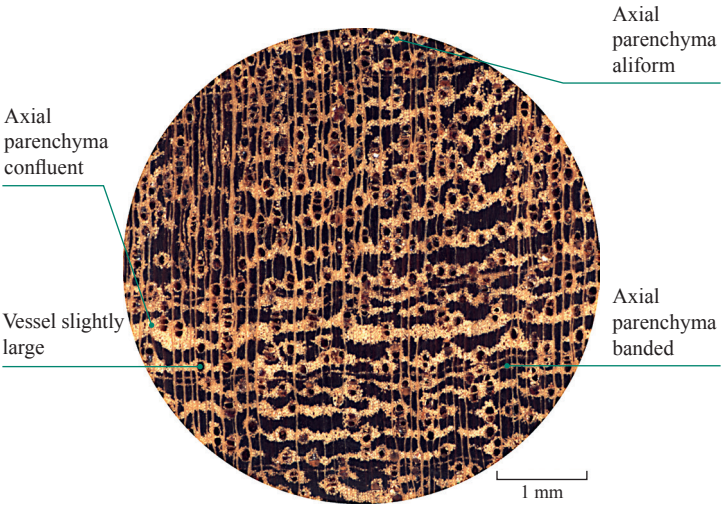
Milicia excelsa Longitudinal surface of wood



Milicia excelsa Transverse section of wood

Pericopsis angolensis

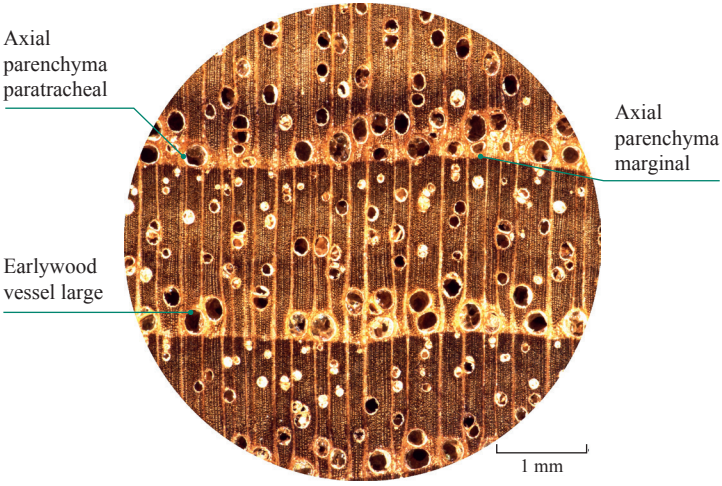
Pericopsis angolensis Longitudinal surface of wood



Pericopsis angolensis Transverse section of wood

Tectona grandis

Tectona grandis Longitudinal surface of wood



Tectona grandis Transverse section of wood

Pterocarpus erinaceus

Ambila

Taxonomy

Pterocarpus (genus), Leguminosae (family)

Geographic distribution

Tropical African countries such as Senegal, Guinea-Bissau, etc.

Morphological characteristics of trees

Trees, up to 30 m in height, 0.6 to 0.9 m in diameter at breast height (DBH).

Wood description

Deciduous wood. Sapwood grey; heartwood ranging in colour from reddish-brown to claret purple or yellowish-brown with black streaks; in water, heartwood fluorescent in yellowish-green to light blue. Without characteristic odour or with slightly acid and unpleasant odour, without characteristic taste, interlocked-grained, fine-textured. The air-dry density is about 0.85 g/cm^3.

Identification characteristics of wood

Wood diffuse-porous, semi-ring-porous trend distinct. Growth rings slightly distinct or distinct. Vessels visible with the naked eye, very few to slightly few. Axial parenchyma distinct or visible with a hand lens, confluent and banded. Rays distinct with a hand lens. Storied rays visible.

Type of wood products

Logs, sawn wood, furniture, musical instrument parts, handicrafts, etc.

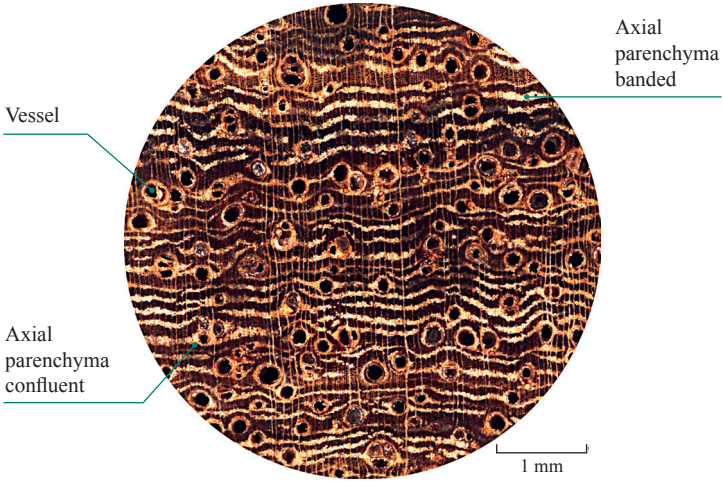
Conservation class

CITES Ⅱ

The key differences between *Pterocarpus erinaceus* and its similar woods

	Wood colour	Axial parenchyma	Air-dried density (g/cm^3)
Pterocarpus erinaceus	heartwood ranging in colour from reddish-brown to claret purple or yellowish-brown with black streaks	banded, confluent	approx. 0.85
(1) ***Afzelia africana***	heartwood light reddish-brown	lozenge aliform, confluent and marginal	approx. 0.80
(2) ***Dialium excelsum***	heartwood dark brown	banded	0.91-1.01
(3) ***Pterocarpus angolensis***	heartwood light yellowish-brown with dark streaks	banded, aliform and confluent	0.51-0.72
(4) ***Pterocarpus indicus***	heartwood ranging in colour from golden to dark reddish-brown with dark streaks	banded, aliform	0.53-0.94

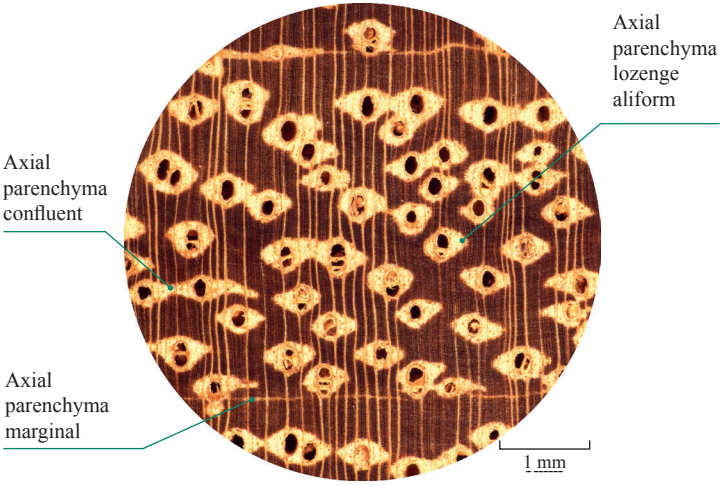
Pterocarpus erinaceus Longitudinal surface of wood



