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IMPLEMENTATION, TEACHING AND PRESERVATION OF WOOD: LATECMA/UEMASUL XYLOTHEQUE

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ABSTRACT

The xylotheque is a collection of wood, with its identification duly ordered and cataloged according to the species to which it belongs, and its systematization allows the production of a database, encompassing greater accessibility to researchers and scholars. In view of this, the objective of the work was to implement a Xylotheque in the Laboratory of Wood Anatomy and Technology (LATECMA) at the Center for Agrarian Sciences (CCA) of the State University of the Tocantina Region of Maranhão (UEMASUL). The xylotheque was structured from the acquisition and standardization of wood samples from seizures carried out by the Federal Highway Police (PRF), allowing the physical storage and digital cataloging of the species. As a result, 103 genera were identified distributed in 33 botanical families, composing an essential collection for studies in wood anatomy and technology. In addition, the creation of a complementary digital catalog facilitates access to information developed about each species. The xylotheque stands out as a didactic and scientific instrument of great relevance, contributing to the preservation of knowledge about timber biodiversity and its application in various areas.

Keywords: Anatomical Characteristics. Wood Technology. Digital Catalog.

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INTRODUCTION

The Xylotheque is a collection of wood duly ordered and cataloged according to the species to which it belongs (Rocha and Jardim, 2023). These collections enable the study of the physical, mechanical and anatomical properties of wood, which can be valuable for the certification of its potential use. In addition, they serve as a reference for the identification of wood by comparison, being useful in several areas, such as archaeology, the timber industry, restoration, forensic analysis, among others (Silva *et al.*, 2021).

In this context, the clusters of botanical samples from different geographical locations function as a collection of information, helping in the recognition of other woods. The systematization of these collections allows the construction of a database, expanding accessibility for researchers and scholars and providing an important plurality of information on biodiversity (Melo Júnior *et al.*, 2014).

Following this approach, Xiloteca represents an extensive repository of physically cataloged wood species, significantly facilitating research and innovation related to this material. This type of collection is essential for the scientific identification of species, especially because empirical recognition alone is often insufficient and can lead to misclassification (Teixeira *et al.*, 2017).

Thus, the study of the properties of wood and its applications has aroused great interest in the scientific community. This growing interest has driven the search for wood for research and the development of new technologies, resulting in an increasing demand for this material as a raw material for innovation. According to Wiedenhoeft (2014), wood analysis provides an essential basis for understanding and solving problems in several areas of knowledge, such as taxonomy, archeology, anthropology, legislation, control and inspection of the timber trade, in addition to wood technology.

Considering this scenario, it is essential that undergraduate courses, especially those related to forest engineering, have laboratories that allow a better understanding of the practical aspects of the profession. In this sense, the implementation of a Xylotheque, making available samples of different species of wood, is a fundamental tool to deepen the knowledge of students about this material of great relevance to humanity.

In view of the above, this work aimed to implement a Xylotheque in the Laboratory of Wood Anatomy and Technology (LATECMA), linked to the Center of Agrarian Sciences of the State University of the Tocantina Region of Maranhão (UEMASUL).

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METHODOLOGY

PLACE OF DEPLOYMENT

The implementation process began in 2023 through an extension project, which enabled the structuring of the space and the systematization of the collection. The implementation of the Xylotheque took place at the Laboratory of Wood Anatomy and Technology (LATECMA) of the State University of the Tocantina Region of Maranhão (UEMASUL), located in the municipality of Imperatriz, Maranhão, Brazil (5°33'43"S; 47°27'16"W, and 124 m altitude).

The choice of this laboratory is due to its connection with the Bachelor's Degree in Forest Engineering, which demands an organized collection of wood samples for didactic and research purposes. In addition, LATECMA already had adequate infrastructure to receive and store samples in a safe and accessible way to the academic community.

For the storage of wood samples, a cabinet was made in partnership with the company ADECO Compensados, belonging to the Arboris Group, located in the municipality of Dom Eliseu, Pará.

ACQUISITION OF SAMPLES AND IDENTIFICATION OF GENERA/SPECIES

The wood samples were made available and donated by the Superintendence of the Federal Highway Police (PRF) of Imperatriz-MA. Such samples come from seizures of wood illegally transported by the highways of Maranhão. Most of these woods are of Amazonian origin, having great ecological and economic relevance for the forestry sector.

