IAWA BULLETIN

Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood Anatomy news</td>
<td>2</td>
</tr>
<tr>
<td>Association affairs</td>
<td>2</td>
</tr>
<tr>
<td>J. COLVILLE, P. BAAS, V. HOIKKA and K. VAINIO</td>
<td>3</td>
</tr>
<tr>
<td>Wood anatomy and the use of carbonised wood as a matrix for bone regeneration in animals</td>
<td>3</td>
</tr>
<tr>
<td>TH. BARTHOLIN</td>
<td>7</td>
</tr>
<tr>
<td>The Pinus–Larix pollon: p. Ab. Øv. oo.</td>
<td>10</td>
</tr>
<tr>
<td>Book review</td>
<td>11</td>
</tr>
<tr>
<td>P. BAAS</td>
<td>17</td>
</tr>
<tr>
<td>The peculiar wood structure of Vaccinium lucidum (Bl.) Miq. (Ericaceae)</td>
<td>17</td>
</tr>
<tr>
<td>N. PARAMESWARAN</td>
<td>19</td>
</tr>
<tr>
<td>A note on the fine structure of trabeculae in Agathis alba</td>
<td>22</td>
</tr>
<tr>
<td>S.H. TURNER, A.P. BUSH and A.J. BOLTON</td>
<td></td>
</tr>
<tr>
<td>A note on the spatial relationship between rays and axial resin canals in Picea abies</td>
<td>23</td>
</tr>
<tr>
<td>Book review</td>
<td>22</td>
</tr>
<tr>
<td>Association affairs (continued)</td>
<td>23</td>
</tr>
</tbody>
</table>

THE WOOD ANATOMY OF THREE PROTOANOE TIMBERS

Placospermum coriaceum, Dilobeia thouarsii and Garnieria spathulaefolia

by

Joyce W. Lanyon

Forestry Commission of New South Wales, P.O. Box 100, Beecroft, N.S.W. 2119, Australia

Abstract

A study has been made of the wood anatomy of three unusual members of the Proteaceae, namely, Placospermum coriaceum, Dilobeia thouarsii and Garnieria spathulaefolia. The anatomy of each is described and their relationship with other members of the family is discussed.

Introduction

Placospermum C.T. White & Francis, Dilobeia Thoars & Bronn. & Gris. are three monotypic genera belonging to the family Proteaceae. Placospermum coriaceum consists of the species P. coriaceum C.T. White & Francis which occurs in the rain forests of Queensland, Dilobeia consists of the species D. thouarsii Room. & Schult. which occurs in Malagasy and Garnieria consists of the species G. spathulaefolia Bronn. & Gris. which occurs in New Caledonia. This study of the wood anatomy of these three species was undertaken firstly because none of them were included by Chattaway in her study of the family (Chattaway, 1948) nor by Metcalfe and Chalk in their 'Anatomy of the Dicotyledons', 1950, and the description of the wood anatomy of Placospermum coriaceum by Briggs, Hyland and Johnson (1975) is brief and is not illustrated. A comprehensive study of the anatomy of these three genera is therefore necessary for a fuller understanding of the wood anatomy of the family as a whole. Also, they are of special interest because they lack the typical wide rays found in most members of the family. The two features by which most members of the family are recognised are the wide rays and the wide to narrow bands of axial parenchyma which curve inwards between the large rays, sometimes enclosing the vessels but more characteristically with the vessels grouped on the pith or convex side. Both these features are lacking in Placospermum coriaceum, Dilobeia thouarsii and Garnieria spathulaefolia.

Material and Methods

The wood specimens listed below were available for study. Wood collection reference numbers are given between brackets, followed by numbers of herbarium collections if available. Abbreviations are according to Stern (1978).
Thin - Lumen greater than thickness of walls.
Thick - Lumen less than thickness of walls.
Very thick - Lumen almost completely closed.

Results

Placospermum coriaceum (Figs. 1–5)

Macroscopic description. — Timber light to moderately light, pale pinkish brown in colour, lacking any distinctive figure except for a slight pattern on the quarter sawn surface produced by the darker coloured rays. Rays not conspicuous on the end grain.

Microscopic description. — Growth rings* not defined. Pores solitary and in multiples of 2 to 3. In one sample the pores showed a definite tendency for arrangement in concentric tangential bands. Pores angular to rounded in shape, numbering 10 per sq. mm with a mean tangential diameter of 115 μm; mean vessel member length 1.25 mm. Perforation plates simple, oblique, with occasional scalariform to reticulate perforation plates present (Fig. 3). Inter-vessel pitting alternate, round to oval, approximately 8 μm in diameter. Pits to contiguous ray and axial parenchyma cells similar to the inter-vessel pits, see Figs. 1 and 4.

Axial parenchyma paratracheal, mostly confined to the abaxial side of the pores forming a 'cap' 1 to 3 cells wide radially, occasionally vascentric, see Fig. 1.

Rays numbering 2–3 per mm and consisting of uniseriate rays and multisierate rays ranging from 2 to 4 cells wide. The uniseriate rays mostly only 1 to 4 cells high and composed of square and upright cells; the multisierate rays composed of a central portion of procumbent cells with several marginal rows of square and/or upright cells, see Figs. 2 and 3. Maximum height of rays approximately 2 mm; all gradations of sizes present. Sheath cells occasionally present.

Ground tissue composed of thin walled fibres with distinctly bordered pits on both tangential and radial walls. Average length of fibres 2.16 mm.

Silica not observed.

*All terms used in this paper are in accordance with the definitions given in: 'Multilingual Glossary of Terms used in Wood Anatomy', International Association of Wood Anatomists, 1964.

Dilobia thouarsii (Figs. 6–9)

Macroscopic description. — Timber heavy to moderately heavy, medium brown to red brown in colour with no distinctive figure. Rays not conspicuous on the end grain.

Microscopic description. — Growth rings not defined. Pores mostly solitary, round to oval in shape, numbering 2.5–3 per sq. mm, mean tangential diameter 195 μm, mean vessel member length 0.82 mm. Perforation plates simple, slightly oblique. Inter-vessel pitting sparse because of the predominantly solitary arrangement of the vessels, alternate, round, 3–4 μm in diameter. Pits to contiguous ray and axial parenchyma similar to the inter-vessel pits, see Figs. 6 and 9.

Axial parenchyma predominantly paratracheal, mainly confined to the abaxial side of the pores forming a 'cap' with tangential wing-like extensions. These wing-like extensions from adjacent pores often coalesce thus linking several pores tangentially. Occasional diffuse cells also present, see Fig. 6.

Rays numbering 4 per mm, one to three (occasionally four) cells wide, composed of procumbent cells, the cells constituting the marginal row having a slightly greater axial dimension than the remaining cells of the ray, see Figs. 7 and 8. Maximum height of rays approximately 1 mm.

Ground tissue composed of very thick walled fibres with some thin to thick walled fibres in the vicinity of the vessels. Pits with small borders present on both the radial and tangential walls. Mean fibre length 1.95 mm.

Silica not observed.

Garniera spathulifolia (Figs. 10–14)

Macroscopic description. — Timber very heavy, brown to reddish brown in colour, no distinctive figure. Rays not conspicuous on the end grain.

Microscopic description. — Growth rings not defined. Pores diffuse, numbering 16 per sq. mm, solitary and in multiples of 2 to 3, the majority arranged in concentric tangential bands 1–2 pores wide radially; round to oval in transverse section, mean tangential diameter 74 μm, mean vessel member length 0.49 mm, see Fig. 7. Perforation plates simple, oblique. Inter-vessel pitting alternate, round, measuring 6–7 μm in diameter, resinated. Pits to contiguous ray cells similar to the inter-vessel pitting. Vessels in the heartwood

Fig. 1–5. Placospermum coriaceum. — Fig. 1. Transverse section showing general arrangement of the cells. x 90. Note axial parenchyma mainly confined to the abaxial side of the pores. — Fig. 2. Tangential longitudinal section. x 90. Note the heterogeneous rays. — Fig. 3. Radial longitudinal section. x 90. Note the heterogeneous rays. — Fig. 4. Macerated material showing a typical vessel element. x 100. — Fig. 5. Portion of a vessel element showing a scalariform to reticulate perforation plate. x 620. Phase contrast.
Discussion

Placospermum, Dilobeia and Garnieria are of interest to the wood anatomist because their endgrain pattern is so unlike that of the majority of Proteaceae. However, of the three, Placospermum is perhaps the most interesting because it shows a number of features which are more primitive than the corresponding features in other members of the family. This is in agreement with the position it has been given by Johnson and Briggs in their reconstruction of the phylogeny of the family (Johnson & Briggs, 1975). In their arrangement of the families, sub-families, tribes, sub-tribes and genera, Placospermum is placed in the sub-family Persoonioideae very close to the Proto-Proteaceae, that is, the hypothetical most advanced common ancestor of the living members of the family.

The following features indicate that Placospermum is more primitive from the wood anatomical point of view than other members of the family:

1. Vessel member length. The usual vessel member length for the family is medium (Metcalfe & Chalk, 1950; Anonymus, 1937), that is 0.35 mm–0.8 mm, whereas those in Placospermum were found to be very long (1.25 mm), see Fig. 4.