Pterocarpus erinaceus Transverse section of wood

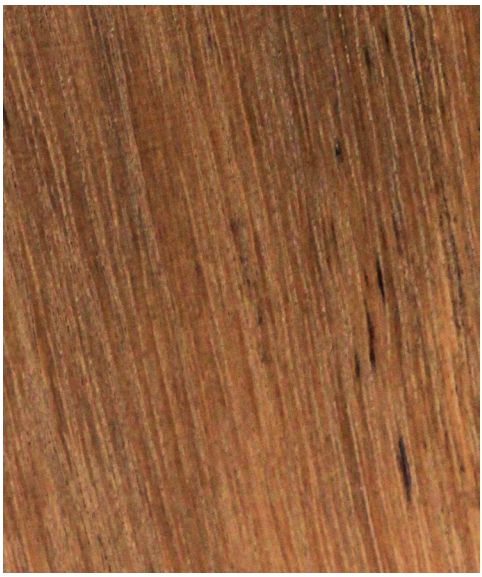
Afzelia africana

Afzelia africana Longitudinal surface of wood

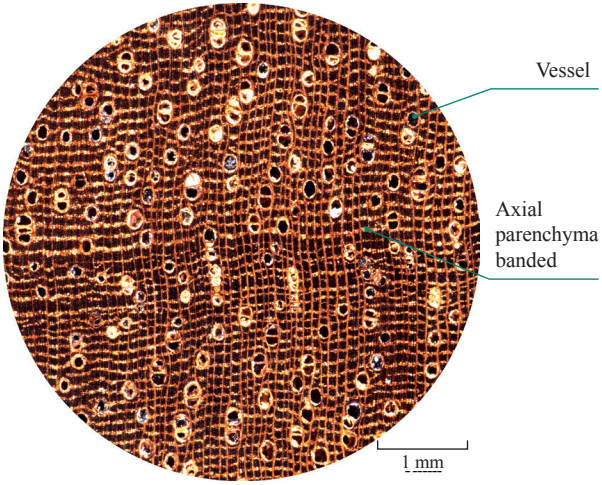


Afzelia africana Transverse section of wood

Dialium excelsum



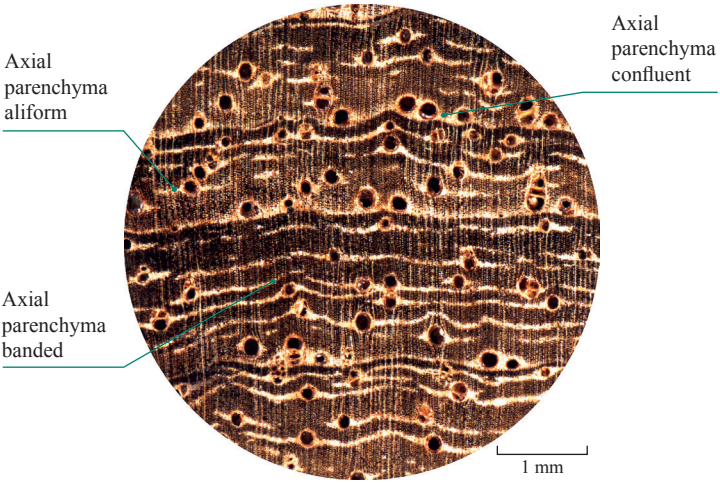
Dialium excelsum Longitudinal surface of wood



Dialium excelsum Transverse section of wood

Pterocarpus angolensis

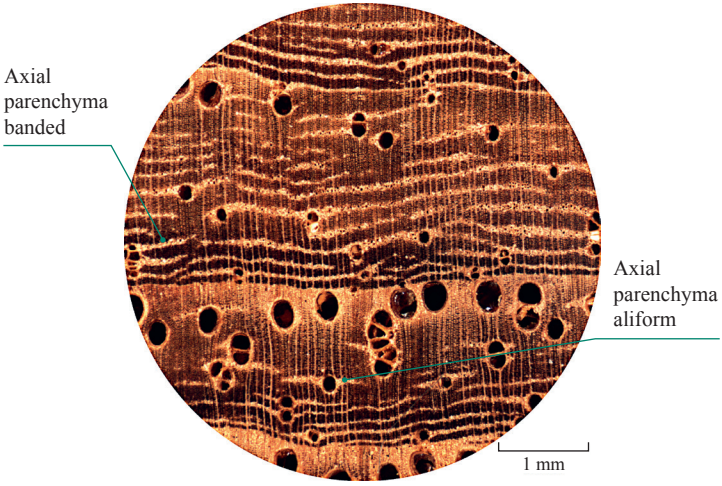
Pterocarpus angolensis Longitudinal surface of wood



Pterocarpus angolensis Transverse section of wood

Pterocarpus indicus

Pterocarpus indicus Longitudinal surface of wood



Pterocarpus indicus Transverse section of wood

Pterocarpus santalinus

Red sanders

Taxonomy

Pterocarpus (genus), Leguminosae (family)

Geographic distribution

India

Morphological characteristics of trees

Trees, range from 8 to 11 m in height, up to 0.4 m in diameter at breast height (DBH). Bark gray to black-brown, block crack.

Wood description

Deciduous wood. Sapwood white; heartwood orange-red when first exposed, turning to claret-purple with light and dark streaks, purplish-black, or almost black; in water, heartwood fluorescent in yellowish-green to light blue; without characteristic odour or with slightly fragrant odour, without characteristic taste, very heavy, interlocked-grained in narrow straight lines, fine-textured. The air-dry density is 1.05-1.26 g/cm^3.

Identification characteristics of wood

Wood diffuse-porous. Growth rings indistinct. Axial parenchyma distinct with a hand lens, in discontinuous tangential bands, aliform and paratracheal. Fibres thick-walled, filled with reddish-brown gums and santalin. Rays visible with a hand lens.

Type of wood products

Logs, sawn wood, furniture, handicrafts, etc.

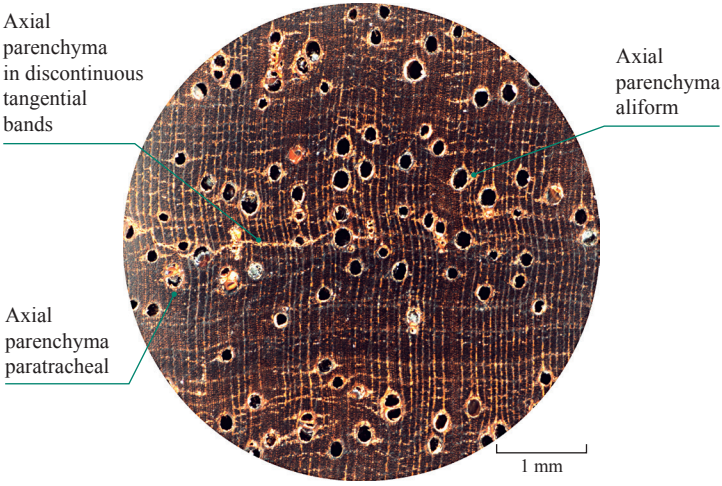
Conservation class

CITES Ⅱ (Annotation #7)

The key differences between *Pterocarpus santalinus* and its similar woods

	Fluorescence	Axial parenchyma
Pterocarpus santalinus	in water, heartwood fluorescent in yellowish-green to light blue	in discontinuous tangential bands, aliform and paratracheal
(1) *Baphia nitida*	none	banded
(2) *Dalbergia louvelii*	none	banded
(3) *Gluta renghas*	none	marginal, banded and paratracheal
(4) *Pterocarpus tinctorius*	in water, heartwood fluorescent weak, visible under ultraviolet light	banded, aliform

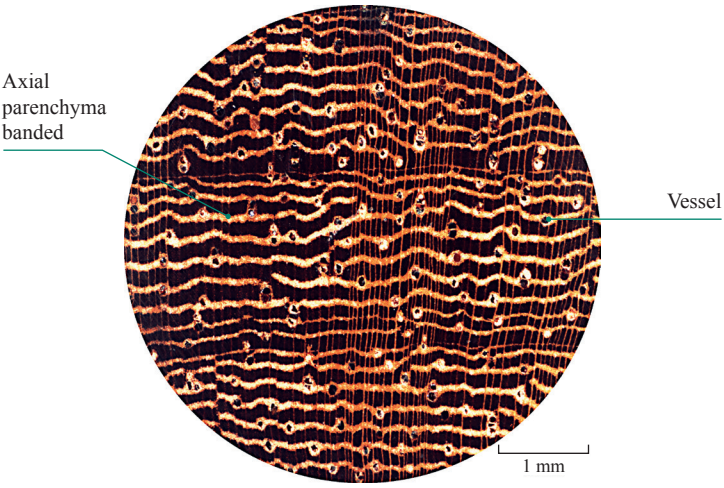
Pterocarpus santalinus Longitudinal surface of wood