The identification of the samples, for the most part, occurs up to the botanical genus level, and is carried out by institutions and laboratories that are partners of the Federal Highway Police itself (example: Forest Products Laboratory of the Brazilian Forest Service). These samples, when sent to the Wood Anatomy and Technology Laboratory, are cataloged and stored to later be used for didactic and research purposes.

DIMENSIONAL STANDARDIZATION AND ENGRAVING OF THE NAME ON THE SAMPLES

The wood samples when they arrive at LATECMA are properly identified, but with irregular sizes, non-standardized, which makes handling, storage and didactic application difficult. Thus, the standardization of sample sizes was sought. This was carried out in the carpentry shop of the National Service for Industrial Learning (SENAI) in Imperatriz-MA, a

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partner institution. At the end, each sample of wood made received the laser engraving of its respective scientific name (at the genus level). This method ensures greater durability in the marking of names, avoiding future problems arising from the use of adhesive labels or similar.

CONFERENCE OF SCIENTIFIC NAMES

The verification of the scientific names of the samples followed the guidelines of the International Code of Nomenclature for Algae, Fungi and Plants (ICN), ensuring standardization and correct taxonomic attribution (IBC, 2018). The conference was held by consulting recognized botanical databases, such as Reflora and *The Plant List* (Reflora, 2025; The Planta List, 2025). This procedure ensured the accuracy in the nomenclature of the samples, avoiding inconsistencies and ensuring the fidelity of the records in the Xyloteca catalog.

DIGITAL CATALOGUING OF SPECIES

In addition to the physical storage of samples, as a complement to Xiloteca, a digital catalog was prepared containing detailed information about each genus and species present in the collection. The digital database with the cataloguing of the genera and species present in the xylotheca, facilitates quick consultation and management of information about each wood present in the collection. The digital catalog has information on the botanical classification, the general characteristics of the wood, as well as information on its anatomical, physical, chemical and mechanical properties. Such information was extracted from bibliographic sources such as books, scientific articles, dissertations, theses and online databases.

RESULTS AND DISCUSSION

The Xylotheca was implemented with the objective of properly organizing and preserving the wood samples. For this, a cabinet with small standardized compartments was used (Figure 1), which facilitates the organization and conservation of samples. This cabinet was installed at LATECMA and remains accessible to students, professors and researchers who use wood as a study material.

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Figure 1. Detail of the Xyloteca for the storage of wood samples from LATECMA/UEMASUL.

Source: Authors (2025).

The Xylotheque has about 103 genera distributed in 33 distinct botanical families (Chart 1). This expressive number of genera demonstrates the relevance of the collection for scientific studies and teaching activities, corroborating the importance of xylotheques as reference centers for the identification of species (Condé *et al.*, 2024).

Table 1. Composition of genera distributed by botanical families of the Xylotheque of LATECMA/UEMASUL.

Family	No.	Gender	Main Species	Popular name
Anacardiaceae	1	*Anacardium* sp.	*Anacardium occidentale* L.	Cashew
	2	*Astronium* sp.	*Astronium lecointei* Ducke	Muiracatiara
	3	*Spondias* sp.	*Spondias mombin* L.	Cajá-da-mata
	4	*Tapirira* sp.	*Tapirira guianensis* Aubl.	Pau-pombo
Apocynaceae	5	*Aspidosperma* sp.	*Aspidosperma polyneuron* Müll.Arg.	Peroba-rosa
	6	*Malouetia* sp.	*Malouetia tamaquarina* (Aubl.) A.DC.	Molongó
	7	*Parahancornia* sp.	*Parahancornia fasciulata* (Poir.) Benoist	Bitter Amapá
Araucariaceae	8	*Araucaria* sp.	*Araucaria angustifolia* (Bertol.) Kuntze	Araucaria
Bignoniaceae	9	*Handroanthus* sp.	*Handroanthus albus* (Cham.) Mattos	Yellow trumpet
Boraginaceae	10	*Cordia* sp.	*Cordia alliodora* (Ruiz & Pav.) Cham.	Freijó
Burseraceae	11	*Protium* sp.	*Protium heptaphyllum* (Aubl.) Art dealer	Pitch
	12	*Trattinnickia* sp.	*Trattinnickia burserifolia* Mart.	Amescla

