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Evaluation Of Fiber Characteristics Of *Ricinodedron Heudelotii* (Baill, Pierre Ex Pax) For Pulp And Paper Making

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ABSTRACT

The fiber characteristics of *Ricinodendron heudelotii* (Baill, Pierre ex Pax), an angiosperm, were investigated for its potential as a fibrous raw material for pulp and paper production. Bolts of about 70 cm were cut from the felled trees at three different merchantable height levels of 10%, 50%, and 90% to obtain: corewood, middlewood and outerwood samples. The fiber characteristics of the selected trees viz: the fiber length, fibre diameter and lumen diameter were measured while the cell wall thickness, Runkel ratio, slenderness ratio, flexibility coefficient, Luce's shape factor and solid factor of the fibers were derived from the measured fibre dimensions. The average fiber length, cell wall thickness, lumen width, Runkel ratio, flexibility and slenderness ratio were 1.40 mm, 4.6 mm, 32.3 µm, 0.31, 0.77 and 35.85, respectively. Some of the fibre morphology revealed that *R. heudelotii* is suitable for pulp and paper production.

Keywords: *Fiber Characteristics, Fiber Length, Cell Wall Thickness, Lumen Width, Runkel Ratio, Flexibility, Slenderness Ratio*

1. INTRODUCTION

Paper global consumption is estimated to be 400 million tons per year and expected to increase to 500 million tons by 2020 (Sharma *et al*., 2013). The worldwide consumption of paper and paperboard products increases continuously due to several reasons, which include population growth and industrialization in developing countries (Hurter and Riccio, 1998). The fibers of softwoods and hardwoods have desirable fiber characteristics for pulp and paper production, but over exploitation of these woods for different purposes has resulted in continuous decline in their supply for pulp and paper production from natural forests (Ashori, 2006). Hence, the consideration of some fast growing wood species in the Nigeria natural forest as a potential fibre source for pulp production is a right step towards meeting the demand for pulp. However, prior to recommending any wood species for pulp production, the detail anatomical properties are expected in order to be well furnished with adequate information on how its properties will affect its paper performance. Horn and Setterholm (1990) found that the majority of variation in burst and tensile strength in hardwood pulp sheets could be accounted for by fibre length and cell wall thickness. *Ricinodendron heudelotti* used in this study is a fast-growing tree and a lesser utilised timber. It normally reaches up to 50 m in height and 2.7 m in girth. It has bole straight with short buttress.

Understanding of the fibre characteristics has been considered to be the most important factor for determining the degree of efficiency of wood species in pulping (Ogunwusi, 2001). The strength property of paper depends on the characteristics of its fibre. Fuwape *et al.* (2010) reported that long fibres have a strong positive correlation with tearing strength only without any clear relationship with other paper properties. It is apparent from the literature that there are different opinions on the relative importance of particular fibre properties and their practical implications on paper properties. The morphological characteristics of a fibre, such as fibre length and width, are important parameters in estimating the qualities of pulp (Marques *et al*. 2010). Fibre length is the most important physical property for pulping as it generally influences the tearing strength of paper. The greater the fibre length, the higher the tearing resistance of paper.

Wood-fibre characteristics that have often been associated with paper strength - in particular, paper made from hardwoods - are the length to diameter ratio and Runkel Ratio. Both are fibre parameters which, by the very nature of their required measurements, should be associated with wood fibre and not with pulp fibre. The Runkel Ratio is a microscopic extension of the wood density in that wall thickness and lumen width are the basic factors used in its determination. Therefore, it should not be expected to provide detailed basic information than the measured wood density. Therefore, this study aimed at investigating the fibre morphological properties of *Ricinodendron heudelotii* as a potential source of pulp and paper fibrous raw material.

2. MATERIALS AND METHOD

Studies on anatomical characteristics were carried out in accordance with the ASTM D 1030-95 (2007) and ASTM D 1413-61 (2007) at the Forestry Research Institute of Nigeria (FRIN), Jericho, Ibadan. Wood samples from the corewood, middlewood and outerwood regions at different sampling height of 10%, 50% and 90% of the merchantable height were prepared into slivers of 3 mm × 10 mm. The slivers were macerated with acetic acid and hydrogen peroxide (1:1) and boiled in a water bath at a temperature of 100°C for 10 minutes following a procedure adopted by Ogbonnaya *et al*.

