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AN ASSESSMENT OF WOOD PROPERTIES OF LESSER-KNOWN TIMBER SPECIES IN SRI LANKA

Ihalaaaddara G.M. CHATHUSHAKI [1]
Chaminda K. MUTHUMALA[2]
Kodithuwakku K.I.U. ARUNAKUMARA[1]
Faiz M.M.T. MARIKAR[3]

Abstract: *Faced with escalating global deforestation, including alarming rates in Sri Lanka, researchers have explored timber as an important and versatile raw material. However, the mechanical properties of locally available lesser-known timber species have not been studied yet thus they have not been included in any timber classification system. The existing timber classification system of the State Timber Corporation was based on demand, availability, and previous experience of workability, where mechanical properties have not been considered. The omission of lesser-known timber species in the existing timber classification system has denied their optimum utilisation in the timber industry. The present study was conducted with 20 lesser-known timber species in Sri Lanka to develop a classification system based on mechanical properties: Wood density, Modulus of Rupture (MOR), Modulus of Elasticity (MOE), and Compression parallel to grain (CPN). A Universal Testing Machine (UTM 100PC) was employed to assess the mechanical properties of the selected timber species. Positive linear relationships between density and CPN, MOR and MOE were observed. The selected lesser-known timber species were then classified according to mechanical properties, and a new type of timber was developed.*

Key words: *density, lesser-known timber species, mechanical properties, timber classification.*

1. Introduction

Wood is a natural material composed primarily of cellulose, hemicellulose, and lignin, which gives strength and rigidity. Wood has been used by humans for various purposes for thousands of years, including construction, furniture making,

[1] Department of Crop Science, Faculty of Agriculture, University of Ruhuna, Mapalana, Kamburupitiya, Sri Lanka;
[2] Research Development and Training Division, State Timber Corporation, Sampathpaya, Battharamulla, Sri Lanka;
Correspondence: FMMT Marikar; email: faiz@kdu.ac.lk.

and as a source of heat energy. Timber, meaning "building material" in old English, is a specific type of wood used in construction and engineering [2]. It is highly valued for its low heat transfer, strength, and lightness, but its high demand has led to shortages. Traditionally, construction and wood products rely on natural timber, but this is becoming increasingly rare [17]. The timber industry needs to find new types of wood that do not come from natural forests, as natural forests are running out. This can compromise safety and cause financial losses. The natural durability, design, and protection measures applied to wood determine its lifespan [5]. With proper care, wooden objects like historical structures, instruments, and artifacts can last for centuries.

The entire area covered by natural forests in Sri Lanka is 1,951,472 ha, of which 429,485 ha are open canopy forests and 1,521,987 ha are closed canopy forests [11]. In these forest areas, in addition to close crown lands, there are more than 350 species of timber trees. At present, the yearly use of timber in Sri Lanka is 1.6 million cubic meters, of which 10% and 40% of the country's total timber required in plantations and home gardens, respectively [13].

Approximately 70% of Sri Lanka's industrial timber requirements is derived from non-forest sources. The development of the economy, the population, and industrialisation are the key factors promoting the growing demand for timber [9]. The State Timber Corporation's timber classification, which is based on a qualitative and quantitative analysis of timber species, has identified eight classes of sawn wood species in response to the increase in demand for sawn wood.

The eight timber categories in the Sri Lankan Timber classification are: Super Luxury, Luxury, Special Upper, Special, Class 1, Class 2, Class 3 and Class 3 lower grade. The most common timber species used in the timber industry have been identified by the State Timber Corporation. Accordingly, Teak (Super luxury), Jack (Luxury), Mahogany (Luxury), Satin (Luxury), Kumbuk (Special) and Grandis (Class 2) belong to the hardwood category, and Pine (Class 3) belongs to the category of softwood.

This Classification of the State Timber Corporation was done based on the commercial value and the availability of the timber, and any scientific or technical logic was not considered. Hence there is no proper guide to selecting suitable timber types for specific tasks, and because of that the proper usage of timber has been limited in Sri Lanka [8].