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Calophyllaceae	13	*Calophyllum* sp.	*Calophyllum brasiliense* Cambess.	Guanandi
Caryocaraceae	14	*Cariocar* sp.	*Caryocar villosum (Aubl.)* Pers.	Piquiá
Chrysobalanaceae	15	*Couépia* sp.	*Couepia robusta* Huber	Agoutian nut
	16	*Licania* sp.	*Licania gracilipes* Taub.	Caraiperana
Clusiaceae	17	*Platonia* sp.	*Platonia insignis* Mart.	Bacuri
	18	*Symphony* sp.	*Symphonia globulifera* L.f.	Anani
Combretaceae	19	*Buchenavia* sp.	*Buchenavia grandis* Ducke	Cuiarana
	20	*Terminalia* sp.	*Terminalia amazonia* (J.F.Gmel.) Exell	Tanimbuca
Dilleniaceae	21	*Curatorship* sp.	*Curatella americana* L.	Sandwood
Elaeocarpaceae	22	*Sloanea* sp.	*Sloanea guianensis* (Aubl.) Benth.	Urucuna
Euphorbiaceae	23	*Alchornia* sp.	*Alchornia triplinervia* (Spreng.) Müll.Arg.	Tapiá
	24	*Hevea* sp.	*Hevea brasiliensis* (Willd. ex A.Juss.) Müll.Arg.	Rubber tree
Fabaceae	25	*Acacia* sp.	*Acacia mangium* Willd.	Australian Acacia
	26	*Albizia* sp.	*Albizia niopoides* (Spruce ex Benth.) Burkart	Dry flour
	27	*Alexa* sp.	*Alexa grandiflora* Ducke	Sucupira-cucumber
	28	*Apuleia* sp.	*Apuleia leiocarpa* (Vogel) J.F.Macbr.	Sugar cane juice
	29	*Bowdichia* sp.	*Bowdichia virgilioides* Kunth	Sucupira
	30	*Capara* sp.	*Carapa guianensis* Aubl.	Andiroba
	31	*Cedrelinga* sp.	*Cedrelinga cateniformis* (Ducke) Ducke	Cedrão
	32	*Copaifera* sp.	*Copaifera langsdorffii* Desf.	Copaiba
	33	*Dialium* sp.	*Guyanese Dialium* (Aubl.) Sandwith	Jutaí-pororoca
	34	*Dinizia* sp.	*Dinizia excelsa* Ducke	Red Angelim
	35	*Diplotropis* sp.	*Diplotropis purpurea* (Rich.) Amshoff	Sucupira
	36	*Dipteryx* sp.	*Dipteryx odorata* (Aubl.) Forsyth f.	Cumaru
	37	*Eperua* sp.	*Eperua falcata* Aubl.	Purple Apa-roxo
	38	*Goniorrhachis* sp.	*Goniorrhachis marginata* Taub.	Itapecuru
	39	*Hymenaea* sp.	*Hymenaea courbaril* L.	Jatoba
	40	*Hymenolobium* sp.	*Hymenolobium excelsum* Ducke	Angelim-stone
	41	*Inga* sp.	*Inga edulis* Mart.	Ingá-de-macaco
	42	*Melanoxylon* sp.	*Melanoxylon brauna* Schott	Braúna-da-mata
	43	*Mimosa* sp.	*Mimosa caesalpiniifolia* Benth.	Thrush
	44	*Parkia* sp.	*Parkia pendula* (Willd.) Benth. ex Walp.	Faveira