2. Type of perforation plate. Simple perforation plates are typical of the family and, although most of the vessel elements in Placospermum were also found to have simple perforation plates, an occasional reticulate to scalariform perforation plate was observed, see Fig. 5.

3. The arrangement of the vessels and parenchyma. Many members of the family have continuous narrow to wide tangential bands of vessels which is a more advanced type of arrangement than the scattered vessels and vessel groups found in Placospermum.

4. Type of ray. The family usually shows homogeneous rays except for a few sheath cells (Metcalfe & Chalk, 1950) whereas in Placospermum the rays are decidedly heterogeneous, see Fig. 2.

5. Type of fibre. Although Chattaway found that in a few genera the ground mass of the wood is formed of fibre trachids with conspicuously bordered pits, she states that "in most genera the ground mass of the wood is formed of fibrous fibres with simple or indistinctly bordered pits." (Chattaway, 1948). The ground mass of the wood of Placospermum is composed of fibres with distinctly bordered pits.

Although all three genera lack the typical bands of axial parenchyma which curve inwards between adjacent rays, it is interesting to note that they all possess predominantly paratracheal axial parenchyma which is mainly confined to the abaxial side of the vessel. This agrees with the arrangement in many other genera of this family which have banded axial parenchyma with the vessels lying mostly on the adaxial or pith side of the parenchyma bands. It would appear therefore that the tendency for the axial parenchyma to occur on the abaxial side of the vessels is a strong family characteristic.

Garnieria, whilst lacking wide rays, does have a definite tangential, banded arrangement of the vessels and axial parenchyma. These tangential bands of parenchyma, however, do not curve inwards between the rays as is the case in most Proteaceae timbers but, instead, more or less follow the contour of the stem. In this respect the wood structure of Garnieria closely resembles that of those species of Persoonia which have narrow rays (Chattaway, 1948). Johnson and Briggs (1975) in their classification of the family, have placed Garnieria in the sub-tribe Persooninae together with Persoonia, Pyxine, Acidania and Tornsia and the wood anatomy supports this classification.

The presence of vestured pits in Garnieria is of interest. The Proteaceae is not one of the families listed by Bailey (Bailey, 1933) as possessing vestured pits. However, vestured pits have been found to be present in Persoonia tora (Butterfield & Meylan, 1974). It is interesting, therefore, that in this respect also Garnieria is similar to Persoonia.

The wood anatomy of Dilobeia is different from that of any other member of the Proteaceae so far examined. Wood samples of three other genera of the tribe Consoproeae (Kenna Johnson...
Anonymus. 1956. The Preparation of Wood for Microm- 
scopic Examination, D.S.I.R., Forest Products Research 
Laboratory Leaflet no. 40. Revised November 1956. 
Anonymus. 1964. Multilingual Glossary of Terms used in 
Wood Anatomy. International Association of Wood 
Anatomists (Committee on Nomenclature). Konkordia, 
Winterthur, Switzerland: 186 pp.

Bailey, I.W. 1933. The cambium and its derivative tissues. 
VIII. Structure, distribution and diagnostic significa-
cance of vented pits in dicotyledons. J. Arn. Arbor. 

several woods of New South Wales. Trop. Woods 
113: 48–53.

Spalhrium, a distinctive new genus of Proteaceae 

and fibre pits in Persoonia toru A. Cunn. IAWA 

Chattaway, M.M. 1932. Proposed standards for numerical 
values used in describing wood. Trop. Woods 29: 
20–28.


the evolution and classification of a southern family. 


Stern, W.L. 1978. Index Xylariorum, Institutional Wood 

Acknowledgements
I wish to thank Dr. R.K. Bamber, Dr. H. Gott-
wald, Mr. D. Edwards and Dr. R. Curtin for help-
ful suggestions and comments during the prepara-
tion of this paper. I am also indebted to Mr. R. 
Colly for help in the preparative and measure-
ment work. Curators of wood collections and 
other institutions who supplied wood samples are 
gratefully acknowledged.

References
Anonymus. 1937. Standard terms of length of vessel 
TH. BARTHOULIN, Department of Quaternary Geology, Tornåvägen 13, S-223 63 Lund, Sweden.
- Environment and dating - Wood anatomy applied to a Neolithic settlement.

The value of wood-anatomical integration in archaeology is demonstrated through results from the current excavations of the Alvastra pile dwelling in the central part of southern Sweden. It is possible to give relative datings of periods of activity in the construction:

1. 1, 2, 8, 11, 12, 14, 15, 16 and 40-42. For all the periods piles were taken from the same forest, which started to grow around 40 years earlier in an open landscape, probably situated on the moraine slope down to the bog with the dwelling.

It is possible to reconstruct in detail the vegetation cover 50 years before the settlement took place and during the years of activity and to see that the piles were collected within a larger area than the twigs and branches in the horizontal layers.

The analyses give information about the season of the activities, the kinds of activities, and details of the tree working techniques.


Artificial wounding was done with a drill bit - 2 cm diameter in the cambium in September 1977 on Acer rubrum, A. saccharum, Betula papyrifera and B. alleghaniensis, in New Hampshire, U.S.A., 10 trees of each species. After cutting of the trees one year later, it was striking that the extent of discolorations in longitudinal direction was for Acer species moderate (av. ~ 30 cm) whilst in Betula species this effect was much more pronounced (av. ~ 100 cm), with distinct variations within a species. Morphological, histotmetrical, and permeability studies on the wood showed that the development of the discoloration apparently influenced the development of the discoloration in longitudinal direction. In Acer species, the vessels were plugged with accessory compounds, in Betula species laying companion parenchyma cells which hinders an extended discoloration reaction upwards and downwards in the tree. In Betula species the vessels remained almost completely empty which might explain the faster penetration of air into the wood stimulating stronger discoloration.

P.D. BURGGRAAF, Botany Department, Nonnensteeg 3, Leiden, The Netherlands. - On the formation of vessels in the wood of Fraxinus excelsior L.

Reas for which on the three-dimensional course of the vessels in the wood of ash indicate that plant hormones may not have a specific regulatory role in the determination of fusiform elements in the cambial zone into vessel-elements, as is currently assumed. An alternative model will be presented, which is based on the following arguments.

The position of developing vessel-elements seems to be negatively related to that of the rays: i.e., these elements do occur, not exclusively, but more frequently, in radial files of fusiform elements which have no contact with ray cells.

Diameter growth of developing vessel-elements is related to differences in cell-division frequencies in adjacent radial files. Such differences in cell-division frequencies are also consistently found between radial files with and without contact with rays. These may produce local differences in pressure within the tissue.

From the literature it is known that pressure differences can have strong effects on cell-division, production and differentiation in the cambial zone of trees.

It would seem possible then, that local pressure differences in the cambial tissue, caused by unequal cell-division frequencies in the radial files, particularly in relation to the position of the rays, are determinative agents for the production of vessel-elements. Hence, a direct one-to-one connection between vessel-elements into vessels is then due to the longitudinal structural direction of the xylem tissue and the tendency to propagate such pressure differences in the longitudinal direction.

Implications of this model for production of different tissue patterns in wood will be discussed briefly.

J. BURLAY, Commonwealth Forestry Institute, South Parks Road, Oxford, U.K. - Variation of wood properties in Pinus cubensis and P. tropica from natural forests in Cuba.

J. BURLAY and A.E. AKACHUKI, Ibid. - Variation of wood anatomy of Gymnocalaburnus Roxb. in Nigerian plantations.

B.G. BUTTERFIELD and B.A. MEYLAN, Botany Department, University of Canterbury, Christchurch, and Physics and Engineering Laboratory, DSIR, Lower Hutt, New Zealand. - Aspects of angiosperm vessel structure.

Scanning electron micrographs are used to illustrate vessel perforation plate development and evolution, unusual perforation plate types, vessel wall structure and pitting, pit membranes, vented pits, helical thickenings, tyloses and trabe.
usual sense of the word, their stems are often phellem and may reach up to 50 cm or more in diameter. This paper describes the wood of coconut (Cocos nucifera L.) and illustrates various features of the vascular and non-vascular bundles, and the ground parenchyma tissue with scanning electron micrographs. Variations in the basic density of the wood are due to differences in the distribution of the bundles, the proportion of cells to other cell types present in the vascular bundles, and the thickness of the fibre and ground parenchyma cell walls. An interesting feature of the intercellular spaces in the ground tissue is the presence of pectic strands.

A.M. CATTESSON and Y. CZANINSKI, Laboratoire de Botanique et Botanique Appliquée, rue Lamouroux, Paris cedex 05, France. - Dynamical cytochemistry of wall development during vessel differentiation.

Polysaccharide deposition was followed by PATAg (periodic acid-thiocarbohydrazide - silver proteinate) technique according to Thiery (1) which chiefly contrasts vic-glycol groups. Lignin was visualized by Coppick and Fowlers procedure (2): chloric water - ethanolation - silver nitrate.

