



Comparison of Lamiaceae medicinal uses in eastern Morocco and eastern Andalusia and in Ibn al-Baytar's Compendium of Simple Medicaments (13th century CE)



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ABSTRACT

Ethnopharmacological relevance: Transmission of traditional knowledge over time and across culturally and historically related territories is an important topic in ethnopharmacology. Here, we contribute to this knowledge by analysing data on medicinal uses in two neighbouring areas of the Western Mediterranean in relation to a historical text that has been scarcely mentioned in historical studies despite its interest.

Aim of the study: This paper discusses the sharing of popular knowledge on the medicinal uses of plants between eastern Morocco and eastern Andalusia (Spain), focusing on one of the most useful plant families in the Mediterranean area: Lamiaceae. Moreover, we used the classical work of Ibn al-Baytar (13th century CE) *The Compendium of Simple Medicaments and Foods* as a basis to contrast the possible link of this information, analysing the influence of this historical text on current popular tradition of medicinal plant use in both territories.

Materials and methods: For data collection, we performed ethnobotanical field research in the eastern part of Morocco, recording current medicinal uses for the Lamiaceae. In addition, we systematically reviewed the ethnobotanical literature from eastern Andalusia, developing a database. We investigated the possible historical link of the shared uses and included in this database the information from Ibn al-Baytar's *Compendium*. To compare the similarity and diversity of the data, we used Jaccard's similarity index.

Results: Our field work provided ethnobotanical information for 14 Lamiaceae species with 95 medicinal uses, serving to treat 13 different pathological groups. Of the total uses recorded in Morocco, 30.5% were shared by eastern Andalusia and found in Ibn al-Baytar's work. There was a higher similarity when comparing current uses of the geographically close territories of eastern Morocco and eastern Andalusia (64%) than for eastern Morocco and this historical text (43%). On the other hand, coincidences between current uses in eastern Andalusia and the ones related in the *Compendium* are lower, 28%.

Conclusions: The coincidence of the current ethnobotanical knowledge in the two territories is high for the Lamiaceae. Probably the shared historical background, recent exchanges, information flow, and the influence of the historical herbal texts have influenced this coincidence. In this sense, there is a high plant-use overlap between Ibn al-Baytar's text and both territories: nearly half of the uses currently shared by eastern Morocco and eastern Andalusia were included in the *Compendium* and are related to this period of Islamic medicine, indicating a high level of preservation in the knowledge of plant usage. The study of 14 species of Lamiaceae suggests that this classical codex, which includes a high number of medicinal plants and uses, constitutes a valuable bibliographical source for comparing ancient and modern applications of plants.

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1. Introduction

1.1. Historical studies on medicinal plants

The need for an interdisciplinary approach to understand the relationship between plants and human societies has been argued many times (Balick and Cox, 1996; Heinrich et al., 2006; Leonti, 2011). The study of the knowledge transmission regarding drugs and *materia medica* from native areas through history is fundamental for ethnopharmacological research (Touwaide and Appetiti, 2013). Knowledge from written tradition cannot simply be taken from any point in history without checking its antecedents. Transmission or, conversely, loss of knowledge as well as the development of new knowledge carry important information for ethnopharmacology, helping to optimise the therapeutic uses of the available resources among populations. The relevance of the historical methods in the context of ethnobotany and ethnopharmacology has been highlighted (Heinrich et al., 2006; Leonti et al., 2009, 2010), and historical studies dealing with the link of the traditional plant uses have recently been developed. For example, Leonti et al (2010) argued that one of five plant uses from the modern ethnobotanical literature in Campania comes directly from Matthioli's *Materia Medica*. Pollio et al. (2008) compared Hippocrates' medicinal uses and contemporary ones throughout the Mediterranean region for the genus *Ruta* in order to analyse their continuity from the ancient antiquity to the present. Vos (2010) stated: "the written historical record becomes increasingly important, not only for information about potential medicines but to address issues of ownership and intellectual property rights for traditional medical knowledge".

To provide a context for this work, we should mention that in the Iberian Peninsula the first written documents on traditional knowledge came from historical figures such as Strabo (64 or 63 BCE–c. 24 CE) or Collumela (4-c. 70 CE) (Pardo-de-Santayana et al., 2014). From 711 to 1492 CE, the Muslims dominated the areas previously known by the Roman name Hispania, and the territory was named "Al-Andalus". It occupied a variable number of territories of Spain and Portugal, leaving a vast legacy in culture and knowledge reflected by the fact that nearly 8% of Spanish words are of Arabic origin (Quintana and Mora, 2002). During this period, the Spanish-Muslim agronomists, botanists, and physicians expanded their therapeutic arsenal, developing vast knowledge on medicinal plants and employing a large number of species. This time of advancement for medicine was shaped by names such as Ibn Zhur (1094–1162 CE), Averroes (1126–1198 CE), Maimonides (c.1138–1204 CE) or Ibn al-Baytar. The so-called "Andalusian Agricultural School" (10th to 15th centuries) was analysed by Hernandez-Bermejo and García (2000), considering it "an unknown world heritage". One of the most important works from this time is Ibn al-Baytar's *Kitab al-Yami' li-mufradat al-adwiya wa-l-aghdiya* (the *Compendium of Simple Medicaments and Foods*, hereafter the *Compendium*).