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	45	*Peltogyne* sp.	*Peltogyne angustiflora* Ducke	Purple
	46	*Piptadenia* sp.	*Piptadenia gonoacantha* (Mart.) J.F. Macbr.	Angico-alligator
	47	*Platimenia* sp.	*Plathymenia reticulata* (Benth.) Ducke	Pau-amarelo
	48	*Platymiscium* sp.	*Platymiscium floribundum* (Mart.) Benth.	Cerrado rosewood
	49	*Schizolobium* sp.	*Schizolobium parahyba* var. *amazonicum* (Huber ex Ducke) Barneby	Parica
	50	*Swartzia* sp.	*Swartzia campestris* (Benth.) Harms	Carobinha
	51	*Tachigali* sp.	*Tachigali paniculata* (Benth.) Ducke	Tacacá
	52	*Enterolobium* sp.	*Enterolobium timbouva* (J. G. Schult.) Benth.	Timborana
	53	*Vatairea* sp.	*Vatairea macrocarpa* (Benth.) Ducke	Angelim-do-cerrado
	54	*Vataireopsis* sp.	*Vataireopsis araroba* (Aguiar) Ducke	Bitter Angelim
	55	*Vouacapoua* sp.	*Vouacapoua americana* Aubl.	Acapu
	56	*Zollernia* sp.	*Zollernia paraensis Huber*	Rosewood
	57	*Zygia* sp.	*Zygia racemosa* (Ducke) Barneby & J.W.Grimes	Brindle Angelim
Goupiaceae	58	*Goupia* sp.	*Goupia glabra* Aubl.	Cupiúba
Humiriaceae	59	*Humiria* sp.	*Humiria balsamifera* (Aubl.) A.St.-Hil.	Mirim
	60	*Vantanea* sp.	*Vantanea macrocarpa* Ducke	-
Lamiaceae	61	*Tectona* sp.	*Tectona grandis* L.f.	Teak
Lauraceae	62	*Mezilaurus* sp.	*Mezilaurus itauba* (Huber) Ducke	Itaúba
	63	*Nectandra* sp.	*Nectandra grandiflora* (Nees) Nees	Stinky cinnamon
	64	*Ocotea* sp.	*Ocotea acutangula* (Miq.) Mez	Guapuru
	65	*Sextonia* sp.	*Sextonia rubra* (Mez) van der Werff	Red laurel
Lecythidaceae	66	*Bertholletia* sp.	*Bertholletia excelsa* Bonpl.	Brazil nuts
	67	*Cariniana* sp.	*Cariniana legalis* (Mart.) Kuntze	Jequitibá-rosa
	68	*Couratari* sp.	*Couratari guianensis* Aubl.	Tauari
	69	*Eschweilera* sp.	*Eschweilera nana* (Berg) Miers	Sapucainha
	70	*Lecythis* sp.	*Lecythis lurida* (Miers) S.A.Mori	Jarana
Malvaceae	71	*Apeiba* sp.	*Apeiba tibourbou* Aubl.	Pau-jangada
	72	*Ceiba* sp.	*Ceiba pentandra* (L.) Gaertn.	Floodplain Kapok
	73	*Eriotheca* sp.	*Eriotheca macrophylla* (K.Schum.) A.Robyns	Cotton
	74	*Ochroma* sp.	*Ochroma pyramidale* (Cav. ex Lam.) Urb.	Balsa wood
	75	*Sterculia* sp.	*Sterculia apetala* (Jacq.) Karst.	Camajuru

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Meliaceae	76	*Azadirachta* sp.	*Azadirachta indica* A.Juss.	Neem
	77	*Cedrela* sp.	*Cedrela odorata* L.	Pink cedar
	78	*Guaréa* sp.	*Guarea macrophylla* (Vahl) S.A. Mori	Café-bravo
	79	*Khaya* sp.	*Khaya senegalensis* (Desv.) A. Juss.	African Mahogany
	80	*Swietenia* sp.	*Swietenia macrophylla* King	Brazilian mahogany
Moraceae	81	*Bagassa* sp.	*Guyanese Bagassa* Aubl.	Tatajubá
	82	*Brosimum* sp.	*Brosimum gaudichaudii* Trécul	Amapá
	83	*Clarisia* sp.	*Clarisia racemosa* Ruiz & Pav.	Guariúba
	84	*Ficus* sp.	*Ficus gummeleira* Kunth	Fig tree
Myristicaceae	85	*Irianthera* sp.	*Iryanthera juruensis* Warb.	Ucuubarana
	86	*Ferrule* sp.	*Virola surinamensis* (Rol. ex Rottb.) Warb.	Mucuíra
Myrtaceae	87	*Eucalyptus* sp.	*Eucalyptus saligna* Sm.	Eucalyptus
Nyctaginaceae	88	*Guapira* sp.	*Guapira opposita* (Vell.) Reitz	Cheeky Mary
Pinaceae	89	*Pinus* sp.	*Pinus elliottii* Engelm.	Pinus
Proteaceae	90	*Roupala* sp.	*Roupala montana* Aubl.	Beef
Rutaceae	91	*Euxylophora* sp.	*Euxylophora paraensis* Huber	Yellowing
Sapotaceae	92	*Chrysophyllum* sp.	*Chrysophyllum lucentifolium* Cronquist	Bapeba-velvet
	93	*Ecclinusa* sp.	*Ecclinusa campinae* Terra-Araujo & Costa	-
	94	*Manilkara* sp.	*Manilkara huberi* (Ducke) A.Chev.	Maçaranduba
	95	*Micropholis* sp.	*Micropholis acutangula* (Ducke) Eyma	Star Abiu
	96	*Pouteria* sp.	*Pouteria caimito* (Ruiz & Pav.) Radlk.	Abiu
	97	*Pradozia* sp.	*Pradosia lahoziana* Terra-Araujo	-
Simaroubaceae	98	*Simaba* sp.	*Simaba orinocensis* Kunth	Marupá
	99	*Simarouba* sp.	*Simarouba will love* Aubl.	Box
Urticaceae	100	*Cecropia* sp.	*Cecropia pachystachya* Trécul	Embaúba
Vochysiaceae	101	Erisma sp.	*Erisma calcaratum* (Link) Warm.	Black sucupira
	102	*Qualea* sp.	*Qualea sprucei* Warm.	-
	103	*Vochysia* sp.	*Vochysia guianensis* Aubl.	Quaruba