After glutaraldehyde - osmium tetroxide fixation PATAg gives strong contrast to primary walls whereas either the outer or not but normal tertiary walls (3). In differentiating secondary thickening the newly deposited polysaccharides strongly react with PATAg and show fibrilar structure. This is the reason why free vic-glycol groups become more and more. However, following treatment with chloric water, PATAg stains secondary walls a good contrast the significance of which will be discussed. During differentiation of secondary walls, the loss of free vic-glycol groups seems correlated with lignin deposition although it may be due to a greater compactness of cellulose microfibrils. Swollen transverse walls intensely react with PATAg; they are easily destroyed after chloric water treatment even at the beginning of vessel differentiation while partial hydrolysis of pit primary walls is one of the last events of vessel maturation.


All man-made fibres have, to a large extent, replaced natural fibres, it is often necessary to identify the species from which plant fibres have been extracted. Some of these results a decrease of the climatic conditions until 1885 was possible for a specific site.

D. ECKSTEIN and W. LIIESE, Ibid. - Structural alterations in the wood due to anthropogenic influences on trees.

The conditions of trees near industrial regions and their destruction by air pollution are of the utmost importance. Trees damaged by such anthropogenic influences often exhibit external symptoms only slightly visible. However, through reactions of the xylem, the ecological stress can exactly be determined and traced back to its very beginning. Thus it is possible to reconstruct the process of destruction. An influence from subirradiation influences accumulating in the course of time.

The wood-anatomical changes might be regarded as an adaptation of the tree to cope with its unfavourable life conditions. The most sensitive tissue has proven to be the hydroxystem. Often, the xylem produced under pollution influences resembles that grown under drought conditions. There is also some evidence that various specific wood structures enable some trees to be more resistant against environmental stress than others. Such structural types may be used as a parameter for selecting suitable trees for breeding.

KAZUMI FUKAZAWA and HITOSHI IMAGAWA, Department of Agriculture, Hokkaido University, Sapporo, Japan. - Quantitative analysis of lignin using UV microscopic image analyser.

The microscopic image analyser which consists of XY scanning stage, stage control unit, amplifying unit, planimeter unit and iso-density plotter was attached to the UV microscope (Carl Zeiss, Type PMP 01). Densitometric analyses are taken out directly from the scanning spots on wood cross section under the UV microscope. Iso-density areas of UV absorbance are graphed and counted by measuring the limits of density. The arbitrary units of lignin content is calculated by integrating UV absorbance. This direct method from wood section is to be preferred to the indirect method which is performed by analysing densitometricaly the negative of UV microscopic images, because of poor reproducibility of densitometric measurement.

In the report, we discuss the fundamental technical aspect of the method and the results of examining variation of lignin content within a growth increment of trees, to some extent, of the same wood. Lignin content attains a maximum value near the beginning of the early wood and a minimum near the end of the late wood. Early wood has much area of high absorbance and the variance in late wood, there is much area of the lowest absorbance. The differences of area of middle lamella and lignin content of S2 between early and late wood were found to be incompatible with the variation within a growth increment.

H. GOTTWALT, Institut für Holzbiologie und Holzdauerbestimmung der Bundesforschungsanstalt für Forst- und Holzwirtschaft, Leuschnerstrasse 92, Hamburg, B.R.D. - The secondary xylem of Magnoliaceae, its taxonomy and possible relation to other family names.

The family of the Magnoliaceae is a prominent group because of its pronounced primitiveness, which characterizes the order of Magnoliales, frequently considered as the cradle point of all living higher plants. In order to find out whether the anatomy of the secondary xylem is in accordance with this hypothesis, about 200 trees of all magnoliaceous genera were investigated and compared with the structure of other so-called primitive families. The results confirm that the Magnoliaceae in its current delimitation represent a well defined natural group distinct from other taxa of the same order. As is common in very homogenous families the diagnostic value of the anatomical features at generic-level is low and often only groups of genera are distinguishable. The most constant and widest structural difference is evident between the genera Liriodendron and Elmeritria, also corresponding with their contrasting north-south positions; in combination with the structural middle- positions of Magnolia, of the other families in the aspectus of the tribes and genera of the family. As a very rare feature in woody plants further species were detected which develop tyloses in the fibrous tissue. In terms of their relationship some only families of the order Magnoliales are considered close to Magnoliaceae. The primitiveness of the structural concept and of individual features is less pronounced in Magnoliaceae than in various other vessel-bearing families within and outside the Magnoliales.


In consequence of stresses, that bear on roadside trees, like subnormal supply of water, soil compression, soil cover with asphalt or concrete, root injuries by digging, salting, salt load after deep winter and air pollution of different kind, in Germany more than 40,000 trees die year by year. The environmental stresses mainly influence leaves or roots, in consequence cambial activity of stem and xylem production is reduced, cell size, arrangement of cells and the proportion of different tissue types are altered. Growth rings therefore are excellent indicators for recognizing environmental influences.

IAWA BULLETIN - 1979/2-3

36

IAWA BULLETIN - 1979/2-3
Especially endangered are species of *Tilia*, Acer and *Aesculus*, the most common of roadside trees, whereas others like *Platanus*, *Quercus*, *Ribinia* and *Sophora* can do comparatively well in the urban environment. In the strategy of survival of trees great importance should be assigned to the structure of root system, bark and leaves, but also to the structure and development of xylem. Using the example of tree damage by de-icing salts, different micrographs of cambial activation, xylem structure and water transport are discussed in relation to relative resistance against various climatic conditions.

If we cannot change environmental conditions to a great extent, we have to look for trees which are better suited to cities, and in this connection xylem structure plays an important role.

I.S. IZUGBOKE, Ministry of Agriculture, Engineering Division, Ipro State, Nigeria. — Grading of structural timbers in Ipro State of Nigeria.

L.J. KUÇERA, H.H. BOSSHARD and E. KATZ, Institute für Mikrotechnologische Holzforschung, ETH, Zürich, Switzerland. — Growth ring depressions and phloem ray development in beech (Fagus sylvatica L.).

Growth ring depression in the area of a broad ray is a characteristic feature of the secondary xylem of trees. Formation also occurs in the secondary xylem of some other European woody species, such as plane (*Platanus sp.*) and lime (*Tilia sp.*).

The present work deals with the quantitative and qualitative morphology of the phloem ray development in beech. The observations and measurements were made with light and scanning electron microscopes. The connection of growth ring depressions with the anatomy of the rays in their phloem parts is demonstrated, and secondary changes of the ray structure, such as dilatation and cellsizing, are described. The functional significance of the observations is discussed.

ZBIGNIEW LAUROW, S.G.G.W.—AR, Warsaw, Poland. — Technical quality of Scots Pine from selected sites of the Piska Forest.

Investigations were carried out on nine experimental plots in the North-East part of Poland (the best pine wood quality provenance in Poland). Structure and properties of wood were examined according to the Polish standards.

Studies reveal, that Pis pine has tracheids distinguishing themselves with a higher than average tracheid length (arithmetical mean often above 4 mm), coefficient of slenderness (to 20) and rigidity (to 0.6), and a higher cellulose content than the pine of other origin. Tracheid slenderness and rigidity coefficients are slightly higher in the wood from poorer sites (excluding boggy ones) and from heartwood.

The largest resistance, late wood proportion and density of wood, were found under site conditions of medium fertility and moisture. Arithmetic means of resistance, calculated for particular areas, were usually large, and differed to above 40%. The intensity of properties increases with increase of the ring width, late wood content and density of wood is lower in wood from the worst and best sites, than from medium ones. Wood from the sites having more moisture had lower resistance and lower increase of properties than from drier ones. Higher vulnerability to deformation under loading was noted in the year 3 to 10 months old. In narrow rings, silica occurs nearer the cambium, but in cells being about 1 year or more old.

This means that neither age nor distance from the cambium but a combination of both these factors affect silica deposition.


Sapotaceae are a wood anatomically very homogeneous family and the identification of red heavy woods is sometimes very difficult, especially if the data are rare and qualitative.

It was thought that a statistical method could be more efficient for this purpose than a dichotomous key. A detailed analysis of 80 samples from 20 genera resulted in 26 varying characters. Two methods were tested: principal component analysis and factorial discriminant analysis. The first one gives the 2 or 3 better linear combinations of initial variables, the 26 characters explaining a maximum of the total variation of the population, without consideration of the identity of the group. The second one tries to compute the data in linear combinations of variables in such a way that a better clustering of each genus and a greater distance between them is obtained. The second method appears more efficient to identify a sample (that is to put it in a group) but the first method gives a natural clustering which may be of interest for taxonomic considerations. A point to be discussed is the use of secondary characters (as silica grains) sometimes very discriminant, together with structural and more basic characters.

ANTON MATOVIĆ, Faculty of Forestry, University of Agriculture, Žemědělská 3, Brno, Czechoslovakia. — Cambial activity and xylem differentiation in Fraxinus angustifolia Vahl ssp. pannonica Soó et Simon.'
Wood Identification: A Practical Aspect of the Behaviour of Trees. The identification of wood is an important aspect of the study of trees, as it helps in understanding their growth patterns and ecological significance. In this paper, we focus on the identification of wood using microscopic techniques.

