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Physical and mechanical characterization of Mimosa tenuiflora wood from the caatinga for structural applications in construction

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Abstract:
The construction industry has been seeking materials that have a lower impact on the built environment. For this reason, wood has become an attractive option due to its natural and renewable properties. In the Northeast region of Brazil, the Caatinga biome stands out for its biodiversity as the only entirely national biome. However, the physical and mechanical properties of local tree species are poorly investigated, limiting potential uses as construction material. Therefore, this study aims to characterize the jurema preta *Mimosa tenuiflora* (jurema preta) species, native to the Caatinga biome, and indicate potential uses in civil construction. To this end, physical tests were conducted to determine moisture content, basic density, bulk density, dimensional stability, thermal conductivity; mechanical tests for parallel-to-grain compression, parallel and perpendicular shear, parallel and perpendicular tension, Janka hardness parallel and perpendicular, and static bending were performed. The Shapiro-Wilk test and Pearson correlation were used between physical and mechanical properties. The results classify the wood in the D20 strength class, with mechanical properties that meet the standards required for civil construction, covering both light and heavy indoor applications.

Keywords: Dimensional stability, Forest product utilization, Mimosa tenuiflora, thermal conductivity, tropical hardwood, wood density

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Introduction

The construction sector significantly contributes to greenhouse gas emissions, which is why in recent years, the industry has been seeking the use of materials that help reduce the negative impacts caused by constructions. One strategy to minimize these impacts is the use of wood, owing to its favorable environmental properties compared to other materials (Crafford *et al*. 2018, Švajlenka and Kozlovská 2021).

Wood exhibits characteristics of being a versatile, durable, and easy-to-use material (Rilatupa 2021). When compared to steel and concrete, it has lower embodied energy levels (Glover *et al.* 2002). When sourced from sustainably managed forest areas, it contributes favorably to carbon sequestration during its growth (Ramage *et al*. 2017). In the Northeast region, the local availability of wood comes from the Caatinga biome, which offers managed areas and a great diversity of species, primarily used for energy and firewood supply (Sampaio 2010). Among the various species, jurema preta (*Mimosa tenuiflora* (Willd.) Poir), popularly known as Jurema-preta, stands out due to its high density and dimensional stability, which can serve as a potential indicator for products with higher added value (Nogueira *et al.* 2021).

In the global context, species with potential structural uses or as construction components are subjects of investigation with the aim of expanding the range of utilization in the construction sector (Nascimento *et al.* 2018, Aquino *et al.* 2021, Tariq *et al*. 2022, Teixeira *et al*. 2021, Nascimento *et al*. 2021, Kana *et al.* 2024, Arriaga *et al.* 2023). ABNT NBR 7190 (2022) provides guidelines for characterizing lesser-known wood species through their physical and mechanical properties.

Understanding these properties allows wood to be classified for appropriate uses, such as applications in outdoor and indoor environments, structural components, housing, panels, and

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others (Araújo 2007). Given the gaps in technological knowledge about species from the Caatinga biome and their primary use for firewood supply, seeking local alternatives with higher economic value requires an understanding of their physical and mechanical properties. In this context, the study aims to characterize the jurema preta (*Mimosa tenuiflora* (Willd.) Poir) species found in the Caatinga, regarding its physical and mechanical properties, and to indicate its safe, efficient, and sustainable use as a construction component.

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Materials and methods

Sampling location

The selection of the species, which were considered criteria such as population density in the collection region, based on data from the management plan, as well as basic density information from the literature. Additionally, it took into account the presence of individuals (trees) with a diameter at breast height (DBH), measured at 1,30 m above the ground, of at least 10 cm ± 0,9 cm to ensure optimal utilization in the preparation of test specimens (CPs).

The sampling was collected at Fazenda Milhã, located between the municipalities of João Câmara/RN and Jardim de Angicos/RN. This area is the only one in Rio Grande do Norte that remained under continuous forest management until the year 2021. The farm has 1132,78 hectares of native caatinga forest under forest management, equivalent to 60 % of the total property area, located at coordinates 5°35'47,3" S; 35°51'59,6" W, in the Agreste region of Rio Grande do Norte. This is the same farm studied by Carvalho (2018). The study area is divided into 15 stands, and among them, stand 1 was chosen due to its post-cutting age, which is 16 years (According to Normative Instruction nº 1 of June 25, 2009, of the Ministry of the Environment, which regulates timber forestry production and aims to guarantee sustainability, in chapter III, Art. 5th. It is recommended to comply with a minimum initial cutting cycle of 15 years (BRASIL 2009).