(1997). Some macerated fibres were randomly selected and mounted on slides; then examined under a Reichet microscope. The fibres length, fibre diameter and lumen diameter were measured using a stage micrometer and an eye piece micrometer. The cell wall thickness, slenderness ratio, flexibility, Runkel ratio, Luce's shape factor and solid factor of the fibres were computed from the measured fibre dimensions. Twenty fibres were measured from each representative sample slide in accordance with Jorge *et al* (2000) who measured at least 20 fibres per slide.

The equations used for the computation of the derived values: cell wall thickness, slenderness ratio, flexibility coefficient, Runkel ratio, Luce's shape factor and solid factor are expressed as equations 1 to 6 (Saikia *et al*., 1997; Ogbonnaya *et al*., 1997).

$$\text{Cell wall thickness} = \frac{\text{Fibre diameter}}{\text{Lumen width}} \quad (1)$$

$$\text{Slenderness ratio} = \frac{\text{Fibre length}}{\text{Fibre diameter}} \quad (2)$$

$$\text{Flexibility coefficient} = \frac{\text{Lumen diameter}}{\text{Fibre diameter}} \quad (3)$$

$$\text{Runkel ratio} = \frac{2 \times \text{Fibre cell wall thickness}}{\text{Lumen diameter}} \quad (4)$$

$$\text{Luce's shape factor} = \frac{\text{Fiber diameter}^2 - \text{Lumen diameter}^2}{\text{Fiber diameter}^2 + \text{Lumen diameter}^2} \quad (5)$$

$$\text{Solid factor} = (\text{Fibre diameter}^2 - \text{Lumen diameter}^2) \times (\text{Fibre length}) \quad (6)$$

3. RESULTS AND DISCUSSION

The anatomical properties of *Ricinodendron heudelotii* wood samples obtained from base to top and corewood to outerwood were evaluated. The fibre length, fibre diameter, lumen width and cell wall thickness are presented in Table 1 while the Runkel ratio, flexibility coefficient, slenderness ratio, Luce's shape factor and solid factor are presented in Table 2.

The fibre length of *Ricinodendron heudelotii* ranged from 1.34 mm at 90% to 1.52 mm at 10% merchantable height with the average fibre length of 1.40 mm. The fibre length obtained for *R. heudelotii* wood is in agreement with previously published studies on other wood species (Kherallah and Aly, 1989; Ogunsanwo 2000; Roger *et al.* (2007; Ogunkunle 2010; Hindi *et al*. 2010). The average fibre length (1.36 mm) observed in this study is greater than 1.29 mm for *Gmelina arborea* reported by Roger *et al.* (2007); 1.35 mm for *Triplochiton scleroxylon* (Ogunsanwo 2000); 1.28 mm and the range of 0.99 to 1.24 mm for *G. arborea* and Ficus spp, respectively (Ogunkunle 2010). However, it is less than 1.66 mm for *Rhizophora racemosa* and 1.72 mm for *R. harrisonii* (Emerhi 2011), 1.57 mm for 42 yrs old *Hevea brasliensis* (Tembe *et al*. 2010), 1.73 mm for 20 yrs old Teak (Izekor and Fuwape 2011) and 1.76 mm and 1.54 for R*hizophora racemosa* and *R. harrisonii* in a Nigerian mangrove forest ecosystem by Emerhi (2012). Hindi *et al.* (2010) reported that *Leucaena leucocephala, Azadirachta indica* and *Simmondsia chinens* had a fibre length of 1.13, 1.04 and 0.50 mm, respectively. Since, the length of fibre greatly affects the strength of the pulp and the paper made from it (Kaila and Aittamaa, 2006), paper made from *R. heudelotii* is expected to show higher quality than the others woods like *L. leucocephala, A. indica* and *S. chinens* with shorter fibres. Higher fibre length results in greater resistance of the paper to tearing (Oluwadare and Sotande, 2007).

The longitudinal variation of wood fibre length was characterised by a slight decrease from the base to the top. This is in agreement with some previous studies (Jorge *et al*, 2000; Ogunsanwo 2000; Izekor, 2010). The theory of auxin gradient also holds for this pattern of variation in the fibre length similar to that of wood density. In relation to the radial variation of fibre length, a significant increase from Corewood to outerwood was observed. This trend was also observed (Shupe *et al*. 1996; Jorge *et al*, 2000; Ogunsanwo 2000; Izekor, 2010). Additionally, Tomazello and Filho (1987) and Bhat *et al*. (1990) also found the same trend of radial variation in *Eucalyptus spp.* The increase of fibre length from Corewood to outerwood could be explained on the basis of the increase in length of cambial initials with increasing cambial age and crown formation (Jorge *et al.* 2000).