According to BS EN 942 [1] timber is classified by spiral grain, slope of grain, loose or unsound knots, cracks, rattles, and resin pockets. Based on quality, BS EN 942 [1] assists the user in selecting the right wood. Timber Strength classes were created by grouping together timbers with comparable strength characteristics. These are specified in BS EN 338 [7], which comprises the D30-D70 strength classes for hardwoods. BS EN 332 [7] provides typical values for the qualities of stiffness and strength.

Wood properties vary with timber species and each property may bring a unique value and important feature to timber and its end use. This variability of timber serves a variety of uses and if a particular timber is good for one purpose it may not be useful for another purpose. Therefore, it is important to have proper classification system for timber. This study systematically evaluates the anatomical, physical, mechanical, and durability properties of 20 lesser-known timber species indigenous to Sri Lanka, with the aim of developing a scientifically grounded timber classification system. This classification will facilitate the appropriate utilisation of these species in structural and non-structural applications, promoting sustainable forest resource management and expanding the commercial timber portfolio of the country.

2. Methodology

2.1. Study Location, Sample Selection

The study was conducted at the State Timber Corporation of Battaramulla and the Timber Complex at Bossa from February 2024 to July 2024. In this investigation, 20 lesser-known timber species (Table 1) that can be used for construction and other purposes were selected.

Selected lesser-known timber species for the experiment Table 1

No.	Common name	Botanical name	Family
1.	Acacia	*Acacia mangium* (Willd.)	Fabaceae
2.	Aladu	*Ailaeanthus zeylanicus* [(Mill.) Swingle]	Moraceae
3.	Arawkeriya	*Araucaria columnaris* (J.R. Forst. Hook.)	Araucariacea
4.	Attikka	*Ficus racemosa* (L.)	Combretaceae
5.	Bora-Daminiya	*Grewia helicterifolia* (Wall.)	Malvaceae
6.	Dunu-Madala	*Stereospermum personatum* [(Buch.-Ham. ex Dillw.) D.L. Mabblerley]	Bignoniaceae
7.	Helamba	*Mitragyna parvifolia* [(Roxb.) Korth]	Rubiaceae
8.	Katuboda	*Cullenia ceylanica* [(Garden) Wight ex Schum.]	Malvaceae
9.	Kaha-Milla	*Vitex altissima* (L.f.)	Lamiaceae
10.	Karaw	*Margaritaria indica* [(Dalzell) Airy Shaw]	Phyllanthaceae
11.	Katu-Andara	*Dichrostachys cinerea* (Wight et Arn.)	Fabaceae
12.	Kora-Kaha	*Memecylon umbellatum* (Burm.f.)	Melastomataceae
13.	Kurumbettiya	*Syzygium rubicundum* (Wight et Arn.)	Myrtaceae
14.	Maha-Kadol	*Rhizophora mucronate* (Lam.)	Rhizophoraceae
15.	Maha-Nuga	*Ficus benghalensis* (L.)	Moraceae
16.	Na-Imbul	*Harpullia arborea* [(Blanco) Radlk.)	Sapindaceae
17.	Path-Kela	*Bridelia moonii* (Thw.)	Euphorbiaceae
18.	Pelan	*Bhesa ceylanica* [(Arn.) Ding Hou]	Centroplacaceae
19.	Ruk-Aththana	*Alstonia scholaris* [(L.) R. Br.]	Apocynaceae
20.	Wana-Sapu	*Cananga odorata* [(Lam.) Hook.f. et Thomson]	Annonaceae

2.2. Sample Preparation

Four timber specimens were prepared from defects-free, heartwood pieces from logs for each timber species. Standard sizes were used to ensure consistency and reliability in the evaluation of wood properties, and standard-sized test samples were prepared according to established testing protocols. For moisture content determination, specimens measuring 20 mm × 20 mm × 20 mm (width × height × length) were used. Density was assessed using slightly larger samples of 25 mm × 25 mm × 30 mm to ensure sufficient volume for accurate mass and volume measurements. The bending strength test employed slender specimens of 20 mm × 20 mm × 300 mm (Figure 1a), allowing for a clear span conducive to assessing flexural performance. For the compression test parallel to the grain (Figure 1b), specimens of 20 mm × 20 mm × 60 mm were utilised to evaluate the wood's strength under axial loading. These standardised dimensions ensure comparability across species and alignment with international wood testing standards.

