

Anatomy and Some Properties of Ruk (*Melanochyla bracteata* King) Wood

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ABSTRACT

Anatomy and some physical properties of Ruk (*Melanochyla bracteata* King) wood were investigated. Permanent slides of wood sections and macerated cells were made. The specimens were observed under light microscope (LM) and scanning electron microscope (SEM). The results showed that Ruk wood is diffuse porous with indistinct growth ring. Rays are uniseriate with 5 – 20 cells height. Axial parenchyma is paratracheal with vasicentric, aliform and confluent types. Wood density is 0.36 g/cm³ and hardness is 1,088.91 N. From this study, it can be evaluated that Ruk wood is not suitable for heavy construction but it is suitable for plywood and furniture production.

Key words: Ruk, Anatomy, Some Properties

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INTRODUCTION

Ruk (*Melanochyla bracteata* King) belongs to the Anacardiaceae family. There are about 17 species in Peninsular Malaysia, Borneo, Sumatra and Java. Only 1 species occurs in peninsular Thailand (Chayamarit, 2010). The species distributes through tropical rain forest and peat swamp forest (Ruttanaveerakun 2003). It is a deciduous tree with buttresses or stilt roots. The bark is brown or greyish-brown color. Leaf is simple. Inflorescence is panicle. Fruit is drupe (Chayamarit, 2010). Latex is toxic to skin inflammation. As it has a beautiful wood with reddish color and durable, the wood is used for construction and furniture (Pengchai *et al*, 1991; Ruttanaveerakun 2003).

This study reveals the anatomical character and some physical properties of Ruk wood. The data can be used for identification and suitable utilization of the wood in this species.

MATERIALS AND METHODS

1. Specimens collection

The specimens of *Melanochyla bracteata* King were collected from Trang Province, Thailand. Species identification was performed and examined with type specimens at the Forest Herbarium (BKF). The wood was collected from the trunk at 1.3 m height from the ground.

2. Macroscopic study

The wood sample was cut into 1x1x3 cm block and then was slid into sections with 120 µm thickness by a sliding microtome (Leica, SM 2010R, Germany). The sections were observed under light microscope (Olympus, SZ30).

3. Microscopic study

3.1 Permanent slides preparation of wood sections.

The wood samples were cut into 1x1x3 cm block. The sample was cut into sections at three dimensions (Cross section - CS, Radial long section - RLS and Tangential long section - TLS) by a sliding microtome (Leica, SM 2010R) with 20 µm thickness. The sections were stained with safranin T for 2 h and then were dehydrated with ethyl alcohol series (30, 50, 70, 95 and 100%). The samples

were in xylene for 6 h before mounted with permount. The permanent slides were observed under light microscope.

3.2 Maceration of wood tissues

Wood sample was cut into small pieces (toothpick size). The specimen was boiled in a mixture of acetic acid and hydrogenperoxide (1:1) for 3 h, followed by washing 3 times with water. The macerated sample was stained with safranin T for 12 h and then were dehydrated with ethyl alcohol series (30, 50, 70, 95 and 100%). The sample was leaved in xylene for 6 h before mounted with permount.

4. Scanning electron microscopic (SEM) study

Wood sections (120 µm thickness) and macerated cells (in 3.2) were dehydrated with ethyl alcohol series (30, 50, 70, 95 and 100%), dried in a critical point dryer (CPD: Emitech, K850) and coated with gold particles (Ohtan *et al.*, 1987; Schneider and Carlquist, 2001). The samples were observed under scanning electron microscope (JEOL, JSM 5600 LV).

5. Wood property measurement

5.1 Wood density

Wood sample was trimmed into a 2x2x2 cm³ block. The wood block was leaved 1 week in room temperature for air dry. The wood density was calculated using the following formula;

$$D = \frac{M}{V}$$

D = Density, M = Mass, V = Volume

5.2 Specific gravity

The Specific gravity was calculated using the following formula;

$$G_n = \frac{M_n}{W_n}$$

G_n = Specific gravity, M_n = Mass under over dry weight, W_n = Weight of replaced water

5.3 Hardness

Wood sample was trimmed into 6x6x8 cm block. The wood block was subjected to a hardness tester machine (Janka, Germany).

