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Research Article

Anatomical Structure of Three Species of *Lannea*

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Abstract

The aim of this study was to examine the wood anatomical structures ofwood from three *Lannea* species grown in Sudan. Samples of wood were collected from different areas. Microscopic slides of wood samples were prepared to measure the size and percentage of wood cells. Analysis of variance was used to determine the differences in wood cells between different species. The results showed similarity timber from genus *Lannea* and there is not a big differences in quantitative structure of the three species of *Lannea* and it is got a medium wooden substance therefore it classified generally light wood.

Keywords: *Lannea*; Anatomy; Wood

Introduction

Wood is an important product of woody plants for wood industry. Wood is a hard, fibrous structural tissue present in the stems and roots of woody plants and is used for furniture, building construction, and also used as firewood for thousands of years. Wood anatomical traits of timbers predict the adaptive capacity of the woody species to environmental stresses and determine the quality of a timber. Anatomical characteristics like cell types, their distribution, number and size play an important role in wood identification and also in determining the characteristics of trees like biomechanical support, storage capacity for water, nutrients and chemical compounds like carbohydrates and lignin [1]. The genus *Lannea* is a member of the family Anacardiaceae includes 91 species [2]. Inthe sudan there are three species of genus *Lannea* (*Lannea barteri, Lannea schimperi* and *Lannea fruticosa*). This genus distributed in Southern Kordufan, Darfur, Red sea and Blue Nile. The wood of barteri and schimperi species is soft, white, used for firewood. Fruticosa species wood is very hard, used for tools, building post and fuel. The fruit of three species is edible and bark make good ropes [3]. The study aims to explore variation in the anatomical structure of three *Lannea* species timber grown in Sudan.

Materials and Methods

An experiment was carried out in Forest products laboratory - Forest Research centre – Sudan.

Wood samples of 3 *Lannea* species trees were randomly selected from different areas. The samples were taken from the mature wood. From each sample, 4 specimens 1 × 1 × 2 cm were prepared for sectioning. A transverse section was prepared from each sample. The cubes were softened and sectioned with sliding microtome. The wood softening method is described elsewhere [4]. The sections were then stained with safranin and mounted in Canada balsam for microstructures. Stereological counts were conducted following a procedure described elsewhere [5], using a 0.294 mm grid length under 10/0.25x magnification. The measurements of the microstructure involved random counts on the microscopic sections superimposed to nine squared on sixteen point grid. The glass slides were fixed on microscope fitted with a camera and the cross sections were projected through the computer screen to obtain the point count (Pp), the number of points of intersection with cell boundaries per unit length of test lines (P_L) and the number of objects or features in the count area of the microstructure (N_A) for vessels, fibres and rays. For the general description of stem anatomy, stereological method was used to calculate average cell diameter vertical and horizontal ($D_{v,h}$), average lumen diameter (LD), the mean free path between cells (MFP), vessel shape factor (VSF), fiber density index (FDI) and double cell wall thickness (DCWT) for vessel and fiber. The following equations were used:

$D_{v,h} = PL\ v,h$ .....(1)

2 NA

$LD = \sqrt{\frac{4 * pp\ lumem}{\pi\ Na}}$ .....(2)

$MFP_{v,h} = 2(1-Pp)$ .....(3)

P L v, h

$DCWT_{v,h} = D_{v,h} - LD$ .....(4)

VSF= D V radial .....(5)

D V tangential

FDI=Pp w ……..(6)

Pp l

The data were analysed using the statistical analysis system (SAS), JMP programs. Analysis of variance and Duncan's Multiple Rage tests at 0.05 probability level was used to study the significance of the differences between the mean of wood parameters.

Lannea schimperi Lannea fruticosa Lannea barter

Results and Discussion

Results showed similarity timber from genus *Lannea* and there is not a big differences in quantitative structure of the three species of *Lannea* and it is got a medium wooden substance therefore it classified generally light wood. We find that the diameter of the vessels (vertical and horizontal) is higher in *Fruticosa* species (0.13 vertical, 1.39 horizontal) but it is not significantly different from the diameter of the vessels of the species *Parteri* (0.09 vertical, 0.11 horizontal), this indicating the large of lumen diameter of vessels in the *Fruticosa* species and this is evident in the results (Table 1). The results show that the percentage of vessels in *Fruticosa* species is higher than the other types (26.6%). The percentage of rays is greater in *Schimperi* species (27.2%) (Table 2 and 3).

Species	dvv	dvh	ldv	dcwtvv	dcwtvh	MfpVv	Mfpvh	SF vessel
Parteri	0.09ab	0.11ab	0.09ab	0.01a	0.29a	0.92a	0.72a	0.93a
Fruticosa	0.13a	1.39a	0.12a	0.01a	0.01a	0.41a	0.40a	0.99a
Schimperi	0.06b	0.08b	0.05b	0.01a	0.02a	1.18a	0.77a	0.85a

Table 1: Diameter, lumen diameter, mean free path, double cell wall thickness and shape factor of vessel. Means fallowed by the same letter in columns are not significantly different using DMRT at P ≥ 0.05.

Species	dfv	dfh	LD fiber	Dcwt-Fv	Dcwt-Fh	FDI
Parteri	0.017a	0.022b	0.016ab	0.014a	0.013a	1.606a
Fruticosa	0.022a	0.019b	0.008b	0.011a	0.014a	1.682a
Schimperi	0.033a	0.033a	0.027a	0.003b	0.006b	2.012a

Table 2: Diameter, lumen diameter, means free path, double cell wall thickness of fiber, Fiber density index. Means fallowed by the same letter in columns are not significantly different using DMRT at P ≥ 0.05.

Species	Vessel%	Fiber%	Ray%	Wood%
Parteri	16.1b	69.4a	14.4b	47.22a
Fruticosa	26.6a	61.6a	11.6b	53.33a
Schimperi	12.6b	60a	27.2a	36.11b

Table 3: Percentage of different cells and wood percentage. Means fallowed by the same letter in columns are not significantly different using DMRT at P ≥ 0.05.

The anatomical structure and characteristic of the cells from the wood of *Lannea* trees were similar among the species. The wood structure does not contain any Parenchymas and there isn't gum in vessels. This wood is easy in drying, easy handling machinery of timber processing, unless species *Fruticosa* which contains a lot of tylosis in vessels and from vessels percentage it requires a great deal of water when it is planting comparing with another two species. From the results that species *Parteri* is the most suitable of pulp.

Conclusion

The three species are an asset in industries that require light timber like packaging boxes, etc.

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