Table 1. Variation in the anatomical properties of *Ricinodendron heudelotii* wood

Property	Wood type	Base (10%)	Middle (50%)	Top (90%)	Pooled mean
Fibre length (mm)	Outerwood	1.52±0.20	1.41±0.18	1.43±0.14	1.45±0.18
	Middlewood	1.41±0.16	1.35±0.14	1.38±0.11	1.38±0.14
	Corewood	1.38±0.19	1.36±0.17	1.34±0.10	1.36±0.16
	Pooled mean	1.44±0.19	1.37±0.17	1.39±0.12	1.40±0.17
Fibre diameter (µm)	Outerwood	47.2±14.9	41.0±14.3	42.2±12.5	43.5±14.2
	Middlewood	43.8±9.1	39.6±9.02	40.5±9.2	41.3±9.3
	Corewood	41.1±10.6	41.3±13.9	36.4±5.6	39.6±10.7
	Pooled mean	44.0±12.1	40.6±12.6	39.7±9.8	41.5±11.7
Lumen width (µm)	Outerwood	36.9±14.1	31.5±13.2	33.9±10.9	33.8±13.0
	Middlewood	34.7±8.3	29.7±7.8	31.6±8.9	32.1±8.6
	Corewood	31.9±9.9	32.7±14.3	28.3±5.8	31.0±10.8
	Pooled mean	34.5±11.2	31.43±12.2	31.0±9.0	32.3±11.0
Cell wall (mm)	Outerwood	5.1±1.5	4.8±1.6	4.6±1.5	4.8±1.6
	Middlewood	4.5±1.3	5.0±1.8	4.5±1.2	4.7±1.4
	Corewood	4.6±1.5	4.3±1.5	4.1±1.3	4.3±1.5
	Pooled mean	4.8±1.4	4.7±1.7	4.4±1.4	4.6±1.5

Table 2. Variation in the derived anatomical properties of *Ricinodendron heudelotii* wood

Property	Wood type	Base (10%)	Middle (50%)	Top (90%)	Pooled mean
Runkel ratio	Outerwood	0.31±0.13	0.33±0.12	0.29±0.09	0.31±0.11
	Middlewood	0.27±0.19	0.34±0.12	0.31±0.10	0.30±0.11
	Corewood	0.32±0.15	0.32±0.19	0.30±0.11	0.31±0.15
	Pooled mean	0.30±0.13	0.33±0.15	0.30±0.10	0.31±0.13
Slenderness ratio	Outerwood	34.70±8.67	37.60±10.39	36.65±10.35	36.32±9.90
	Middlewood	33.41±7.64	35.70±8.81	35.60±7.16	34.91±7.96
	Corewood	35.63±9.80	35.56±9.12	37.77±6.45	36.32±8.63
	Pooled mean	34.58±8.78	36.29±9.50	36.68±8.20	35.85±8.89
Flexibility	Outerwood	0.77±0.07	0.76±0.06	0.78±0.05	0.77±0.06
	Middlewood	0.79±0.05	0.75±0.06	0.77±0.06	0.77±0.06
	Corewood	0.77±0.07	0.77±0.09	0.77±0.06	0.77±0.08
	Pooled mean	0.78±0.07	0.76±0.07	0.77±0.05	0.77±0.07
Luce's shape factor	Outerwood	0.25±0.09	0.29±0.08	0.25±0.07	0.26±0.08
	Middlewood	0.23±0.07	0.29±0.08	0.25±0.06	0.26±0.07
	Corewood	0.26±0.07	0.24±0.06	0.25±0.07	0.25±0.07
	Pooled mean	0.25±0.08	0.27±0.07	0.25±0.07	0.26±0.07
Solid factor	Outerwood	0.0473±0.2179	0.0010±0.0004	0.0026±0.0076	0.0170±0.0753
	Middlewood	0.0725±0.3199	0.0008±0.0003	0.0009±0.0002	0.0247±0.1068
	Corewood	0.0009±0.0003	0.0009±0.0003	0.0007±0.0002	0.0008±0.0003
	Pooled mean	0.0402±0.1794	0.0009±0.0003	0.0014±0.0027	0.0142±0.0608

Furthermore, the many molecular and physiological changes that normally occur in the vascular cambium during the aging process could be responsible for the increase in the fibre length (Plomion *et al* 2001). The cells produced in the primary xylem divide less frequently, thus allowing more time for the fusiform initial section to elongate longitudinally and transversely (Horacek *et al*., 1999). Note that the result also showed that the radial variation was small in all the trees, similar to the report of Hans and Burley (1972) on *Eucalyptus camaldulensis*, *E. citriodora*, *E. pilularis*, *E. saligna*, *E. tereticornis* and Taylor (1973) in *E. grandis*.