RESULTS AND DISCUSSION

Macroscopic characters

Outer bark is brown while inner bark is grey. The wood has no luster and odorless. Wood grain is straight. Sapwood is brownish and heartwood is reddish color. Growth ring is indistinct. Pore is small with brown deposits (Figure A). Wood grain is an appearance of wood fiber, which affects the tensile strength of wood materials. If the grain is not parallel with the wood length, the tensile strength of wood will decrease subsequently. The wood that has straight grain is usually hard and has more tension than cross-grained wood (Zhou and Jun, 2003). The wood texture is fine because of its small pore and straight grain (Patsabut, 1987).

Microscopic characters

Vessel (pore):

Ruk wood is diffuse - porous with more solitary pores and few multiple (2-6) pores. Pore density is 5 pores/mm² (in transverse diamention). The percentage of vessel covering area are 6 percents. Vessel is round to oval shaped with 132 (80 – 209) µm diameter and 419 (217 – 663) µm lenght. Perforation plate is simple type (Figure C) which refers to the complete connection of each vessel resulting easier water and mineral translocation (Numsuwan and Lamsak , 2009). Inter-vessel pit is polygonal shaped with 5 (3 – 8) µm diameter, and alternate arrangement (Figure D). Vessel – ray pit is large (11 µm) and oval shaped with much reduced borders to apparently simple (Figure E). Gum, deposit, and tylose were observed in vessel (Figure B). Canny (1977) and Jaquish and Ewers (2001) mentioned that tylose formation blocks water translocation in vessel. Furthermore, tylose causes the difficulty of chemical coating in wood products.

Fiber:

Libiform fibers usually were observed, with 18 (9 – 26) μm diameter and 998 (368 – 1,419) μm length. Fiber wall is very thin with 2.5 μm thickness. The thickness of fiber wall relates to wood density and weight (Chattaway, 1995). This result correlated with the study of Desch and Dinwoodie (1996) who reported that wood density influences mechanical property of wood. Low wood density and mass lead to the low strength of wood to apply for loading.

Axial parenchyma:

Axial parenchyma are paratracheal, with vasicentric, aliform and confluent with 3 - 4 cells strand (Figure B).

Ray:

Rays are exclusively uniseriate with 19 (11 – 36) μm height. (Figure F). Both procumbent and upright cells present in a ray. There are 8 rays / mm. Prismatic crystals were observed in ray cells (Figure G). Crystal is calcium oxalate compound deposited in the cell and it can be used for wood identification (Fahn, 1982; Chattaway, 1995). It has been claimed that crystals in wood tissue play a role of pest protection (Haberlandt, 1914).

Physical characters

Specific gravity of Ruk wood is 0.37 which is categorized in the range of light (0.3-0.4) according to specific gravity table of Patsabut (1987). Density is 0.36 g/cm^3 (at 12 % humidity) and hardness is 1,088.91 N. It is indicated that the wood is extremely light. Specific gravity or density of wood influences wood property. When the wood has low density (low mass), strength and hardness of wood to apply for loading also decrease. Many researchers emphasized in wood density because it is an important parameter that affects wood property and is a good indicator of wood strength and hardness (Zobel and Buijtenen, 1989; Kantavichai *et al.*, 2010; Leeuwen *et al.*, 2011). This study indicated that Ruk wood has low density and strength; therefore it is not suitable for heavy construction which requires strength such as column, beam, wall, and board (Development of forest products, 2005). Eiadthong (2007) suggested that Ruk wood is suitable for plywood.

