

# Macroscopic Features of Root Wood and Fiber Dimension of Pasak Bumi (*Eurycoma longifolia*) from Katingan, Central Kalimantan\*

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**Abstract.** The purpose of this study was to characterise the macroscopic feature and fiber dimension of root wood of pasak bumi (*Eurycoma longifolia*). Macroscopic structures of the root wood were observed using stereoscopic microscope NIKON SMZ645 with magnification of 20-50x. Fiber cells were obtained from the maceration process using immersion in a solution of HNO<sub>3</sub>, KClO<sub>3</sub>, alcohol 50% and distilled water. Fiber dimension measurements using the Olympus BH-2 microscope equipped with a micrometer at ocular lens. Categorization of fiber dimension follow the IAWA (International Association of Wood Anatomist) method. In macroscopically, the root wood of pasak bumi has a distinctive features, i.e. yellowish brown color with unobvious border of sapwood and heartwood, unobvious growth-ring, a distinctive wood odor, moderately fine and even in texture, and straight to occasionally wavy grain. Fiber dimensions with length  $57.5 \pm 12.7 \mu\text{m}$ , diameter  $7.75 \pm 2.22 \mu\text{m}$ , and lumen diameter  $2.26 \pm 5025 \mu\text{m}$ . Such indications can be used to recognize and distinguish the root wood of pasak bumi from that of other plants.

## 1. Introduction

Pasak bumi (*Eurycoma longifolia*) is one of the many medicinal plants found in the forests of Indonesia, Malaysia, Thailand, Philippines, Vietnam, and Burma. This plant is a small tree with a height of 20 m [1]. The root part of pasak bumi is a medicinal plant that is very important, especially for people who used it as an alternative to traditional healing. Pasak bumi is efficacious as stomachics and antipyretics, amoebic dysentery, and fever medications [2] sprue, weak bodies, dirty blood, healing back pain due to fatigue, increasing the vitality of the body for males as well as increasing sexual activity [3]. The use of traditional medicine is generally considered safer than using modern medicine. This is because traditional medicine has fewer side effects when used appropriately than modern medicine.

*E. longifolia* root has become a commodity as medicinal plant and is traded domestically and abroad. As for small industries of traditional medicine and traditional medicine industries in Java, Bali and West Nusa Tenggara in 2003 averaged 2,154 kg/year and 34 tons/year in the form of simplisa with the root as the part of the plant used. As for the herbal industry from Malaysia is massively buying *E. longifolia* from the island of Sumatra through the black market [4].

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People often do not recognize the characteristics of the pasak bumi roots since it is difficult to distinguish them from other plants roots that are traded in the market. One way that can be used to recognize the characteristics of the pasak bumi roots is the macroscopic observation either by naked eye or by using magnifying glass. Macroscopic wood is an introduction to the common properties of wood; covering color, style, texture, fiber direction, luster and hardness in this wood refers in the wood identification manual [5]. In this study, the macroscopic data is also equipped with fiber characteristics obtained from the maceration process. Maceration is the separation of wood fibers from a solid by using a solvent. The advantage of maceration is the simpler and easier way of the workmanship and equipment used [6].

The purpose of this study was to characterize and recognize the macroscopic structure of wood and fiber dimensions of the pasak bumi roots so that it can be used as information for the identification of wood from the pasak bumi root and differentiate it from other root types.

## 2. Materials and methods

### 2.1. Wood Sample

The samples of the *Eurycoma longifolia* wood roots (Figure 1) used in this study were from Tumbang Atie Village, Sanaman Mantikei Katingan District of Central Kalimantan province.



**Figure 1.** Photograph of pasak bumi wood root

### 2.2. General and Macroscopic Property of the Wood

The stereoscopic microscope of NIKON SMZ 645 used at 10-30 times magnification of pasak bumi wood root sample and it was observed in the general and macroscopic property of wood in 3 fields; transverse, tangential and radial fields. The observed wood characteristics include color, texture, gloss, hardness, and odor (common properties), the presence of annual ring, sapwood and heartwood; shape, porosity, arrangement and pore grouping; spoke shape (macroscopic wood).

### 2.3. The process of Maceration and Measurement of Fiber Dimensions

The wood fiber maceration process uses the method of IAWA [5] using HNO<sub>3</sub>, KClO<sub>3</sub>, 50% alcohol and Aquades.