The relationship between fibre length and pulp and paper properties cannot be over-emphasized. Fibre length influences most of the pulp strength properties; positive correlations have been found between fibre length and tear index for *Pinus radiata* and *P. elliotttii* (Wright and Sluis-Cremer, 1992), burst strength (El-Hosseiny and Anderson 1999, Ona *et al.* 2001), tear strength (Haygreen and Bowyer 1996) and folding endurance (Ona *et al*. 2001). Fibre length and strength has been shown to be particularly important for tearing resistance (Wangaard and Williams 1970). A greater fibre length corresponded to a higher tearing resistance of paper, which was ascribed to stress dissipation; the longer the fibre, the greater the area over which the stress was dissipated (Gallay 1962). Ademiluyi and Okeke (1979) reported that the longer the fibre, the higher the tear resistance and the better the quality of paper produced from it. However, longer fibres tended to give a more open and less uniform sheet structure. The fibre length was of secondary importance in determining the breaking length and other properties (Gallay 1962).

The observed fibre diameter (41.5 µm) is greater than 30.67 µm for *G. arborea* (Roger *et al.* 2007); 26.46, 18.69 to 28.93 µm for *G. arborea* and various Ficus species, respectively (Ogunkunle 2010). It is also greater than 36.09 and 34.25 µm for *R. racemosa* and *R. harrisonii*, respectively (Emerhi 2012), 29.47 µm for 20 years old Teak (Izekor and Fuwape 2011), 20.3 µm for *T. scleroxylon* (Ogunsanwo 2000).

Fibre diameter decreased from base to top along the longitudinal position. The observed trend could be due to the fact that minimal net photosynthate for cell development at the top caused by competition for leaf and branch development lead to better cells production at the base. Across the radial direction, fibre diameter increased from corewood to outerwood. Similar trend was reported by Ogunsanwo (2000) on *T. scleroxylon*, Izekor and Fuwape (2011) on Teak. The reason for this trend was attributed to the influence of cambium age on development and maturation of fibre from pith to bark.

The observed lumen width (32.3 µm) is greater than 30.67 µm for *G. arborea* (Roger *et al.* 2007); 20.06 µm and 18.69 to 28.93 µm for *G. arborea* and different Ficus species, respectively (Ogunkunle 2010). The mean value of 32.3 µm is also greater than 18.92 and 17.55 µm for *R. racemosa* and *R. harrisonii*, respectively (Emerhi 2012), 15.60 µm for 20 years old Teak (Izekor and Fuwape 2011) and 12.5 µm for *T. scleroxylon* (Ogunsanwo 2000).

Lumen width decreased from base to top while a general increase from corewood to outerwood was observed radially (Table 3.4). A similar trend was reported by Izekor and Fuwape (2011) on Teak. The increase from corewood to outerwood is attributed to increase in cell size and physiological development of the wood as the tree grows in girth. Lumen width has an effect on the pulping process. Larger lumen width gives better pulp beating because of the penetration of liquid into empty spaces of the fibres (Emerhi 2012).

The average cell wall thickness of 4.6 µm for *Ricinodendron heudelotii* observed in this research was greater than 4.02 µm for *G. arborea* (Roger *et al.* 2007); 3.83 µm for *G. arborea* (Ogunkunle 2010) but fall within 1.94 to 4.99 µm for different Ficus species (Ogunkunle 2010). However, the value is less than 8.58 µm for *Rhizophora racemosa* and 9.45 µm for *R. harrisonii* (Emerhi 2012), 7.89 µm for 20 years old Teak (Izekor and Fuwape 2011).Cell wall thickness decreased from base to top longitudinally while a general increase from corewood to outerwood was observed radially. A similar trend was reported by Izekor and Fuwape (2011) on Teak. Variations in fibre wall thickness from tree to tree and within individual trees are similar to the patterns of variation in density as a result of the close relationship between these two wood properties (Bhat *et al*. 1990). Fibre length, diameter and wall thickness of *E. grandis* increased with increasing distance from the pith, levelling off after about 8 to 15 years (Bhat *et al*. 1990). The cell wall volume and wall thickness of fibres increase with age as a result of the combined effects of an increase in fibre diameter and a decrease in lumen size (Malan 1991) which, according to Zamudio *et al.* (2002), probably accounts for most of the radial variation in wood density. However, Akachuku (1982) attributed the increase in cell wall thickness of *G. arborea* to changes in cell size, which associate with annual and periodic growth cycles and the increasing age of the cambium.

