Forests and Forest Products Journal 21: 35-42

Variation in the Selected Physical Properties Between and Within-Tree Of 21-Year- Old *Polyalthia longifolia* (Sonn.) Thawaites

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Abstract

The rate of depletion of the economic timber species in the forests makes imperative the need to search for alternative timber species. *Polyalthia longifolia* is well known for its ornamental and medicinal services but little is known about its wood properties which can aid in ascertaining its suitability for timber. Therefore, this study investigated the between and within-tree variation in selected physical properties of *P. longifolia* with a view to identifying its suitability as a timber species. Five 21-year-old *P. longifolia* trees (T) were harvested from Akobo area in Ibadan, Nigeria. Bolts of 60 cm length were obtained from the breast height of the trees; central planks were obtained from each bolt and each central plank was radially partitioned into three radial zones (RZ): innerwood, middlewood and outerwood. Test samples were collected from each radial zone and the Moisture content (MC), Specific gravity (SG), Longitudinal shrinkage (LS), Tangential Shrinkage (TS), Radial Shrinkage (RS), and Volumetric shrinkage (VS) were evaluated. Using a Factorial design, the data obtained were subjected to one-way analysis of variance (ANOVA) at 5% probability level. The mean MC was 13.76%, ranging from 13.11% (innerwood) to 14.68% (outerwood) and also ranged from 13.09% (T1) to 15.29% (T4) between trees. The SG was highest in the inner wood (0.57) and T3 (0.54), and least in the middle wood (0.49) and T1 (0.49). The LS decreased consistently from the inner wood (0.44%) to the outerwood (0.23%).The mean TS and RS both varied radially from 3.95% and 3.37% (middle wood) to 4.65% and 3.77% (outerwood), respectively. The mean VS was 7.96%, ranging from 8.13% (innerwood) to 8.42% (outerwood), while it was highest in T5 (9.07%) and least in T4 (7.47%).The wood had a uniform MC, LS, TS and VS between and within-tree ($p>0.05$), while it significantly varied in its SG within-tree, and RS between trees ($p<0.05$). Based on the results, it is concluded that *P. longifolia* wood exhibited properties, which compare well with those of some other commercial timber species, hence, the wood is in no way inferior to some of the highly sought timber species.

Keywords: *Polyalthia longifolia,* moisture content, specific gravity, volumetric shrinkage

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Introduction

In years past, forest exploitation was limited to a few known economic timber species, which unfortunately led to a tremendous depletion and scarcity of these economic species. Due to the scarcity and high prices of these economic species, exploitation of the forest have been extended to other lesser-used species. Consequently, some of these lesser-used species have gained prominence for utilization in some certain areas of application. The influx of these lesser-used species into the timber market has helped in easing the pressure on the dwindling economic species. However, the utilization of these lesser-used species as a substitute to the economic species may be grossly limited, as their acceptance by wood users for utilisation in broader areas of structural application may be impaired due to paucity of information on their technical properties. Barany *et al.* (2003) opined that when lesser-used wood species are used to replace or supplement economic species, the products face problems of acceptance in international markets. To address this, there is a need to provide adequate information on the properties of these lesser used wood species to herald their selection or choice for any specific end use.

Furthermore, effective utilisation of wood for any particular end use requires a good knowledge of its properties (Adenaiya and Ogunsanwo, 2016). It will be very difficult to realize the full potentials of wood as a raw material in the contemporary society unless there is a good understanding of its properties. Because wood will not reach its highest use potential unless it is fully described, understanding the mechanisms that control its performance properties and eventually being able to manipulate those properties to suit some particular end use is therefore imperative.

Polyalthia longifolia is a tall, evergreen tree with a straight trunk and horizontal branches and is widely cultivated in India. In Nigeria, *P. longifolia* is popularly called masquerade tree, and it is mostly planted as an ornamental or aesthetic plant, as fence or as windbreak. According to Jothy *et al.* (2013), *P. longifolia* is utilized pharmacologically due to its antifungal, antibacterial, antitumor, anti-ulcer, anti-diabetic and antioxidant properties. Its wide adoption in landscaping to provide environmental services is borne out of its fast growth rate, evergreen nature, resistance to wind throw and its straight bole. *P. longifolia* has shown excellent stem formation attributes capable of being used for pole production and possibly as timber for structural application. However, there is still limited information on its technical properties which can help ascertain the applications it is best suited to.