Pterocarpus santalinus Transverse section of wood

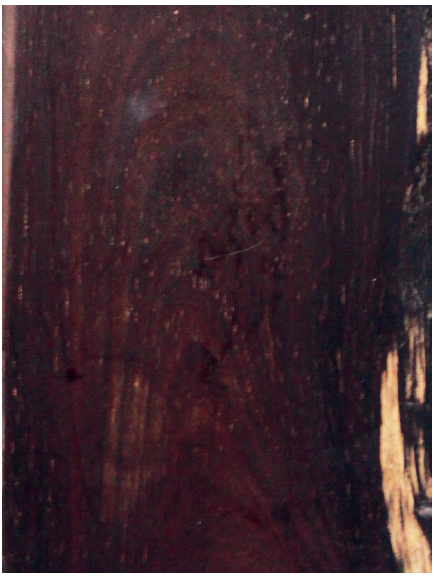
Baphia nitida

Baphia nitida Longitudinal surface of wood

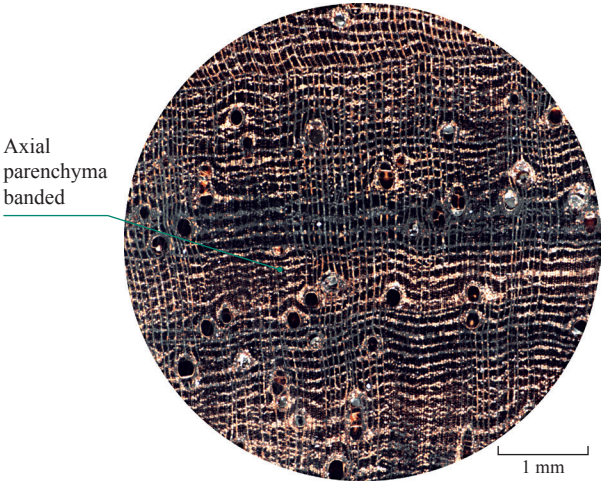


Baphia nitida Transverse section of wood

Dalbergia louvelii



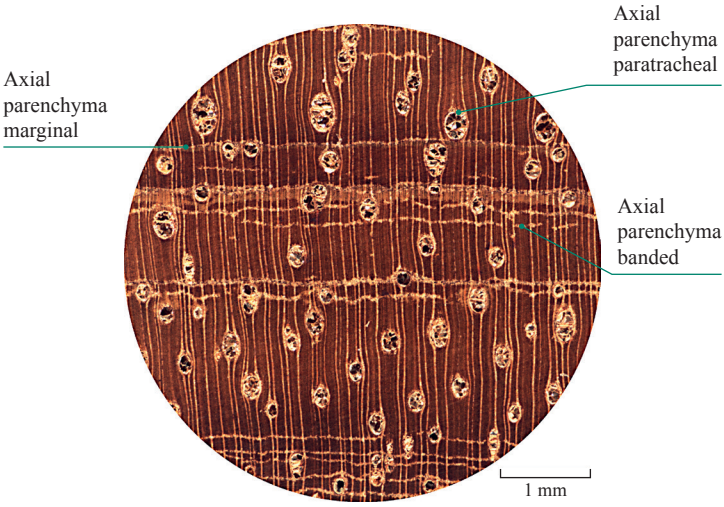
Dalbergia louvelii Longitudinal surface of wood



Dalbergia louvelii Transverse section of wood

Gluta renghas

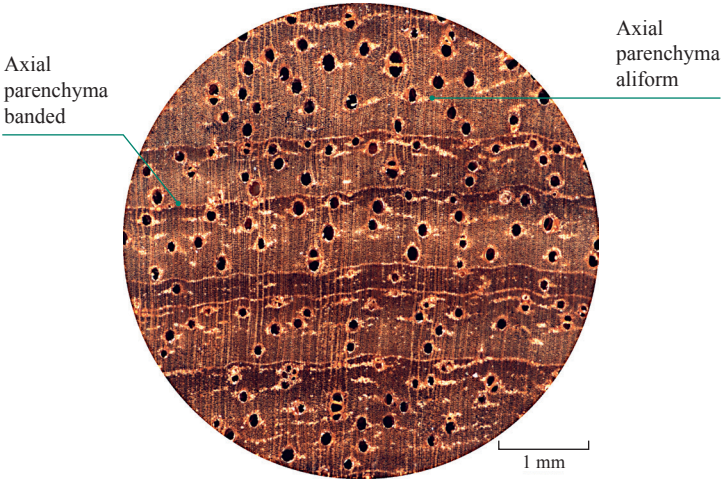
Gluta renghas Longitudinal surface of wood



Gluta renghas Transverse section of wood

Pterocarpus tinctorius

Pterocarpus tinctorius Longitudinal surface of wood



Pterocarpus tinctorius Transverse section of wood

Pterocarpus tinctorius

Mukula, Mukurungu

Taxonomy

Pterocarpus (genus), Leguminosae (family)

Geographic distribution

D.R. Congo, Tanzania, Angola, Zambia, Malawi, Mozambique, etc.

Morphological characteristics of trees

Trees, up to 25 m in height, 0.7 m in diameter at breast height (DBH). Bark taupe.

Wood description

Deciduous wood. Sapwood yellow white, heartwood reddish-brown, with dark streaks. Very heavy, straight-grained, and fine-textured. The air-dry density is 0.70-1.08 g/cm^3.

Identification characteristics of wood

Wood diffuse-porous. Growth rings indistinct. Axial parenchyma distinct with a hand lens, banded, aliform. Fibres thick-walled, filled with reddish-brown gums. Rays visible with a hand lens. In water, heartwood fluorescent weak, visible under ultraviolet light.

Type of wood products

Logs, sawn wood, furniture, handicrafts, etc.

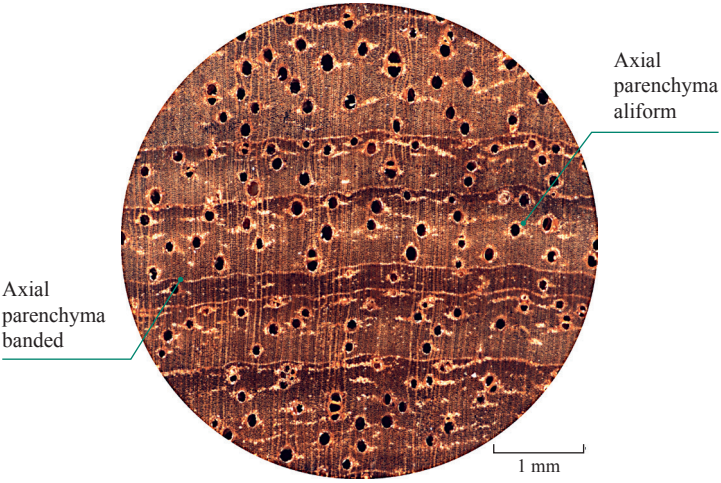
Conservation class

CITES Ⅱ (Annotation #6)

The key differences between *Pterocarpus tinctorius* and its similar woods

	Fluorescence	Axial parenchyma
Pterocarpus tinctorius	in water, heartwood fluorescent weak, visible under ultraviolet light	banded, aliform
(1) *Baikiaea plurijuga*	none	paratracheal, aliform and banded
(2) *Baphia nitida*	none	banded
(3) *Dalbergia louvelii*	none	banded
(4) *Pterocarpus santalinus*	in water, heartwood fluorescent in yellowish-green to light blue	in discontinuous tangential bands, aliform and paratracheal

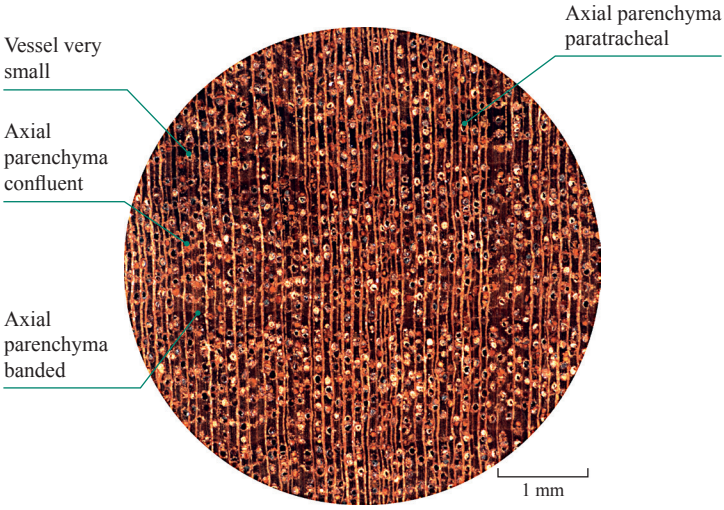
Pterocarpus tinctorius Longitudinal surface of wood



Pterocarpus tinctorius Transverse section of wood

Baikiaea plurijuga

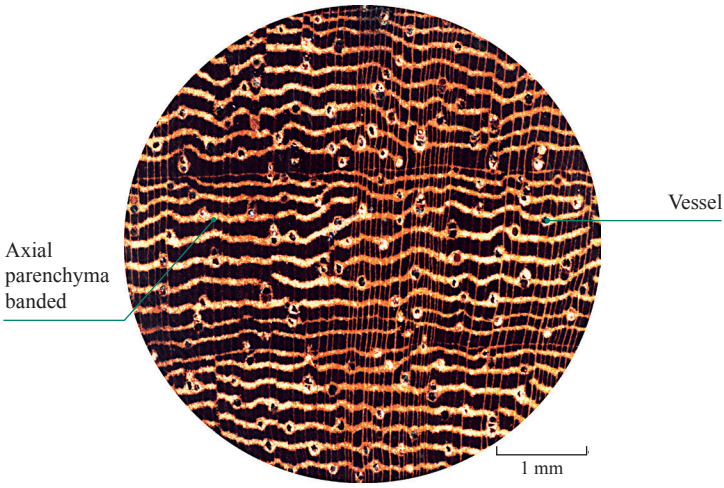
Baikiaea plurijuga Longitudinal surface of wood