Dendrometric data

When defining the species, dendrometric data for 16 jurema preta (*Mimosa tenuiflora* (Willd.) Poir) individuals were collected in the field, including: base diameter (DB), diameter at breast height (DBH) measured at 1,30 m above the ground, and total height (Ht), as shown in Figure 1.

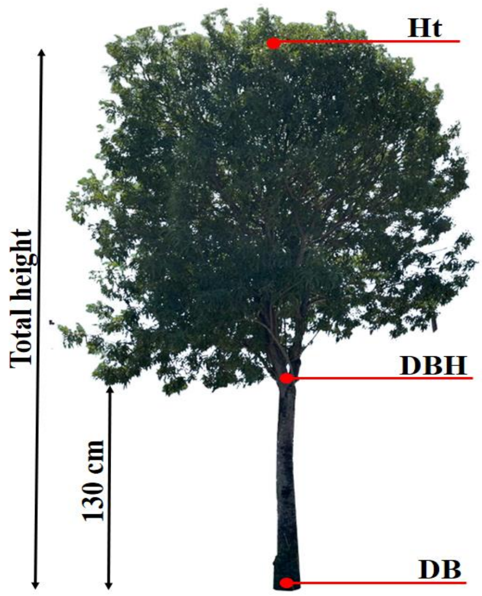

Figure 1: Representation of field-obtained variables.

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Collection and processing

The collection and testing followed the principles of NBR 7190 (2022) through the characterization of the species using physical tests to determine moisture content (U), basic density (ρbas), bulk density (ρap), dimensional stability $(\varepsilon_r, \varepsilon_i, \Delta V)$, mechanical tests for parallel-to-grain compression (f_{c0}), parallel and perpendicular shear (fv_0, fv_{90}), parallel and perpendicular tensile strength (ft_0, ft_{90}), Janka hardness parallel and perpendicular (fH_0, fH_{90}), and static bending (fM_0). Thermal conductivity (κ) was assessed following the equipment manual.

The wood pieces were subjected to a drying period lasting 6 months, with the aim of reaching a moisture content of 12 %, as prescribed by the ABNT NBR 7190 (2022) standard of the Brazilian Association of Technical Standards. After the drying process, the logs were processed to produce the physical and mechanical test specimens (referred to as CPs). For a complete characterization of the resistance of unknown species, according to part 3 of ABNT NBR 7190 (2022), at least 30 CPs must be extracted. Therefore, Figure 2 depicts the processing performed for each test, totaling a set of 322 CPs.

