

WOOD ANATOMY OF INDIAN SPECIES OF *MICHELIA* WITH PARTICULAR REFERENCE OF THEIR IDENTIFICATION

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Introduction

Michelia is one of the commercially important genera of the family Magnoliaceae. The wood finds a variety of uses such as posts, boards, veneers, decorative fittings, manufacture of plywood and light construction work. The timber is specified for ammunition boxes, plywood boxes, battens of internal fitting, jute hobbins, turnery articles, handles for brushes, decorative plywood and door, window and ventilater frames etc.

In India, *Michelia* is represented by 11 species. The woods of all the species are homogeneous in physical and gross anatomical features (Chowdhury and Ghosh, 1958) and are known as 'champ' in the trade (Anon, 1976). With a view to distinguish the different *Michelia* species for their effective utilisation, detailed anatomical studies have been undertaken on 8 species of *Michelia* available in the wood collection of Forest Research Institute, Dehra Dun. Anatomical characters such as shape, size and frequency of vessels, presence and absence of spirals, ray height and width, presence and absence of oil cells in the rays and shape of fibres as seen in cross section were taken into consideration for the separation of the species.

Material and Methods

The authentic samples of the following species available in the Wood collection (Xylarium) of the F.R.I were taken for the present study.

M. baillonii Finet and Gagnep.—DDw 7256 Assam.

M. champaca L.—DDw 5806 West Bengal, DDw 7265 West Bengal, DDw 7892 Bihar.

M. doltsopa DC.—DDw 60 0 West Bengal, DDw 8267 West Bengal.

M. kisopa Ham. ex DC.—DDw 8155 U.P.

M. mannii—DDw 7257 Assam, DDw 7488 Assam.

M. nilagirica Zenk—DDw 6078 Tamil Nadu, DDw 6399 Tamil Nadu.

M. oblonga Wall. DDw 7411 Assam, DDw 7413 Assam, DDw 7514 Assam.

M. velutina DC.—DDw 3331 West Bengal, DDw 8290 West Bengal.

Cross, radial and tangential sections were prepared and stained with haematoxylin and safranin. The sections were mounted by following the usual laboratory procedure. For observations of crystals and silica, unstained sections were first bleached by sodium hypochlorite solution and then washed, dehydrated and mounted after treating with phenol crystals.

Table 1
Diagnostic anatomical features of *Michelia* species

Species	Acc. No.	Sp. gr.	Vessels										Fibres				Rays				Parenchyma		
			% Solitary	Radial multiples	Frequency per mm ²	Angular in cross section.	Oval to circular in cross section	Diameter	Max. Tang.	Bars on perforation plate	Tyloses	Spirals	Silica (vitreous)	Pits on radial walls	Circular to angular in cross section	Rectangular in cross section	Serialion	Max. width in μ m	Max. height in μ m	Oil cells	Diffuse	Concentric bands (Terminal)	Serialions
<i>M. baillonii</i>	7256		50-60	2-4	15-22	-	+	160	3-6	+	-	+	+	+	+	+	1-4	55	800	+	+	+	2-6
<i>M. champaca</i>	5806		50	2	4	11-17	-	+	128	2-8	+	-	+	+	+	+	1-4	65	800	+	+	+	4-1
	7265		60	2	4	25-35	-	+	130	2-6	+	-	+	+	+	+	1-4	75	900	+	+	+	4-7
	7892		60	2-5	15-20	-	+	128	2-5	+	-	+	+	+	+	+	1-5	46	880	+	+	+	2-5
<i>M. doltsopa</i>	6000		60	2-8	30-45	+	-	80	5-12	+	+	-	+	+	+	+	1-4	65	650	-	+	+	3-6
	8267		50	2-7	30-50	+	-	65	5-15	+	+	-	+	+	+	+	1-4	60	900	-	+	+	2-5
<i>M. kisopa</i>	8155		30	2-10	40-80	+	-	95	2-11	+	+	+	+	+	+	+	1-3	44	800	-	+	+	2-5
<i>M. manii</i>	7257		50	2-4	14-20	-	+	160	5-10	+	-	+	+	+	+	+	1-4	67	800	+	+	+	2-6
	7488		60	2-4	10-22	-	+	165	4-7	+	-	+	+	+	+	+	1-4	48	960	+	+	+	3-6
<i>M. nilagirica</i>	6038		40	2	5	40-60	\pm	+	128	2-5	+	+	+	+	+	+	1-3	41	640	+	+	+	2-5
	6399		40	2-6	40-60	\pm	+	120	2-8	+	-	+	+	+	+	+	1-3	55	960	+	+	+	2-5
<i>M. oblonga</i>	7411		50	2	4	15-30	-	+	141	2-5	+	-	+	+	+	+	1-3	44	850	-	+	+	2-5
	7413		40	2-7	18-30	-	+	144	2-5	+	+	-	+	+	+	+	1-4	62	850	-	+	+	2-6
	7514		60	2-4	30-35	-	+	112	2-5	+	+	-	+	+	+	+	1-4	52	850	-	+	+	2-5
<i>M. velutina</i>	3331		40	2-4	30-50	+	-	80	5-9	+	+	+	+	+	+	+	1-3	52	850	-	+	+	3-10
	8290		60	2-6	30-50	+	-	65	2-9	+	+	+	+	+	+	+	1-3	48	850	-	+	+	3-10