Baikiaea plurijuga Transverse section of wood

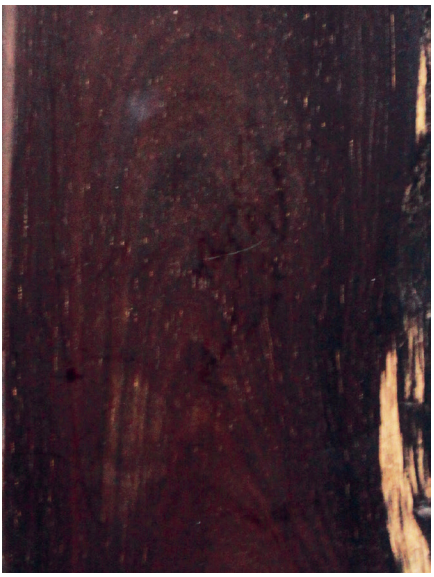
Baphia nitida

Baphia nitida Longitudinal surface of wood

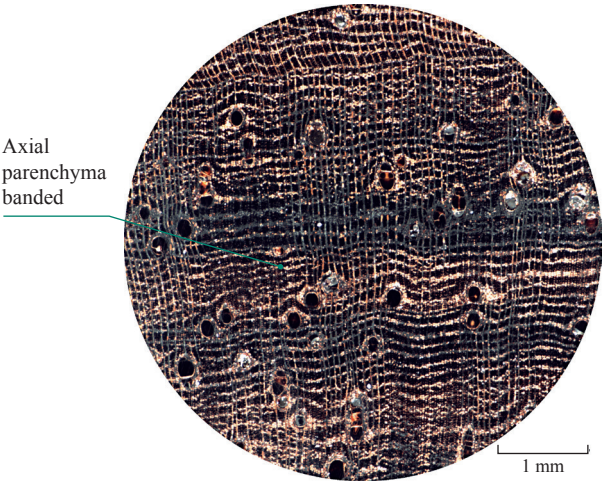


Baphia nitida Transverse section of wood

Dalbergia louvelii



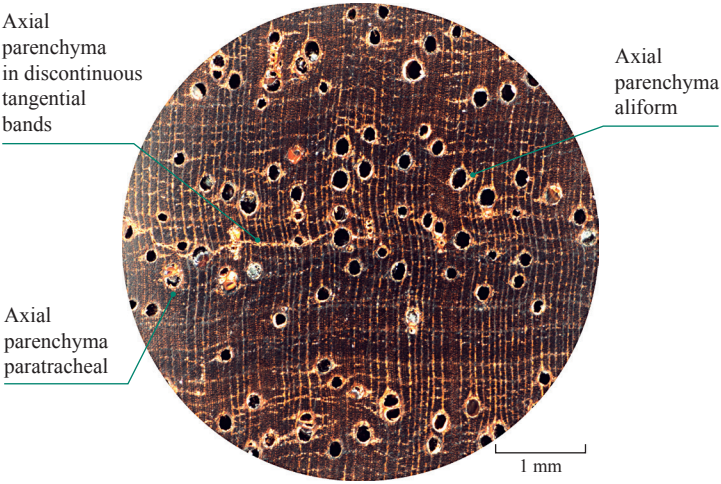
Dalbergia louvelii Longitudinal surface of wood



Dalbergia louvelii Transverse section of wood

Pterocarpus santalinus

Pterocarpus santalinus Longitudinal surface of wood



Pterocarpus santalinus Transverse section of wood

Quercus mongolica

Mongolian oak

Taxonomy

Quercus (genus), Fagaceae (family)

Geographic distribution

Northeast China, Russia, Mongolia, D.P.R. Korea, Japan, etc.

Morphological characteristics of trees

Trees, up to 30 m in height, 1 m in diameter at breast height (DBH).

Wood description

Deciduous wood. Sapwood light yellowish-brown; heartwood yellowish-brown or light chestnut brown. Lustrous, without characteristic odour or taste, straight- to more or less irregular-grained, medium fine- but uneven-textured. The air-dry density is 0.77-0.83 g/cm^3.

Identification characteristics of wood

Wood ring-porous. Growth rings distinct. Earlywood vessels slightly large, slightly distinct with the naked eyes, continuous arrangement forming a distinct earlywood zone, 1-2 (few 3) vessels wide. Thylose in the heartwood abundant. Transition from earlywood to latewood abrupt. Latewood vessels extremely small, invisible or slightly distinct with a hand lens, in dendritic radial pattern and tangential multiples. Axial parenchyma numerous, narrow banded, distinct with a hand lens. Rays slightly close. Storied rays and intercellular canals absent.

Type of wood products

Logs, sawn wood, furniture, etc.

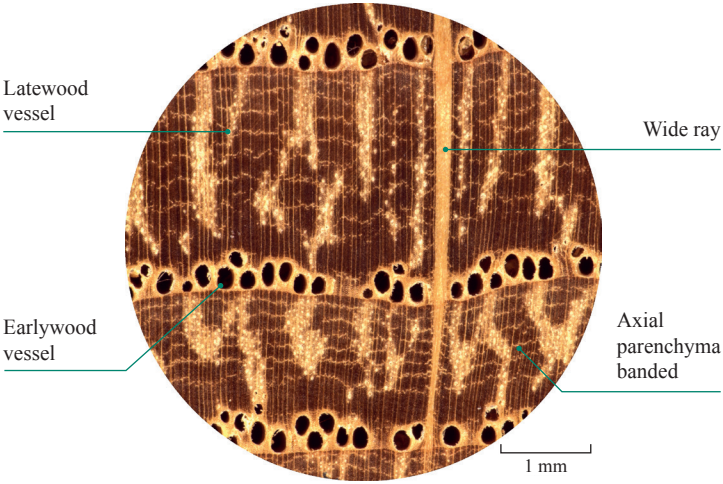
Conservation class

CITES Ⅲ (Populations of Russian Federation, Annotation #5)

The key differences between *Quercus mongolica* and its similar woods

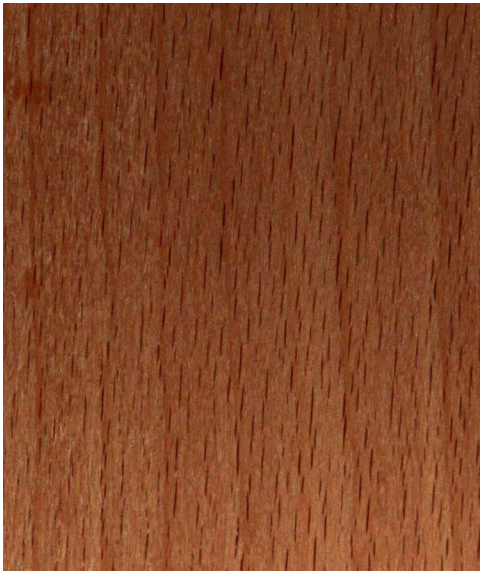
	Wood color	Vessel arrangement	Axial parenchyma	Wide rays commonly> 10-seriate	Air-dried density (g/cm^3)
Quercus mongolica	sapwood light yellowish-brown; heartwood yellowish-brown or light chestnut brown	earlywood vessels continuous arrangement forming a distinct earlywood zone, latewood vessels in dendritic radial pattern	banded	exist	0.77-0.83
(1) ***Fagus grandifolia***	heartwood yellowish-brown or light brown	very abundant and small vessels, diffuse in arrangement	marginal, paratracheal	none	0.50-0.85
(2) ***Fraxinus chinensis***	heartwood yellowish-brown or light brown	earlywood vessels continuous arrangement forming a distinct earlywood zone, latewood vessels diffuse or in diagonal pattern	marginal, banded and aliform	none	approx. 0.66
(3) ***Fraxinus mandshurica***	sapwood yellow-white or light yellowish-brown; heartwood greyish-brown or light chestnut brown	earlywood vessels continuous arrangement forming a distinct earlywood zone, latewood vessels diffuse or in short diagonal pattern	paratracheal, marginal	none	0.64-0.69
(4) ***Quercus acutissima***	sapwood dark yellowish-brown or grayish-yellowish-brown; heartwood light reddish-brown	earlywood vessels continuous arrangement forming a distinct earlywood zone, latewood vessels in radial pattern	banded	exist	0.92-0.93