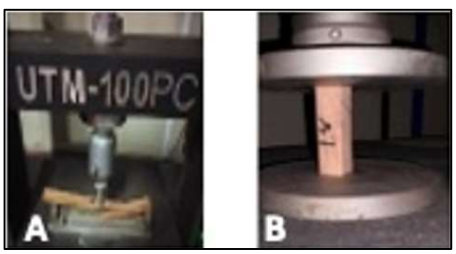

Fig. 1. *Bending (a.) and compression parallel to grain (b.)*

2.3. Determination of Wood Density

Two wooden block samples with the measurement of 2 cm x 2 cm x 2 cm from the lesser-known timber samples were prepared, labelled, and cleaned to remove saw dust, mud, or any other dirty particles. Wood density was measured using a densitometer and the water displacement method (Archimedes' law). The weight of a water-filled beaker was measured (W_1). A wood sample was submerged in the water to a constant depth and the final weight of the beaker was measured (W_2). The timber samples were oven-dried at 103°C for two days until a constant weight was reached. After cooling in a desiccator, the dry weight of each sample was measured using an electronic balance (*g*).

2.4. Three Point Bending Test and Compression Test (Mechanical Test)

2.4.1. General Aspets

Mechanical tests were performed at the laboratory of the State Timber Corporation, Battaramulla, Sri Lanka. Three point bending test and compression tests of the prepared samples were conducted using a Universal Testing Machine (UTM) following BS 373:957 [14].

2.4.2. Bending Test

Three point bending test was conducted with the UTM machine by applying a central loading at 2 mm/min rate. Displacement was recorded with the applied load and load vs. displacement graph was plotted. Modules of rapture (*MOR*) were calculated for the ultimate state. Modules of elasticity (*MOE*) were calculated for the serviceability load vs. displacement graph for each species (Figure 1).

MOR and *MOE* were calculated using Equations (1) and (2). The load was applied at a constant speed of 2 mm/min at UTM.

$$MOR = \frac{3 \cdot P \cdot L}{2 \cdot b \cdot d^3} \quad (1)$$

where:

MOR is the modulus of rupture [N/mm^2];
P is the maximum load [N];
L – the length of sample [mm];
b – the width of the sample [mm];
h – the thickness of the sample [mm].

$$MOE = \frac{P \cdot L^3}{4 \cdot b \cdot d^3 \cdot \Delta} \qquad (2)$$

where:

MOE is the modules of elasticity [N/mm^2];
P – the maximum load at proportionate stage [N];
L – the length of sample [mm];
b – the width of the sample [mm];
d – the thickness of the sample [mm];
Δ - *δ* - the deflection of timber specimen [mm].

2.4.3. Compression Parallel to Grain

The compression parallel to grain (*CPG*) test was conducted using the UTM machine. Dimensions of the test specimens were taken and placed in the UTM. The test was carried out with the loading plate moving speed of 0.5 mm/min and load vs. displacement variation was obtained. Values were calculated using the following Eq. (3). The load was applied at a constant speed of 0.5 mm/min in the UTM machine (Figure 1).

$$CPG = \frac{Load_{max}}{Load_{active}} \qquad (3)$$

where:

CPG is the compression parallel to grain [N/mm^2];
$Load_{max}$ – the maximum load at serviceability state [N];
$Load_{active}$ – the load acting area [mm^2].