Wood with thick cell walls tends to produce paper with a poor printing surface and poor burst strength. Thick-walled cells do not bend easily and do not collapse upon pulping, which inhibits chemical bonding (Zobel and van Buijtenen 1989). Thinner-walled cells collapse upon pulping, bond well together chemically, and produce a smoother paper surface. Paper quality and strength are negatively impacted upon with decreased fibre length; while a decline in wood density reduces pulp yield (Malan 1991).

The thicker cell wall gives a higher pulp yield and increase in tear resistance, however, thicker wall give coarse, bulky sheets (Joransen, 1960). In addition, the thicker wall cause decrease in burst and tensile and fold. The thickness of the cell wall had an important bearing on most paper properties. Paper manufactured with thick-walled fibre would be bulky with lower tensile, bust, but with a high tearing strength (Haygreen and Bowyer 1996). Biermann (1993) mentioned that paper made from thick-walled cells resulted in low folding endurance.

The Runkel ratio (0.31) was less than 0.39 for *G. arborea* and fall within 0.26 to 0.68 reported for other Ficus species (Ogunkunle 2010). No definite variation was observed with both longitudinal and radial positions. Runkel ratio is a measure of the suitability of fibre for paper production. Higher Runkel ratio fibres form bulkier paper of lower bonded areas in comparison with lower Runkel ratio fibre (Ververis *et al* 2004).

The fibres with Runkel's ratio less than 1 are good for paper making because fibres are more flexible, collapse easily and form a paper with large bonded area. However, the fibres with a Runkel ratio above one is considered as thick-walled fibres, which are stiffer, less flexible and form a bulky paper sheet of lower bonded area (Dutt *et al*., 2009). Runkel ratio is also related to paper conformability, pulp yield and fibre density (Ona *et al*., 2001). The thick-walled and narrow lumen fibres tend to retain its tubular structure on pressing and thus, offer less surface contact for fibre bonding (Dutt *et al*., 2004). From this point of view, fibres of *R. heudelotii* wood can be considered as suitable for pulp and paper production because its Runkel ratio is slightly lower than that of *G. arborea*.

The observed coefficient of flexibility (0.77) was greater than 0.73 for *G. arborea*, but fall within 0.63 to 0.79 reported for various Ficus species (Ogunkunle 2010). Variation from base to top does not follow any definite pattern, but the same values were obtained from corewood to outerwood. However, high flexibility gives the bonding strength of individual fibre and enhances the tensile strength and bursting properties (Ona *et al.* 2001). Fibre flexibility influences the number of inter-fibre bonds because more flexible fibres have more inter-fibre contact (Amidon 1981).

Flexibility coefficient is one of the important derived indices to determine strength properties of paper and is governed by lumen diameter and fibre diameter. It determines the degree of fibre bonding in paper sheet. The values for hardwood and softwoods are 0.55-0.70 and 0.75 respectively (Smook 1997). The fibres having flexibility coefficient more than 0.75 and between 0.50-0.75 are considered as highly elastic and elastic fibres (Bektas *et al*. 1999). The flexibility ratio of *G. arborea* and *Pinus kesiya* was 0.76 and 0.82 (Sharma *et al*. 2013). It indicates that fibres in *R. heudelotii* wood are flexible and satisfies the requirement for their suitability for pulp and paper production.

The slenderness ratio of *R. heudelotii* obtained in this research was 35.85 which is less than 50.06 for *G. arborea* and 42.38 to 71.99 reported for different Ficus species (Ogunkunle 2010). Sharma *et al* (2013) reported 39.1 for *G. arborea*. Along the longitudinal plane, slenderness increased from the base to the top while the same pattern of variation was observed across the radial direction from the corewood to outer wood. Nevertheless, low slenderness ratio means production of weak paper; hence *R. heudelotii* will produce weak paper compared to *G. arborea* and some Ficus species.

