

**Wood Anatomy of *Mangifera indica* L.
(Anacardiaceae)**

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ABSTRACT

The wood anatomy of *Mangifera indica* belonging to the species of Anacardiaceae native to Bangladesh was described. The species of this family was distinctive in having growth rings, thin-to thick-walled, nonseptate libriform fibres, vessels with simple perforation plate and nonvestures intervessel pittings. Paratracheal axial parenchyma was vasicentric, lozenge-aliform and confluent. Axial parenchyma band more than 3 cells wide and in marginal or in seemingly marginal bands. 3-4 cells per axial parenchyma was dominantly present. Ray height was less than 1mm. Body ray cells were procumbent with one row of upright and square marginal cells. More than one prismatic crystals of about the same size was present in upright or square ray cells.

Keywords : *wood anatomy, hardwood, wood identification.*

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1. Introduction

Anacardiaceae is a family of flowering plants bearing fruits that are drupes. Other species included in this family are mango, poison ivy, sumac, smoke tree, and pistachio. The latter is sometimes placed in its own family, the Pistaciaceae. The family Anacardiaceae are trees, shrubs, woody climbers and very rarely herbs, occurring mostly in the tropical and subtropical regions throughout the world and a few extending into the temperate zones (Dong and Peter 1993).

The mango (*Mangifera* spp.; plural mangos or mangoes) is a genus of about 35 species of tropical fruiting trees in the flowering plant family Anacardiaceae, native to India and Southeast Asia, of which the Indian Mango (*M. indica*) is by far the most commercially important species. Geographic distribution: India, Pakistan, Sri Lanka, or Burma, or Thailand, Laos, Vietnam, Cambodia, or Indomalesia (as fruit tree cultivated worldwide in tropical regions) (Richter and Dallwitz 2000). Reference to mangos as the "food of the gods" can be found in the Hindu Vedas. The name of the fruit comes from the Tamil word *manga*, and popularised by the Portuguese after their Indian exploration, hence the word 'manga' in Portuguese.

Mangos are large trees, reaching 35-40 m in height, with a crown radius of 10 m. The leaves are evergreen, alternate, simple,

15-35 cm long and 6-16 cm broad; when young they are orange-pink, rapidly changing to a dark glossy red, then dark green as they mature. The flowers are produced in terminal panicles 10-40 cm long; each flower is small and white with five petals 5-10 mm long, with a mild sweet odour suggestive of lily of the valley. After the flowers finish, the fruit takes from three to six months to ripen. The mango fruit is a drupe; when mature, it hangs from the tree on long stems. They are variable in size, from 10-25 cm long and 7-12 cm diameter, and may weigh up to 2.5 kg. The ripe fruit is variably coloured yellow, orange and red, reddest on the side facing the sun and yellow where shaded; green usually indicates that the fruit is not yet ripe, but this depends on the cultivar. When ripe, the unpeeled fruit gives off a distinctive resinous slightly sweet smell. In the center of the fruit is a single flat, oblong stone that can be fibrous or hairless on the surface, depending on cultivar. Inside the shell, which is 1-2 mm thick, is a paper-thin lining covering a single seed, 4-7 cm long, 3-4 cm wide, 1 cm thick. This paper describes the wood anatomy of *Mangifera indica* in the family of Anacardiaceae.