Asides the well-documented medicinal properties of the species, Ogunsanwo *et al.* (2014) studied the anatomical characteristics of the wood species, reporting that the wood exhibited anatomical characteristics comparable with that of other hardwood species. Documenting the physical properties of the wood will equally help in eliciting other structural applications the wood could be suitably utilized in. Thus, due to the dearth of information on the physical properties of the *P. longifolia* wood, this study therefore aims to investigate the between and within variation in the physical properties of the wood with a view to identifying its suitability for some structural end uses in order to ensure its effective utilisation.

Materials and Methods.

Sample Collection

The experiment was laid in a 3 x 5 Factorial Design, consisting of three treatments (Radial zones) and five trees (tree effect). Five defect-free trees of 21-year-old *Polyalthia longifolia* were harvested from Akobo area in Ibadan, Oyo State, Nigeria, located between latitude $7^0$25’48’’ North and longitude $3^0$56’20’’ East. The age of the trees was obtained from residents around the area who were familiar with when the trees were planted. Bolts of 60 cm in length were obtained from the breast height of the masquerade tree with the aid of a power saw. The bolts were obtained from the breast height because of the strong correlation between wood density and the whole tree density at this point (Kiaei *et al.* 2013; Adenaiya and Ogunsanwo, 2016). The bolts were subsequently taken to the University Teaching and Research Sawmill at Ajibode area within the University of Ibadan, Nigeria for further processing.

Test Blocks Preparation

The central planks measuring about 6 cm in thickness were obtained from each bolt and were radially partitioned into innerwood, middlewood and outerwood based on their distance from the pith by dividing the entire radial length from pith to bark into three equal parts (Ogunsanwo and Akinlade, 2008). Samples from each radial zone were further processed into 2 cm x 2 cm x 6 cm test blocks in accordance with standard procedure. Four wood samples were obtained from each radial wood zone per tree. Thus, a total of 60 wood samples were extracted for the determination of each physical property.

Determination of Moisture Content

Test specimens were initially weighed and recorded. They were afterward transferred to the oven for drying at 103ºC ± 2ºC until a constant weight was attained. Samples were allowed to cool in a desiccator and were then re-weighed and recorded. The moisture content was then calculated in accordance with ASTM D 4442-84 (1984) using the equation:

$$\mathrm{MC} = \frac{Wm - Wo}{Wo} \mathrm{X}\ 100$$

Where:-
MC = Moisture Content
W_m = Weight of specimens before oven-drying (g)
W_o = Weight of specimens after oven-drying (g)

Determination of Specific Gravity

Test samples were subjected to a gravimetric procedure developed by Smith (1954) for the determination of specific gravity in which specimens were completely saturated with water by boiling from initial moisture content of 17%. Test samples were removed from the water, blotted to remove excess water, weighed and oven-dried to a constant weight at 103ºC.

Specific gravity was determined using the formula:

$$SG = \frac{1}{\frac{Ws-Wo}{Wo}+\frac{1}{1.53}}$$

Where:

SG = Specific gravity
W_S = Saturated weight of wood
W_O = Oven dry weight of wood
1.53 = Constant weight of wood substance

Determination of Percentage Shrinkage

Test specimens were soaked in water for 48 hours in order to get them conditioned to moisture above Fibre Saturation Point (FSP). Specimens were removed one after the other; their dimensions in wet condition along the three planes were taken to the nearest millimetre using a digital vernier calliper. Dimensions along the three planes were also measured after specimens were oven-dried at a temperature of 103ºC ± 2ºC. The tangential, radial, longitudinal and volumetric shrinkages of the test samples were determined using the following relationship in accordance with Areo *et al.* (2020):

$$Tgs = \frac{Dt - dt}{Dt} \times 100$$

$$Rds = \frac{Dr - dr}{Dr} \times 100$$

$$Lgs = \frac{D_l - d_l}{D_l} \times 100$$

Where:

TgS = tangential shrinkage (%)
RdS = radial shrinkage (%)
LgS = longitudinal shrinkage (%)
D_t = initial dimension along the tangential axis at MC of ≥ 30%
D_r = initial dimension along the radial axis at green MC of ≥ 30%
D_l = initial dimension along the longitudinal axis at green MC of ≥ 30%
d_t = final dimension along the tangential axis at oven-dry MC of ≥ 30%
d_r = final dimension along the radial axis at oven-dry MC of ≥ 30%
d_l= final dimension along the longitudinal axis at oven-dry MC of < 30%o_R + S_T

Where:

VS = Volumetric Shrinkage
S_R = Radial Shrinkage
S_T = Tangential Shrinkage

Data Analysis

The between and within tree effect of the wood on the physical properties of the wood was determined using Analysis of Variance (ANOVA) at 5% probability level. Where significant differences were observed, post-hoc analysis was conducted using Duncan Multiple Range Test (DMRT).

