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Short communication. Wood identification based on their common name and their transversal surface anatomy. Application to the batch from the expedition of Ruiz and Pavon

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Abstract

Aim of study: To identify species of wood samples based on common names and anatomical analyses of their transversal surfaces (without microscopic preparations).

Area of study: Spain and South America

Material and methods: The test was carried out on a batch of 15 lumber samples deposited in the Royal Botanical Garden in Madrid, from the expedition by Ruiz and Pavon (1777-1811). The first stage of the methodology is to search and to make a critical analysis of the databases which list common nomenclature along with scientific nomenclature. A geographic filter was then applied to the information resulting from the samples with a more restricted distribution. Finally an anatomical verification was carried out with a pocket microscope with a magnification of x40, equipped with a 50 micrometers resolution scale.

Main results: The identification of the wood based exclusively on the common name is not useful due to the high number of alternative possibilities (14 for "naranjo", 10 for "ébano", etc.).

The common name of one of the samples ("huachapelí mulato") enabled the geographic origin of the samples to be accurately located to the shipyard area in Guayaquil (Ecuador). Given that Ruiz y Pavon did not travel to Ecuador, the specimens must have been obtained by Tafalla. It was possible to determine correctly 67% of the lumber samples from the batch. In 17% of the cases the methodology did not provide a reliable identification.

Research highlights: It was possible to determine correctly 67% of the lumber samples from the batch and their geographic provenance.

The identification of the wood based exclusively on the common name is not useful.

Key words: historic wood; Ruiz and Pavon's expedition; wood anatomy; wood identification; wood nomenclature.

Introduction

In 1777 a botanical expedition headed by Ruiz and Pavon set out for the viceroyalty of Peru. Over a period of 34 years a variety of plant material was sent back to Spain, among which are various batches of small wooden planks. These planks are currently deposited at the Royal Botanical Garden in Madrid (RBGM), along with samples from other expeditions. The Spanish Crown's main interest lay in locating alternative sources of lumber to those traditionally used in naval construction, in order to enlarge their shipping fleet. Most of the pieces are identified only by their common name, by means of a label stuck on during the expedition.

The traditional procedure for identifying wood consists of preparing samples for observation under a microscope. This process is slow due to the fact that the samples must be extracted, softened, cut into slices of 20 micrometres, dyed, etc. It is also a complex task to identify lumbers whose source is unknown. The advantage of this traditional method is that it generates reliable results (with the drawback of high economic costs).

This work proposes an alternative method of identification based on the common name and the

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Abbreviations used: RBGM = Royal Botanical Garden in Madrid.

anatomical observation of the transversal surface. The advantages of this method are its lower costs and its speed. It should also be added that in the case of historical samples, the pieces remain practically unaltered.

However the method must be assessed to determine whether the appearance of errors detracts from the utility of this process.

Material and methods

The sample on which the test was done was the batch of planks from the expedition of H. Ruiz and J. A. Pavon (measuring approximately 500 mm long and 100 mm × 20 mm in cross section), which exceptionally present the scientific name together with the common name. Previously the staff at the RBGM were asked to conceal the original labels and reveal only the common name. The common names identifying each plank are shown in Table 1.

The first stage of the methodology is to search the databases which list common nomenclature along with scientific nomenclature. The existence of accurate lists of this type began with Meyer (1936). Since then, several authors have produced works relating the two denominations in a general way (Guindeo and Peraza, 1976; AITIM, 1997; Villasante, 2007; Forest Products Laboratory, 2011) or specialising in one particular aspect (Chichignoud, 1990).

The advances in digital information in recent decades have enabled more extensive lists to be compiled, with a greater classification of the contents, making it possible to establish the degree of reliability of different alternatives. This factor is of great importance in the case of wood, as the relationships between the common and scientific names are not biunivocal: the same species may be denominated with different names ("samba", "obeche" or "ayous"); or a single name ("cedar") may be applied to various species of different genera. It should be added that these relationships are also progressively distorted over the passage of time, thereby further hindering the study of historic lumbers.

In 2004, AENOR published the standard EN 13556:2004 in order to establish European agreement on the common denominations of woods (a requirement already highlighted by Meyer in 1936). Unfortunately, these recommendations are not as yet being followed (Villasante, 2007).

Table 1. Localised scientific names for each common name in each of the phases

Common name	Phase 1	Phase 2	Filter Phase
Ébano	7	10	3
Huachapelí mulato	2	2	1
Huaranga	3	3	3
Huayabo de montaña	6	7	3
Huayacán	5	9	4
Mamey de Cartagena	3	3	1
Matasaña	1	5	5
Morita	1	3	1
Naranjo	1	14	4
Níspero	2	8	3
Olivo	2	9	3
Palo colorado de montaña	4	10	2
Palo de vaca	1	4	1
Palo santo	5	12	4
Peliche	3	5	3

The numbers indicate the quantity of different scientific names associated to each common name in each phase. Phase 1: search in Villasante (2007); Phase 2: extended search centred on America; Filter Phase: elimination of sources outside Ecuador and neighbouring countries.

We opted to use as the primary database (Phase 1) the one compiled by Villasante (2007), which lists 92 databases, including those of Guindeo and Peraza (1976), AITIM (1997) and Chichignoud (1990). To include possible terminological alterations the search was expanded to words with modifications (for example in the case of "huayacan" the terms "huaiacan", "guayacán", "guaiacán", etc., were incorporated).

Based on this preliminary approach, the search was extended to focus on woods from America (Phase 2), incorporating information from printed or digital documents from this continent. Of particular interest was the publication of Grandtner (2005), where most of the information was found. A geographic filter was then applied to the information resulting from the samples with a more restricted distribution (Filter Phase). Finally an anatomical verification was carried out with a pocket microscope with a magnification of ×40, equipped with a 50 micrometers resolution scale. The observations were made on the transversal surface, and the following variables were analysed:

- Distribution of vessels and grouping.
- Quantity of vessels per square millimetre.
- Presence of deposits in the vessels.
- Tangential diameter of the vessels.