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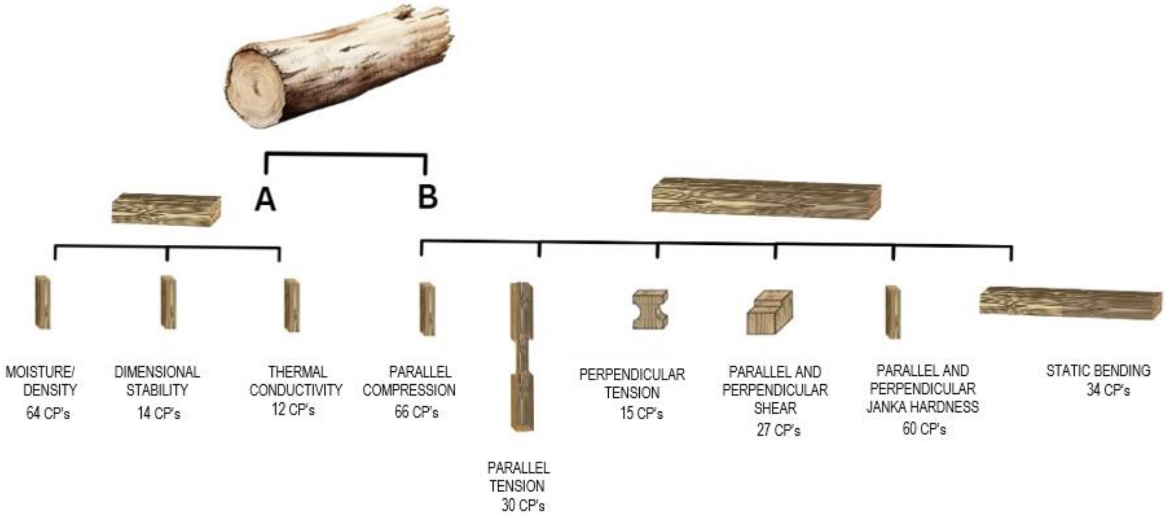
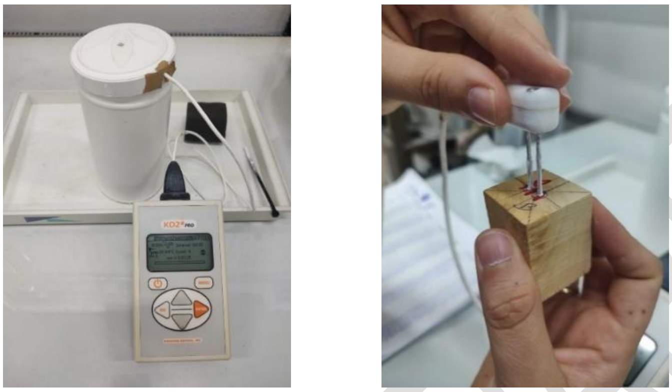


Figure 2: Schematic representation of sample cutting.

Physical properties

The parameters of moisture content, density, and dimensional stability were evaluated in accordance with established normative principles. To determine the anisotropy coefficient, the calculation was performed by the ratio between the values of tangential and radial shrinkage. For the correction of bulk density, considering the moisture content of 12 % stipulated by the standard, as well as for the supplementary classification based on the species' use, an additional correction was made for a moisture content of 15 % (ISO 13061-2 (2014) equation was also used to correct for moisture content to 15 %, replacing the value of 12 in the equation with 15). Equations from ISO 13061-2 (2014) were employed for this purpose. In the thermal conductivity analysis, the KD-2 Pro Thermal Properties equipment (Figure 3a) was used, which employs the SH-1 type probe. This probe consists of two rods with a diameter of 1,3 mm, a length of 3 cm, and a spacing of 6 mm between the rods, as illustrated in Figure 3b. For the tests on the test specimens (CPs), the average moisture content considered was 14,21 %. The

CPs were prepared with double perforations of 30 mm using a low-speed drill and a 1,5 mm drill bit for the probe insertion. The probe rods were pre-lubricated with thermal paste to facilitate insertion and eliminate air between the rods and the hole walls.



(a) (b)

Figure 3: Test for determination of thermal property.

After inserting the probe, the test specimens were placed in a thermally insulated container with Expanded Polystyrene (EPS) for thermal stabilization. The procedure was carried out with three measurements for each sample and a 15 minute interval, allowing the generated heat to dissipate and not interfere with subsequent measurements, thus obtaining the values of wood thermal conductivity.

Mechanical properties

The mechanical tests were conducted in accordance with regulatory requirements using the Emic DL 10000 equipment. Mechanical properties of strength and stiffness were corrected for moisture content to 12 % and 15 % using Equation 1 and Equation 2, and the coefficient of variation (CV) in bending was obtained, with the condition that the CV be less than 20 % for

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classification. The characteristic strength was calculated as per Equation 3, and the species was classified in the strength class of native forest species according to ABNT NBR 7190-1 (2022), as shown in Table 1.

$$f_{12} = f_{u\%}\left(\frac{3(U\%-12}{100}\right) \qquad (1)$$

$$E_{12} = E_{u\%}\left(\frac{2(U\%-12}{100}\right) \qquad (2)$$

$$f_{wk} = \left(2\frac{f_1 + f_2 + \ldots + f\frac{n}{2}-1}{\frac{n}{2}-1} - f\frac{n}{2}\right)1{,}1 \qquad (3)$$

Table 1: Strength Class of Native Forest Species.