Results

Moisture Content

The result presented in Table 1 shows the mean moisture content of *P. longifolia* to be 13.76%. This value ranged radially within the tree from 13.11% (innerwood) to 14.68% (outerwood), and from 13.09% (T1) to 15.29% (T4) between trees. The moisture content between and within the tree was not significantly different (p>0.05), neither was there a significant interaction between the trees and the radial zones on the wood's moisture content (Table 2). There was a consistent and gradual decrease in moisture content from the outerwood to the innerwood (Table 3).

Specific gravity

The mean specific gravity for the sampled species is 0.52 (Table 1). This value ranged radially from 0.49 (middlewood) to 0.57 (innerwood), and from 0.49 (T1) to 0.52 (T5) between trees (Table 1). Radially, the specific gravity of the wood varied inconsistently, sharply decreasing significantly (p<0.05) from the innerwood to the middlewood, followed by a slight and insignificant increase (p>0.05) to the outerwood (Table 3). Statistical significance was also established (p<0.05) between the interactions of the radial wood zone and tree effect (Table 2).

Table 1: Mean values of the physical properties between and within trees of *Polyalthia longifolia* wood.

Wood properties	Radial zone	T1	T2	T3	T4	T5	**Mean**
Moisture content (%)	Innerwood	12.60±0.38	12.79±0.25	13.70±1.21	13.45±0.49	13.00±0.20	**13.11±0.70**
	Middlewood	12.97±0.31	13.30±0.39	15.03±2.93	13.38±0.39	12.76±1.96	**13.49±1.65**
	Outerwood	13.72±0.17	13.63±0.30	13.36±0.31	19.06±10.9	13.65±0.45	**14.68±4.92**
	Mean	**13.09±0.56^{a}**	**13.24±0.46^{a}**	**14.03±1.83^{a}**	**15.29±6.39^{a}**	**13.14±1.13^{a}**	**13.76±3.05**
Longitudinal shrinkage (%)	Innerwood	0.46±0.15	0.31±0.10	0.51±0.15	0.69±0.55	0.21±0.68	**0.44±0.40**
	Middlewood	0.34±0.29	0.23±0.30	0.58±0.21	0.22±0.19	0.21±0.05	**0.32±0.25**
	Outerwood	0.08±0.12	0.14±0.13	0.28±0.30	0.11±0.15	0.54±0.47	**0.23±0.30**
	Mean	**0.29±0.24^{a}**	**0.23±0.19^{a}**	**0.46±0.25^{a}**	**0.34±0.4^{a}**	**0.32±0.46^{a}**	**0.33±0.33**
Tangential shrinkage (%)	Innerwood	3.73±1.45	4.33±1.11	4.60±1.04	4.12±1.19	5.23±1.58	**4.40±1.26**
	Middlewood	3.28±1.19	4.15±0.98	3.78±0.65	4.31±0.95	4.24±2.16	**3.95±1.22**
	Outerwood	4.50±1.88	3.54±0.61	4.69±0.48	5.06±0.62	5.46±1.05	**4.65±0.94**
	Mean	**3.84±1.20^{a}**	**4.01±0.91^{a}**	**4.36±0.81^{a}**	**4.50±0.96^{a}**	**4.98±1.60^{a}**	**4.34±1.16**
Radial shrinkage (%)	Innerwood	3.90±1.43	4.00±0.07	3.35±0.42	2.93±0.16	4.45±1.47	**3.73±1.00**
	Middlewood	3.68±0.27	3.02±0.73	3.44±0.68	3.22±1.06	3.48±0.33	**3.37±0.65**
	Outerwood	4.55±1.03	3.43±0.97	3.73±0.41	2.77±0.07	4.35±0.88	**3.77±0.95**
	Mean	**4.05±1.01^{a}**	**3.48±0.76^{ab}**	**3.51±0.50^{ab}**	**2.97±0.59^{b}**	**4.09±1.02^{a}**	**3.62±0.88**
Volumetric shrinkage (%)	Innerwood	7.63±2.37	8.32±1.14	7.95±1.17	7.05±1.30	9.68±3.04	**8.13±1.96**
	Middlewood	6.97±1.28	7.18±1.34	7.22±0.90	7.53±1.56	7.72±1.90	**7.32±1.30**
	Outerwood	9.05±1.23	6.97±1.11	8.43±0.59	7.83±0.61	9.81±1.53	**8.42±1.39**
	Mean	**7.88±1.79^{a}**	**7.49±1.25^{a}**	**7.87±0.98^{a}**	**7.47±1.16^{a}**	**9.07±2.27^{a}**	**7.96±1.62**
Specific Gravity	Innerwood	0.54±0.08	0.58±0.04	0.57±0.02	0.56±0.05	0.58±0.03	**0.57±0.05**
	Middlewood	0.52±0.07	0.51±0.02	0.46±0.01	0.50±0.05	0.48±0.06	**0.49±0.05**
	Outerwood	0.43±0.02	0.47±0.01	0.60±0.04	0.48±0.04	0.51±0.07	**0.50±0.07**
	Mean	**0.49±0.08^{a}**	**0.52±0.05^{a}**	**0.54±0.07^{a}**	**0.51±0.06^{a}**	**0.52±0.07^{a}**	**0.52±0.06**

