ITTO PD 14/92 Rev.2(F)

海南岛欠知名树种

Lesser-known Tree Species in Hainan Island

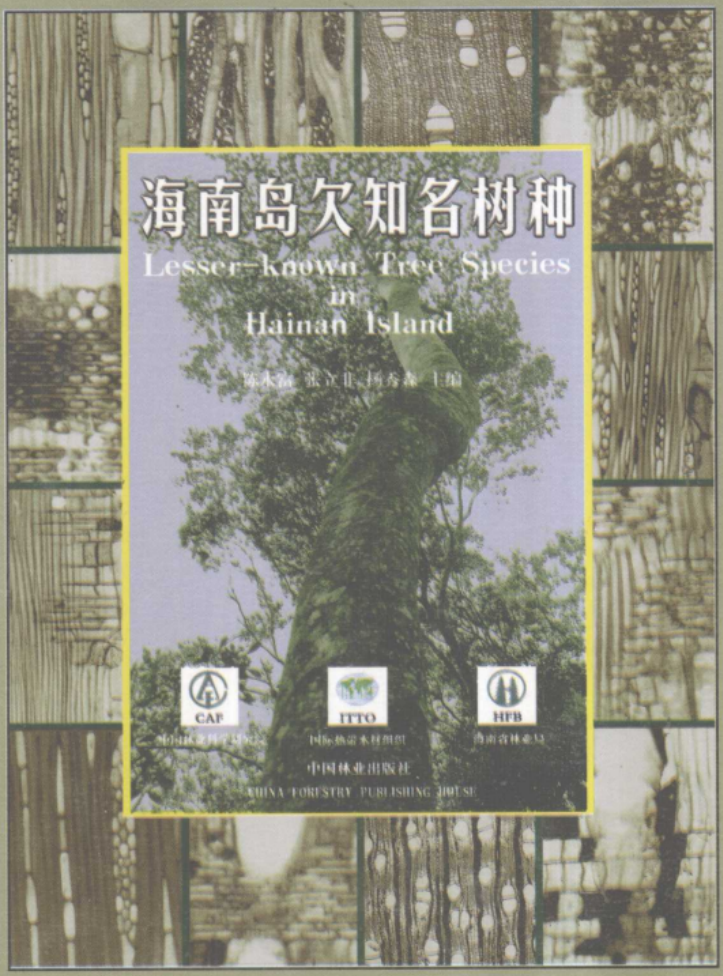
陈永富 张立非 杨秀森 主编

CAF 中国林业科学研究院
ITTO 国际热带木材组织
HFB 海南省林业局

中国林业出版社
CHINA FORESTRY PUBLISHING HOUSE

责任编辑　吴金友
Editor　Wu Jinyou, CFPH

封面 图版设计　李忠信
Cover and Plate Designer　Li Zhongxin, CFPH



ISBN 7-5038-2045-4

9 787503 820458 >

ISBN 7-5038-2045-4/S · 1174
定价：120.00 元

ITTO PD 14/92 Rev.2(F)

海南岛欠知名树种

Lesser-known Tree Species in Hainan Island

陈永富　张立非　杨秀森　主编

中国林业出版社

CHINA FORESTRY PUBLISHING HOUSE

图书在版编目(CIP)数据

海南岛欠知名树种/陈永富等编/北京:中国林业出版社,1998.9
ISBN 7-5038-2045-4

Ⅰ.海… Ⅱ.中国… Ⅲ.树种-中国-海南岛 Ⅳ.S796.08

中国版本图书馆 CIP 数据核字(98)第 17666 号

本书是重大国际合作项目 ITTO PD 14/92 Rev.2(F)《海南岛热带森林分类经营永续利用示范》的系列专著之一。也是该项目 No.2 子项目《海南岛热带天然林永续经营示范区》的重要成果之一。本书在对海南岛热带天然林树木进行全面调查研究的基础上,在海南岛霸王岭林区选取了 30 个具有一定分布数量、生长快、更新繁殖容易、没有被认识和利用或者没有被充分认识和利用的树种—欠知名树种。对选中树木的分布、生物学特性、形态特征、木材构造、木材性质和利用等进行分析研究和系统描述,并附有每个树种的树皮、树干的彩色照片和木材解剖黑白照片。本书是一本供科学研究、教学工作者及木材生产和加工利用单位使用的参考书。