1.2. Ibn al-Baytar, an overview of his life and work

"Diya al-Din Abu Muhammad Abdullah Ibn Ahmed Ibn al-Baytar", hereafter referred to as "Ibn al-Baytar", was a physician, pharmacologist and botanist, probably born in Benalmádena (Malaga, Spain) in 1197 CE. Called "the Spanish Dioscorides" by the historian Menéndez Pelayo, he was probably the foremost botanist among the Moors of this age (Álvarez-de-Morales, 2008). He studied the works of Dioscorides and Galen as well as those from the main physicians from Persia, eastern Arabia, and Al-Andalus. He focused on botany and pharmacology as the complementary disciplines for medicine (Cabo-González, 1999). He has also been recognized as the first author to give a written description of distillation and essential oils (Pavela, 2015). Although his biography is not completely clear, it is thought that in 1219, after his studies, he left Malaga to travel the Islamic world to collect plants, even reaching Syria, Anatolia, Palestine, and Arabia. He died in

Damascus in 1248 AD, leaving a large collection of botanical and pharmacological works (Cabo-González, 1997). The most important, the *Compendium*, is one of the major works in Arabic on this issue (Álvarez-de-Morales, 1986). It is considered a pharmacopoeia where some 1400 simple medicaments and foods are described and alphabetically listed, mostly medicinal plants, but also animal and mineral derivatives. To write the work, apart from including his own observations, he consulted about 150 works from previous Arab authors and 20 Greek ones (McNeil, n/d,). The value of the work is manifold: he added 300–400 new simple medicaments to the previous pharmacological works, systematized the discoveries of earlier Arabs, and gave plant names in different languages (Arabic, Persian, Indian, Greek, Latin, and Romance languages) (Álvarez-de-Morales, 1986; Navarro, 1997). Some of the studies on his life and work include Álvarez-de-Morales, (1986, 2008), Cabo-González (1997), Carrillo and Torres-Palomo (1982), Navarro (1997) and Cabo-González (1999), but a historical overview can be found in some general Islamic Medicine books (Akhmisse, 1985; Sterpellone and El sheikh, 1995; Bellakhdar, 1997; Guardi, 1999). This medical tradition, shaped in the 10th century and developed in the 11th to 12th, reached its peak in the 13th to 16th centuries and later declined during the 17th to 19th centuries (Hamarneh, 1991; Lev, 2002). Medical literature and healing methods that had been the core of traditional medicine for over a thousand years were marginalized by the advent of Western medicine in the 19th to 20th century, becoming the exclusive domain of folk medicine and traditional healers (Lev, 2002; Lev and Amar, 2000).

1.3. Modern ethnobotany in Morocco and Andalusia

Ethnobotanical scientific studies in Morocco are relatively young, starting with works by Bellakhdar during the 1970s, 1980s, and 1990s (Bellakhdar, 1978, 1984, 1997; Bellakhdar et al., 1982, 1991). Since then, many works have appeared, with special attention to those of Boulos (1983), Kahouadji (1995), Hmamouchi (1999), Merzouki et al., (2000, 2003), Jouad et al. (2001), Eddouks et al. (2002), El-Hilaly et al. (2003), and Tahraoui et al. (2007). However, only two references focus on the neglected eastern part of the country (Ziyyat et al., 1997; Fakchich and Elachouri, 2014). The bibliographic research concerning classical Arabic texts on *Materia Medica*, by authors from Andalusia and the Maghreb, indicate that the current Moroccan pharmacopoeia has a remarkable historical continuity with respect to the nature of the remedies: 77.7% of simple medicaments employed (including medicinal plant parts) were mentioned in the texts consulted (Bellakhdar, 1997).

Similarly, modern ethnobotanical studies in Andalusia started with the work of González-Tejero (1985), pursuing a research line with several local works (Muñoz-Leza, 1989; González-Tejero, 1990; González-Tejero et al., 1995; Martínez-Lirola et al., 1996, 1997; Mesa, 1996; Triano et al., 1998; Guzmán-Tirado, 1997; Fernández-Ocaña, 2000; Benítez, 2009; Benítez et al., 2010a) and some comprehensive analyses (Benítez et al., 2010b, 2012), focused mainly on the eastern part of the region. As in other Iberian territories where ethnobotanical studies were undertaken during the last two decades (e.g. some of the most recent ones being Carrió and Vallès, 2012; Menendez-Baceta et al., 2012; Alarcón et al., 2015; Rigat et al., 2015), eastern Andalusia can be now considered a region with noteworthy literature on traditional knowledge. However, even with some historical studies (Hernández-Bermejo and García, 1998, 2000), this topic still lacks in-depth studies on the origin of the current traditional knowledge on the use of plants.

This research is part of a more comprehensive study comparing Morocco and Andalusia in terms of the current medicinal uses of species from several botanical families. Several classical texts were used in order to analyse the similarities between territories and the influence of classical texts in the accumulation of ethnobotanical knowledge in each territory. As the importance of the family Lamiaceae in ther-

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