Class	$f_{c0,k}$ (MPa)	$f_{v0,k}$ (MPa)	$E_{c0,med}$ (GPa)	ρ_{12} (kg/m³)
D20	20	4	10,0	500
D30	30	5	12,0	620
D40	40	6	14,5	750
D50	50	7	16,5	850
D60	60	8	19,5	1000

Adapted from ABNT NBR 7190 (2022).

$F_{c0,k}$ compression parallel to the grain, $f_{c0,k}$ shear strength parallel to the grain, ρ_{12} density at 12 % moisture content.

Classification criteria

The criteria of Nahuz (1974) and Nogueira (1991) were used. Table 2 presents the classification ranges based on bulk density classified according to the criteria of Nahuz (1974) at 15 % moisture content.

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Table 2: Classification ranges for bulk density.

Class	Bulk Density at 15 % Moisture Content (kg/m³)
Light	$\rho_{15} < 575$
Semi-Heavy	$575 \leq \rho_{15} \leq 805$
Heavy	$\rho_{15} > 805$

Adapted from Nahuz (1974).

Table 3 presents the classification for shrinkage, compression, and shear using the criteria of Nahuz (1974) as well.

Table 3: Classification Ranges for Shrinkage, Parallel Compression, and Shear.

Class	Shrinkage			Parallel Compression to the Grain (MPa)*	Shear (MPa)*
	Radial	Tangential	Volumetric		
Very Low	< 1,5	< 3,0	4,5	< 20	< 5,0
Low	1,6 a 2,5	3,1 a 5,0	4,6 a 7,5	20,1 a 35	5,1 a 10
Medium	2,6 a 4,5	5,1 a 9,0	7,6 a 13,5	35,1 a 55	10,1 a 15
High	4,6 a 6,5	9,1 a 13,0	13,6 a 19,5	55,1 a 85	15,1 a 20
Very High	> 6,6	> 13,1	> 19,6	> 85,1	> 20,1

Adapted from Nahuz (1974). *15 %.

Table 4 presents the class based on Janka hardness, static bending, and modulus of elasticity in bending according to the criteria of Nahuz (1974). Meanwhile, parallel tensile strength was classified according to the criteria of Nogueira (1991) at 12 % moisture content.

Table 4: Classification ranges for janka hardness, static bending, modulus of elasticity, and tensile strength.

Class	Janka Hardness Parallel to the Grain (MPa)*	Static Bending (MPa)*	Modulus of Elasticity in Static Bending (GPa)*	Class	Tensile Strength Parallel to the Grain (MPa)**
Very Low	<10	<50	<10		-
Low	10,1 a 40	50,1 a 85	10,0001 a 12	Low	≤75

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Medium	40,1 a 90	85,1 a 120	12,0001 a 15	Medium	75,1 a 100
High	90,1 a 140	120,1 a 175	15,0001 a 20	High	≥ 100,1
Very High	>140	>175,1	>20,0001	-	

Adapted from Nahuz (1974). *15 %; adapted from Nogueira (1991) at **12 %.

For the classification of the species, the indication of use was based on the criteria provided by the Institute of Technological Research (IPT 2013) in conjunction with the Superintendency for the Development of the Amazon (SUDAM 1981) using physical, strength, and stiffness parameters. This classification suggests the use for heavy civil construction, light civil construction, or for flooring applications.

Data analysis

The normality of the data and the correlations between physical and mechanical properties were assessed. The Shapiro test was used to check for normality, and Pearson correlation was employed to investigate the correlations.

Results and discussion

Dendrometric data

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The dendrometric analysis of the individuals indicated moderate variability in both diameter and height, reflecting the inherent heterogeneity of natural ecosystems. Differences in parameters such as diameter at breast height and total height are likely influenced by factors including natural regeneration, age variation, and intra-species diversity. These variations underscore the structural complexity of the population, as summarized in Table 5.

Table 5: Dendrometric characteristics of the collected individuals.

Mimosa tenuiflora			
	DB	DBH (cm)	Ht (m)
Máx	25,00	17,00	8,15
Mín	12,20	9,10	6,35
Méd	17,36	12,41	7,24
SD	3,59	2,38	0,42
CV(%)	20,68	19,18	5,80

Max, maximum; Min, minimum; Avg, average; SD, standard deviation; CV, coefficient of variation; DB, base diameter; DBH, diameter at breast height; Ht, total height.