This book is not only one of a series of treatises of the significant International Cooperation Project, ITTO PD 14/92 Rev.2 (F), *A Demonstration Programme of Sustainable Utilization of Tropical Forests by Differentiated Management in Hainan Island*, but is an important achievement of the sub-project No.2, *The Demonstration Area of Sustainable Management of Tropical Natural Forest in Hainan island*. On the basis of overall investigation and study on the tropical natural forests in Hainan Island, 30 tree species which have a certain quantity, grow fast, easy to regenerate and breed, unknown and untilized or not known and utilized enough - lesser-known tree species were selected. The distribution, biological characters, morphological characters, wood structure, wood quality and utilization of these tree species were analyzed and systematically described in the book, and it also attached color photographs of bark and trunk of each tree species and black-and-white photographs of wood anatomy. The book can provide the references for science researchers, educators, wood production and processing and utilization units etc..

中国林业出版社出版
(100009 北京西城区刘海胡同 7 号)
北京地质印刷厂印刷 新华书店北京发行所发行
1998 年 11 月第 1 版 1998 年 11 月第 1 次印刷
开本:787mm×1092mm 1/16 印张:8.5
字数:246 千字 印数:1～1050 册 插页 32 页
定价:120.00 元

ITTO PD 14/92 Rev.2(F)
编写委员会

主　任：洪菊生
副主任：韩剑准　侯元兆　黄金城
委　员：陈洪健　蒋厚镇　汪绍龙　温茂元　陈永富　曾庆波
李意德　周绪梅　白嘉雨　郑海水　王秉勇　陆文明
于　玲　杨众养　杨秀森　谢明东

Writing Committee

Director: Hong Jusheng
Vice Directors: Jiang Houzhen, Hou Yuanzhao, Huang Jincheng
Members: Chen Hongjian, Jiang Houzhen, Wang Shaolong, Wen Maoyuan, Chen Yongfu, Zeng Qingbo, Li Yide, Zhou Xumei, Bai Jiayu, Zheng Haishui, Wang Bingyong, Lu Wenming, Yu Ling, Yang Zhongyang, Yang Xiusen, Xie Mingdong

《海南岛欠知名树种》编者

Lesser-known Tree Species in Hainan Island

主　编：陈永富　张立非　杨秀森

编　委：（按汉语拼音排序）

曹再新　华网坤　鞠洪波　姜笑梅　李大江

骆秀梅　王松令　杨彦臣　周亚东　张怀清

Authors: Chen Yongfu, Zhang Lifei, Yang Xiusen

Members: Cao Zaixin, Hua Wangkun, Ju Hongbo, Jiang Xiaomei, Li Dajiang, Luo Xiumei, Wang Songling, Yang Yanchen, Zhou Yadong, Zhang Huaiqing

序

根据联合国粮农组织《1991 年生产年鉴》资料，1990 年全球共有热带森林面积 17.148 亿公顷。其中 60％为密林，40％为疏林。另外热带荒漠地带还有零星分布 810 万公顷。热带密林中的 53％分布在拉丁美洲，其余分布在热带非洲和热带亚洲。热带疏林主要分布在热带非洲和美洲。中国的热带天然林面积为 241.41 万公顷，主要分布在海南岛、广东南部、广西南部、云南南部、西藏东南部和台湾岛南部。