The frequency (per mm²) and size of vessels have been recorded from cross sections. The detailed anatomical observations have been presented in Table 1.

Observations and Discussion

From the samples and sections the following properties and characteristics were observed. The colour of wood varies from yellowish-white to olive-green or olive-brown. They are soft to moderately hard, light to moderately heavy and medium fine-textured. The woods are diffuse-porous with distinct growth rings. The vessels are small to moderately large, 15-60 per mm² in frequency, solitary or in short (Pl. 1, Fig. 1) to long, radial multiples and clusters (Pl. 1,

Figs 2, 3 and 4) with scalariform perforation, spiral thickening are present in some species (Pl. 2, Figs. 7 and 9), intervacular pitting is large and scalariform and the pits to rays and parenchyma are large and simple, unilaterally compound (Pl. 2, Fig. 8) tyloses are often present. The parenchyma is terminal 2-10 cells wide (Pl. 1, Fig. 1). The rays are 1-4 seriate composed of upright and procumbent and square cells, heterogeneous (Pl. 2, Figs. 5 and 6) with 1-4 rows of upright and square cells. Oil cells are present in some species (Pl. 2, Figs. 5, 6) and fibre wall 3-5µm thick. Crystals are absent. Silica is present in some species as lining the vessel walls and tyloses (Fig. 11).

Plate 1

- Fig. 1— *Michelia champaca* L. Cross section showing moderately large, vessels arranged solitary or in short radial multiples and terminal band of parenchyma ×14.
- Fig. 2— *M. doltsopa* DC Cross section showing small to very small vessels arranged in short to long radial multiples ×14.
- Fig. 3— *M. kisopa* Ham ex DC. Cross section showing small to very small vessels arranged in radial multiples and clusters ×14.
- Fig. 4— *M. nilagirica* Cross section showing small to moderately large very numerous vessels arranged in short to long radial multiples and clusters ×14.

Plate 2

- Fig. 5— *M. baillonii* Gagnep and Finet.— Radial section showing oil cells in rays and spirals in vessels ×80.
- Fig. 6— *M. baillonii* Tang. Section ×80.
- Fig. 7— *M. doltsopa* DC. Radial section showing tyloses and spirals in vessels ×80.
- Fig. 8— *M. doltsopa* DC. Radial section showing scalariform perforation and ray-vessel pitting ×80.
- Fig. 9— Same Tang. Section ×80.
- Fig. 10— *M. champaca* L. Radial section showing non-septate fibres with small bordered pitting.
- Fig. 11— *M. kisopa* DC. Tang. section showing silicified tyloses.