The results for DAP remained within the range of 8 cm to 25 cm, which is consistent with findings from other research studies such as those by Rocha *et al*. (2015), Batista *et al.* (2020), and Nogueira; Castro and Araujo (2021) for the same species.

Physical properties

The results for moisture content, basic density, and bulk density properties are provided in Table 6. Based on the moisture content results, the other physical and mechanical properties of the species were corrected.

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Table 6: Moisture content, basic density, and bulk density of jurema preta (*Mimosa tenuiflora* (Willd.) Poir).

	$U(\%)$	ρ_{bas}(kg/m³)	ρ_u(kg/m³)	$\rho_{apa\ 12\%}$(kg/m³)	$\rho_{apa\ 15\%}$(kg/m³)
Mín	13,39	850	1000	990	1020
Máx	15,17	960	1130	1100	1140
Méd	14,46	910	1070	1040	1080
SD	0,44	0,04	0,04	0,04	0,04
CV	3,04	4,39	3,74	3,85	3,70

Max, maximum; Min, minimum; Avg, average; SD, standard deviation; CV, coefficient of variation; U (%), moisture content; ρ_{bas}, basic density; ρ_u (kg/m³), bulk density at initial moisture; $\rho_{apa,12\%}$, bulk density at 12 % moisture content; $\rho_{apa,15\%}$, bulk density at 15 % moisture content.

The properties exhibited coefficients of variation ranging from 3,04 % to 4,39 %. The coefficient of variation of 3,04 % for moisture content was lower than that obtained by Ferreira (2018), which was 7,47 %. This difference may be due to the drying time, which was approximately 1 month in Ferreira's study. According to Moshtaghin *et al*. (2016), the variability in wood properties can be influenced by factors related to the collection site, moisture, temperature conditions, defects, soil, and tree age.

The average basic density results of 910 kg/m³ exceeded those obtained in the Campo Grande/RN region (790 kg/m³) and the Cruzeta/RN region (830 kg/m³) as reported by Santos *et al*. (2020). Meanwhile, the average bulk density of 1040 kg/m³, corrected to a moisture content of 12 %, fell within the range established in other studies, ranging from 990 kg/m³ to 1100 kg/m³ according to Carneiro *et al*. (2013), Rocha *et al*. (2015), and Ferreira (2018). Furthermore, jurema preta (*Mimosa tenuiflora* (Willd.) Poir) exhibited densities similar to those of commercially traded species for construction use, such as 1070 kg/m³ for Jatobá and 1050 kg/m³ for Ipê (Rocco-Lahr *et al*. 2010), making it comparable to Brazilian tropical woods used for high-value applications.

The results for dimensional stability in terms of shrinkage Ɛr,1 (axial direction), Ɛr,2 (radial direction), and Ɛr,3 (tangential direction) were 0,32; 2,45 and 4,71 respectively. For swelling Ɛi,1 (axial direction), Ɛi,2 (radial direction), and Ɛi,3 (tangential direction), the values were 0,32,

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2,51, and 4,95, respectively. The species exhibited a volumetric variation ΔV=7,93 %, which was lower than 9,32 % reported by Rocha *et al*. (2015) and 9,45 % obtained by Nogueira and Castro (2021), possibly due to differences in tree age. Additionally, the species showed radial shrinkage values lower than other native caatinga species mentioned in the study by Farias and Melo (2020), such as aroeira (*Myracrodruon urundeuva* M.Allemão), angico (*Anadenanthera colubrina* (Vell.) Brenan), canafistula (*Senna trachypus* (Benth.) H. S. Irwin & Barneby), cedro (*Cedrela odorata* L.), and cumaru (*Amburana cearensis* (Allemão) A.C.Sm.), which had radial shrinkage ranges of 2,54 % to 4,31 % and tangential shrinkage of 3,12 % to 6,08 %. The anisotropy coefficient obtained of 1,92 for the species falls within the normal range considering the values indicated by Moreschi (2014) of 1,5 to 2,0.