热带森林具有“地球之肺”之称。它不仅提供大量的木材和林副产品，创造巨大的经济财富，而且为热带森林生态系统环境和依赖于这种环境的工农业生产以及人类生存提供保障。据 Olson 1974 年的研究表明：在不到全球森林面积 50％的热带森林提供了全球森林生态系统碳的净第一生产量（即固化在一切活植物中的碳）的 60％以上。热带密林中栖息的生物物种约占全球物种的 50％～90％。因此，热带林又是一个珍贵的丰富的生物物种宝库，而其中任一个物种的消亡，都将影响到整个森林生态系统的结构、功能和稳定性。

近 50 年来热带森林的发展由“为着工业发展的森林”发展为“可持续经营的森林”。自 20 世纪 80 年代以来，国际社会对热带林的持续经营作出了不懈的努力。其中 FAO、ITTO、PAFT 和 CIFOR 等国际组织相继采取了一系列行动，并专门对热带林的可持续经营制定了标准和指标体系。随着经济的发展和人口的增加，对热带森林的压力越来越大，尤其是对一些优质珍贵材种的树木需求日益增加。因此，造成大量珍贵优质材树种不断减少，有的甚至灭绝。在海南岛的热带森林中有乔木树种达 800 种，被国家列为商品材树种有 458 种，高级材质的树种有 85 种，珍贵树种 45 种，有 32 种被国家列为珍稀濒危保护植物。因此，对一些未充分利用的商品材树种和未被充分认识和利用的非商品材树种的开发利用具有十分重要的意义。课题组的全体研究人员，在广泛调查研究的基础上，规范性采样，采用最先进的设备和技术进行分析研究，提出了 30 种海南岛热带天然林可开发利用的树种。

《海南岛欠知名树种》一书具有较强的综合性和实用性，其内容广泛涉及所研究树种的名称、地理分布、形态特征、生物学特性、材性及利用等诸多方面，它对拓宽热带用材树种，减轻对热带珍贵树种的压力，保护热带生物多样性，合理利用热带森林资源，实现可持续经营均具有重要的实际意义，对科研和教学也具有重要的参考价值。此书的出版，它是课题组全体同志团结奋斗、努力拼搏的集体智慧结晶，是对我国乃至世界热带林实现可持续经营作出的出色奉献。对本书的出版谨表由衷的祝贺。

洪菊生

1998 年 6 月 10 日

PREFACE

According to the materials in the *Production Yearbook in* 1991 compiled by FAO, there are 1714.8 million ha area tropical forests in all over the world, in which dense forest and sparse forest respectively make up three-fifths and two-fifths. And tropical forests also scatter about 8.1 million ha. in tropical desert region. 53 percent of tropical dense forests distribute in Latin America and the rest disperse in tropical Africa and tropical Asia, tropical sparse forests mainly distribute in tropical Africa and America. There are 2414.1 thousand ha. tropical forests in China and they mainly distribute in Hainan Island, South of Guangdong, Yunnan provinces, Guangxi autonomous region, southerneast of Tibet and south of Taiwan Island.

As "the lung of the world", tropical forests not only provide large quantity of woods and wood-products, which bring about huge economic wealth, but also ensure the ecological system environment of tropical forests and industry and agriculture production which relies on the environment, as well as human being survival. It was indicated by the research of Olson in 1974 that tropical forests, which cover no more than 50 percent of the land in the world, supply more than 60 percent of net primary product of carbon in forest ecological system in the world (namely carbon solidified in all alive plants). Species habituated in tropical dense forests take about 50 – 90 percent of total species in the world, so tropical forests are precious and rich treasure-home of species. And the elimination of any species will effect the structure function and stability of whole forests ecological system.

Since recent 50 years, the development of tropical region changes from the "forest of aiming for industry development" to "forest of sustainable management". Since 1980s', international societies have taken unremitting efforts for sustainable management of tropical forest, among which FAO, ITTO, PAFT and CIFOR, etc., have taken a serial actions in succession and specially worked out criteria and indicators system for sustainable management of tropical forests. With the economic developing and population increasing, there are more and more pressure on tropical forest, especially the needs of some precious tree species with high quality increase.