2.5. Statistical Analysis

The statistical analysis was done with Minitab 17.0 version. Densities, MOR values, MOE values, and compression parallel to grain values of all the samples were computed, and confidential intervals were determined using one sample t test. Suitable classes were identified. The mechanical property index was developed manually using the data available for the following timber species.

3. Results and Discussion

3.1. The Wood Properties of Timber

Table 2 shows the values of *MOR*, *MOE*, *CPG,* and density for the timber species of concern. According to the findings, Diya na has the highest density, *MOE.* and compression parallel to grain values. The values are higher than the respective values of commonly used timber species. Dunumadala has the highest *MOR* value. Most of these lesser-known timber species show acceptable characteristics. The lowest *MOR*, density and *CPG* values were recorded for Wanasapu and the lowest *MOE* value was recorded for Kurumbattiya.

The density, *MOR*, *MOE* and compression parallel to grain (*CPG*) values were varied in each timber species. The same timber species did not show high values for every mechanical property. The selected lesser-known timber species cannot be directly incorporated into the already available STC classification because of their lower values for the mechanical properties. So, the timber species were categorised into classes separately based on mechanical properties. Many researchers [3, 4] found differences in the mechanical and density characteristics of wood.

Selected wood properties of 20 lesser-known timber species in Sri Lanka Table 2

Species	Average *MOR* [N/mm²]	Average *MOE* [N/mm²]	Average C*PG* [N/mm²]	Average density (12%) [kg/m³]
Acacia	94.53	8101.23	46.54	948.95
Aladu	89.65	14331.14	60.88	927.77
Arawkeriya	143.57	5737.59	26.08	450.53
Attikka	45.53	3471.32	21.21	491.25
Boradamaniya	42.94	10956.16	51.49	826.26
Diya na	125.62	16620.54	69.57	1238.26
Dunumadala	188.01	6769.36	52.35	1088.68
Halamba	88.57	9667.69	46.68	736.77
Kahamilla	72.59	7150.55	46.98	633.45
Karaw	77.96	8141.43	44.33	735.22
Katu andara	103.58	7534.92	50.85	887.44
Katu kithul	34.39	5059.07	38.65	861.56
Katuboda	54.22	4948.21	27.77	534.36
Korakaha	83.80	8365.94	52.35	1055.55
Kurumbattiya	77.51	899.15	44.42	362.41
Mahanuga	50.80	5583.35	32.07	623.02
Path kela	68.88	7663.22	43.33	685.15
Pelan	98.24	9814.56	43.68	787.36
Rukkaththna	38.57	3944.08	21.59	403.10
Wanasapu	11.48	1758.57	7.27	225.23

3.2. Timber Classification Based on Mechanical Properties

Strength classes are derived from the mechanical qualities of various timber species and grades. Due to differences in mass and volume brought on by the alteration in moisture content, mechanical properties, even for timber traded from tree species, may change significantly [15]. Timber exhibits large variations in mechanical properties, which makes grading of timber into appropriate strength classes important for the competitiveness towards other construction materials. The mechanical characteristics of wood define its structural integrity. Wood with the proper mechanical properties is essential for creating long lasting and secure finished goods whether they are used to build buildings or create furniture. Different end uses require specific mechanical properties. So mechanical property classification gives access to information to select suitable timber species for particular purposes and lesser-known timber species can also be used instead of commonly used timber species which have the same mechanical characteristics. Based on the literature, commonly used timber species have been classified into seven classes based on their mechanical properties. When considering each parameter, the density classification was developed first. In commonly used timber species, density values were varied between 400 kg/m³ (Pine) and 1100 kg/m³ (Ebony, Palu, Termarind). Based on that density value range, a density classification was developed.