The tests resulted in an average thermal conductivity value of 0,34 W/mK. jurema preta (*Mimosa tenuiflora* (Willd.) Poir) exhibited high bulk density, at 1040 kg/m³, exceeding values of woods considered by standards as having high density, and therefore surpassing the range of conductivity of 0,29 W/mK, as shown in Figure 4.

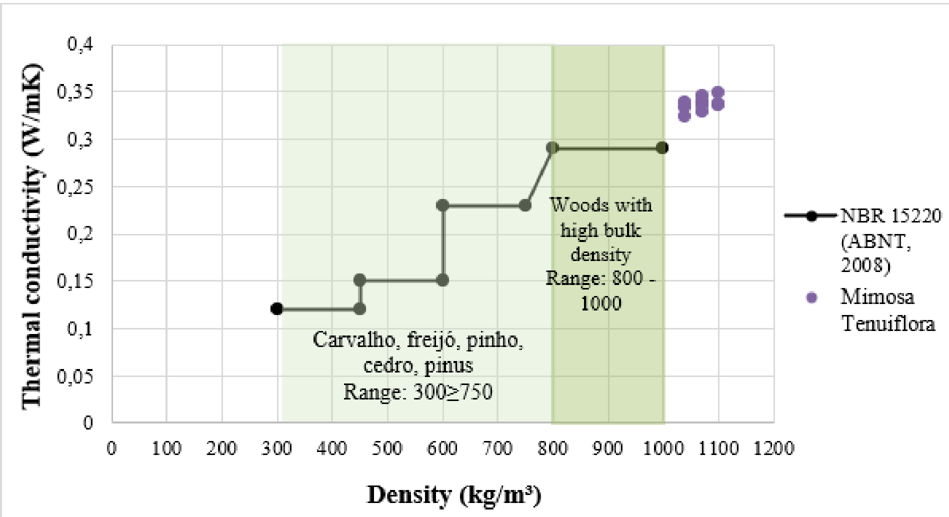

Figure 4: Ranges of thermal conductivity as a function of density.

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As Sovaa *et al*. (2018) suggest, there is a linear relationship in some materials associated with the increase in density and the corresponding increase in thermal conductivity, which justifies the behavior observed in the species.

Mechanical properties

Table 7 presents the results of the mechanical properties at moisture contents of 12 % and 15 %. Based on the variation coefficient of 18,81 % in bending, which is below 20 %, and the characteristic strength in compression, parallel shear, and the average modulus of elasticity of 65,80 MPa, 21,60 MPa and 10,12 GPa, respectively, along with an apparent density of 1,04 g/cm², the species falls within the strength class indicated in Table 1 as D20. Although the compressive strength and density place it in the D60 class, the low modulus of elasticity limits it to the D20 strength class, as also observed by Ferreira (2018) for the species jurema preta (*Mimosa tenuiflora* (Willd.) Poir) and other species from the Caatinga biome.

Table 7: Results of mechanical strength tests.

$U_{12\,\%}$	f_{c0} (MPa)	f_{v0} (MPa)	f_{v90} (MPa)	f_{H0} (MPa)	f_{H90} (MPa)	f_{t0} (MPa)	f_{t90} (MPa)	f_M (MPa)	M_{oe} (GPa)
$\bar{x}$	73,66	23,97	15,21	93,68	96,53	90,81	38,01	133,93	10,12
f_1	61,54	20,21	10,64	64,50	76,93	58,99	17,21	87,00	7,18
$0{,}7f_m$	51,56	16,78	10,65	65,57	67,57	63,56	26,61	93,73	-
f_{wk}	65,80	21,60	10,21	79,39	89,63	61,44	20,14	97,94	-
$f_{wk,final}$	65,80	21,60	10,65	79,39	89,63	63,56	26,61	97,94	-
$(\pm SD)$	8,32	2,93	3,70	11,36	10,22	22,30	11,50	25,20	1,41
$U_{15\,\%}$	f_{c0} (MPa)	f_{v0} (MPa)	f_{v90} (MPa)	f_{H0} (MPa)	f_{H90} (MPa)	f_{t0} (MPa)	f_{t90} (MPa)	f_M (MPa)	M_{oe} (GPa)
$\bar{x}$	67,49	21,96	14,63	85,83	88,44	83,19	34,83	122,71	9,54
f_1	56,38	18,50	8,44	59,09	70,43	54,07	15,83	79,74	6,76
$0{,}7f_m$	47,24	15,37	10,24	60,08	61,91	58,23	24,38	85,90	-
f_{wk}	60,39	19,76	7,35	72,72	82,01	56,28	18,56	89,74	-