Quercus mongolica Longitudinal surface of wood

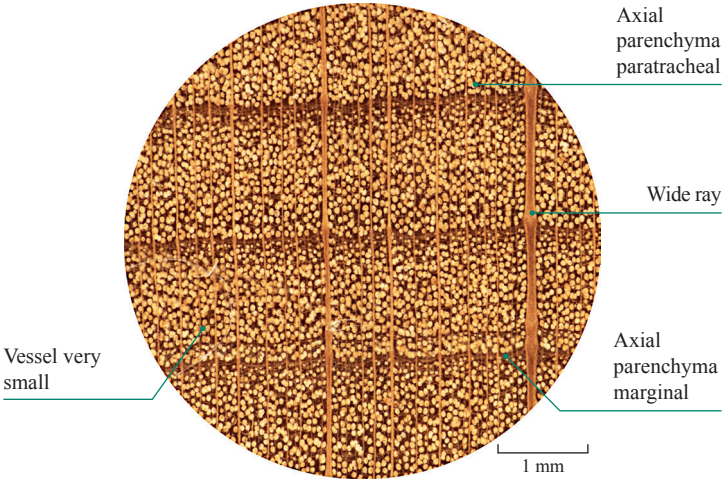


Quercus mongolica Transverse section of wood

Fagus grandifolia



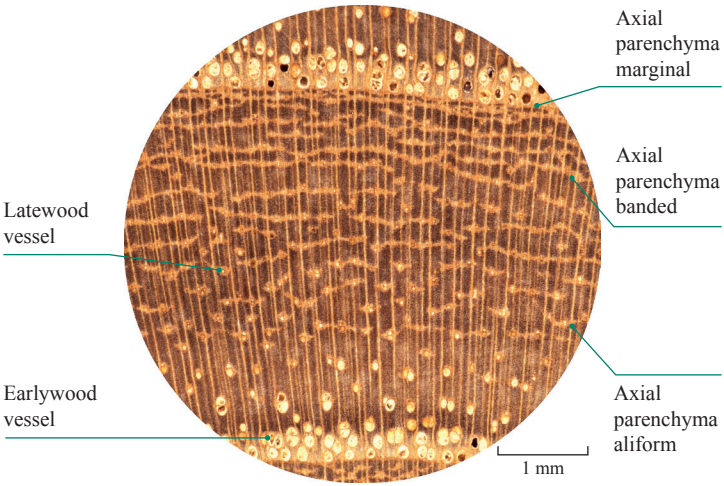
Fagus grandifolia Longitudinal surface of wood



Fagus grandifolia Transverse section of wood

Fraxinus chinensis

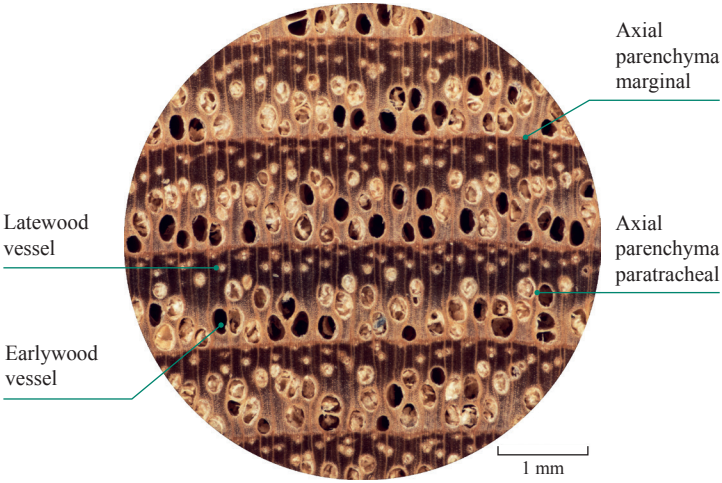
Fraxinus chinensis Longitudinal surface of wood



Fraxinus chinensis Transverse section of wood

Fraxinus mandshurica

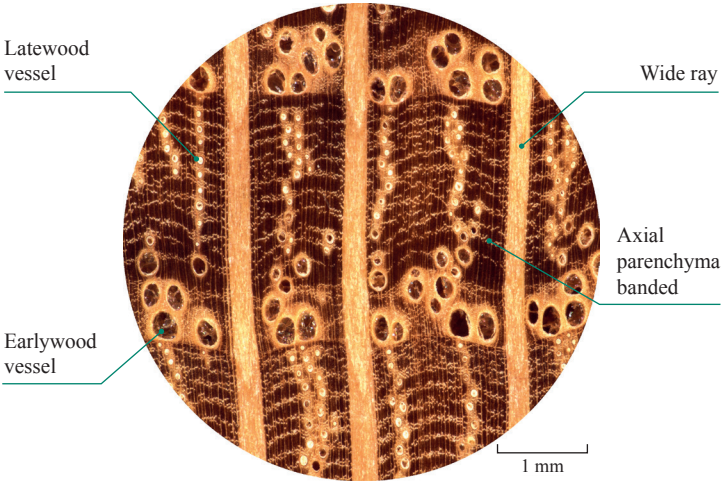
Fraxinus mandshurica Longitudinal surface of wood



Fraxinus mandshurica Transverse section of wood

Quercus acutissima

Quercus acutissima Longitudinal surface of wood



Quercus acutissima Transverse section of wood

Swietenia macrophylla

American mahogany

Taxonomy

Swietenia (genus), Meliaceae (family)

Geographic distribution

Latin American countries such as Mexico, Columbia, Peru, Venezuela, Bolivia, Brazil, etc.

Morphological characteristics of trees

Trees, range from 46 to 60 m in height, 1 to 2 m in diameter at breast height (DBH).

Wood description

Deciduous wood. Heartwood brown to reddish-brown, sapwood slightly light; vessels open or plugged with red or black inclusions. Lustrous, moderately heavy, straight- or slightly diagonal-grained, even- and fine-textured. The air-dry density is about 0.59 g/cm^3.

Identification characteristics of wood

Wood diffuse-porous. Vessels visible with the naked eye, solitary & radial multiple of 2 pores distinct with a hand lens, diffuse, few, slightly large. Axial parenchyma marginal and paratracheal. Rays distinct with a hand lens, slightly close, fine.

Type of wood products

Logs, sawn wood, furniture, musical instrument parts, handicrafts, etc.

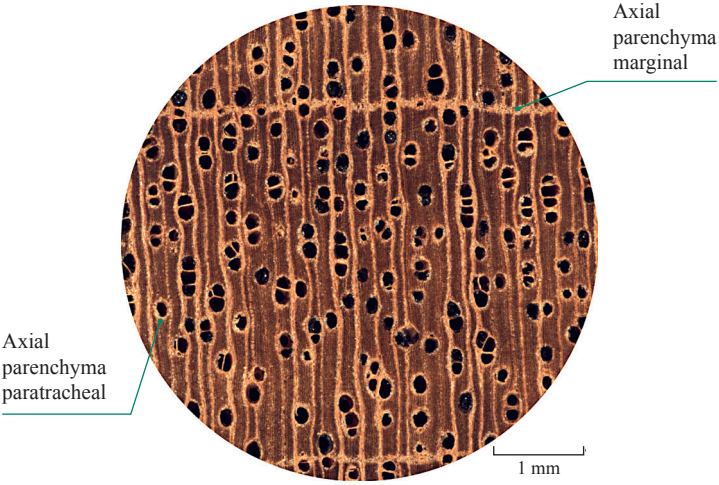
Conservation class

CITES Ⅱ (Populations of the Neotropics, Annotation #6)

The key differences between *Swietenia macrophylla* and its similar woods

	Wood colour	Axial parenchyma
Swietenia macrophylla	heartwood brown to reddish-brown, sapwood slightly light	marginal, paratracheal
(1) ***Carapa guianensis***	heartwood light reddish-brown, sapwood yellowish-white	banded, paratracheal
(2) ***Cedrela odorata***	heartwood brown or light brown, sapwood slightly light	marginal, paratracheal
(3) ***Entandrophragma angolense***	Heartwood reddish-brown, sapwood light	banded, paratracheal
(4) ***Guarea grandifolia***	heartwood reddish-brown, sapwood light	banded, paratracheal, aliform and confluent
(5) ***Khaya anthotheca***	heartwood light reddish-brown, sapwood yellowish-white	paratracheal