As shown in Table 3, Ebony, Tamarind, and Palu can be included in the first class, which has a density higher than 1,091 kg/m^3. Therefore, these three timber species showed high density values that compare with commonly used timber species. Lunumidella, Ethdemata and Pine can be included in the last class (Class 7) where density is equal to or lower than 515 kg/m^3. The density of the different types of wood determines the Malaysian timber classification. The density of the various wood species has a major influence on pricing. According to the State Timber Corporation, timber species are classified into four groups based on density. Those are soft woods (density range lower than 400 kg/m^3), lightwood (400-700 kg/m^3), medium hardwood (700-800 kg/m^3), and heavy hardwood (>800 kg/m^3). This density classification is slightly different from the newly developed one herein.

As shown in Table 4, the highest *MOE* value was reported for Ebony, Satin, Na, and Tamarind, where the *MOR* values were higher than 131 N/mm^2. Lunumidella and Cypress were included in the lowest class (Class 7) and the *MOR* value was lower than 55 N/mm^2.

As shown in Table 5, the highest *MOE* value occurs in Mahogany (N.L), Gammalu, Hulanhik, Katakala, Na, and Horam where the values were higher than 11,760 N/mm^2. Eucalyptus can be included in the lowest class (Class 7) where the MOE value was lower than 3,159 N/mm^2.

Classification system of commonly used timber according to density Table 3

Class	Density range [kg/m^3]	Species
1	>131	Ebony, Palu, Tamarind
2	116-130	Na, Coconut
3	101-115	Milla, E. citriodora, Kon, Pihimbiya, Mee
4	86-100	Halmilla, Mahogany (N.L), Gammalu, Kumbuk, Dawata, Thibiri, Kahata
5	71-85	Teak, Nadun, Mahogany (N.L), Jack, Katakale, Madan, Godapara, Cypress
6	56-70	Domba, Ginisapu, A doecurens, A.mangium, Etaba, Rubber, Kolon, Velang
7	< 55	Lunumidella, Ethdemata, Pine

Classification system of commonly used timber according to MOR Table 4

Class	*MOR* range [N/mm^2]	Species
1	>131	Ebony, Satin, Na, Termarind
2	116-130	Milla, Kon
3	101-115	Katakale, Pihimbiya, Hora, Ehela
4	86-100	Teak, Nadun, Halmilla Mahagany (N.L), Gammalu, Hulanhik, Madan
5	71-85	Wewarana, Palu, Coconut, Alstonia, Khaya, Rubber
6	56-70	Mahogany (B.L), Jack, Margosa, Kolon, Velang, Mee, Pine
7	< 55	Lunumidella, Cypress

Classification system of commonly used timber according to MOE Table 5

Class	*MOE* range [N/mm^2]	Species
1	>11760	Mahogany (N.L), Gammalu, Hulanhik, Katakala, Na, Hora
2	10040 -11759	Satin, Wewarana, Palu, Termarind
3	8320 -10039	Teak, Ebony, Nadun, Godapara, Alstonia, Khaya
4	6600 – 8319	Halmilla, Milla, Margosa, Rubber, Pine
5	4880 – 6599	Mahogany (B.L), Jack, Kolon,Velang, Kumbuk, Madan, Pihimbiya, Mee
6	3160 -4879	Cypress
7	< 3159	Mahogany (N.L), Gammalu, Hulanhik, Katakala, Na, Hora

As shown in Table 6, the highest value for compression parallel to grain occurs in Tamarind and Eucalyptus, where the values were higher than 59 N/mm^2. Velang, Lunumidella, and Cypress can be included in the lowest class (Class 7), where the *CPG* value was equal to or lower than 26 N/mm^2. Based on the value ranges of density, *MOR*, *MOE,* and *CPG* of commonly used timber species, the lesser-known timber species were categorised.