2. Materials and Methods

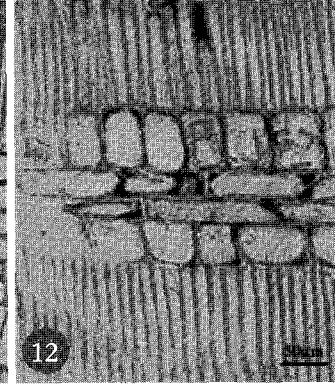
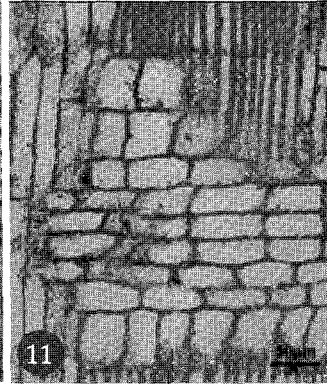
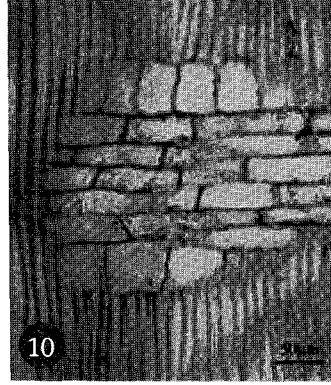
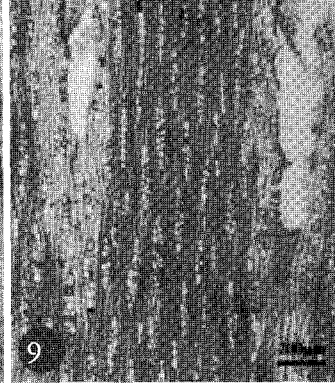
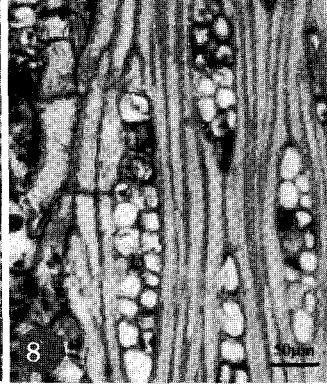
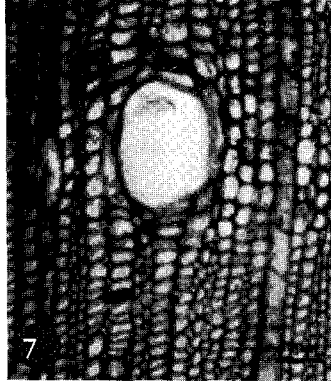
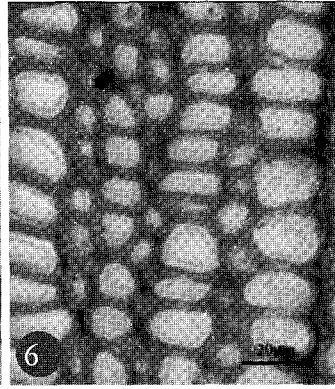
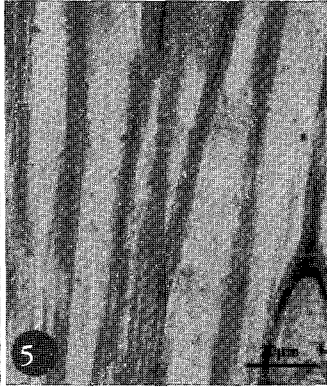
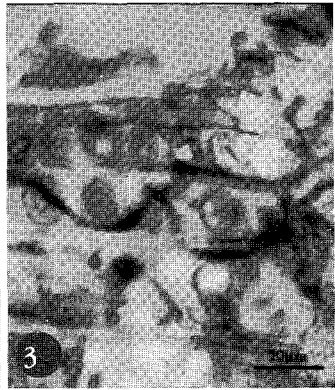
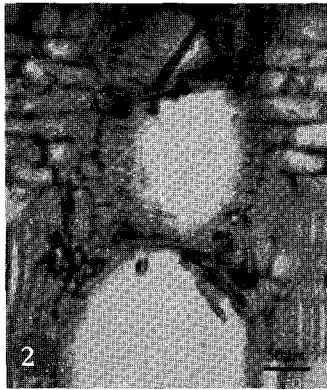
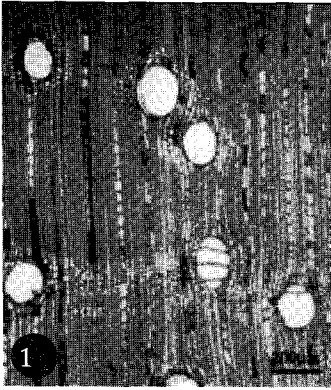
Wood samples of *Mangifera indica* L. are obtained from different wood suppliers in Bangladesh. Microscopic slides and