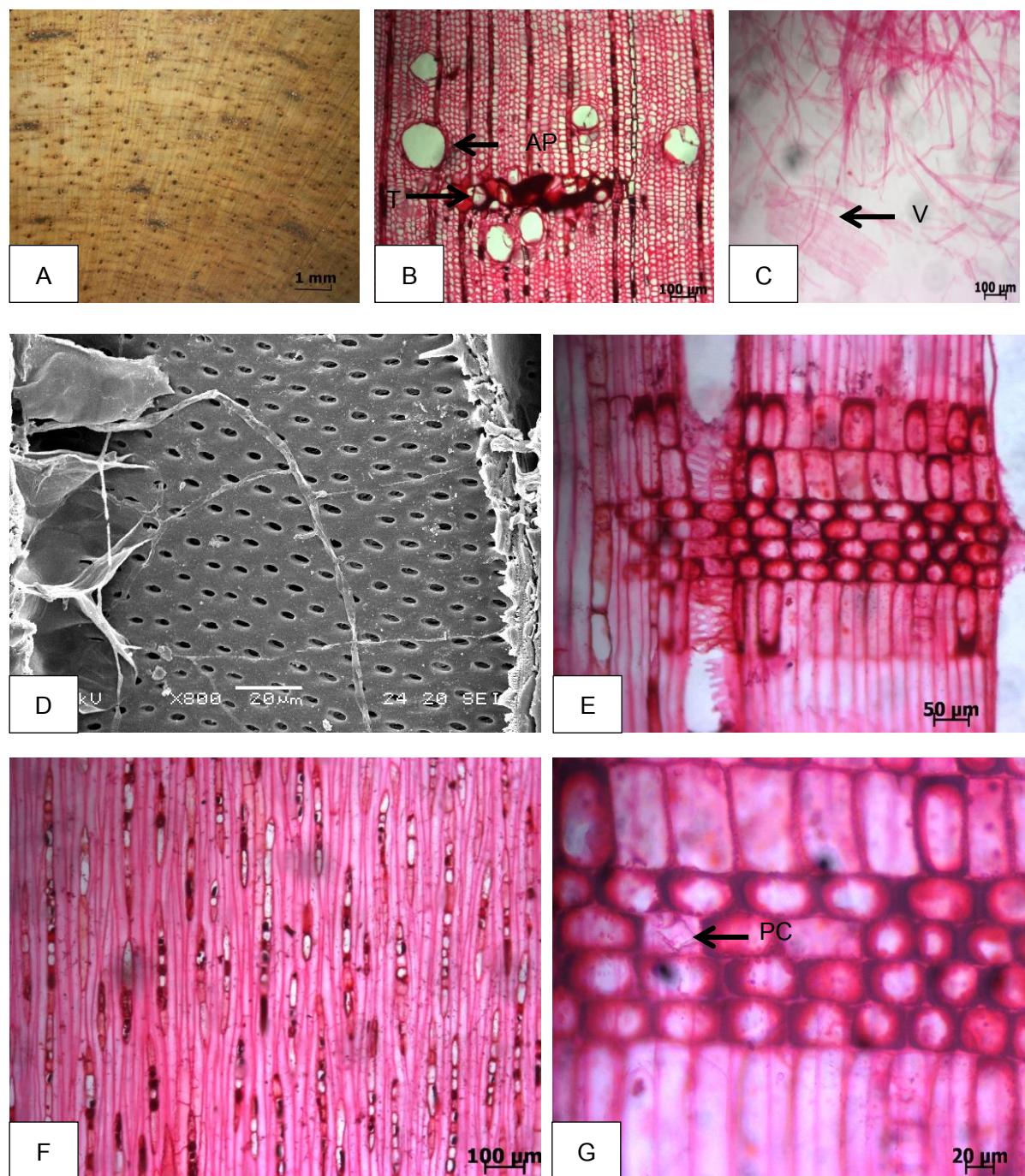


Figure A. – G. *Melanochyla bracteata* King: A. Transverse section showing macroscopic characters, B. Transverse section showing tylose and axial parenchyma, C. Macerated wood showing vessel and fibers, D. Tangential long section showing intervessel pit, E. Radial long section showing vessel – ray, F. Tangential long section showing rays and G. Primatic crystal in ray cell (PC = Crystal, AP = Parenchyma, T = Tylose, V = Vessel)

CONCLUSION

Ruk wood is diffuse porous with small vessels. Rays are uniseriate. Axial parenchyma are vasicentric, aliform and confluent types. Wood density is 0.36 g/cm³ and the hardness is 1,088.91 N.

The wood is fine – textured, light weight and low density and strenght. This study suggests that Ruk wood is not suitable for heavy construction but it is suitable for plywood and furniture productions.

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