Classification system of commonly used timber according to CPG Table 6

Class	*CPG* range [N/mm^2]	Species
1	> 59	Termarind, Eucalyptus
2	53- 58	Milla, Palu, Kon, Na, Phibiya
3	47- 52	Ebony, Halmilla, Mahogany (N.L), Katakale, Madan, Thibiri, Pinus
4	40 - 46	Teak, Nedun, Satin, Jack, Gammalu, Hora, Alstonia
5	34 - 39	Kolon, Kumbuk, Mee, Ehela, Kahaya
6	27-33	Mahogany (B.L), Ginisapu, Godapara, Rubber, Mango
7	≤26	Velang, Lunumidella, Cypress

As shown in Table 7, Diya Na can be placed in class 1, where the density value is higher than 1,091 kg/m^3. According to Muthumala et al. [10], the density value of Ebony, which belongs to the Super Luxury class of the existing timber classification, was found to be 1,100 kg/m^3. So, Diya na showed a density value nearly similar to Ebony. No selected lesser-known timber species can be placed in class 2, where existing timber species show a density value between 976-1,096 kg/m^3. Arawkeriya, Attikka, Katuboda, Rukkaththana, and Wanasapu can be placed in Class7 where density is equal to or lower than 515 kg/m^3.

Density is regarded a main predictor of wood strength, and therefore may be utilised for assessing other properties like hardness, ease of manufacturing and resistance to nailing [6]. When compared to other building materials, wood exhibits a higher association between density and strength. Thus, choosing the right kind of wood for a certain purpose could be based on its strength characteristics [12].

Classification system of lesser-known timber according to density Table 7

Class	Density range [kg/m^3]	Species
1	>=1091	Diya Na
2	976-1090	-
3	861-975	Dunumadala, Korakaha
4	746-860	*Acacia auriculiformis*, Aladu, Katu andara,
5	631-745	Katu kithul
6	516-630	Boadamaniya, Halamba, Karaw, Kurumbattiya, Pelan
7	< =515	Kahamilla, Maha nuga

As shown in Table 8, the highest class for *MOR* occurs in Aladu and Diya na, whose *MOR* values were higher more than 131 N/mm^2. According to Sri Lankan timber trees by Ruwanpathirana [13], the *MOR* value of Nedun, which belongs to the Super Luxury class in the existing Timber classification, was 111 N/mm^2 and according to Muthumala et al. [10], the *MOR* value of Ebony was 136 N/mm^2. Therefore, Diya na showed a *MOR* value similar to Nedun, which is one of the most used timber species in Sri Lanka.

Classification system of lesser-known timber according to MOR Table 8

Class	*MOR* range [N/mm^2]	Species
1	>131	Aladu, Diya Na
2	116-130	Boradamaniya
3	101-115	Katu andara
4	86-100	*Acacia auriculiformis,* Dunumadala, Halamba, Pelan
5	71-85	Kahamilla, Karaw, Korakaha, Kurumbattiya
6	56-70	Pathkela
7	< 55	Arawkeriya, Attika, Katu kithul, Katuboda, Mahanuga, Rukkaththana, Wanasapu

As shown in Table 9, the highest class for *MOE* occurs in Aladu and Diya Na, whose *MOE* values were higher than 11,760 N/mm^2. Boradamaniya belongs to class 2, which has density values between 10,040-11,759 N/mm^2. Wanasapu belongs to the lowest class (class 7) and the *MOE* value was lower than 3159 N/mm^2.

As shown in Table 10, the highest class for compression parallel to grain (*CPG*) occurs in Aladu and Diya Na, whose *CPG* values were higher than 59 N/mm^2. Arawkeriya, Attikka, Maha nuga, Rukkaththana, and Wanasapu belong to the lowest class (class 7) and the *CPG* values were equal to or lower than 26 N/mm^2. Therefore, it is apparent that the performance and strength of wood used in structural applications could vary with the mechanical properties of wood [16]. However, a strength-based timber classification system is yet to be developed in Sri Lanka. The existing timber classification system in Sri Lanka was been developed considering factors such as timber availability, demand, and supply [10]. Muthumala et al. [10] developed a timber classification of Sri Lankan timber species based on strength properties, which indicated 32 commonly used timber species and classified timber into five groups based on index value. The classification closely nearly matches the commonly used timber classification in this study.