Source: Authors (2025).

In Chart 1, a column was added that highlights the main species of each genus, in a representative way, in order to highlight the most significant species or those with greater

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representativeness in the Xylotheque. As can be seen, the Fabaceae family stands out in the Xylotheque, with 33 cataloged genera. This predominance highlights the ecological and economic relevance of this family in the Amazon region, where several species are widely exploited for commercial purposes (Souza, 2023; Morais *et al.*, 2024).

The Fabaceae family stands out as a primordial element in Amazonian ecosystems, playing a vital role in the species richness and forest structure of the region (Morais *et al.*, 2024; Myster, 2023). Its species are remarkably adapted to the conditions of the Amazonian environment, which contributes to the diversity and complexity of the local flora (Morais *et al.*, 2024). The detailed study of this botanical family, along with others such as Arecaceae and Myrtaceae, is essential to understand ecological interactions and support biodiversity conservation strategies in the Amazon (Miranda *et al.*, 2025; Santos *et al.*, 2024).

In addition to its ecological importance, the Amazonian flora, especially the Fabaceae, has enormous potential for the development of new scientific discoveries, such as bioactive compounds that can improve both local and global health practices (Santiago *et al.*, 2025). Understanding the functions and interactions of these plants not only supports conservation, but also provides a basis for more informed and effective environmental policymaking (Morais *et al.*, 2024; Myster, 2023). This demonstrates the need for an integrated approach, which considers both the ecological complexities and the social and economic benefits of Amazonian plants.

Additionally, genera such as *Apuleia*, *Dipteryx*, *Hymenaea* and *Peltogyne* are widely known and used in civil construction, furniture and other applications, due to their favorable physical and mechanical properties (Almeida *et al.*, 2014; Oliveira *et al.*, 2017; Grobério, 2000; Christoforo *et al.*, 2013). The marked presence of the Fabaceae family in the Xylotheque reinforces the need for in-depth studies on the anatomy and wood properties of these species, aiming at the conservation and sustainable use of forest resources.

Other families with significant representation in the Xylotheque include Anacardiaceae (4 genera), Apocynaceae (3 genera), Lecythidaceae (5 genera), Meliaceae (5 genera) and Sapotaceae (6 genera). Each of these families has distinct characteristics and properties, which give their woods different applications and potential uses (Terrazas, 2017; Marbun *et al.*, 2023). For example, species of the Lecythidaceae family, such as the Brazil nut tree (*Bertholletia excelsa*), are important for the economy of the Amazon region, both for the production of nuts and for the exploitation of wood. Species of the Meliaceae

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family, such as mahogany (*Swietenia macrophylla*) and cedar (*Cedrela odorata*), are highly valued in the timber market due to their beauty and durability (Silva *et al.*, 2014).

The presence of genera such as *Araucaria* (Araucariaceae) and *Pinus* (Pinaceae) in the Xylotheque indicates the inclusion of species not native to the Amazon region, probably from other regions of Brazil. The inclusion of these species in the collection can be useful for comparative purposes and for the study of the wood properties of different types of trees, allowing a comprehensive analysis of timber diversity (Tagliari *et al.*, 2021).