Consequently, not only large amounts of precious tree with high quality constantly decrease, but also some of them even become extinct. There are 800 tree species of arbors in tropical forest in Hainan Island, which include 458 species listed commodity wood by nation, 85 tree species with high quality, 45 specious species and 32 specious, dangerous and protected plans listed by nation. So it is very important to exploit and utilize the commodity tree species which did not be fully used, as well as the non-commodity tree species which are less-known and less-utilized. On the basis of wide investigation and research, the whole members of project group standardized to sample and adopted the most advance equipment and technology to analyses and research, and

then put forward 30 tree species of tropical natural forest to be exploited and utilized possibly in Hainan Island.

The book of *Less-known Tree Species in Hainan Island* is fairly comprehensive and practical. The content widely involves many aspects of tree species such as the name, geographic distribution, biological characters, wood quality and utilization, etc.. It has important practical significance to expend wood tree species of tropical forest, to alleviate the pressure on tropical precious tree species and to protect tropical bio-diversity, as well as to reasonably utilize resources of tropical forests, and it also has important reference value for science research and education. This book publication is a crystallization of collective wisdom which the whole members of project group unite to exert themselves to strive and it also offers an excellent contribution for my country or the world to realize sustainable management of tropical forest. With sincerely congratulations to the book's publishing.

Hong Jusheng
June 10, 1998

前　言

热带森林具有丰富的树种资源，据估计，热带雨林中的生物总计有250～500万种，我国海南岛的维管束植物估计约在3500种上下，在1400多种针、阔叶树种中，乔木树种达800种。虽然热带森林中的树种繁多，但是，在市场上，特别是在国际市场上认可的树种却不多。大部分树种人们还不认识或了解不够深入，在海南岛的乔木树种中仅有458种被列为商品材树种，而实际上真正被利用的树种就更少了。因此，近年来，特别是法国、日本等都在进行系统研究欠知名树种，ITTO也资助了一批有关项目，尤以法国、荷兰项目为典型，其中荷兰项目建立了一个热带欠知名树种数据库，把这些树种的一些基本材性指标搞清楚。

为了解决热带森林大量优质材树种不断减少和国民经济日益发展对珍贵材树种需求日益增加的矛盾，ITTO海南热带森林分类经营永续利用项目中的热带天然林永续经营示范区子项目专门设立了“海南岛热带天然林欠知名树种开发利用研究”课题。本项研究拟定了确定欠知名树种的原则：树种具有一定的面积分布和蓄积量；未被认识和利用或了解不深入和利用不充分；生长较快；繁殖力强。根据以上原则本项研究人员于1996年在海南岛霸王岭林区内选定了30个欠知名树种，对其进行综合的全面的研究。研究内容包括：树种名称（中文、英文、拉丁文及别名）；地理分布；外部形态特征；生物学特性；木材宏观特征和微观特征；木材材性（力学性质和化学及结构性质）；木材用途。每个树种选取3株样木，样木胸径在30厘米以上，每株样木自胸径处往上取100厘米长的原木作样本，并现场拍摄树皮、树基、树干和树冠照片。

本项研究得到了ITTO海南总项目主任、前中国林业科学研究院副院长洪菊生教授和总项目副主任、海南省林业局蒋厚镇局长的指导和关怀，中国林业科学研究院资源信息研究所、海南省霸王岭林业局和中国林业科学研究院木材工业研究所等单位的支持和帮助，在此表示衷心感谢。

由于树木的生长发育受环境的影响巨大，虽然在研究过程中力求详细、准确、规范化、标准化，但限于我们的水平和外部条件的限制难免有不妥之处，希望从事有关工作的同志们，随时给予指正和补充。

作　者

1998年6月14日

INTRODUCTION

Tropical forest presents rich resources of tree species. It was estimated that there are 2500-5000 thousand species in tropical rain forest. There are about 3500 vascular bundle plants in Hainan province of China and about 800 species of arbors among more than 1400 species of coniferous and broadleaf trees. Although tree species are numerous in tropical forest, there are few approved tree species in market especially in international market. Most parts of tree species are still unknown or not enough known for people. There are only 458 species listed as commodity tree species among arbors in Hainan, and the tree species really utilized are even less. So the systematic study on less-known tree species was carried out in many countries especially in France and in Japan. ITTO also aided financially on a series of the related projects, especially on France project and Holland project, in which Holland project built database of tropical less-known tree species and also made clear some basic indicators of wood quality of the tree species.