Plate 1

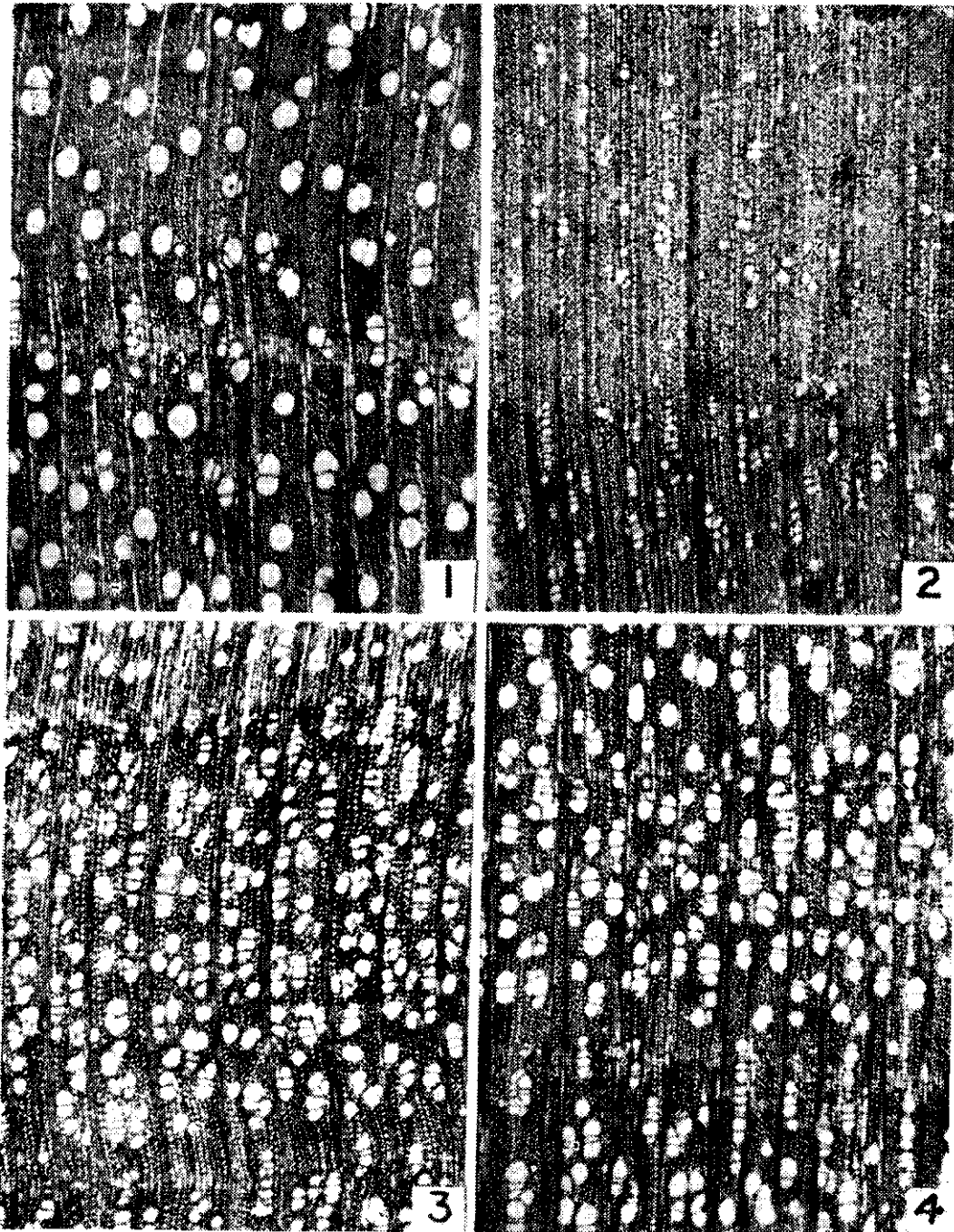
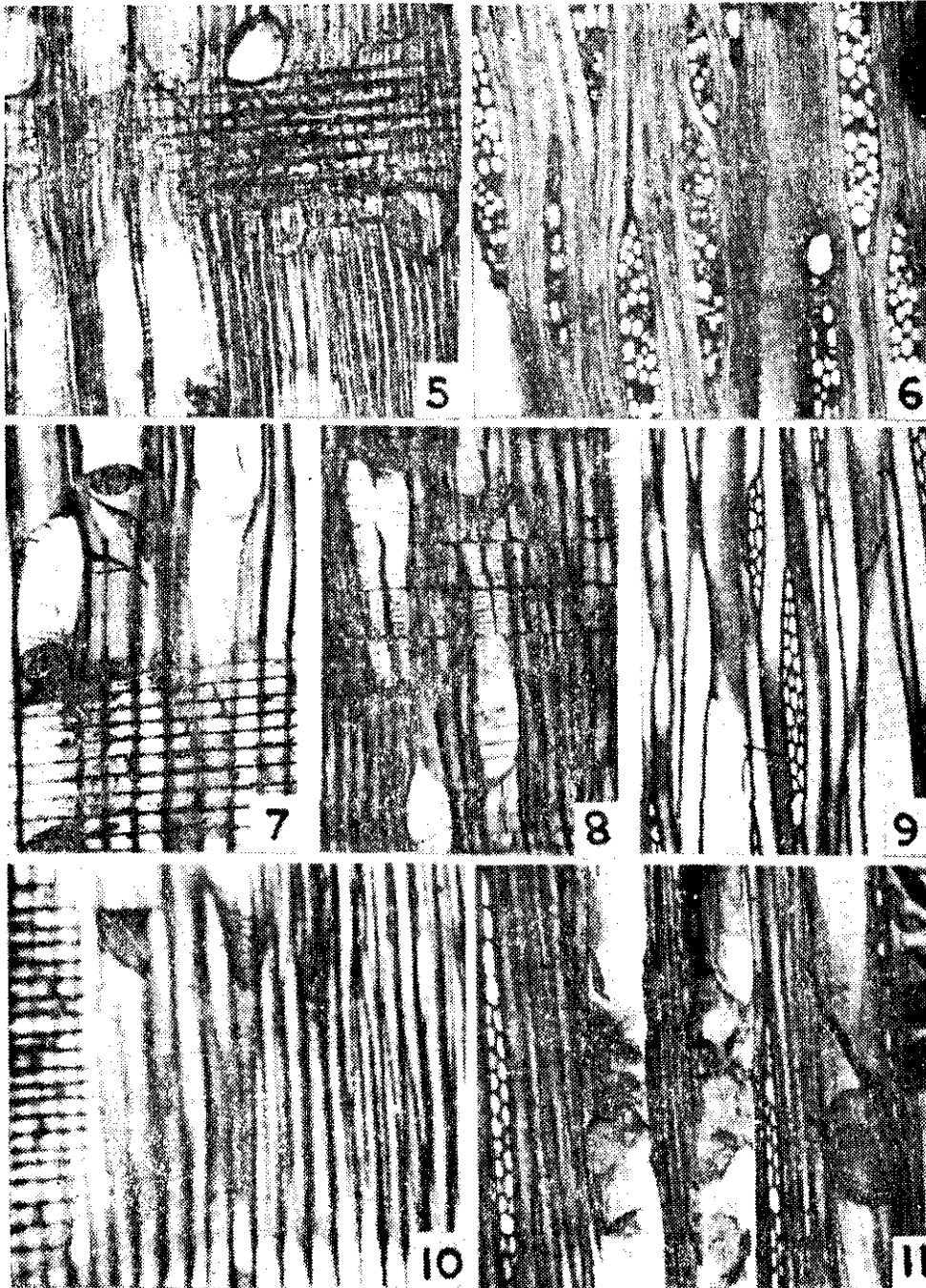