The wood structure is influenced by many factors, including climate, soil conditions, and genetics. The identification of wood involves examining the microscopic characteristics of the wood, such as the arrangement of cells, the presence of various substances, and the overall appearance of the wood.

The identification process begins with the selection of appropriate samples. These samples are then treated with reagents and subjected to various microscopic techniques, such as light microscopy and electron microscopy. The resulting images are analyzed to identify the species and other characteristics of the wood.

The identification of wood is not only important for scientific research but also for practical applications, such as in the wood industry and in the construction of buildings. The accurate identification of wood can help in selecting the appropriate species for various applications, ensuring the longevity and strength of the resulting structures.

In conclusion, the identification of wood is a critical aspect of the study of trees. It involves the use of microscopic techniques to examine the wood structure and identify its characteristics. This process is important for scientific research and practical applications, ensuring the selection of appropriate species for various purposes.
variable of course is the wood pattern (relative proportion of the different types of cell, cell wall thickness, lumen diameters, ... ) and, for the same reasons, large numbers of trees also are to be sampled for studying wood anatomy in order to explain wood quality. This was difficult up to recently owing to the time required for measuring the different anatomical features on microscopic sections. That time is especially long because the examination of many cells is necessary on each sample to take in account the additional within-ring and between-rings variation of cell characteristics.

By chance a new electronic equipment initially designed for metallographic studies has now become available for automatically or semi-automatically quantifying the wood anatomy: the image analyser. This apparatus has proved suitable for several anatomical applications:

- Wood pattern comparison of early and late flushing oaks.
- Explanation of beech mechanical strength by the area and the number per cm² of the large xylem rays.
- Differentiation of individuals in beech by the elliptical form of the vessels.
- Variability of beech vascular characteristics in several stand situations.
- Specific and infraspecific variability study of diameter, bark thickness and fibre percentage in 4 years old oak seedlings.
- Shrinkage of specimens of Silver fir by tracheid characteristics and of beech by vessel characteristics.
- Relationship between the sap or sugar yield and the number or the sizes of sapwood xylem rays or vessels.
- Influence of long day exposures on the cell wall thickness and the lumen diameter of the tracheids of Douglas fir, Grand fir, Norway spruce and Abies nordmanniana.

At the present time an image analyser is used at the wood quality research station in Nancy for 2 important studies: The first one concerns the effect of different parameters (water availability, photoperiod, quantity of light, auxin applications) on the wood structure of beech and oak. The second one deals with the selection of oak plus trees having large and/or numerous vessels in the early wood and a low relative area of fibres in the late wood in spite of a quick growth.

ANA MARIA RAGONESE, Instituto de Botânico Darwinion, Lavarden 200, 1640 San Isidro, Argentina.

The woods of several genera of the Leguminosae such as Pithecellobium and Samanea possess certain elements which are difficult to classify, being intermediate between parenchyma and fibres. The typical paratracheal parenchyma of the family is represented in Pithecellobium scalare by parenchyma strands (usually 2-celled) and fusiform parenchyma cells, with a prevalence of the latter. In contact with the vessels there are cells with numerous and conspicuous pits that can easily be recognized as parenchyma and the same occurs with part of the fibres, viz. those with thick walls. The ground mass of parenchyma is constituted in this species by short fibres, with wide lumina and thin walls, and between these and the fusiform parenchyma cells, a sort of intermediate forms possessing transitional features occurs. It is possible to recognize these elements in sections as well as in macerated material. As the wide lumina fibres compose the ground tissue of the wood, it is rather difficult to detect, in transverse sections at low magnifications, the precise distribution pattern of the parenchyma.

P.J. ROBBERTSE, Department of Botany, University of Pretoria, Republic of South Africa.

Wood anatomy of the South African Acaicas.

Wood specimens of 35 different Acaica species were used for this study. Specimens were taken at breast height from trees with stems not less than 8 cm in diameter and immediately fixed in FAA. Of all the wood characters investigated only nine were found to be useful to use in a principal component analysis to differentiate between the different species. Of these the width and to a lesser extent, the height of the rays gave the best results. The rays in the wood of the subgenus Acaica are 1–3-seriate, while those of the subgenus Anacalceus are multiserial. The variation of the wood of Acaica karroo from different localities and different ecological habitats is also discussed.

JEAN-CLAUDE ROLAND and BRIGITTE VIAN, Laboratoire de Biologie Végétale, Cytologie Expérimentale, ENS, 24 rue Lhomond, Paris Cedex 05, France.

Cytochemical observations on growing and non-growing walls of cambium in Diocyteldons.

WERNER SCHOCH, Eidgenössische Anstalt für das forstliche Versuchswesen, 8903 Birmensdorf, Switzerland. – Holzstruktur von ane~r~b~au~ten Hölzern nach der Konservierung mit verschiedenen Methoden (Wood structure of anec~r~b~au~t~e~n Hölzern after the preservation by different methods).

In Schweizerischen prähistorischen Sceurfor- siedlungen wurden viele hölzerne Gegenstände gefunden. Da die Hölzer infolge langer Lagerungs- zeit in wassergetränkten Sedimenten durch anaerobe Organismen abgebaut wurden und infol~ge- des in ihrer Struktur so~w~e~n den mechanischen und physikalischen Eigenschaften verändert sind,


Melastomataceae: Are they really uniform? (based on wood research by J. Koek-Noorman, G.J.C.M. van Vliet, and B.H. ter Welle).

This very natural family comprises over 240 genera and about 4000 species. Melastomataceae are mainly tropical, being especially well represented in the New World, and include herbs, shrubs, trees, lianas and epiphytes. Based on morphological characters, a classification of 3 subfamilies is accepted by most plant taxonomists. These subfamilies are: Melastomatoideae (11), Astroniodioideae (2) and Memecyloideae (2). The number of tribes is given between brackets.

Even without flowers or fruits the taxae are easy to recognize as representatives of the Melastomataeae by their peculiar leaf venation, the Memecyloideae excreted.

The wood anatomy of the Melastomatoideae and some of genera of the Astroniodioideae, representing over 95% of the number of genera of the family, is rather uniform. Characteristic are the narrow heterogeneous rays, commonly without procumbent cells, and the parenchyma or parenchyma-like structures, often as short wavy tangential bands and with conspicuous intercellular spaces. However, certain types of intervascular pits, ray-composition, parenchyma distribution and crystals are sometimes restricted to systematic units like genera or tribes.

A small group of genera, viz. Memecylon, Mou-riri, and Kibesia (including Pierandrea), differs in so many xylem characters (fibres with bordered pits instead of simple pits, a F/V ratio of 2 to 3 instead of 1.2–1.6, presence of included phloem) from the other Melastomataeae examined, that a separation of this part of the family and a re-instatement of the Melastomaceae is proved. The anatomical evidence will be discussed and finally a possible phylogenetic scheme will be presented.

M.T.M. WILLEMSE, Botanical Laboratory, Arbo- retumlaan 4, Wageningen, The Netherlands. – Pri- mary fluorescence of secondary xylem.
Proposal on wood terminology

A brief note "Proposals on wood terminology" in IAWA Bulletin 1978/4: 80 proposed that this journal be the site of amended or new definitions of wood anatomical terms for a new edition of the 'Multilingual Glossary of Terms Used in Wood Anatomy', the current edition being of 1964 vintage. I wholeheartedly agree with this suggestion. However, since the note just cited presented as samples for four levels of degree, I would like to take this opportunity to correct the definitions of 'protoxylem' and 'metaxylem' as presented in the aforementioned note to bring them in conformity with my original proposal (Schmid, 1977), namely:

Protoxylem - First-formed primary xylem; in stems usually with trachyxyelic elements characterized by annular or helical (spiral) wall thickenings (patterns).

Metaxylem - Later-formed primary xylem; in stems usually with trachyxyelic elements characterized by scalariform, scalariform-reticulate, or pitted wall thickenings (patterns).

The corrections are twofold. First, I believe that definitions of wood pairs such as the above should have a parallel format. Secondly, and much more importantly, the point I wished to make in my 1977 article is that 'in stems' must be added as a qualifier in mentioning the type of wall patterns since vascular bundles of reproductive structures typically have only annular or helical wall thickenings, whereas vascular bundles of roots often have only scalariform-reticulate or pitted wall thickenings.

In my 1977 article I proposed several other redefinitions of commonly used terms, which I would formally like to list here:

Xylem lacuna - A space involving part or all of the xylem of a vascular bundle and resulting from the destruction of the trachyxyelic elements during extension of the axis. 'Protoxylem lacuna' upon 'protoxylema lacuna' are inaccurate designations unless developmental evidence is available. See also xylem-phloem lacuna.

Xylem-phloem lacuna - A space involving part or all of the xylem and phloem of a vascular bundle and resulting from the destruction of the trachyxyelic and phloem elements during extension of the axis. Also called vascular lacuna. See also xylem lacuna.

Vascular lacuna - See xylem-phloem lacuna.
Protoxylem lacuna – An often improper designation for xylem lacuna, which see. Also called protoxytary lacuna.