In order to resolve the contradictions between the constant decreasing of large amount of high quality tree species in tropical forest and the increasingly needs for precious tree species with continuous development of national economy, "The Demonstration Area of Sustainable Management of Tropical Natural Forest", which is the sub-project of ITTO project of "A Demonstration Programme of Sustainable Utilization of Tropical Forests by Means of Differentiated Management", specially set up a subject of "Exploitation and Utilization of Less-known Tree Species of Tropical Forest in Hainan Island". The study drew up principles to determine less-known tree species, which have a certain area and stock, unknown and unused or not enough known and used, growing fast with high ability of breeding. According to the above principles, the researchers of the project selected 30 less-known tree species in Bawangling forest area of Hainan Island in 1996, and carried out comprehensive and overall study on them. The contents of the study included: the name of tree species (Chinese, English, Latin and Vernacular names), geographical distribution, morphological characters, biological characters, macrostructure and microstructure of the wood, wood properties (mechanical, chemical and structural properties) and wood uses. 3 samples were selected in each tree species with diameter above 30 cm. The log with 100 cm long above the breast diameter of very sample was selected for specimen, and the pictures of bark, base, stem and crown were taken on the spot.

The project enjoyed the guide and concerns of Project Director, Professor Hong Jusheng, former vice president of Chinese Academy of Forestry, and Project vice Director, Jiang Houzheng, Director of Forest Bureau of Hainan Province. And it also gains the supports of the Research Institute of Resource and Information of Chinese Academy of Forestry, Bawangling Forestry Bureau of Hainan province and the Research Institute of Wood Industry of Chinese A-

cademy of Forestry, etc. . Here give them sincere thanks.

Due to trees' growth effected heavily by environment, although we strive to be detail, precise and standardized, there will have some incorrect parts in the book within the limits of our level and external conditions. We sincerely hope that all of those who study on related work will provide helpful criticisms and comments of the papers that need to be revised and replenished.

Authors

June 14th, 1998

目　录

CONTENTS

序

PROFACE

前言

INTRODUCTION

松科…… (1)

南亚松…… (1)

番荔枝科…… (3)

海南暗罗…… (3)

夹竹桃科…… (4)

灯架…… (5)

冬青科…… (6)

榕叶冬青…… (6)

五加科…… (8)

鸭脚木…… (8)

橄榄科 …… (10)

橄榄 …… (10)

柿树科 …… (12)

乌材 …… (12)

杜英科 …… (14)

圆果杜英 …… (14)

大戟科 …… (16)

光叶巴豆 …… (16)

黄桐 …… (17)

粘木科 …… (19)

粘木 …… (19)

樟科 …… (21)

琼楠 …… (21)

平托桂 …… (23)

丛花厚壳桂 …… (24)

大萼木姜 …… (26)

胡桃科 …… (28)

海南黄杞 …… (28)

桃金娘科 …… (29)

大果水翁 …… (29)

线枝蒲桃 …… (31)
子凌蒲桃 …… (32)
密脉蒲桃 …… (34)
赤枝蒲桃 …… (36)
五列木科 …… (37)
五列木 …… (37)
远志科 …… (39)
黄叶树 …… (39)
水石梓科 …… (41)
水石梓 …… (41)
安息香科 …… (42)
拟赤杨 …… (43)
灰木科 …… (44)
薄叶灰木 …… (44)
丛花灰木 …… (46)
山茶科 …… (48)
荷木 …… (48)
榆科 …… (49)
白颜树 …… (49)
山黄麻 …… (51)