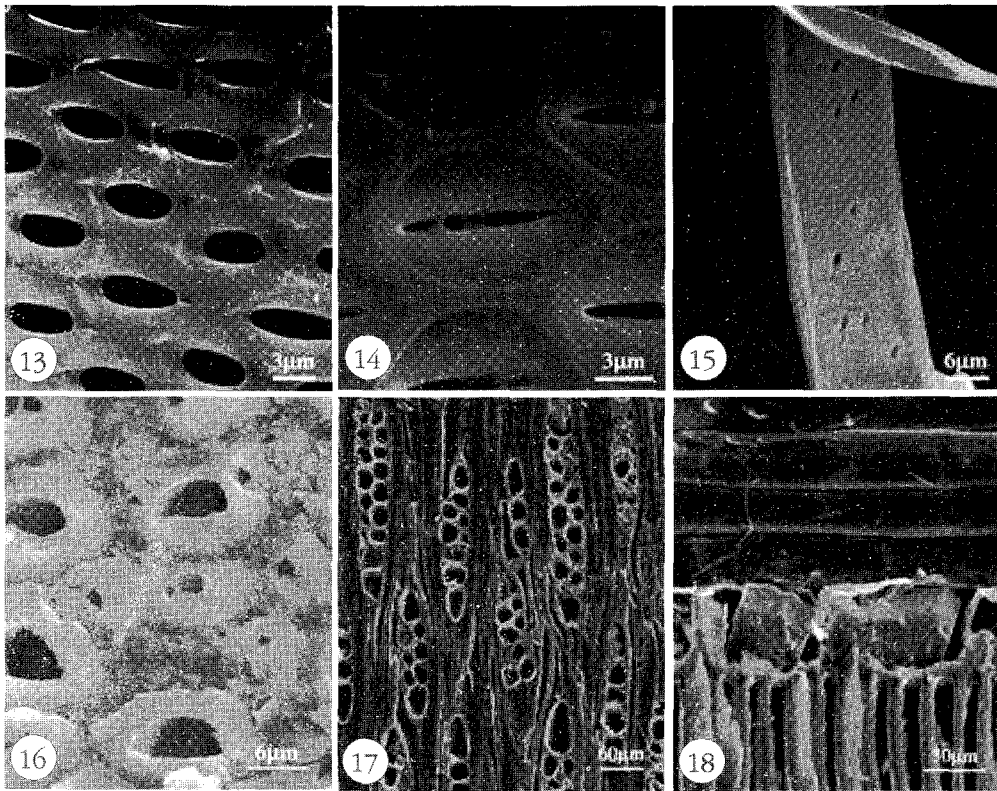
macerations were made according to standard techniques (Baas & Zhang 1986). Samples for FE-SEM (Field Emission Scanning Electron Microscope) were prepared after Exley et al. (1977). Samples were dried under vacuum condition and coated with platinum and palladium by using an ion sputter apparatus. At different resolution and magnification, samples were examined at 15kV in a Field Emission Scanning Electron Microscope (FE-SEM) including macerated cells. Terminology and the method for determining quantitative features conform to recommendations from the IAWA Feature List (IAWA Committee 1989).

3. Results and Discussion

Growth ring boundaries distinct, marked by marginal parenchyma (Fig. 1). Wood diffuse-porous. Vessels arranged in no specific pattern, in multiples, commonly short (2-4 vessels) radial rows (Fig. 1). Mean tangential vessel diameter $154.69\mu\text{m}$ (sd=46.55, range 78.71-214.50 μm). 1-8 vessels per sq.mm. Perforation plates simple (Fig. 3). Intervessel pits alternate and vested (Fig. 13 and 14). Shape of alternate pits polygonal (Fig. 13). Mean intervessel pit size $12.99\mu\text{m}$ (sd=4.05, range 7.52-20.17 μm). Vessel-ray pits with distinct borders similar to intervessel pits in size and shape throughout the ray cell (Fig. 5). Helical thickenings absent. Mean vessel element length $370.79\mu\text{m}$ (sd=83.15, range 243.77-

562.77 μm). Tyloses common. Vascular or vasicentric tracheids absent. Libriform wood fibre with simple to minutely pits (Fig. 15), non-septate (Fig. 5). Fibre pits mainly restricted to radial walls. Mean fibre pit diameter $1.72\mu\text{m}$ (sd=0.31, range 0.98-2.40 μm). Mean fibre length $767.80\mu\text{m}$ (sd=0.10, range 497.00- 979.00 μm). Fibre walls thin to thick (Fig. 10) and very thick in latewood region (Fig. 16). Axial parenchyma paratracheal. Paratracheal axial parenchyma vasicentric, aliform, or confluent (Fig. 1). Aliform parenchyma lozenge (Fig. 7). Axial parenchyma in marginal band. Banded axial parenchyma more than 3 cells wide (Fig. 1). Axial parenchyma as strands. Average number of cells per axial parenchyma strand 2-8 cells (Fig. 8). Rays per millimeter 10 (sd= 1.50, range 7-13). Ray width 1-3 cells (Fig. 8). Aggregate rays absent. Rays of one size. Multiseriate rays composed of procumbent ray with mostly 1 row sometimes 2 rows of square or upright cells (Fig. 11). Ray height variable from 0.16-0.41mm, mean of 0.28mm (sd =0.07). Storied structure, sheath cells and tile cells absent; no perforated ray cells observed. Prismatic crystal present, located in ray cells (Fig. 12). Crystal-containing ray cells upright and/or square or procumbent, upright and/or square ray cells not chambered. Crystal in procumbent ray cells not in radial alignment. Number of crystals per cell or chamber one or more than one (Fig. 18). Crystal in one cell or chamber of the same size. Cystoliths absent. Silica not observed.