The observation of fiber dimension was done 20 times of replications using micrometer on ocular screen with 100 times magnification for fiber length measurement and 400 times for fiber diameter and fiber lumen diameter measurement using Olympus BH-2. The measurement result was converted in micron (μm). To find out the category of fiber dimension is used classification standard of IAWA [5].

## 3. Results and Discussions

### 3.1. Physical Features of Root Wood

From the observation result can be obtained the physical features of root wood as shown in Table 1.

**Table 1.** Physical features of wood root of *Eurycoma longifolia*

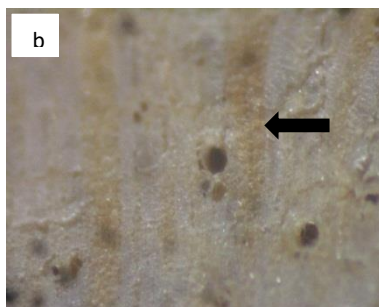
Growing ring	unobvious
Color	yellowish brown color with the boundary between sapwood and heartwood is unobvious
Texture	moderately fine and even
Odor	a distinctive odor
Grain	straight and occasionally wavy

The common features of pasak bumi wood root are the unclear annual growth rings, which has a fawn color and has an unclear heartwood and sapwood because its cells are mainly small (pore) vessels, and have a distinctive odor of pasak bumi roots (Figure2).

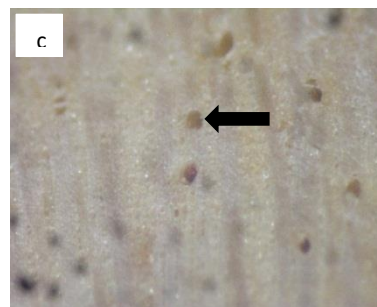
### 3.2. Anatomical Features of Root Wood



**Figure 2.** General view of transverse section: a. Vessel with diffuse porosity and radial arrangement. b. Rays. c. Fibers.



**Figure 3.** Transverse section : Rays



**Figure 4.** Transverse section: .Vessel with round shape and solitary/single.

The Rays on the transverse area is in the form of a long line, unlike the Mandang and Pandit [6,7] the wood radiuses are actually horizontal sheets originating from the outer surface of the wood toward the longitudinal area (Figure 3).

The vessels in the transverse area are round, in the tangential area and the radial vessel cell (pore) is elongated like a tube is adjusted by Mandang and Pandit [7] by grouping, the cell image of the vessel is almost entirely solitary for it is being surrounded by other tissues or not connected to other cell vessels based on IAWA [5,9]. (Figure 4).

### 3.3 Fiber Dimension

From the measurement of the average fiber dimension value, the results then obtained as in Table 2

<b>Table 2.</b> Characteristics of Fiber	
Dimension of fiber	Results measurement ( $\mu\text{m}$ )
Fiber length	$57.5 \pm 12.7$ (short fiber)
Fiber diameter	$7.75 \pm 2.22$ (small fiber diameter)
Fiber lumen	$5.02 \pm 2.26$ (small fiber lumen)
Fiber walls	$5.24 \pm 1.25$ (thin fiber walls)

From the measurement of dimension of of pasak bumi wood root fiber at the end part which include fiber length, fiber diameter, fiber lumen diameter and wall thickness of the fiber can be explained as follows. Fiber length at tip end  $57.5 \pm 12.7 \mu\text{m}$ , fiber diameter  $7.75 \pm 2.22 \mu\text{m}$ , fiber lumen diameter  $5.02 \pm 2.26 \mu\text{m}$  and fiber wall thickness  $5.24 \pm 1.25 \mu\text{m}$ . The average fiber dimension studied is very short compared to the results of Fillemond , Dodd research [10,11] examining mahogany fibers. Eurycoma longifolia root fibers are widely used traditionally as anti-microbial, anti-nflamative, anti-hypertensive dysentery or commonly known as aphrodisiacs based on Olwin and Walles [12]. Unlike Wijayanti [13] which examines mangrove roots as a traditional antifertility drug.

## 4. Conclusions

1. Pasak bumi wood root has a typical fawn color, smooth texture, and has a distinctive odor
2. While macroscopic wood characteristic of Pasak bumi can be seen from the absence of annual growing circle, the shape of a round pore and straight radius.
3. The fiber on the pasak bumi wood root is very short so that the indication of macroscopic characteristics and dimensions of the fiber can be used to recognize and distinguish the pasak bumi root with other types of wood roots.

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