Plate 2



Pearson and Brown (1932) have given a key for identification of three commercial species by using vessel diameter, range of radial multiples, ray height and presence/absence of spiral thickening. The quantitative anatomical features recorded in the present study (Table 1) indicate that percentage of radial multiples, number of bars on scalariform perforation plate, ray

width and height are of limited value in specific delimitation. The features such as frequency, shape and maximum tangential diameter of vessels, presence/absence of oil cells in rays and presence/absence of spirals in vessels are of diagnostic value in identification of different species studied. A tentative key has also been prepared and is given below :

Key to the Species

1. (i) Max. tangential diameter of vessels $> 100\mu\text{m}$ —2
1. (ii) Max. tangential diameter of vessels $< \mu\text{m}$ —5
2. (i) Oil cells in rays present—3
2. (ii) Oil cells in rays absent—*M. oblonga*
3. (i) Spirals in vessels present—4
3. (ii) Spirals in vessels absent—*M. champaca*, *M. manii*
4. (i) Frequency of vessels 40-60 per mm^2 —*M. nilagirica*
4. (ii) Frequency of vessels 15-20 per mm^2 —*M. bailonii*
5. (i) Frequency of vessels 50-80 per mm^2 —*M. kisopa*
5. (ii) Frequency of vessels 30-50 per mm^2 —6
6. (i) Silica (viterous) in vessels present—*M. lanuginosa*
6. (ii) Silica (viterous) in vessels absent—*M. excelsa*

SUMMARY

The wood structure of eight Indian species of *Michelia* have been studied in detail with a view of determining features of diagnostic value for their identification. The study indicate that various anatomical characters viz. frequency, size and shape of vessels, presence/absence of oil cells in rays and presence/absence of spirals in vessels are likely of value for their specific delimitation. A tentative key has also been given.

अभिज्ञान के विशेष संदर्भ में माइकेलिया प्रजाति की भारतीय वृक्ष जातियों का काष्ठ-शारीर

लक्ष्मी चौहान व आर० दयाल

सारांश

माइकेलिया प्रजाति की आठ भारतीय प्रकाष्ठ जातियों की काष्ठ संरचना का विस्तृत अध्ययन अभिज्ञान के पहचान परक मूल्यों हेतु संरचना विशिष्टताओं का निश्चय करने की दृष्टि से

किया गया। अध्ययन से पता चलता है कि वाहिनियों की बारंबारता, आकार और रूप, रश्मियों में नेल कोशाओं का होना या न होना तथा वाहिनियों में वृत्तलता का होना या न होना उनका शिशिष्ट निश्चयन करने में संभावित मूल्य के हैं। परीक्षात्मक कुंजी भी दी गई है।

References

- Anon. (1976). *Indian Standards Institution. Trade name and abbreviated symbols for timber species* (Second revision), Delhi.
- Chowdhury, K.A. and S.S. Ghosh (1958). *Indian Woods-their identification, properties and uses*. Vol. 1. Manager of Publication, Delhi.
- Pearson, R.S. and H.P. Brown (1932). *Commercial Timbers of India*. Vol. 1. Central Pub. Branch (Govt. of India), Calcutta.
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