The format for cross references in the above definitions is based on the glossary in Eau's well-known textbook (Eau, 1977, and the 1960 first edition). This well thought out glossary could (should) serve as the basis for revising terms for a new ‘Multilingual Glossary of Terms Used in Wood Anatomy’ since the terms in Eau's glossary are frequently based on developmental criteria. Although many wood anatomists are little concerned with developmental aspects, it is generally preferable, as elaborated earlier (Schmid, 1976, 1977), to involve whenever possible developmental criteria in defining terms. Otherwise, terms based mainly or exclusively on structural (so-called morphological) criteria may be ambiguous or even inaccurate (see especially the discussion in Schmid, 1977).

References:

Department of Botany Rudolf Schmid
University of California Berkeley 94720, U.S.A.

ASSOCIATION AFFAIRS

Financial Report 1978

<table>
<thead>
<tr>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance 1977</td>
<td>Dfl. 8530.46 IAWA Bulletin</td>
</tr>
<tr>
<td>Glossary and Directory sales</td>
<td>Dfl. 106.00 Index Xylariurn</td>
</tr>
<tr>
<td>Reprints</td>
<td>Dfl. 1374.00 Postage</td>
</tr>
<tr>
<td>Old Bulletin sales</td>
<td>Dfl. 95.00 Banking costs (extra)</td>
</tr>
<tr>
<td>Registration fees congress 1979</td>
<td>Dfl. 155.00 Balance</td>
</tr>
<tr>
<td>Dues and subscriptions</td>
<td>Dfl. 9372.66</td>
</tr>
<tr>
<td>Interest</td>
<td>Dfl. 425.95</td>
</tr>
<tr>
<td></td>
<td>Dfl. 20059.07</td>
</tr>
</tbody>
</table>

Statement of account:
Checking account: Dfl. 2335.66.
High interest savings account (No. 45.14.36.067): Dfl. 9950.00.

The financial report over 1978 shows a further increase of our funds, albeit a much smaller one than in 1977. In 1979 production costs of the IAWA Bulletin will rise substantially and ultimately expenditure will be higher than our income. Our savings of the present years will then be a welcome buffer to avoid a direct increase of Membership dues.

WOOD ANATOMY OF ARCHIDENDRON F. V. MUELLER, MIMOSOIDEAE, LEGUMINOSAE

by

Tine Baretta-Kuipers
Institute of Systematic Botany, University of Utrecht, Heidelberglaan 2, Utrecht, The Netherlands

Abstract

A description is given of the wood structure of six Archidendron species. The wood structure is of an obviously advanced nature and by this does not support the theory of primitiveness of these plicate-perulate genera in an otherwise almost exclusively uniseriell family.

Archidendron (Mimosoideae) is a genus that has aroused interest time and again, because it is rather exceptional in the Leguminosae in view of its plicate-perulate flowers. Archidendron occurs in New Guinea, the Moluccas, the Solomon Islands, the Philippine Islands and Queensland/Australia. The genus was described by F. von Mueller in 1865, revised by De Wit in 1942 and 1952; by Mohlenbrock in 1966 and in part by Verdcourt in 1977.

The etymological derivation of its name has been given both as 'chief of trees' and as 'primitive tree'. The first alternative could be correct, because the first described species is a beautiful tree (Archidendron vaillantii F.v.Muell.), but most of the later species are small inconspicuous trees. The second alternative seems more appropriate because of the supposed primitive nature of the flower within the family Leguminosae.

The number of ovaries was decisive in the separation of the genus from its closest ally, the genus Pithecocellobium. The latter always has a single ovary, although Mohlenbrock (1963) refers to a Pithecocellobium species as having one or two ovaries and specimens of Archidendron as having a single ovary. This caused Mohlenbrock (1966) to incorporate Archidendron as a section in Pithecocell-lobium, as in his opinion the main discrepancy between the two allied genera was removed.

Verdcourt (1977), however, does not agree with Mohlenbrock and according to De Wit (1952) the plicate-perulate condition is occasionally found in all three subfamilies of the Leguminosae. It is to be hoped that the group of scientists (including a wood anatomist) now working on the Pithecocel-lobium complex, will be able to clarify some of the many taxonomic problems concerning these genera.

As the structure of the wood of Archidendron has, to my knowledge, never been described before and because the structure of its wood may be especially of interest in a phylogenetic sense, a description is given here.

Material studied


Because the wood structure of all species is essentially the same, one general description suffices.

General description of the wood structure of the genus Archidendron

Colour. In all species, except A. lucyi, the colour is a pale yellow without a clear demarcation between sapwood and heartwood. In A. lucyi the colour is pinkish brown, more or less streaked.

Microscopic characters. Growth rings faintly to well demarcated by flattened crystalliferous fibres, in A. pitenopum also by banded parenchyma.

Vessels diffuse, solitary as well as in short radial multiples and in occasional clusters in different proportions. Number of vessels 1–7/mm², up till 9 in A. aruense. (Multiples and clusters always counted as one vessel.) Pores round, diameter ranging from 50–200 µm, with average values from 100–150 µm; an exception is A. glabrum which has considerably smaller vessels, ranging from 30–70 µm with a mean of 60 µm. Vessel member length ranges from 200–550 µm with average values from 340 till 450 µm; A. lucyi being above average with vessel members 450–750 µm with a mean of 575 µm. Perforations are always simple, mostly transverse or nearly so, but rather oblique perforations are also seen. Intervascular pits very rare, mostly about 6 µm, sometimes confluent. Pits to axial and radial parenchyma as the intervacular pits. Vascular tracheids scanty in all species, associated with vessels.

Fibre tissue libriform, thin-walled, wall thickness 2–3 µm, diameter of fibres ca. 20 µm. Simple, round, to oval pits on radial walls mainly. A. lucyi is an exception in having slit-like pits with a vestigial border. Fibre length 750–1450
Figures from top to bottom: transv. x 40, tang. x 100, rad. x 100. — Fig. 1. Archidendron glabrum (K. Schum.) Laut. & K. Schum., NGF 11930. — Fig. 2. Archidendron muricarpum (Kosterm.) Verdc., NGF 8612, Holotype.

Figures from top to bottom: transv. x 40, tang. x 100, rad. x 100. — Fig. 3. Archidendron lucyi F. von Muell., BW 9258. — Fig. 4. Archidendron pteropum Verdc., NGF 25011, Holotype.
Pithecellobium /A abundantly investigated, 30 rays. The 'chambers'), wood rays with structure most contrary: as give the average diameter. Very 6-celled; uniseriate parenchyma is predominant. The rays are another striking feature in Archidendron: they are uniseriate, very low and rather widely spaced. This feature is shared with many Pithecellobium s.l. species. In my opinion this is an indication of the close relationship of Archidendron and Pithecellobium, as indeed is always stressed by taxonomists.

The structure of the wood of Archidendron does not give any indication of a primitive nature. On the contrary: all characters of the wood point to a high specialisation level. (No mention will be made of features of the wood of Archidendron that are common to all leguminous woods and that also indicate a high level of specialisation.) These high-specialisation characters of Archidendron are for instance:
1) the very low, uniseriate rays that consist of procumbent cells only;
2) the abundance of the axial parenchyma in wide bands;
3) the length of vessel members and fibres (short to of medium length).

Within the subfamily Mimosoideae, which in itself has a wood structure of a rather specialised type, Archidendron to my idea certainly is not among its least specialised members, but on the contrary among the most advanced ones according to the Baikian concepts of evolution in xylem.

Acknowledgements
I am grateful for the provision with excellent and rare material by Mr. Ingle, CSIRO, Melbourne and by Dr. Baas, Rijksherbarium, Leiden. Thanks are due to Ben ter Welle, Henri Kypkema and Mr. Kuiper for their technical assistance and to Dr. Menegna, Dr. Kock-Noorman and Dr. Westra for their discussions on the subject.

References
Summary of Reichenbach's paper, "Investigations on the cell-like structures that fill some vessels." (The original illustrations, reproduced here, are re-arranged to fit the IAWA Bulletin page size.)

In many plants cell-like structures fill the lumen of vessels more or less as soon as these have reached a certain age. This phenomenon had been described earlier by Malpighi, Leeuwenhoek, Sprengel, Kieser, and Michel. Meyer gave a historical survey of earlier reports and added his own observations. Many authors considered these vessels to be separate entities, without contact with each other and with neighboring cells. Schleiden, Endlicher and Unger made little progress, the origin of these little 'bubbles' remained unknown. There follows a long list of plants, including several tropical and subtropical species, the vessels of which show the phenomenon. However, it has never been observed in the tracheids of conifers.

A detailed description follows, based upon the author's own observations in many species. The size of these structures varies considerably, even within one vessel. They look real cells, in some plants they are thin, in others thick-walled. Where they touch there are pit pairs between them, where one can clearly distinguish a primary and secondary wall. The slight unevenness of the wall thickness is exactly like what von Mohl describes it for parenchyma cells. They contain variable amounts of starch, depending on the species. They also contain the substance that von Mohl calls 'Primordialschlauch' (cytoplasm) which is characterized by certain staining reactions and shows plasmolysis under the influence of certain solutions. Brownian movement can be seen clearly. In many plants the nucleus and nucleolus can be observed suspended in the cytoplasm, either freely within the cell lumen, or next to the wall. The cytoplasm shows streaming, particularly clearly in Cucurbita. The conclusion is inevitable: these are real cells.