Mean±Standard deviation values with the same superscript along the same row are not significant different ($p<0.05$).

Table 2: ANOVA results of the between and within tree effect on the physical properties of *Polyalthia longifolia* wood.

Source of variation	**df**	**MC**	**SG**	**LS**	**TS**	**RS**	**VS**
T	4	0.377	0.151	0.481	0.141	0.007*	0.086
RZ	2	0.235	0.000*	0.126	0.159	0.236	0.075
T*RZ	8	0.475	0.002*	0.183	0.735	0.525	0.582
Error	45						
Total	59						

Values under each physical property depict the p-values. Values with asterisk (*) indicate significant p-values at $\alpha = 0.05$. T = Tree effect; RZ = Radial zone effect; MC = Moisture Content; SG = Specific Gravity; LS = Longitudinal Shrinkage; TS = Tangential Shrinkage; RS = Radial Shrinkage; VS = Volumetric Shrinkage.

Table 3: Radial variation in the physical properties of *Polyalthia longifolia* wood.

Wood property	Innerwood	Middlewood	Outerwood
Moisture content (%)	13.11±0.70^a	13.49±1.65^a	14.68±4.92^a
Longitudinal shrinkage (%)	0.44±0.40^a	0.32±0.25^a	0.23±0.30^a
Tangential shrinkage (%)	4.40±1.26^a	3.95±1.22^a	4.65±0.94^a
Radial shrinkage (%)	3.73±1.00^a	3.37±0.65^a	3.77±0.95^a
Volumetric shrinkage (%)	8.13±1.96^a	7.32±1.30^a	8.42±1.39^a
Specific gravity	0.57±0.05^a	0.49±0.05^b	0.50±0.07^b

Means±Standard deviation values with the same superscripts within same row are not significant at p<0.05

Dimensional shrinkage

The mean longitudinal, tangential, radial and volumetric shrinkage of *Polyalthia longifolia* are presented in Table 1. The mean longitudinal shrinkage was 0.33%. Among the sampled trees (between trees), the highest longitudinal shrinkage was in T3 (0.46%), while the least was in T2 (0.23%). Across the radial zones, longitudinal shrinkage decreased from the innerwood (0.44%) to the outerwood (0.23%). Analysis of variance showed that the longitudinal shrinkage was uniform ($p<0.05$) between and within the trees of the wood species (Table 2). The mean tangential shrinkage of the wood was 4.34% (Table 1). Among the sample trees, the value ranged from 3.84% (T1) to 4.98% (T5). Radially, the tangential shrinkage ranged from 3.95% (middlewood) to 4.65% (outerwood). Statistical analysis revealed that there was no significant difference in the tangential shrinkage between and within the trees ($p>0.05$). There was also no significant interaction effect between trees and radial zones on the tangential shrinkage of the wood (Table 2).

The mean radial shrinkage of the wood as depicted in Table 1 was 3.62%. Among the sample trees, the radial shrinkage ranged from 2.97% (T4) to 4.09% (T5). Similar to the tangential shrinkage, the pattern of radial shrinkage was inconsistent from pith to bark, ranging from 3.37% (middlewood) to 3.77% (outerwood). Analysis of variance showed that significant difference exists in the radial shrinkage between trees ($p<0.05$), while there was no significant effect ($p>0.05$) of the radial zones and interaction effect of trees and radial zoneson the wood radial shrinkage (Table 2). As shown in Table 1, the mean volumetric shrinkage of *P. longifolia* wood was 7.96%. Among the trees, the volumetric shrinkage was highest in T5 (9.07%), while it was least in T4 (7.47%). Across the radial plane, the pattern of volumetric shrinkage was equally inconsistent; the lowest being observed in the middlewood (7.32%), while the highest was observed in the outerwood (8.42%). The ANOVA result for the volumetric shrinkage (Table 2) indicates that there was no significant difference between trees and within the trees, neither was there a significant interaction effect of the trees and radial zones on the volumetric shrinkage of the wood ($p<0.05$).