— Distribution of the parenchyma.

— Quantity of rays per millimetre (in tangential direction).

For this analysis we used the information provided by Richter and Dallwitz (2000) and by InsideWood Working Group (2004). The definition of these variables (together with the types they include and the processing criteria) was done according to Richter and Dallwitz (2000). Four repetitions were carried out in the analysis of each variable (in random areas of the section). The repetitions coincided due to the fact that the criteria defined in Richter and Dallwitz (2000) tend to be of the interval type.

Results and discussion

Some of the denominations ("naranjo", "olivo", etc.) are somewhat vague and may refer to very different species from sources which are quite distant from each other. However certain common names are more specific and enable the geographic origin of the samples to be determined. In Phase 1 it can be deduced that the American continent is the area in which all the common names coincide. In Phase 2, the case of "huachapelí mulato" is particularly clear due to the fact that the information on this denomination was only localised in the coastal zone of Ecuador, in connection with the shipyards of Guayaquil and corresponding to the species *Pseudosamanea guachapele* (Kunth) Harms. In the case of other samples, all the information indicates that the origin of the batch of planks is associated with this shipyard. The area established in the Filter Phase was Ecuador and the neighbouring countries, assuming the homogeneity of the source of the batch.

Table 1 shows the number of alternatives obtained in Phase 1 (an average of 3.1), Phase 2 (an average of 6.9) and the filter phase (an average of 2.7).

In all 15 samples the anatomical analyses produced a single alternative, except in the sample "ébano" which has two (in this case, a subsequent microscopic analysis would be required). In the samples for "olivo" and "palo de vaca" the methodology discarded all the alternatives and thus does not offer any results. Table 2 shows the identification obtained for each sample.

Due to the fact that the botanists Ruiz and Pavon did not manage to visit Ecuador, information was sought in the works of Tafalla, who continued in the Americas after most of the expedition returned to Spain in 1788. His work *Flora Huayaquilensis* (published in 1989) includes the following quotation on page 105 of the first volume: "List of planks worked in various precious timbers from Peru Huayaquil and Province of Quito existing in the Office of Peruvian Flora" [original in spanish]. The information from this list coincides with the names concealed on the original labels of the samples. Tafalla's identifications are shown in Table 2, in order to establish the number of correct results. Of the 15 planks, Tafalla was unable to identify three (he adds the note "Genus novum" or "ignota") and one, *Rhamnus lotus*, is erroneous as this Mediterranean species does not grow in America.

Table 2 shows the correct results obtained with the method proposed in this work. In 67% of the cases the samples were correctly identified, and in 8% microscopic analysis was required to select between two alternatives. In one of the cases, "morita", the identification made by Tafalla is doubtful, as *Eugenia malaccensis* L. comes from Asia and although it is currently widespread throughout the tropics, it is unlikely to have had a significant presence in Ecuador in the early 18th century. The methodology proposed gave no results in 17% of the cases.

Conclusions

The samples studied were collected by Tafalla, not by Ruiz and Pavon.

It was possible to determine correctly 67% of the lumber samples from the batch. In 17% of the cases the methodology did not provide a reliable identification. Verification was impossible in another 17% due to doubts arising from the scientific names for Tafalla.

In order to obtain acceptable results it was essential to use a combination of analysis of common names, geographic origin and wood anatomy with a magnification of 40.

The geographic origin of the samples was determined fairly accurately (area of Guayaquil, Ecuador).

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Table 2. Identification of the samples according to the methodology proposed and according to their collector J.J.Tafalla

Common name	Identification using the proposed methodology	Identification according to Tafalla	Correct?
Ébano	*Tabebuia* sp. o *Caesalpinia paipai* Ruiz & Pav.	*Rhamnus lotus*? *	Microscopic analysis needed
Huachapelí mulato	*Pseudosamanea guachapele* (Kunth) Harms	Mimosa	YES (*Pseudosamanea* belongs to Mimosaceae)
Huaranga	*Parkia* sp.	Mimosa	YES (*Parkia* belongs to Mimosaceae)
Huayabo de montaña	*Calycophyllum spruceanum* (Benth.) Hook.f. Ex K.Schum.	Ignota	
Huayacán	*Tabebuia* sp.	*Bignonia*	YES *(Bignonia chrysantha = Tabebuia chrysantha)*
Mamey de Cartagena	*Mammea americana* L.	*Mammea americana*	YES
Matasaña	*Piscidia carthagenensis* Jacq.	*Piscidia erythrina*?	YES *(P. erythrina* comes from Central America)
Morita	*Maclura tinctoria* (L.) D.Don Ex Steud.	*Eugenia malacensis* L.*	DOUBTFUL
Naranjo	*Aspidosperma* sp.	Genus novum	
Níspero	*Manilkara* sp.	*Achras zapota*?	YES (*Achras zapota = Manilkara zapota*)
Olivo	—	*Cervantesia ferruginea*	No results
Palo colorado de montaña	*Simira* sp.	Gen. novum?	
Palo de vaca	—	*Bignonia triflora*	No results
Palo santo	*Triplaris cumingiana* Fisch. & C.A.Mey.	*Triplaris racemosa*	YES *(T. racemosa* only appears in the work of Tafalla)
Peliche	*Vitex gigantea* Kunth.	*Vitex leucoxylon*?	YES (The area of *V. leocoxylon* is Asia)

* Tafalla's identification of "*Rhamnus lotus*" is incorrect and "*Eugenia malacensis* L." is doubtful.

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