A description of a series of observations follows, beginning in the summer and continuing throughout autumn and winter. In a four-year-old Robinia branch, for example, all of this year's vessels are open, all older vessels are completely filled. Formation of these cells in the current year's vessels begins in October and is completed in December. One-year-old twigs behave like this year's growth ring of older branches. Several other species have been investigated and found to behave similarly. Young cells are always attached to the vessel wall where axial or radial parenchyma cells are, never next to an adjacent vessel element. There is no doubt that they originate from pits. Thinner sections finally revealed that the growing cell is part of the neighboring cell. Sections of Vitis vinifera and Sambucus nigra show this particularly well, especially when treated with KOH solution. The author concludes that these vesicles are parts of the neighboring cells.

The second part of the paper begins with the suggestion of the name 'Thyllen' (tyloes), deriving from the Greek word ὑθύλη, meaning bag, or container. A very detailed description of tyloes development then follows; the author takes pride to be working with the most modern and excellent microscope made by Pössl (Fig. 25). The range of plants inspected is remarkable, it includes not only European species, but 'exotic' ones such as Musa and Strychnos as well. A budding tylosis is first very transparent, eventually cytoplasm can be identified (staining brownish-yellow with iodine). Starch grains, nucleus and nucleolus appear later. A more detailed description of cytoplasmic streaming, staining and plasmolysis experiments then follows. Nuclei and cytoplasm eventually disappear with age.

During formation of a tylosis, the primary wall does not get thinner, it is therefore not merely stretched, but actually grows. When different tyloes in a vessel element finally touch each other and cannot expand any further, secondary wall formation begins and neighboring tyloes develop pit pairs. Pits never appear between tyloes and vessel walls. The tylosis and its mother cell remain a unit and do not separate. Starch is always found in quantities corresponding to starch quantities in other, nearby tissues.

Legends to Figures 1–14 of the original plate of Reichenbach's paper. — Figs. 1, 2. Transverse sections of two vessels of Robinia pseudacacia. a. Walls of the tyloes with pits and pit canals. b. Nuclei. — Fig. 3. Transverse section of the innermost growth ring of a four-year-old grape stem, stained with iodine. a. Wood (parenchyma) cells. b. Vessel. c. Tyloes, containing starch. — Fig. 4. Transverse section of a vessel of Cucurbita pepo. a. Vessel wall. b. Tyloes with cytoplasm. c. Nuclei. — Fig. 5. A tylose-filled vessel of Streptiza reginae. — Figs. 6, 7. Two vessels of Cucurbita pepo. a. Tyloes with cytoplasmic streaming. b. Nuclei. — Fig. 8. A vessel from the same plant with young tyloes. a. Cytoplasm (plasmolized). b. Nucleoli. — Fig. 9. Transverse section from Cucumis sativus. — Figs. 10, 11. Transverse sections of one-year-old shoots of Vitis vinifera. a. Primary cell walls. b. Secondary cell walls of wood parenchyma. c. Secondary vessel wall. d. Young tyloes with their respective mother cells. — Figs. 12, 13. Transverse sections of one-year-old shoots of Sambucus nigra, treated with KOH. — Fig. 14. Vessel of Cucurbita pepo. a. Very young, translucent tyloes. b. Somewhat older tyloes with granular content (cytoplasm).
The author concludes that tyloses develop when the vessels are air filled; they appear in the fall after cessation of water conduction. They remain in contact with their mother cells because they cannot get any water or nutrients from the vessels. A similar phenomenon, but unrelated, is that in some plants non-functional vessels are filled with gum ("körniger Schleim"), which ooze through the pits into vessels. When a gum deposit is followed along the vessel in serial sections, its origin can almost invariably be traced to a wound.

Tyloses are produced by thin-walled parenchyma cells that have only primary and, at most, very little secondary wall. The mother cells are axial or radial parenchyma. Tyloses are usually found in pitted vessel members, rarely in elements with ring or spiral-shaped secondary wall.

The paper concludes with a description of the course of vascular bundles in the Cucurbita stem. General comments about the origin of plant cells then follow, the logic of which is somewhat difficult for us to follow today. It is obviously not easy for us 20th century biologists to judge these general remarks fairly, without studying the knowledge and philosophies of the time. Taking the paper for what it is, namely a description of the most careful and detailed original observations, the reader is left with the greatest admiration. Most impressive perhaps is the clear recognition that tyloses formation and gum production are the result (not the cause) of the cessation of water conduction (or of injury), an observation that only much later found firmer experimental support (e.g., Klein, 1923).

A brief biography of Hermine von Reichenbach

Hermine's father, Karl Ludwig (1788-1869), came from a middle-class family of surgeons, civil servants, etc. He was a very colorful personality. Right at the outset of writing about Hermine, one runs into the danger of having her overshadowed by her father, as it probably happened during her lifetime. Karl Ludwig studied the natural sciences and married Friederike Luise Ehhardt, the daughter of a wealthy Stuttgart book dealer. He traveled widely during his studies and did extensive work on charcoal manufacture whereby he isolated and described wood distillates, such as paraffin and creosote. His interests ranged very widely; he worked on steel production (e.g., the manufacture of railroad tracks), collected and studied meteorites and even tried to cultivate silk worms. The King of Württemberg made him a Baron in 1839. Later in his life he became quite interested in spiritualism and made considerable efforts to investigate and describe some of the obscure phenomena scientifically, thereby causing endless controversies.

Hermine was born on September 5, 1819, as the fourth child and second daughter of a family to which three years later, a fifth child was added. Her mother died on May 11, 1835 when Hermine was fifteen. We have not been able to find out where she studied, but it is safe to assume that she was stimulated by her father's love for natural history. She was twenty years old when her father became a Baron, thus becoming a Baroness herself. She published her tylosis papers at the age of twenty-six, and her papers on laticifers at twenty-seven. On November 11, 1849, she married Karl Schuh. She seems to have discontinued her studies at this point, at least no further publications are known to us. Her husband died fourteen years later and she spent the rest of her life as a widow.

Two more entries in botanical journals have come to our attention. The first is a note in Bot. Z., 7: 104 (1849), where she is listed as one of eleven corresponding members admitted to the Royal Botanical Society of Regensburg during the years 1847 and 1848. In addition, seven regular members are listed. The second entry was found in Flora 61(4): 64 (1878), in 'Kurze Mitteilungen' (brief notes) prepared by M. Göppert of Breslau (now Wroclaw, Poland). The paragraph is entitled 'Honor to whom honor is due' and reveals the identity of the author of the articles on tylosis and laticifers. But Göppert knows neither if any further publications exist and if she continued her botanical studies at all. He appeals to his Viennese colleagues for further information. He praises her for having assembled a very rich herbarium collection and being very knowledgeable in systematic botany.

Legends to Figures 15-24 of the original plate of Reichenbach's paper. — Figs. 15, 16. Transverse sections from Vitis vinifera, treated with KOH. a. Primary cell walls. b. Secondary cell walls of wood parenchyma. c. Secondary vessel wall. d. Young tyloses with their respective mother cells. — Figs. 17-18. Transverse sections of Juglans regia. a. Wood (parenchyma) cells. b. Ray parenchyma. c. Vessels. d. Tyloses. — Fig. 19. Transverse section from Quercus robur: tyloses containing starch. — Fig. 20. Transverse section of a one-year-old shoot of Robinia pseudacacia with young tyloses and (a) plasmolyzed cytoplasm. — Fig. 21. Transverse section of the stem of Streblis reginae. Vessel with spiral thickening, filled with tyloses. a. Tyloses, with their mother cells (b). — Figs. 22-23. Two vessels of Cucurbita pepo in longitudinal section. a. Cytoplasm of the tyloses. b. Nuclei. Both are from a stem which had been fixed in alcohol (brandy) for a longer period of time. — Fig. 24. Transverse section of a vessel of Cucurbita pepo with a tylosis and appearing nucleus.
The elusive question why she published her papers anonymously remained unanswered. The earlier suspicion that, as a baroness, she might not have wanted to use her name is almost certainly wrong, because her father published so many papers under his own name. One clue to this mystery can be found in a recent article about the history of the ‘Allgemeine Forst- und Jagdzeitung’ (published by Sauerländer, Frankfurt am Main, Germany) which now celebrates its 150th year of existence (Hasel, 1979). It is a forestry journal, but botanists may remember that much of Theodor Hartig’s work on forest botany was published there during the mid-19th century. Th. Hartig is, of course, best known for the discovery of the sieve tubes. Hasel (1979, page 2) makes the following statement about the early days (before 1850). ‘As was customary at the time, authors remained often anonymous. Anonymity was not even lifted in the case of controversy so that a quarrel had to be carried out against an unknown or suspected opponent. Only well-known authorities signed their articles.’ (Free translation by this writer). This may be the very simple answer to our seemingly elusive question.