Discussion

In a living tree, moisture is very important for tree physiology and other biochemical processes. However, in wood utilization, moisture in wood affects the processing and utilization of wood adversely, requiring that wood be properly seasoned before utilization. The increase in moisture content from innerwood to outerwood in this study may be attributed to higher bound water in the outerwood. This is because after the harvesting of the wood and during the processing of the wood into samples, a considerable amount of free water is lost as the wood tries to attain equilibrium moisture content. Consequently, the bound water is grossly retained in the wood as higher temperature is required to eliminate them. Since the outerwood is usually denser (Adenaiya and Ogunsanwo, 2016), and hence, possesses more sorption sites and higher amount of bound moisture, the outerwood, as a result has higher moisture content than the innerwood and middlewood. Alternatively, the higher extractive content in the innerwood than the outerwood may also be responsible for the lower water-holding ability of the innerwood; a common feature associated with heartwood formation in trees (Siau, 1984). This increase in moisture content from pith to bark is in agreement with that reported by Oluwadare and Somorin (2007) and Riki *et al.* (2021) for *Gliricidia sepium* wood, but contrasts with the findings of Olayanu (2021) for *Blighia sapida* wood where moisture content decreased from pith to bark. The average moisture content in this study compares well with that reported by Oluwadare and Somorin (2007) for *Gliricidia sepium* wood (8.63%), but is appreciably lower than values reported by Sotannde *et al.* (2015) and Riki *et al.* (2021) for *Khaya senegalensis* (25.73%) and *Gliricidia sepium* (36.87%) wood, respectively. The uniformity in moisture content between and within the wood of *P. longifolia,* which is in contrast to the significant moisture content variations reported by Sotannde *et al.* (2015) and Riki *et al.* (2021), implies that the wood from the various radial zones or trees can be easily oven-dried together within a specific period. Furthermore, the low moisture content of the wood suggests that the wood can be dried with ease within a short period under low temperature using either air-drying or low temperature kiln driers which will save drying cost.

Specific gravity is a measure of the relative amount of solid cell wall materials and has long been used as a predictor of wood strength properties and quality (Larson *et al*., 2001). The pattern of radial variation in specific gravity observed in this study is similar to that reported by Riki *et al.* (2021) for *Gliricidia sepium* wood. However, it is in dissonance with that reported by several studies for some tropical hardwood and softwood species (e.g. Ogunsanwo and Onilude, 2000; Ogunsanwo and Akinlade, 2008; Adenaiya and Ogunsanwo, 2016), where a consistent increase in specific gravity from pith to bark was observed. Generally, specific gravity or wood density increases from pith to bark due to the age-related effects and its impact on cambial activity (Zobel, and van Buijtenen, 1989; Desch and Dinwoodie, 1981). The corewood contains predominantly juvenile wood cells, which is formed under the influence of the crown and has thin-walled cells with low density. As the tree ages, the crown is gradually pushed up and mature wood cells are being produced in the outerwood with characteristic thick-walled cells. Thus, the predominance of higher proportion of the thick-walled cells in the outerwood than the innerwood is responsible for this pattern of density variation in wood. However, the kind of silvicultural treatments received by the tree can alter this pattern (Zobel, and van Buijtenen, 1989; Larson *et al*., 2001). *P. longifolia* tree, being an amenity tree planted primarily for its aesthetic services, is often pruned regularly in such a way as to maintain its aesthetic quality, which as a result increases the crown concentration of the tree towards the base. Thus, the higher crown concentration will lead to production of more low-density juvenile wood at the base. Ogunsanwo *et al.* (2014) also reported higher mean cell wall thickness for the innerwood than the outerwood for *P. longifolia*, thereby further corroborating the effect of silvicultural treatment on the observed pattern of specific gravity variation radially within the tree. The heterogeneity in the specific gravity of the wood radially will have an adverse implication on the wood utilization of the species as uniformity is highly desired by wood users (Larson, 1969). Thus, manipulating the wood properties of the wood to produce a uniform specific gravity is therefore feasible if the wood species receives appropriate silvicultural treatment required for quality timber production. The average specific gravity value of the wood falls within a similar range reported by Ogunkunle *et al.* (2014) for some commercial timber species such as *Gmelina arborea* (0.46), *Tectona grandis* (0.57) and *Afzelia africana* (0.52), implying that the wood is suitable for light to medium structural applications.