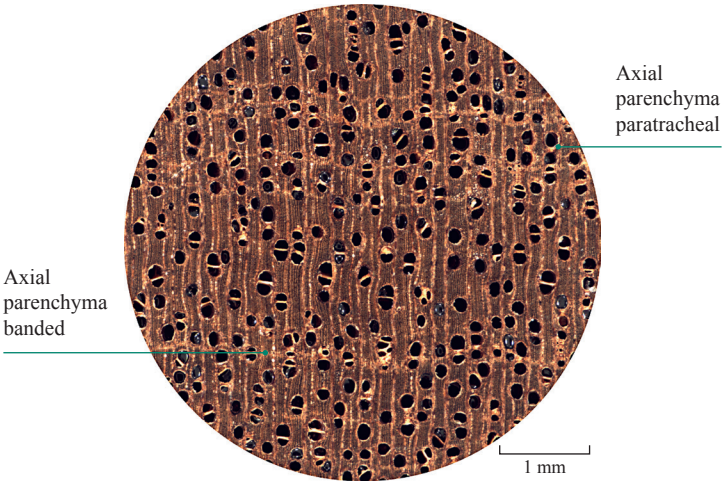
Swietenia macrophylla Longitudinal surface of wood



Swietenia macrophylla Transverse section of wood

Carapa guianensis

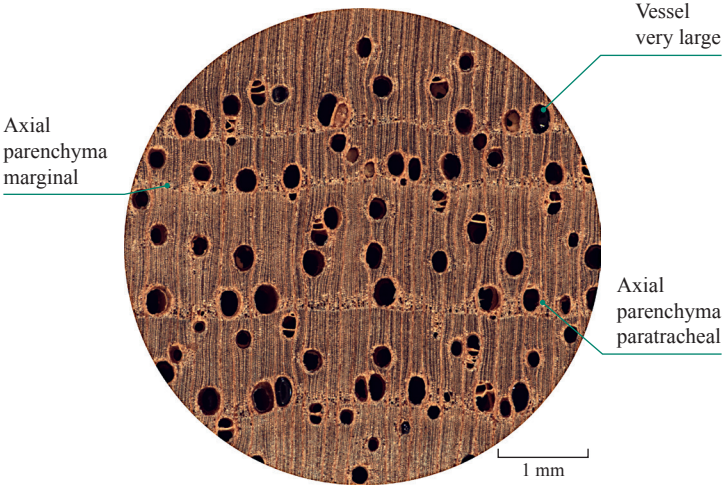
Carapa guianensis Longitudinal surface of wood



Carapa guianensis Transverse section of wood

Cedrela odorata

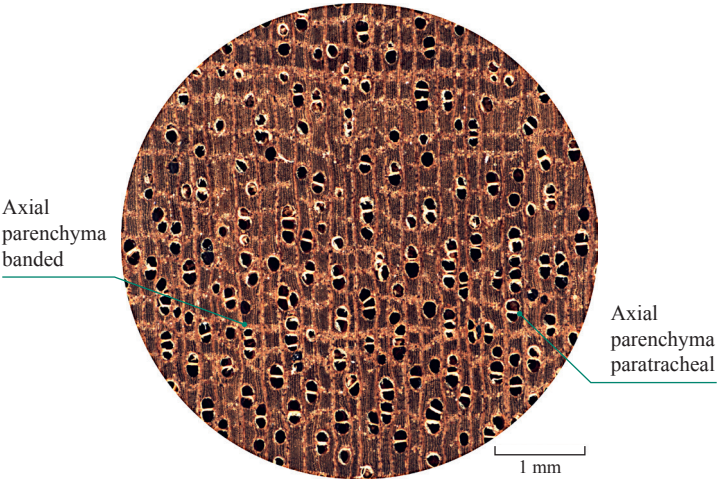
Cedrela odorata Longitudinal surface of wood



Cedrela odorata Transverse section of wood

Entandrophragma angolense

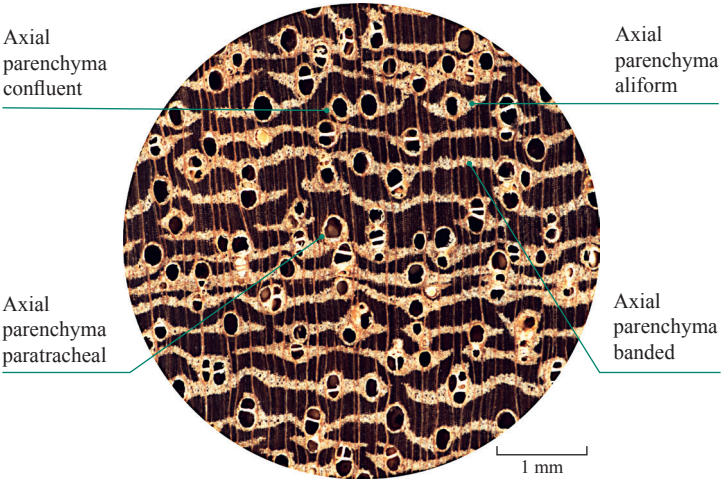
Entandrophragma angolense Longitudinal surface of wood



Entandrophragma angolense Transverse section of wood

Guarea grandifolia

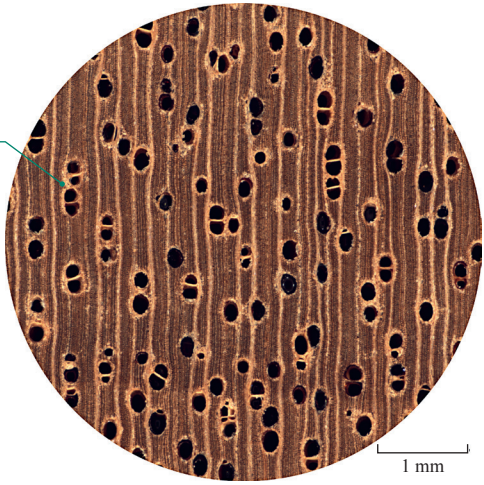
Guarea grandifolia Longitudinal surface of wood



Guarea grandifolia Transverse section of wood

Khaya anthotheca

Khaya anthotheca Longitudinal surface of wood



Khaya anthotheca Transverse section of wood

Swietenia mahagoni

Cuban mahogany

Taxonomy

Swietenia (genus), Meliaceae (family)

Geographic distribution

Latin American countries such as Cuba, Columbia, Dominican Republic, Peru, Venezuela

Morphological characteristics of trees

Trees, up to 25 m in height, 4 m in diameter at breast height (DBH).

Wood description

Deciduous wood. Heartwood reddish-brown, indistinct with sapwood; vessels plugged with red or black inclusions. Lustrous, straight- or slightly diagonal-grained, fine-textured and moderately heavy. The air-dry density is about 0.64 g/cm^3.

Identification characteristics of wood

Wood diffuse-porous. Vessels visible with the naked eye, solitary & radial multiple distinct with a hand lens, diffuse, few, slightly large. Axial parenchyma paratracheal. Rays distinct with a hand lens, slightly close.

Type of wood products

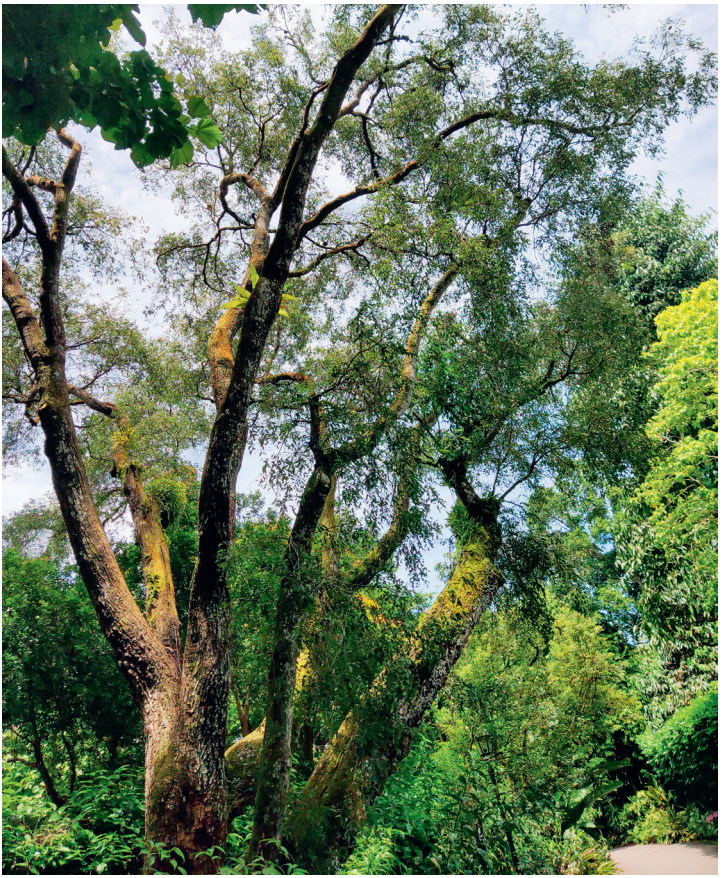
Logs, sawn wood, furniture, musical instrument parts, handicrafts, etc.