Slenderness ratio, a measure of tearing property of pulp in paper making is determined from fibre length and fibre diameter. The fibres with a high slenderness ratio are long, thin and have high tearing resistance, where as short and thick fibres have less slenderness ratio and tearing resistance. It is reported that slenderness ratio of fibrous material more than 33 is considered good for pulp and paper production (Xu *et al.* 2006). *R. heudelotii* wood fibre had slenderness ratio that is higher than 33 and are also comparable with *G. arborea* (39.09) reported by Sharma *et al*. (2013).

Slenderness ratio also referred to as felting power is a measure of the tear properties of pulp in paper production. The strength properties of papers were positively correlated with the slenderness ratio. Slenderness ratio is produced by shorter and thicker fibres which in turn reduced tearing resistance drastically. There is a positive correlation between the slenderness ratio and folding endurance (Ona *et al.* 2001). However, it was stated that if the slenderness ratio of a fibrous material was lower than 0.70, it was not valuable for quality pulp and paper production (Shakhes *et al*., 2011)). From this point of view, fibres of *R. heudelotii* wood can be considered as suitable for pulp and paper production because its Runkel ratio is slightly lower than that of *G. arborea*.

The average Luce's shape factor of *R. heudelotii* wood was 0.26. Luce's shape factor is an important fibre index and derived from fibre diameter and lumen diameter. It is directly related to paper sheet density (Sharma *et al*., 2013). Luce's shape factor was found to be related to paper sheet density and could be significantly correlated to breaking length of paper (Ona *et al*. 2001). Similar to Runkel ratio, the trend of variation of Luce's shape factor might be associated with that of wall thickness, because both the fiber diameter and the fiber lumen diameter were used to obtain the cross-sectional fiber wall area in the equation for Luce's shape factor (Luce 1970). Luce's shape factor of *R. heudelotii* (0.26) was within the range of the computed factor for *G. arborea* using the data reported Ojo (2013) and Ogunkunle (2010). However, it was lower than for *Afzelia Africana and Detarium senegalense* and *Leucaena lencocephala* (Oluwadare and Sotannde 2007; Ojo 2013). Luce's shape factor was computed from various data reported by some researchers. Luce's shape factor for the study conducted by Ogunkunle (2010) on *Gmelina arborea, Ficus mucuso, F. exasperate* were 0.29, 0.25 and 0.16. Ojo (2013) gave Luce's shape factor for *Gmelina arborea, Afzelia Africana and Detarium senegalense* as 0.20, 0.47 and 0.73, respectively. The data reported by Oluwadare and Sotannde (2007) on *Leucaena lencocephala* gave its Luce's shape factor 0.41. It means that *R. heudelotii* wood is suitable for pulp and paper production.

The average solid factor of *R. heudelotii* wood 14.2×10^{-3}, which is higher than the value computed from the data reported by other researchers. Solid factor was computed from various data reported by some researchers. Luce's shape factor for the study conducted by Ogunkunle (2010) on *Gmelina arborea, Ficus mucuso, F. exasperate* were 4.4×10^{-4}, 2.1×10^{-4} and 1.5×10^{-4}. Ojo (2013) gave Luce's shape factor for *Gmelina arborea, Afzelia Africana and Detarium senegalense* as 1.5×10^{-4}, 1.0×10^{-4} and 4.1×10^{-4}. The data reported by Oluwadare and Sotannde (2007) on *Leucaena lencocephala* gave its Luce's shape factor 1.0×10^{-4}. Solids factor was found to be related to paper sheet density and could be significantly correlated to breaking length of paper (Ona *et al*. 2001).

4. CONCLUSSION

The basic information on the fiber characteristics of *Ricinodedron heudelotii* for possible utilisation as a source of fibrous raw material for pulp and paper production was investigated. Fibre length, fibre diameter, lumen width, cell wall, Runkel ratio, flexibility, slenderness ratio, Luce's shape factor and solid factor were considered. Generally, wood fibre length, cell wall thickness and lumen width decreased from the base (10% merchantable height) to top (90% merchantable height). The fibre length observed in this study was longer than 1.29 mm for *Gmelina arborea*. Hence, it would produce a paper that has greater resistance to tearing than that of *G. arborea*. However, since it has longer fibres, more open and less uniform sheet structure would be produced from it. Its fibre diameter, lumen width and cell wall thickness are larger than that of *G. arborea*. So, since the larger lumen width gives better pulp beating because of the penetration of liquid into empty spaces of the fibres, *R. heudelotii* would be preferred to that of *G. arborea*. Thicker cell wall *R. heudelotii* would give higher pulp yield and increase in tear resistance, but, bulky sheets than *G. arborea*.

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