(Fig. 1-12) Observed by optical microscope, -Fig. 1, Growth ring boundaries distinct, wood diffuse-porous vessels in short radial multiples, axial parenchyma in marginal band also axial parenchyma vesicentric and confluent, -Fig. 2, Simple perforation plate, -Fig. 3, Vessel-ray parenchyma pit, -Fig. 4, Tyloses in vessel, - Fig. 5, Fibre non-septate, -Fig. 6, Fibres thin to thick walled, -Fig. 7, Axial parenchyma lozenge-aliform, -Fig. 8, Tow cells per parenchyma strand, -Fig. 9, Two-eight cells per axial parenchyma strand, -Fig. 10, Body ray cells procumbent with one row of upright and/or square marginal cells, -Fig. 11, Body ray cells procumbent with 2 rows of upright/square marginal cells, -Fig. 12, Prismatic crystals in upright and/or square ray cells, more than one crystal of about the same size per cell, Fig. 13-18 observed by FE-SEM, -Fig. 13, Intervessel pit alternate, shape of intervessel pit polygonal, -Fig. 14 Vestured pits, -Fig. 15, Fibre with simple pit, -Fig. 16, Fibres very thick walled, -Fig. 17, Ray width 1-3 cells, -Fig. 18, Prismatic crystal in upright/square ray cells,

Number of ray cells in vertical line variable due to uniseriate and multiseriate ray. Rays 3-13 cells with mean 8 (sd=2.62). Ray cell lumen diameter vary from body ray cell to marginal ray cells. In tangential surface, mean body ray cell horizontal and vertical lumen diameter 18,60 μm (sd=5.42, range 9.90- 32,26 μm) and 25,57 μm (sd=6.01, range 14,52-36,41 μm) respectively. Mean

marginal ray cell horizontal and vertical lumen diameter 21,36 μm (sd=3.04, range 14.91-26.13 μm) and 49.22 μm (sd=10.16, range 30.56- 69.88 μm) respectively. Body and marginal ray cell length in radial direction 62,41 μm (sd=20.50, range 32.55-128.74 μm) and 45.27 μm (sd=10.05, range 32.54-75.90 μm) respectively. Number of endwall pit in body ray cell 16 (sd= 5.24), range 5-28 and

marginal ray cell 10 (sd= 4.05, range 2-20). Endwall pit diameter varies from body ray cell to marginal ray cell. Endwall pit diameter in body ray cell 1.81 μ m (sd= 0.58, range 1.03-2.99 μ m) and marginal ray cell 1.13 μ m (sd= 0.54, range 0.46-2.14 μ m). Number of pits in radial surface of body ray cell 10 (sd= 3.98, range 5-18), diameter 2.12 μ m (sd= 0.63, range 1.08-3.76 μ m) and in marginal ray cell 6 (sd= 2.50, range 2-11) and diameter 2.30 μ m (sd= 0.44, range 1.65-2.98 μ m). Vessel-ray pit number in body ray cell 4 (sd= 1.73, range 2-7) marginal ray cell 4 (sd= 1.00, range 3-5).

Wood of this species has commercial importance. Basic specific gravity medium, 0.40-0.75. Heartwood basically white to grey. It has no distinctive odor. Water extract basically red or shades of red. Ethanol extract basically colourless to brown or shades of brown. Froth test positive. Chrome Azurol-S test negative. Splinter burns to a full ash, and colour of ash white.

4. Conclusion

The wood anatomy of *Mangifera indica* was observed in the following features. Growth rings boundaries were distinct, wood diffuse-porous. Perforation plates were simple. Vessel-ray pits were with distinct borders similar to intervessel pits in size and shape throughout the ray cell. Tyloses were present in vessel. Thin-to thick-walled

libriform fibres were nonseptate. Paratracheal axial parenchyma cells were vasicentric, lozenge-aliform and confluent; axial parenchyma banded more than 3 cells wide and in marginal or in seemingly marginal; 3-4 cells per axial parenchyma presented dominantly. Rays composed of two cell types: body ray cells were procumbent with one row of upright and square marginal cells. Prismatic crystals presented, located in ray cells.

5. References

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