References

A NOTE ON THE WOOD ANATOMY OF DILLENIA (DILLENIACEAE)

by William C. Dickson

Department of Botany, The University of North Carolina, Chapel Hill, North Carolina 27514, U.S.A.

Abstract

The wood anatomy of 31 species of Dillenia is described and discussed with reference to environmental factors. The number of bars on scalariform perforation plates appears to be lowest in species of seasonally dry habitats.

Introduction

Dillenia L. is a genus of approximately 65 species that ranges from Madagascar through SE. Asia and Malesia to N. Australia and Fiji (Hoogland, 1972). Although a few species are shrubby, these plants are mostly trees which bear large leaves and large flowers in few-flowered inflorescences. Most species occur in everwet forests, with several showing a pronounced preference for temporarily flooded situations. Some species, however, are more or less confined to savannahs whereas others typically grow in regions with a distinct dry period (Hoogland, 1952). Plants vary from evergreen to deciduous although this feature is not always correlated with habitat since some deciduous species are found in, or even confined to, wetter areas and some evergreen species extend into periodically dry regions. The genus occurs from sea level to an elevation of about 2000 meters.

Since my earlier detailed description of the secondary xylem of Dillenia (Dickson, 1967) a large number of additional collections and species have become available for study. The objectives of this study were to ascertain the extent of wood anatomical diversity within Dillenia and analyze the observed variability in relation to various environmental factors.

Materials and methods

Wood samples were obtained from xylariae throughout the world. A total of 71 samples representing 36 species were examined. Sections were cut on a sliding microtome and subsequently stained with safranin. Quantitative data were obtained from macerations prepared with Jeffrey’s macerating fluid. For each sample 25 measurements or counts were made of vessel element length (tubae included), fiber length, and scalariform perforation plate patterns. Cell diameters were measured from transverse sections. All specimens studied appeared to represent older wood.

材枓與方法

木材样品来自世界各地。共收集了36种31种样品。切片是在轨道显微镜上切片并用沙酚显色。定量数据是从先用Jeffrey的脱木纤维素液制备的木纤维素中获得的。每个样品测量25个木纤维素长度（管胞包括）,纤维长度,和筛孔型。细胞直径从横切面测量。所有标本似乎代表了老木。

Observations and discussion (Fig. 1–4)

Habitat data and selected quantitative characteristics of the xylem of species studied are summarized in Table 1, all specimens examined fall within the range of variability described for the
The number corresponding to character states are: 1. Plants evergreen (E) or deciduous (D), 2. Mean vessel diameter, mm, 3. Mean vessel element length, mm. 4. Bars per perforation, average. 5. Mean fiber length, mm.

<table>
<thead>
<tr>
<th>Species</th>
<th>Habitat and Altitude*</th>
</tr>
</thead>
<tbody>
<tr>
<td>aurea</td>
<td>seasonally dry forests</td>
</tr>
<tr>
<td>auriculata</td>
<td>dense forests, riverbanks or ridges, low elevation</td>
</tr>
<tr>
<td>beccariana</td>
<td>low elevation forests</td>
</tr>
<tr>
<td>biformis</td>
<td>wet situations, up to 300 m</td>
</tr>
<tr>
<td>castaneifolia</td>
<td>dense forests, riverbanks, swamps, up to 200 m</td>
</tr>
<tr>
<td>cycloplenens</td>
<td>low elevation forests</td>
</tr>
<tr>
<td>diantha</td>
<td>forests, up to 400 m</td>
</tr>
<tr>
<td>exsica</td>
<td>forests on dry to swampy soil, low elevation</td>
</tr>
<tr>
<td>eximia</td>
<td>primary and secondary forests, up to 300 m</td>
</tr>
<tr>
<td>grandifolia</td>
<td>lowland rainforest, up to 300 m</td>
</tr>
<tr>
<td>indica</td>
<td>moist forests</td>
</tr>
<tr>
<td>ingens</td>
<td>lowland rainforests, up to 150 m</td>
</tr>
<tr>
<td>megalantha</td>
<td>often on riverbanks, up to 1000 m</td>
</tr>
<tr>
<td>montana</td>
<td>forests between 1350–2000 m</td>
</tr>
<tr>
<td>nakigi</td>
<td>lowland rainforest</td>
</tr>
<tr>
<td>ovata</td>
<td>open forests, savannas, up to 1500 m</td>
</tr>
<tr>
<td>papuana</td>
<td>primary forests, temporary flooded lands, also permanently dry situations, mostly at low elevations</td>
</tr>
<tr>
<td>parviflora</td>
<td>dry, open forests</td>
</tr>
<tr>
<td>penangiana</td>
<td>open forests of savannas</td>
</tr>
<tr>
<td>philippinensis</td>
<td>forests at low and medium elevations</td>
</tr>
<tr>
<td>pulchella</td>
<td>primary and secondary forests, wet, often peaty soil, low elevation</td>
</tr>
<tr>
<td>quercifolia</td>
<td>low elevation rainforests</td>
</tr>
<tr>
<td>reticulata</td>
<td>usually in swampy localities, up to 200 m</td>
</tr>
<tr>
<td>retusa</td>
<td>moist low country</td>
</tr>
<tr>
<td>salomonensis</td>
<td>lowland rainforest</td>
</tr>
<tr>
<td>scabrella</td>
<td>forests up to 1300 m</td>
</tr>
<tr>
<td>schlechteri</td>
<td>forests between 1300–1700 m</td>
</tr>
<tr>
<td>subfruticosa</td>
<td>wet lowlands</td>
</tr>
<tr>
<td>sumatrana</td>
<td>forests up to 500 m</td>
</tr>
<tr>
<td>triquetra</td>
<td>forests at low altitude</td>
</tr>
<tr>
<td>turbinata</td>
<td>forests between 500–1200 m</td>
</tr>
</tbody>
</table>


Wood parenchyma is diffuse, diffuse-in-aggregates, and scanty. Raphides are numerous in the ray parenchyma.

Despite their apparent homogeneity, however, some interesting species specific variation is present. The one variable structural feature that is most conspicuous is the number of bars on scalariform perforation plates. Whereas the majority of species possess vessel elements with an average of 20 or more bars per perforation plate, Dillenia parviflora, D. pentagyna, and D. scabrella average less than 10 bars per plate with as few as 5 bars occasionally present. Although it may appear somewhat subtle, there is clearly a correlation between perforation plate bar number and habitat, since all species with reduced numbers of perforation plate bars occur in seasonally dry habitats.
Dillenia aurea, also from seasonally dry areas, shows a similar condition but to a lesser degree. A similar trend toward reduction in bar number in response to drier habitats is also present in the dilleniaceous genus Hibbertia (Dickinson et al., 1978). Although vessel elements from Dillenia species growing in drier regions tend on an average to be slightly shorter than other taxa, there is not a corresponding decrease in pore diameter or increase in pore number per unit area. The significance, if any, of the observed variation in pore diameter is unclear. Fiber length is relatively uniform in all species.

In his discussion of functional and adaptive aspects of vessel element morphology, Baas (1976) used Dillenia as an example of a genus in conflict with the adaptive hypothesis of Carlquist (1975), i.e., species from drier habitats possess vessel elements with predominantly simple perforation plates in response to adaptive selective pressures. Baas (loc. cit.) discussed several woody genera which both follow and deviate from this pattern with regard to perforation plate type. Although it is true that no species of Dillenia possesses simple perforation plates, the reduction in bar number within scalariform perforation plates in the drier habitat species is very apparent. The only species which is seemingly in contradiction to this trend is *D. ovata*, which grows in mixed evergreen, deciduous, or dry dipterocarp forests, or savannahs, but retains a higher bar number. It should be noted, however, that this is an evergreen species. Although all of the species with reduced bar numbers are deciduous, deciduous species (e.g., *D. grandifolia*) growing in wet conditions exhibit the same features as other dillenias from everwet habitats. The shrubby species *D. suffruticosca* did not deviate significantly anatomically from other plants.

No altitudinal differences of the type described for *Fex* (Baas, 1974) have been observed. Hoogland (1952) found no satisfactory way of recognizing subgeneric groups within the genus and wood anatomy provides no clues in this regard.

Acknowledgement

I wish to thank Mr. Philip M. Rury for his assistance in slide preparation.

References


FIBRE CHARACTERISTICS OF SOME CUBAN HARDWOODS

by

Károly Babos

Research Institute for the Woodworking Industry, Víziváros 4, 156, H-1201 Budapest, Hungary

Abstract

Fibre length and fibre wall thickness of 7 Cuban hardwood species has been studied and is compared with that of 2 species grown in Hungary.

Seven species of Cuban woods from a wood collection donated to our institute by Miguel Vales from the Botanical Institute of the Cuban Academy of Sciences were studied for fibre characteristics considered of importance for industrial applicability.