Pinaceae …… (53)
Pinus latteri Mason …… (53)
Annonaceae …… (55)
Polyalthia laui Merr. …… (55)
Apocynaceae …… (57)
Winchia calophylla A. DC. …… (58)
Aquifoliaceae …… (60)
Ilex ficoidea Hemsl. …… (60)
Araliaceae …… (62)
Schefflera octophylla (Lour.) Harms. …… (62)
Burseraceae …… (64)
Canarium album (Lour.) Raeusch. …… (65)
Ebenaceae …… (67)
Diospyros eriantha Champ. …… (67)
Elaeocarpaceae …… (69)
Elaeocarpus subglobosus Merr. …… (69)
Euphorbiaceae …… (71)
Croton laevigatus Vahl …… (71)

Endospermum chinense Benth …… (73)
Ixonanthaceae …… (75)
Ixonanthes chinensis Champ. …… (75)
Lauraceae …… (77)
Beilschmiedia intermedia Allen …… (78)
Cinnamomum tsoi Allen …… (80)
Cryptocarya densiflora Bl. …… (81)
Litsea baviensis Lec. …… (83)
Juglandaceae …… (85)
Engelhardtia hainanensis P. Y. Chun …… (85)
Myrtaceae …… (87)
Cleistocalyx conspersipunctatum Merr. et Perry …… (88)
Syzygium araiocladum Merr. et Perry …… (89)
Syzygium championii Merr. et Perry …… (91)
Syzygium chunianum Merr. et Perry …… (93)
Syzygium rysopodum Merr. et Perry …… (95)
Pentaphylaceae …… (97)
Pentaphylax euryoides Gardn. et Champ. …… (97)
Polygalaceae …… (99)
Xanthophyllum hainanese Hu …… (99)
Sarcospermataceae …… (101)
Sarcosperma laurinum (Benth.) Hook. f. …… (101)
Styraceae …… (103)
Alniphyllum fortunei (Hemsl.) Perk. …… (104)
Symplocaceae …… (106)
Symplocos anomala Brand …… (106)
Symplocos poilanei Guill. …… (108)
Theaceae …… (110)
Schima superba Gardn. et Champ. …… (110)
Ulmaceae …… (112)
Gironniera subaequalis Planch. …… (112)
Trema orientalis (L.) Bl. …… (114)
参考文献(Reference)…… (117)

松科 Pinaceae

英文名:Pine Family

常绿或落叶乔木,稀灌木。我国有 10 属,113 种,全国各地均有分布。海南主要分布有:海南油杉 *Keteleeria hainanensis*,海南五针松 *Pinus fenzeliana*,南亚松 *P. latteri* 等。

南亚松 *Pinus latteri* Mason

英文名:Latter Pine, Merkus Pine

商品名:南亚松

别　名:枞树,海南松,海南二针松,越南松,南洋二叶松,滨松。

分布

在海南的白沙、琼中、东方等地有较大面积的南亚松森林。在海南的昌江、保亭、屯昌、定安、儋州、临高等地有分布,印度、泰国、越南、菲律宾、老挝、柬埔寨及印度尼西亚也有分布。多生于花岗岩、沙岩山地或在红壤及砂砾土上。

形态特征 (图版 1)

常绿大乔木。高 30m,胸径可达 2m,树干通直高大。树皮厚,灰褐色,深裂成鳞片状。幼树树冠圆锥形,老树则呈圆球形或伞状。1 年生枝褐色或暗褐色,无毛,不被白粉;冬芽圆柱状长圆形,先端尖,芽鳞褐色,卵状披针形或披针形,先端疏松,微向外反卷,边缘薄,具透明的细缺齿。针叶二针一束,长 15～27cm,宽 1.5～2mm,边缘具细锯齿,背腹面均有气孔线,叶鞘长 1～2cm;横切面通常有 2 个中生或内生树脂管,偶而有横生树脂管出现,多型皮下层,在表皮下呈倒三角细胞状断续分布,通常三层,除第一层细胞连续外,其余各层为不连续排列。球果卵状圆柱形或长卵形,成熟前绿色,上部渐窄,熟时红褐色,长 5～8(～10)cm,径 4～6cm,果柄较细长,长 1～1.5cm;中部种鳞长圆方形,长约 3cm,宽 1.2～1.5cm,鳞盾近斜方形或五角状斜方形,有光泽,上部厚,稍隆起,下部平,横脊明显而隆起;鳞脐微凹;种子椭圆状卵形,长约 7mm,上端具有关节的长翅,种翅长约 2cm。