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$f_{wk,final}$	60,39	19,76	10,24	72,72	82,01	58,23	24,38	89,74	-
$(\pm SD)$	7,59	2,69	5,20	10,42	9,36	20,41	10,55	23,08	1,33

$f_{c0}, f_{v0}, f_{h0}, f_{t0}$, compressive strength, shear strength, Janka hardness, and tensile strength, all parallel to the fibers, respectively; $f_{c90}, f_{v90}, f_{h90}, f_{t90}$, in the perpendicular direction; $f_{M,12\%}$ flexural strength; $M_{oe,12\%}$, modulus of elasticity in bending; $\bar{x}$ average; SD, standard deviation; f_1, lowest value; f_{wk}, calculated characteristic strength; 0,7 f_m, 70 % of the average strength; $f_{wk,final}$, final characteristic strength accepted.

The mechanical strength values exhibited significant variabilitymong the samples, as confirmed by the standard deviation analysis. According to Calil-Junior *et al.* (2003), the biological nature of wood makes it susceptible to structural variations. The presence of internal defects can lead to a reduction in strength and the interruption of continuous load transfer, which may have contributed to the diversity observed among the evaluated individuals. The average compressive strength at 12 % humidity was 73,66 MPa, resembling values found in some species commonly used in construction, as indicated by Zanatta *et al*. (2021) for Ipê, Maçaranduba, and Muiracatiara woods, which achieved strengths of 73,91 MPa, 68,63 MPa, and 48,86 MPa, respectively. Furthermore, the compressive strength of the studied species proved to be higher than the values reported by Rocha *et al*. (2015) and Ferreira (2018) for the same species.

T tensile strength was 23,28 % higher than that obtained for compressive strength. Furthermore, when comparing the mechanical properties with the data provided by IPT (2013) in Table 8, we observe that both the compressive and static bending strength of jurema preta (*Mimosa tenuiflora* (Willd.) Poir) surpass those of Angelim-pedra and Cedrorana woods. In terms of parallel shear, jurema preta (*Mimosa tenuiflora* (Willd.) Poir) wood also exhibited higher values than Angelim-amargoso, Angelim-pedra, and Cedrorana woods, which are often used in heavy and light construction within the building industry.

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Table 8: Values of mechanical properties for commercially traded species

Species	$f_{c0\,(MPa)}$	$f_{v0\,(MPa)}$	$f_{M\,(MPa)}$	$M_{oe\,(GPa)}$
Angelim-amargoso	84,8	21,9	161,9	18,27
Jatobá	89,6	27,0	165,5	15,73
Angelim-pedra	52,3	12,3	109,3	11,57
Cedrorana	46,6	7,2	77,8	12,85

Adapted from IPT (2013) for 12 %.

The modulus of elasticity obtained from the static bending test was lower than the values specified for commercial species listed in Table 8. Finally, jurema preta (*Mimosa tenuiflora* (Willd.) Poir) showed similarities in terms of mechanical properties with commercially native woods, notably Angelim-pedra and Cedrorana woods. This highlights the potential of the studied species, which has so far been predominantly commercialized as a source of biomass for energy in the semi-arid region of Brazil.

Classification

The Table 9 presents the classification of the species based on the obtained physical and mechanical properties.

Table 9: Species classification based on the criteria of Nahuz (1974) and Nogueira (1991).

Properties	Classification	Reference Values	Obtained Values
Apparent Density (kg/m³)	Heavy	$\rho_{15} > 805$	1,08
Shrinkage (Volumetric)	Medium	7,6 a 13,5	7,93
Compression Parallel to the Grain (MPa)	High	55,1 a 85	67,49
Shear Parallel to the Grain (MPa)	Very high	>20,1	21,96
Janka Hardness Parallel to the Grain (MPa)	Medium	40,1 a 90	85,83
Static Bending (MPa)	High	120,1 a 175	122,71

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Tensile Strength Parallel to the Grain (MPa)	Medium	75,1 a 100	90,81
Modulus of Elasticity in Bending (MPa)	Low	<10000	9540,37

* Values indicated by Nahuz (1974) and Nogueira (1991).