The species studied are: Bombacopsis cubensis A. Robyns (Bombacaceae); Garrya fadyeni Hook. (Garryaceae or Cornaceae); Ceratopyxis verticillata Hook. ex Hook. (Rubiaceae); Magnolia cubensis Urb. ssp. cubensis (Magnoliaceae); Tabebuia lepilota (Bignoniaceae); Catalpa punctata Griseb. ssp. punctata (Bignoniaceae); Pera buxifolia Griseb. (Euphorbiaceae). For details on stature and habitat of these species see Babos & Vales (1977) and Knapp (1965). For comparison the same fibre characters were studied in two species grown in Hungary, viz. Austrian oak (Quercus cerris var. cerris Loid., Fagaceae) and giant poplar (Populus x euramericana (Dode) Guinier cv. 'robusta', Salicaceae); see also Babos, 1970 and 1974.

All measurements were carried out on tulouzin blue stained macerated material. Mean values are based on 100 measurements each. The characteristics of fibre ends were also recorded.

Table 1. Fibre characteristics of 7 Cuban hardwoods and 2 woods grown in Hungary.

<table>
<thead>
<tr>
<th>Species</th>
<th>Fibre length</th>
<th>Wall thickness</th>
<th>Lumen diameter</th>
<th>Fibre end</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean S.D.</td>
<td>Sg</td>
<td>C.V.</td>
<td>Mean S.D.</td>
<td>Sg</td>
</tr>
<tr>
<td>Bombacopsis cubensis (Bombacaceae)</td>
<td>1779</td>
<td>210</td>
<td>25.9</td>
<td>1.5</td>
</tr>
<tr>
<td>Garrya fadyeni (Garryaceae or Cornaceae)</td>
<td>1280</td>
<td>190</td>
<td>76.6</td>
<td>6.0</td>
</tr>
<tr>
<td>Ceratopyxis verticillata (Rubiaceae)</td>
<td>1091</td>
<td>160</td>
<td>67.9</td>
<td>6.2</td>
</tr>
<tr>
<td>Magnolia cubensis ssp. cubensis (Magnoliaceae)</td>
<td>1669</td>
<td>259</td>
<td>86.7</td>
<td>5.29</td>
</tr>
<tr>
<td>Tabebuia lepilota (Bignoniaceae)</td>
<td>925</td>
<td>119</td>
<td>54.1</td>
<td>5.9</td>
</tr>
<tr>
<td>Catalpa punctata ssp. punctata (Bignoniaceae)</td>
<td>1047</td>
<td>167</td>
<td>76.6</td>
<td>7.3</td>
</tr>
<tr>
<td>Pera buxifolia (Euphorbiaceae)</td>
<td>1952</td>
<td>248</td>
<td>79.3</td>
<td>4.0</td>
</tr>
<tr>
<td>Populus x euramericana cv. 'robusta' (Salicaceae)</td>
<td>1300</td>
<td>327</td>
<td>172.3</td>
<td>13.2</td>
</tr>
<tr>
<td>Quercus cerris var. cerris (Fagaceae)</td>
<td>1318</td>
<td>151</td>
<td>89.3</td>
<td>6.7</td>
</tr>
</tbody>
</table>

Measurements in μm. S.D. = Standard Deviation; Sg = Standard Error of the mean; C.V. = Coefficient of variation.

IAWA BULLETIN – 1979/2–3
The results are summarized in Table 1. It appears that the tropical species do not differ significantly from the two temperate species. It should be noted that all species studied only reach a maximum of 70% with an average of 50% of the values for tracheid length measured in pines. Felt- ling is an important factor in the application of deliberated wood products, and it is strongly influenced by fibre length, wall thickness and fibre end morphology of the species. In this respect pine tracheids have the most advantageous properties. It is hoped that the fibre data recorded here may contribute to the understanding of the possible applications of the combustion species involved.

References


BOOK REVIEWS


The author, Prof. Pieters, has lived in Zaïre for several years and has thus felt the urgent need for a work through the trees of the tropical rainforest zone of this country. He has now pro- duced a book containing numerous field observa- tions complemented with data from herbarium material and from literature. Although data on some of the species can also be found in the Flore d’Afrique Centrale and similar works, many species belong to families not yet treated in these floras. The book by Pieters is therefore more than a compilation.

In the introduction guidelines for botanical identification are given. The main part consists of accounts of 112 species, comprising commercial names (no vernacular names are given), data on habitat and habit of the tree (bole, bark, heart-wood etc.), a detailed botanical description, ma- croscope features of the wood and notes on its utilization, and the distribution in Zaïre (no wood anatomy).

In my opinion it would have been interesting to include data on distribution of the species out- side Zaïre. The distribution data for Zaïre itself are sometimes incomplete. The book would also have gained in value if additional species had been included. For instance for Entandopogon, the rare species E. palustris is described but not the lo- cally common E. congestum which is often confused with E. cylindericum.

The book is produced in offset which some- times has resulted in greyish phototypes lacking in detail. The photographs are of the trunks of the trees and of leaves and fruits. The necessity of publishing at low cost with a decrease of printing quality is a common phenomenon. However, for a work of this kind it is a better solution than not to publish at all.

The author still has some copies which are available to IAWA members on request. If the need for publication of the book is good, the University of Gent would be prepared to produce a second printing to be sold at a very low price. This should be wel- come, I think. Let us hope that this volume will be complemented with another including species not yet treated.

R. Dechamps


Clad in an even nicer cover than the first, suc- cessful edition, this new version of Wood - Struc- ture and Identification contains a number of signifi- cant improvements and additions. It is gratifying that all desiderata mentioned in a review of the first edition (IAWA Bull. 1977/3: 60-61) have been met with. Apart from some corrections there are two major additions, viz. the collection of ex- cellent low power incident light micrographs of all 76 woods dealt with in the keys, and an indexed glossary of terms. This will certainly help students to interpret the micrographs of individual features and to use the keys.

The definition of wood anatomical terms is no- toriously difficult, but the authors have usually succeeded in doing so adequately. Just to show that perfection is hard to achieve, the definition of a tracheid as 'a specialized fiber having conspic- uous bordered pitting and with a definite second- ary wall' may be cited as sounding rather unfor- tunate to the phylogenetically inclined wood anatomist.

It is a good omen for wood anatomy that books of this kind sell out at such a fast rate. The low price cannot be prohibitive to use it for courses at various levels.

Pieter Baas


This impressive collection of high-quality micro- graphs is a welcome companion to the widely used FPR Bulletins nos. 22 and 46 on the identification of softwoods and hardwoods by Phillips (1948) and Brazier and Franklin (1961). Transverse, tangen- tial and radial sections mostly at x 60, of 451 taxa are pictured. This will certainly facilitate identification for wood anatomists who lack the luxury of a well-stocked reference slide collection although the dangers of basing an identification on comparisons with photomicrographs alone are also recognized by the author of this atlas.

There are pros and cons for each editorial choice one has to make for a work of this kind: for in- stance the consistently more manageable magnification of x 60 for the radial and tangential sections of hardwoods has the advantage of showing ray his- tology quite satisfactorily but leaves much to be desired about the identification of such important diagnostic features as vessel wall pitting and even type of vessel perforations. Fortunately the soft- woods are provided with x 250 radial photomicro- graphs showing these features quite clearly.

Although it is quite legitimate to state that cer- tain woods cannot be distinguished from each other, I object to the practice adopted here that for a given set of illustrations the legend gives a number of species names or simply genus name with the epithet spp. without stating the actual species used for the illustrations. Similarly there seem to be a number of well labelled illus- trations of several species of a genus to- gether with an unnamed set (e.g. for the genus Ulmus).

The botanical nomenclature follows the British Standard of 1974 - and the author is therefore not to be blamed for not having assimilated all taxonomic changes of the last decades (e.g. by still recognizing Pygeum in the Rosaceae, which should be Prunus according to a widely accepted monograph of 1965).

These critical remarks should certainly not re- sult in the impression that this atlas merits a nega- tive review. As for the positive side, what else can one say than: well executed, extremely valuable because many of the wood plates are never before pictured so well, and as a must for all insti- tutes and individual wood anatomists engaged in identification or comparative wood anatomy.

Pieter Baas

IAWA BULLETIN – 1979/2-3
IAWA BULLETIN

Contents

IAWA BULLETIN

Association affairs ................................................................. 26
J. W. LANYON
The wood anatomy of three Proteaceous timbers — Placospermum coriaceum, Dillo-
beia thouarsii and Garnieria spathulatafolia ............................... 27
Abstracts of papers to be presented at the Wood Anatomy Congress of the Afro-European
Regional Group of the IAWA, IUFRO Division V, 1, and of the Plant Morphology
and Anatomy Section of the KNBV ........................................... 34
Wood Anatomy news ............................................................... 44
Association affairs (Financial report) ......................................... 46
T. BARETTA-KUIPERS
Wood anatomy of Archidendron F.v. Mueller, Mimosoideae, Leguminosae .............. 47
M. H. ZIMMERMANN
The discovery of tylose formation by a Viennese Lady in 1845 .......................... 51
W. C. DICKISON
A note on the wood anatomy of Dillenia (Dilleniaceae) ................................ 57
K. BABOS
Fibre characteristics of some Cuban hardwoods .................................. 61
Book reviews ........................................................................ 62