Conservation class

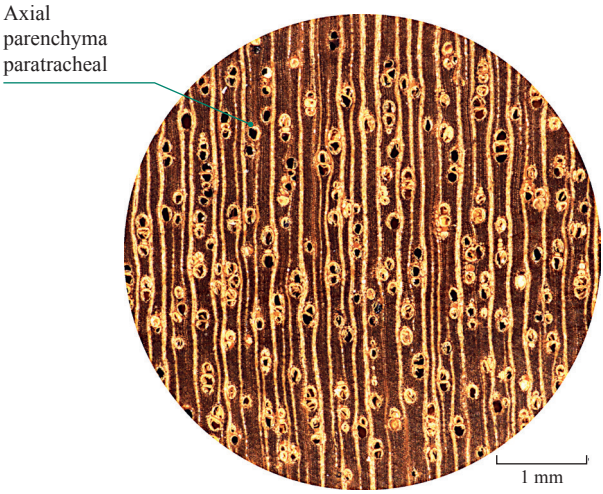
CITES Ⅱ (Annotation #5)

The key differences between *Swietenia mahagoni* and its similar woods

	Wood colour	Axial parenchyma
Swietenia mahagoni	heartwood reddish-brown	paratracheal
(1) *Cedrela fissilis*	heartwood grey-brown	paratracheal
(2) *Guarea grandifolia*	heartwood reddish-brown	banded, aliform, confluent and paratracheal
(3) *Khaya ivorensis*	heartwood brown to reddish-brown	paratracheal
(4) *Khaya senegalensis*	heartwood reddish-brown or grey-brown	banded
(5) *Swietenia humilis*	heartwood reddish-brown	marginal



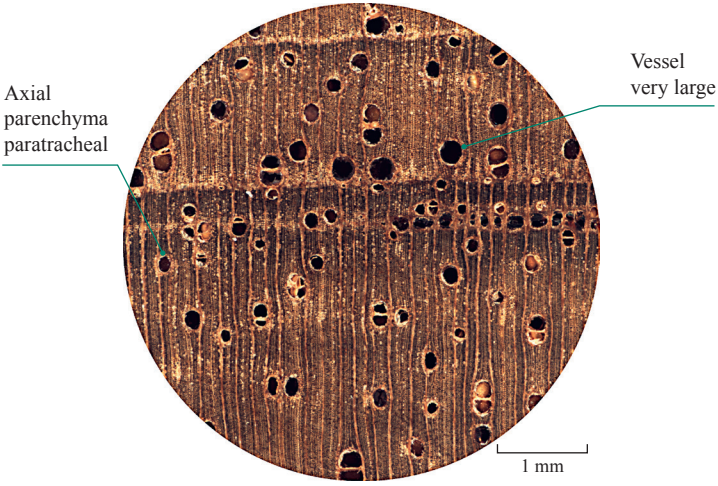
Swietenia mahagoni Longitudinal surface of wood



Swietenia mahagoni Transverse section of wood

Cedrela fissilis

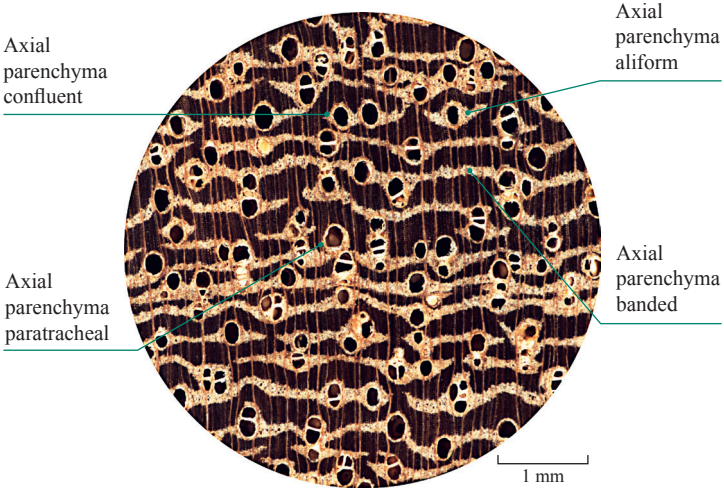
Cedrela fissilis Longitudinal surface of wood



Cedrela fissilis Transverse section of wood

Guarea grandifolia

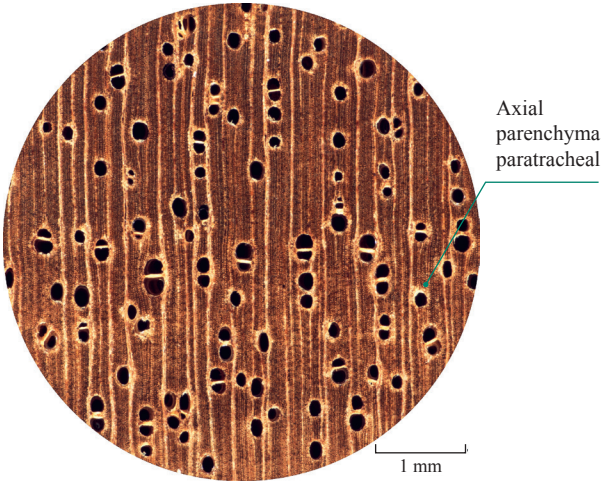
Guarea grandifolia Longitudinal surface of wood



Guarea grandifolia Transverse section of wood

Khaya ivorensis

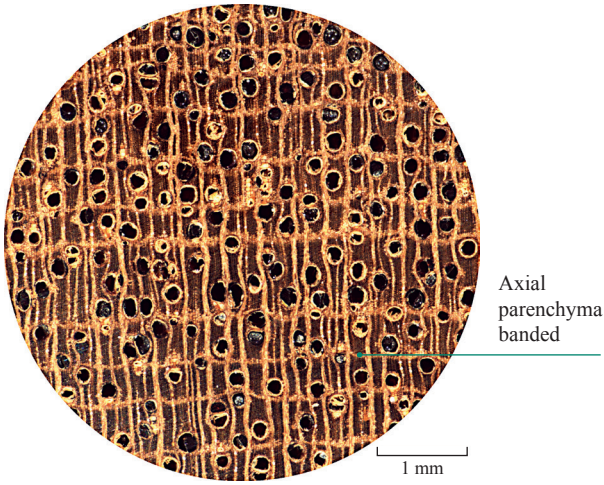
Khaya ivorensis Longitudinal surface of wood



Khaya ivorensis Transverse section of wood

Khaya senegalensis

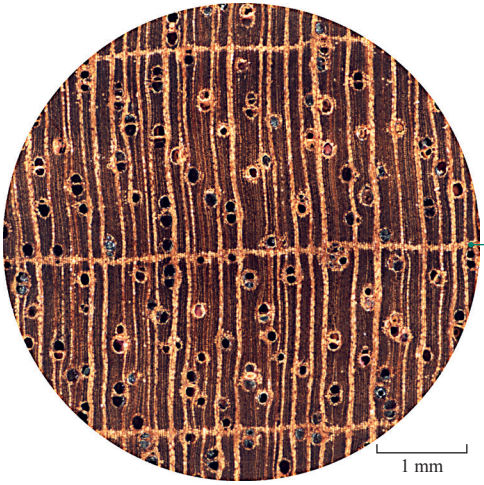
Khaya senegalensis Longitudinal surface of wood