生物学特性

南亚松为松属中最具有热带性的一种,在热带地区海拔 13～1000m 均有分布,伴生树种有麻栎、枫香、黄杞、余甘子、黄牛木等,林下植被有芒草、扭黄毛、金狗尾、飞机草等。为强喜光树种,幼年表现出喜光的特点,在疏林地、林隙和林缘更新生长较好。自然生长较快,幼年生长较慢,树高年生长最高达 50cm,径年生长最快时达 1cm。花期每年3～4 月份,果翌年 8～9 月份成熟。

木材构造（图版 18）

宏观特征：与心材区别明显，边材淡黄至浅红褐色，心材淡红褐色，常呈蓝变。生长轮明显。早材至晚材急变。轮间晚材带色深，管胞放大镜下不见。轴向薄壁组织缺如。木射线肉眼下可见，密度略密，甚细至略细。树脂道分轴向和径向两类：①轴向者横切面肉眼下明显，呈浅色点状，通常分布晚材带内；纵切面可见褐色条纹、明显；②径向者肉眼下不见。

材料：W11136(海南)。

微观特征：早材管胞横切面为长方形或多边形，径壁具缘纹孔 1～2 列，圆形及椭圆形，眉条长，管胞平均长 3370μm；晚材管胞横切面长方或多边形，径壁具缘纹孔 1 列，平均长 3630μm。轴向薄壁组织缺如。木射线 4～7 根/mm，具单列和纺锤形两类；单列射线高 1～40 个或 40 个细胞以上，多数 4～17 个细胞；纺锤射线具径向树脂道。射线管胞存在上述两类木射线中，位于上下边缘 1～4 列(通常 1～2 列)，在射线中部常见，低射线有时全由射线管胞组成；内壁锯齿状，外缘波浪形。射线薄壁细胞与早材管胞间交叉场纹孔式为松木型，少数窗格状，1～5(通常 2～3)个，1～2 个(通常 1 个)横列。树脂道泌脂细胞壁薄。

木材各组织比量(%)			胞壁率(%)
管　胞	射　线	树脂道	
87.32	11.12	1.56	50.14

材料：W11136(海南)。

木材性质

木材无光泽；具松脂气味，纹理直或斜，结构中至细，不均匀。径切面射线斑纹略见。木材重量中，强度中，干缩中。冲击韧性中等。

密度 g/cm³		干缩系数 %			顺纹抗压强度	抗弯弹性模量	抗弯强度	顺纹抗拉强度	顺纹抗剪强度		冲击韧性	硬　度		
基本	气干	径向	弦向	体积					径向	弦向		端面	径面	弦面
					MPa	MPa	MPa	MPa	MPa		kJ/m²	(N)		
0.53	0.66	0.21	0.30	0.53	42.83	12054	93.39				47.07	4619.1	4423.0	4776.0

由于木材比较硬重，强度较大，干燥则较困难，且多裂纹，多松脂，锯刨亦难，夹锯严重，油漆及胶粘性能亦差，不抗海生钻木动物为害，握钉力大。但容易被变色菌侵染。

本种生长快，晚材带宽，其产脂量和木材强度、硬度、密度等通常为国产松属木材中最高者。

木材用途

木材棕色带红，材质优良，纹理直，结构稍粗，比重 0.60～0.64，具有丰富的树脂，为采割松脂的优良树种，东南亚主要采脂树种。可做枕木、桥梁、桩柱、搁栅、车辆、器具、门、窗、家具、造纸材，不用作包装材。