Identification of samples at the botanical genus level is essential, especially for timber from illegal seizures, which often lack accurate information about their origin. This type of identification is essential for monitoring the illegal timber trade, as it facilitates traceability and enforcement of marketing patterns. According to But *et al.* (2023), although identification at the genus level is not sufficient for the direct preservation of endangered species, it contributes to conservation efforts, as it helps to identify exploitation patterns and the potential presence of at-risk species.

Accurate identification of wood, at least at the gender level, is essential to understand its characteristics and properties, ensure the sustainable use of forest resources, and comply with regulations and certifications. This allows industries, such as construction, furniture and crafts, to obtain information for the development of products and services and to use wood effectively and safely (Marbun *et al.*, 2023).

The conservation of biodiversity is one of the fundamental benefits of a xylotheque with high diversity, as it contributes to the preservation of genetic resources essential for the resilience and adaptability of ecosystems in the face of environmental changes (Condé *et al.*, 2024). This is because, through the analysis of wood samples, it is possible to identify valuable genetic resources that can be used for conservation strategies and to restore damaged ecosystems. A practical example of this contribution is the development of DNA barcode libraries, which facilitate the accurate identification of wood species. These codes are critical to monitoring the legality of the timber trade and to protecting endangered species (Durmaz *et al.*, 2024; Beaumelle *et al.*, 2023).

Additionally, this diversity plays an important role in the conservation of rare and endangered species, driving global efforts to preserve biodiversity (Solaiman and Akerman, 2022). The 3D scanning of wood samples, as in the CuTAWAY project, also enables the virtual preservation of specimens, making them accessible for future research and facilitating long-term monitoring of forest biodiversity (Cramer *et al.*, 2024). These digital

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specimens can be widely shared, fostering collaboration between scientists, educators, and conservationists, thereby increasing the impact of biodiversity research (Blackburn *et al.*, 2024). In this way, the Xylotecas not only help in the identification and conservation of species, but also promote the integration of new technologies and methodologies that expand the understanding of biodiversity and the environmental threats that these species face.

Ecological research also benefits significantly from the diversity present in xylotheques. This variety enables in-depth dendroecological studies, such as the analysis of tree growth rings, which is essential for monitoring climate change (Camarero, 2021). In addition, a diversity of families and genera facilitates the investigation of interactions between species, expanding the understanding of ecosystem dynamics and sustainable management of natural resources.

To ensure the efficient and long-lasting identification of the xylotheque samples, laser engravings of the scientific names corresponding to each genus were performed (Figure 2).

Figure 2. Detail of the laser engraving on the wood samples of the LATECMA/UEMASUL Xyloteca (a and b).

Source: Authors (2025).

In addition to the physical samples, Xiloteca has a digital catalog, which in turn is a valuable reference resource to obtain detailed information about each genus/species cataloged. The contents of the catalogue cover various information, such as characteristics and general properties of the woods in the collection, the family to which each genus belongs, the main species within each genus, the occurrence of the genera, representative

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images of the genus/species and a description of the anatomical characteristics. It is worth mentioning that this digital catalog can be accessed via *QR code* (Figure 3).

Figure 3. Online access via *QR-code* to the digital catalog of Xiloteca of LATECMA/UEMASUL.

Source: Authors (2025).

In the future, it is sought to expand the xylotheque collection with new species from different Brazilian biomes, increasing its representativeness. In addition, digitizing the samples and creating an interactive database will facilitate remote access to information. Partnerships with other institutions will also be strengthened to improve the identification and cataloguing of wood, consolidating the xylotheque as a reference for teaching, research and forest conservation.

CONCLUSION

The implementation of the xylotheque at LATECMA/UEMASUL represented a significant advance for teaching, research and the preservation of knowledge about wood. The collection has 103 genera distributed in 33 botanical families, offering essential support for the identification and study of the physical, anatomical and technological characteristics of wood. The diversity present in the xylotheque allows the expansion of research on different genera/species, contributing to the appreciation of timber biodiversity. In addition, the digitization of the xylotheque through the digital catalog expands access to knowledge, facilitating consultation and promoting the dissemination of information. In this way, the

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xylotheque strengthens the academic training of students and boosts external scientific research for the appreciation and conservation of forest biodiversity.

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