Khaya senegalensis Transverse section of wood

Swietenia humilis

Swietenia humilis Longitudinal surface of wood



Swietenia humilis Transverse section of wood

Appendix 1

26 Endangered Woods Common in Trade and Their Similar Woods

No.	Endangered woods	Similar woods
1	*Pinus koraiensis*	(1) *Pinus armandii*
		(2) *Pinus sylvestris*
		(3) *Pinus sylvestris* var. *mongolica*
		(4) *Pinus tabuliformis*
2	*Taxus chinensis*	(1) *Cephalotaxus fortunei*
		(2) *Cupressus funebris*
		(3) *Pseudotaxus chienii*
		(4) *Torreya grandis*
3	*Aquilaria sinensis*	(1) *Chamaecyparis formosensis*
		(2) *Cocos nucifera*
		(3) *Gonystylus bancanus*
		(4) *Memecylon ligustrifolium*
		(5) *Strychnos ovata*
4	*Bulnesia sarmientoi*	(1) *Chlorocardium rodiei*
		(2) *Guaiacum officinale*
		(3) *Guaiacum sanctum*
		(4) *Handroanthus serratifolius*
5	*Cedrela odorata*	(1) *Carapa guianensis*
		(2) *Guarea laurentii*
		(3) *Khaya anthotheca*
		(4) *Swietenia macrophylla*

Continued

No.	Endangered woods	Similar woods
6	*Dalbergia cochinchinensis*	(1) *Dalbergia latifolia*
		(2) *Dalbergia oliveri*
		(3) *Dalbergia retusa*
		(4) *Platymiscium pinnatum*
		(5) *Swartzia benthamiana*
7	*Dalbergia granadillo*	(1) *Dalbergia congestiflora*
		(2) *Dalbergia stevensonii*
		(3) *Machaerium scleroxylon*
		(4) *Platymiscium pinnatum*
8	*Dalbergia latifolia*	(1) *Dalbergia cochinchinensis*
		(2) *Dalbergia granadillo*
		(3) *Dalbergia retusa*
		(4) *Dalbergia stevensonii*
		(5) *Swartzia leiocalycina*
		(6) *Terminalia tomentosa*
9	*Dalbergia louvelii*	(1) *Dalbergia granadillo*
		(2) *Dalbergia melanoxylon*
		(3) *Gluta renghas*
		(4) *Pterocarpus santaliuns*
10	*Dalbergia melanoxylon*	(1) *Combretum imberbe*
		(2) *Dalbergia louvelii*
		(3) *Diospyros ebenum*
		(4) *Guibourtia conjugata*
		(5) *Swartzia bannia*
		(6) *Xanthostemon melanoxylon*
11	*Dalbergia oliveri*	(1) *Bobgunnia madagascariensis*
		(2) *Burkea africana*
		(3) *Dalbergia odorifera*
		(4) *Dalbergia retusa*
		(5) *Dalbergia sissoo*

Continued

No.	Endangered woods	Similar woods
12	*Dalbergia retusa*	(1) *Dalbergia cochinchinensis*
		(2) *Dalbergia stevensonii*
		(3) *Dalbergia tucurensis*
13	*Dalbergia stevensonii*	(1) *Anadenanthera macrocarpa*
		(2) *Dalbergia granadillo*
		(3) *Dalbergia latifolia*
		(4) *Dalbergia tucurensis*
		(5) *Machaerium scleroxylon*
14	*Fraxinus mandshurica*	(1) *Fraxinus americana*
		(2) *Fraxinus chinensis*
		(3) *Quercus acutissima*
		(4) *Quercus mongolica*
15	*Gonystylus bancanus*	(1) *Brosimum alicastrum*
		(2) *Brosimum utile*
		(3) *Falcataria moluccana*
		(4) *Jacaranda copaia*
16	*Guaiacum sanctum*	(1) *Bulnesia sarmientoi*
		(2) *Guaiacum officinale*
		(3) *Handroanthus serratifolius*
17	*Guibourtia demeusei*	(1) *Colophospermum mopane*
		(2) *Guibourtia ehie*
		(3) *Guibourtia pellegriniana*
		(4) *Hymenaea courbaril*
18	*Guibourtia tessmannii*	(1) *Daniellia oliveri*
		(2) *Guibourtia arnoldiana*
		(3) *Guibourtia coleosperma*
		(4) *Guibourtia conjugata*
		(5) *Hymenaea courbaril*
		(6) *Pachyelasma tessmannii*

Continued

No.	Endangered woods	Similar woods
19	*Paubrasilia echinata*	(1) *Baikiaea plurijuga*
		(2) *Cynometra malaccensis*
		(3) *Libidibia punctata*
20	*Pericopsis elata*	(1) *Baikiaea plurijuga*
		(2) *Milicia excelsa*
		(3) *Pericopsis angolensis*
		(4) *Tectona grandis*
21	*Pterocarpus erinaceus*	(1) *Afzelia africana*
		(2) *Dialium excelsum*
		(3) *Pterocarpus angolensis*
		(4) *Pterocarpus indicus*
22	*Pterocarpus santalinus*	(1) *Baphia nitida*
		(2) *Dalbergia louvelii*
		(3) *Gluta renghas*
		(4) *Pterocarpus tinctorius*
23	*Pterocarpus tinctorius*	(1) *Baikiaea plurijuga*
		(2) *Baphia nitida*
		(3) *Dalbergia louvelii*
		(4) *Pterocarpus santalinus*
24	*Quercus mongolica*	(1) *Fagus grandifolia*
		(2) *Fraxinus chinensis*
		(3) *Fraxinus mandshurica*
		(4) *Quercus acutissima*
25	*Swietenia macrophylla*	(1) *Carapa guianensis*
		(2) *Cedrela odorata*
		(3) *Entandrophragma angolense*
		(4) *Guarea grandifolia*
		(5) *Khaya anthotheca*

Continued

No.	Endangered woods	Similar woods
26	*Swietenia mahagoni*	(1) *Cedrela fissilis*
		(2) *Guarea grandifolia*
		(3) *Khaya ivorensis*
		(4) *Khaya senegalensis*
		(5) *Swietenia humilis*

Appendix 2

CITES Appendices Annotation

#2 -All parts and derivatives except:

a) seeds and pollen; and

b) finished products packaged and ready for retail trade.

#4 -All parts and derivatives, except:

a) seeds (including seedpods of Orchidaceae), spores and pollen (including pollinia). The exemption does not apply to seeds from Cactaceae spp. exported from Mexico, and to seeds from *Beccariophoenix madagascariensis* and *Dypsis decaryi* exported from Madagascar;

b) seedling or tissue cultures obtained *in vitro*, in solid or liquid media, transported in sterile containers;

c) cut flowers of artificially propagated plants;

d) fruits, and parts and derivatives thereof, of naturalized or artificially propagated plants of the genus *Vanilla* (Orchidaceae) and of the family Cactaceae;

e) stems, flowers, and parts and derivatives thereof, of naturalized or artificially propagated plants of the genera *Opuntia* subgenus *Opuntia* and *Selenicereus* (Cactaceae); and

f) finished products of *Aloe ferox* and *Euphorbia antisyphilitica* packaged and ready for retail trade.

#5 -Logs, sawn wood and veneer sheets.

#6 -Logs, sawn wood, veneer sheets and plywood.

#7 -Logs, woodchips, powder and extracts.

#10 -Designates logs, sawn wood and veneer sheets, including unfinished wood articles used for the fabrication of bows for stringed musical instruments.

#11 -Logs, sawn wood, veneer sheets, plywood, powder and extracts. Finished products containing such extracts as ingredients, including fragrances, are not considered to be covered by this annotation.

#14 -All parts and derivatives except:

a) seeds and pollen;

b) seedling or tissue cultures obtained in vitro, in solid or liquid media, transported in sterile containers;

c) fruits;

d) leaves;

e) exhausted agarwood powder, including compressed powder in all shapes; and

f) finished products packaged and ready for retail trade, this exemption does not apply to wood chips, beads, prayer beads and carvings.

#15 -All parts and derivatives, except:

a) Leaves, flowers, pollen, fruits, and seeds;

b) Finished products to a maximum weight of wood of the listed species of up to 10 kg per shipment;

c) Finished musical instruments, finished musical instrument parts and finished musical instrument accessories;

d) Parts and derivatives of *Dalbergia cochinchinensis*, which are covered by Annotation # 4;

e) Parts and derivatives of *Dalbergia* spp. originating and exported from Mexico, which are covered by Annotation # 6.

#17 -Logs, sawn wood, veneer sheets, plywood and transformed wood.

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