Classification system of lesser-known timber according to MOE Table 9

Class	*MOE* range [N/mm^2]	Species
1	>11,760	Aladu, Diya Na
2	10,040 – 11,759	Boradamaniya
3	8,320 – 10,039	Halamba, Korakaha, Kurumbattiya, Pelan
4	6,600 – 8,319	*Acacia auriculiformis*, Dunumadala, Kahamilla, Karaw, Katuandera, Path kela
5	4,880 – 6,599	Arawkeriya, Katukithul, Katuboda, Mahanuga
6	3,160 – 4,879	Attikka, Rukkaththana
7	< 3,159	Wanasapu

Classification system of lesser-known timber according to CPG Table 10

Class	*CPG* range [N/mm^2]	Species
1	> 59	Aladu, Diya Na
2	53- 58	-
3	47- 52	*Acacia auriculiformis*, Boradamaniya, Dunumadala, Katu andera, Korakaha
4	40 - 46	Halamba, Kahamilla, Karaw, Kurumbattiya, Path kela, Pelan
5	34 - 39	Katu kithul
6	27-33	Katuboda
7	≤26	Arawkeriya, Attikka, Maha nuga, Rukkaththana, Wanasapu

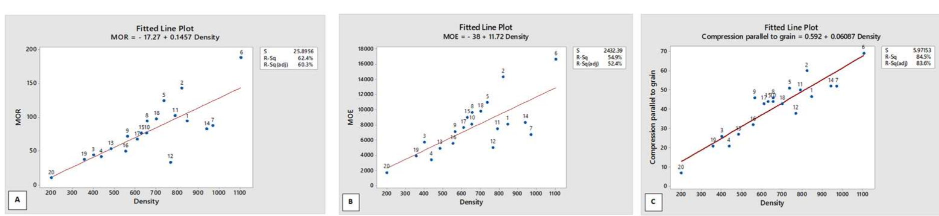

Fig. 2. *Regression between density versus MOR (a.), MOE (b.), and compression parallel to grain (c.), according to BS EN 942 [1]*

The Pearson correlation of density and *MOE* was a positive correlation (0.734, p-value = 0.000 – Figure 2a). The Pearson correlation of density and compression parallel to grain (*CPG*) exhibited a positive correlation (0.92, p-value = 0.000 – Figure 2c). Previous studies [10] have demonstrated that mechanical characteristics (*MOR*, *MOE,* and *CPG*) and wood density have favourable associations. The correlation analysis that was done to investigate the relationship between wood density and mechanical properties yielded the following results: 0.92, 0.79, and 0.72% for *CPG*, *MOE* and *MOR*.

4. Conclusion

This study addresses a critical gap in Sri Lanka's timber industry by evaluating the mechanical properties of 20 lesser-known timber species which have previously been excluded from formal classification systems. Through comprehensive testing using a Universal Testing Machine, significant positive correlations were found between wood density and key mechanical properties – modulus of rupture (*MOR*), modulus of elasticity (*MOE*), and compression parallel to grain (*CPG*). Based on these findings, a new timber classification system grounded in mechanical performance was developed. This system not only enhances the scientific understanding of underutilised timber species but also promotes their optimal use, contributing to more sustainable forest resource management and helping to mitigate the impact of global deforestation.

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Reference

1. Adediji, O.C., Wilson, U.N., Mohammed, I.S., 2023. Characterization of three selected timber species according to BS 5268 (2002), EN 338 (2009) and NCP 2 (1973). IN: NIPES – Journal of Science and Technology Research, vol. 5(4), pp. 40-50. DOI: 10.5281/zenodo.10342311.
2. Bukauskas, A., Mayencourt, P., Shepherd, P. et al., 2019. Whole timber construction: A state-of-the-art review. In: Construction and Building Materials, vol. 213, pp. 748-769. DOI: 10.1016/j.conbuildmat.2019.03.043.
3. Cabral, J.P., Kafle, B., Subhani, M. et al., 2022. Densification of timber: a review on the process, material properties, and application. In: Journal of Wood Science, vol. 68(1), ID article 20. DOI: 10.1186/s10086-022-02028-3.
4. Cai, Z., Senalik, C.A., Ross, R., 2021. Mechanical properties of wood-based composite materials. In: Catennial (Ed.): Wood handbook: wood as an engineering material – Chapter 12. General Technical Report FPL-190, Department of Agriculture, Forest Service, Forest Products Laboratory, Madison, U.S.A., pp. 12.1-12.12.
5. Duan, Z., Huang, Q., Zhang, Q., 2022. Life cycle assessment of mass timber construction: A review. In: Building and Environment, vol. 221, ID article 109320. DOI: 10.1016/j.buildenv.2022.109320.
6. Hoadley, R., Hoadley, B.L., 2000. Understanding wood: A craftsman's guide to wood technology. The