Since longitudinal shrinkage in normal woods is usually within the range of 0.1 – 0.2% (Panshin and de Zeeuw, 1980), the higher mean longitudinal shrinkage observed in this study suggests the presence of some reaction wood within the tree. The pattern of longitudinal shrinkage variation in this study is similar to that reported by Hashemi and Kord (2011) for *Cupressus sempervirens* wood. This decrease in longitudinal shrinkage from pith to bark can be attributed to the higher microfibrillar angle of the wood cells present in the juvenile region, which is mainly high in proportion within the innerwood (Desch and Dinwoodie, 1981; Larson *et al*., 2001). The radial uniformity in the longitudinal shrinkage of the wood implies that the wood has a low tendency of warping during drying, as the pith-to-bark longitudinal shrinkage variation is a major determinant of warping in wood during timber seasoning (Desch and Dinwoodie, 1981; Hashemi and Kord, 2011). The mean percentage shrinkage obtained in the tangential direction is slightly greater than that observed in the radial direction. Several reasons have been advanced in the literature to support why tangential shrinkage exceeds radial shrinkage. The most commonly attributed factors are the restraining effects of the rays in the radial direction and the higher lignification of the radial walls than the tangential walls of wood cells (Desch and Dinwoodie, 1981). The range of tangential and radial shrinkage of *P. longifolia* is quite low in comparison to that reported for *Blighia sapida*, having a mean tangential and radial shrinkage of 9.07% and 6.17%, respectively (Olayanu, 2021). This implies that the wood of *P. longifolia* will be relatively stable to moisture fluctuations during service due to its low anisotropic shrinkage values. The Tangential-Radial ratio of the wood species (1.2) is relatively low, which further proves that the wood species will dry easily during seasoning with little tendency for internal (honeycombing) and external (checks and splits) fractures of wood cells occurring (Desch and Dinwoodie, 1981), while also confirming its suitability for outdoor structural purposes where there is direct or indirect exposure to precipitation.

Usually, wood with higher density or specific gravity swell or shrink more than those with low density (Walker, 2006; Harte, 2009). Thus, it is expected that the innerwood of the species should exhibit higher volumetric shrinkage than the middlewood and outerwood because of its higher specific gravity. The higher shrinkage observed in the outerwood than the innerwood may therefore be attributed to the presence of greater amount of extractives in the innerwood which possibly inhibited normal shrinkage by bulking the cell wall spaces of the wood cells, thereby preventing maximum shrinkage in innerwood than expected, when compared to shrinkage in cell walls that are free of extractives (Panshin and de Zeeuw, 1980). This observation is also in conformity with reports by Olayanu (2021) where it was observed that the heartwood region of *Blighia sapida* exhibited lower volumetric shrinkage than its sapwood. The mean volumetric shrinkage of *Polyalthia longifolia* wood obtained for this study (7.96%) compares favourably with the shrinkage values of commonly used timber species such as *Pericopsis elata* (10.00%), *Terminalia superba* (10.10%), *Khaya ivorensis* (9.10%), *Triplochiton scleroxylon* (9.70%), *Mansonia altissima* (10.30%) and *Afzelia africana* (9.80%) (Ghelmeziu, 1981), but is considerably lower than that reported by Olayanu (2021) for *Blighia sapida* (15.24%).

Conclusion

The study has provided basic useful information regarding the potential of *Polyalthia longifolia* as a substitute for the over-exploited commercial timber species. The wood is a medium density wood, which has a minimal tendency of developing drying defects during seasoning. The wood exhibited uniformity in most of the investigated physical properties between and within tree, except for its specific gravity and radial shrinkage, which bodes well for wood users as uniformity is highly desired in wood utilization. Findings from the study also show that the wood compares favourably with other choice timber species for all its physical characteristics. Being a tree mostly cultivated for the environmental services it provides, particularly for its aesthetic services, the wood properties exhibited by the wood can be improved upon for better uniformity of its properties through silvicultural manipulation if the appropriate silvicultural treatment required for producing timber is applied to the tree. Thus, plantation establishment of this species for timber production is therefore strongly recommended owing to its suitability for use in structural applications.

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