Based on the results in Table 9 and the classification criteria of IPT (2013) and IPT-SUDAM (1981), the species evaluated is not recommended for heavy external civil construction, as it does not meet the requirements for Janka hardness and high tensile mechanical properties. On the other hand, the species is suitable for heavy internal civil construction, due to its high shear strength, compressive strength and static flexure. In addition, it can be used in light civil construction, both internal and external (for decorative, utilitarian or structural purposes), considering its classification in physical properties. However, it is not recommended for use in residential flooring, as it does not reach the minimum required Janka hardness value greater than 90,1 MPa.

Data analysis

The species exhibited a normal distribution. There were two known correlations, but with low correlation coefficients: density with thermal conductivity (Figure 5a, R=0,690) and density with modulus of elasticity (Figure 5b, R=0,600).

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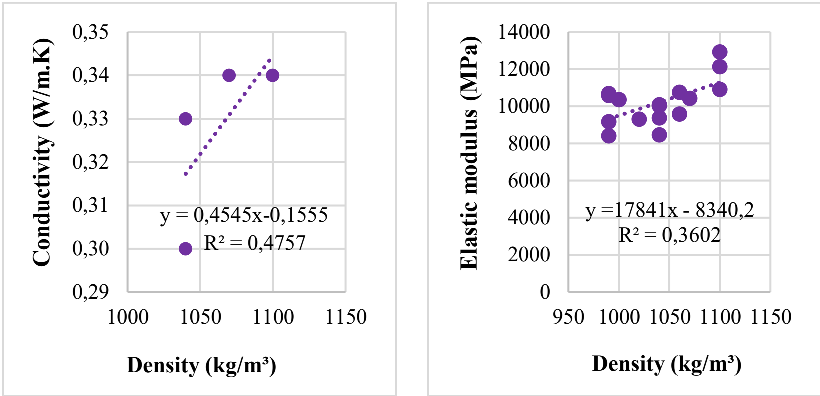

(a) (b)

Figure 5: Correlations of density with other properties, (a) density with thermal conductivity, (b) density with elastic modulus.

The low correlation between the highlighted properties and the absence of a higher number of correlations between physical and mechanical properties can be explained by internal defects, knots, or the presence of sapwood in the wood, which can cause changes in its properties and consequently in the correlations. The dendrometric characteristics of the species regarding diameter and the presence of bifurcations imply that the test specimens are free of defects.

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Conclusions

The species *Mimosa tenuiflora* falls into class D20 due to its low modulus of elasticity. It is classified as high-density (heavy) with medium dimensional stability, allowing its use in finishing pieces, flooring, and frames. Furthermore, its thermal conductivity suggests its use in coatings, moldings, and fittings with joints.

The mechanical pr

operties were similar to those of some wood species commercially available in Brazil, and it can be used in internal heavy civil construction, such as carpentry for trusses and stairs. In light civil construction, it can be used for posts, struts, gates, roofing elements, frames, and in the making of doors, louvers, frames, door frames, baseboards, trim, and fittings with joints.

The length of the pieces is a limiting factor. Therefore, lengths up to approximately 1,30 meters should be considered.

The correlations between physical and mechanical properties were low.

The results obtained through the characterization of the species from the Caatinga biome are important for expanding the database and indicating potential applications of local woods that have limited technological knowledge. *Mimosa tenuiflora*, in particular, exhibited favorable characteristics for structural and decorative use, thereby increasing the options for sustainable and renewable materials.

Therefore, the study of Mimosa tenuiflora addressed the scarcity of data on woody species from arid and semi-arid tropical regions, serving as a model for research on under-studied species, promoting the sustainable use of resources, and expanding material options for construction in challenging climates.

Athorship contributions

M. L. X. F. N-A.: Investigation, writing – review & editing. K. C. C.: Supervision, methodology. E. M. P.: Supervision, methodology. R. C. A.: Data curation, visualization. R. C. S. C: Resources, validation.

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