Taunton Press, Newtown, U.S.A., 288 p.
7. Lamidi, N.A., Hassan, Q.O., Ajoje, G.O. et al., 2022. EN 338 – Strength characterization and grading of four less-used timber species grown in Nigeria for structural uses. In: LAUTECH Journal of Civil and Environmental Studies, vol. 8(1), pp. 29-37. DOI: 10.36108/laujoces/2202.80.0140.
8. Maduwanthi, M.A.R., 2019. Development of a classification system for Sri Lankan timber species based on physical properties. Institutionary Repository University of Moratuwa. Master Thesis, Department of Materials Science and Engineering, University of Moratuwa. Available at: https://dl.lib.uom.lk/server/api/core/bitstreams/42062a1b-cba2-41e8-9192-02474f0cdb07/content. Accessed on: December 08, 2025.
9. McEwan, A., Marchi, E., Spinelli, R. et al., 2020. Past, present and future of industrial plantation forestry and implication on future timber harvesting technology. In: Journal of Forestry Research, vol. 31(2), pp. 339-351. DOI: 10.1007/s11676-019-01019-3.
10. Muthumala, C.K., de Silva, S., Alwis, P.L. et al., 2025. Assessment of quality parameters of finger-jointed timber products: A review. In: Bulletin of the Transilvania University of Brasov. Series II: Forestry, Wood Industry, Agricultural Food Engineering, vol. 18(67), no. 1, pp. 65-82. DOI: 10.31926/but.fwiafe.2025.18.67.1.5.
11. Premakantha, K.T., Chandani, R.P.D.S., Kingsly, S.A.D. et al., 2021. Forest cover assessment in Sri Lanka using high resolution satellite images. In: The Sri Lanka Forester, vol. 40, pp. 1-16.
12. Reinprecht, L., 2016. Wood deterioration, protection and maintenance. Wiley-Blackwell Publishing House, West Sussex, United Kingdom, 384 p.
13. Ruwanpathirana, N.D., 2014. Development of timber property classification based on the end-use with reference to twenty Sri Lankan timber species. In: Journal of Tropical Forestry and Environment, vol. 4(1), pp. 1-13.
14. Seidu, H., Nemeth, R., Owusu, F.W. et al., 2023. Effect of temperature and relative humidity variations on bending strength properties of hybrid Eucalyptus wood in Ghana. In: Wood Research, vol. 68(4), pp. 781-791. DOI: 10.37763/wr.1336-4561/68.4.781791.
15. Thybring, E.E., Fredriksson, M., 2023. Wood and moisture. In: Niemz, P., Teischinger, A., Sandberg, D. (Eds.): Springer handbook of wood science and technology, pp. 355-397. DOI: 10.1007/978-3-030-81315-4_7.
16. Winandy, J.E., 1994. Effects of long-term elevated temperature on CCA-treated Southern Pine lumber. In: Forest Product Journal, vol. 44(6), pp. 49-55.
17. Younis, A., Dodoo, A., 2022. Cross-laminated timber for building construction: A life-cycle-assessment overview. In: Journal of Building Engineering, vol. 52, ID article 104482. DOI: 10.1016/j.jobe.2022.104482.