

**Anatomical characteristics of tension and normal wood
in rubberwood (*Hevea brasiliensis*)**

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Abstract

An anatomical study was conducted on normal and tension wood of rubber trees (*Hevea brasiliensis*). Understanding the wood structure is important for its identification, quality, preservation, processing and utilization. A variety of techniques are available that can provide information on wood structure. The objective of this study was to examine the anatomical characteristics of the normal and tension wood with respect to vertical and radial trend. Measurements of anatomical features were done using light microscope fitted with micrometer. The analysis of variance was used to analyze the anatomical differences in both normal and tension rubberwood. Some microscopic observations on *Hevea brasiliensis* wood using light microscope, confocal laser scanning microscope and scanning electron microscope were also conducted. Light microscopy permits rapid viewing of many cells with minimal and ease of specimen preparation. Confocal microscopy using 20 µm thick and safranin stained sections was found to reveal more exact images of *Hevea brasiliensis* wood cells compared to transmitted light microscopy. Images obtained by scanning electron microscope (SEM) provided three-dimensional shape of cells, showed starch grains in parenchyma cells and illustrate the present of gelatinous layer of tension wood. Result from pooled data showed that fiber length of 1347µm in tension wood was significantly longer than in normal wood, which was 1311µm. Fiber wall thickness was similar between normal and tension wood, approximately 4.5 to 5.0 µm. However, measurement of fiber wall that includes the gelatinous layer (G-layer) as part of cell wall showed that fiber wall in tension wood was about 5 to 7 µm which make it thicker than normal wood. This follows that fiber diameter and fiber lumen diameter was found to be larger in normal wood when the G-layer is included in the cell wall measurement. Apparently this indicates that G-layer significantly thicken the fiber wall and reduced the fiber lumen. In tension wood ray height and its diameter were higher and wider, respectively. Vessels diameter are smaller and more abundant in normal wood. The overall results showed that the anatomical characteristics for both normal wood and tension wood were significantly different. In terms of vertical trend, the fiber length, fiber diameter, fiber lumen diameter ray height and vessel diameter of normal and tension wood showed similar trend of increasing from bottom to middle trunk and decreasing trend from middle to upper trunk. Examination of radial variation of both normal and tension wood did not show any consistent pattern.